Facilitation of phonological awareness in three and four year old children

Thesis

UNRESTRICTED

FACILITATION OF PHONOLOGICAL AWARENESS IN THREE AND FOUR YEAR OLD CHILDREN

LYNN
SARA INNES

A thesis submitted in partial fulfilment of the requirements for the degree of Master of Philosophy in the discipline of Child Language Development
to the Open University

QUEEN MARGARET COLLEGE

APRIL 1995

Date of submission: April 1995

Abstract

This study investigated the effect of a short-term facilitation programme aimed at increasing the phonological awareness of pre-school, pre-literate children between three-and-a half and four-and-a-half years of age.

Forty-eight subjects were assessed both before and after a four-week intervention phase on four measures of metaphonological ability as well as measures of metasyntactic ability, auditory memory, auditory discrimination.
Following the pre-intervention assessments, subjects were allocated to one of three groups, Groups A, B and C each containing sixteen subjects and matched for age, gender, social background and linguistic ability.
Group A received a programme specifically designed to facilitate metaphonological abilities in 8 half-hour sessions. The first control group (Group B) received the same amount of input with a programme targeting semantics instead. Group C, the second control group, received no intervention.

The increase in mean combined metaphonological score from pre- to post-intervention testing for Group A was significantly greater than for either Group B or Group C while the two control groups did not significantly differ from one another. No significant difference was found amongst the three groups for any other measures. No statistically significant difference was found amongst Groups A, B and C for any of the pre-intervention assessment measures.

The results suggest that the metaphonological intervention programme significantly influenced the metaphonological abilities of a group of three and four year old children while the control conditions had no such effect. Although previous studies have obtained similar results, they have all involved older pre-school or school-age children. The present study provides evidence that a metaphonological intervention programme could benefit young pre-school, pre-literate children in their preparation for school and their pursuit of reading readiness.
Pre-school children have disparate levels of metaphonological ability having had different metaphonological experiences. Not all children are equally ready to develop literacy skills when they start school. Children with poor phonological awareness, especially those with delayed or disordered language, are thought to be at risk of future reading difficulties and would particularly benefit from pre-school metaphonological intervention.

Contents

Chapter 3: Method

Appendices

List of tables

Acknowledgements

I have quite a few people to thank. Without some of these people I would never have come so far along the road towards producing this work.
They know who they are.

Firstly, I would like to thank my supervisor Daphne Waters for her tireless efforts to keep me on track and maintain my motivation. She has done a wonderful job, for which I will remain forever grateful. I also need to thank my second supervisors, Liz Dean and Christine Skinner for their contributions to proof reading, suggestions an discussion. There are other members of staff at Queen Margaret College who also deserve thanks: for his advise on statistical analysis, I would like to acknowledge Granville Bevan; and for his assistance in producing audio-tape material I want to thank Ron Motherwell.

Nursery teachers, nursery nurses, head teachers and parents at each nursery school have all helped the data gathering run as smoothly as it has. Their co-operation is very much appreciated. Thanks should also go to the children, without whom there would be no study. They have made the work so enjoyable.

Finally, for his enduring emotional, fiscal and physical support, I would like to thank John. He has helped to sustain this prolonged struggle to put 'it' all down on paper.

Introduction

Children's awareness of language, and awareness of the sounds of the language in particular, are thought to be important skills in the acquisition of literacy (for example, Bialystok and Mitterer, 1987; Garton and Pratt, 1989). There is evidence that awareness of phonology begins to emerge in early childhood (e.g. Chaney, 1992; Tunmer and Fletcher, 1981) although rapid development in metaphonological abilities occurs in school-age children (e.g. Liberman, Shankweiler, Fischer and Carter, 1974; Fox and Routh, 1975). Children with poor phonological awareness are thought to be at risk for future reading difficulties (e.g. Catts, 1991). The literature suggests that it might be better to train metaphonological abilities before children begin to learn to read (for example, Lie, 1991; Torgesen, Wagner and Rashotte, 1994).

There is evidence from previous training studies that phonological awareness can be accelerated in both school age (e.g. Lie, 1991; Bradley and Bryant, 1983) and pre-school children over the age of four and a half years (e.g. Byrne and Fielding-Barnsley, 1991; Cunningham, 1990; Lundberg, Frost and Petersen, 1988). There have been no training studies investigating the effect of metaphonological training below this age.

The present study investigated the effect of a short-term facilitation programme aimed at increasing the phonological awareness of three and four year old pre-school and pre-literate children. This thesis describes the investigation and the context within which the study was designed.

The first chapter provides an introduction to metaphonological abilities within the wider context of metalinguistic abilities in general. Having defined and described metaphonological abilities, evidence for the development of these abilities is presented. The remainder of the chapter deals with the relationship between metaphonological abilities in particular and other developmental abilities and factors: linguistic development, social and family background, cognitive abilities and the acquisition of literacy.

Chapter Two reviews the studies which are precursors to the investigation. The studies are described and the methodological issues which emerge are discussed. The following chapter describes the method of the investigation which includes the aims, methodology and methods of statistical analysis employed in the study.

In Chapter Four the results of the investigation are reported and the final chapter discusses the results in relation to the hypothesis. The study is critically reviewed and implications of the results and directions for future reseach are suggested. Conclusions are drawn regarding the benefits that this type of programme might afford pre-school children in their preparation for school and their pursuit of reading readiness.

Chapter One

An introduction to metaphonological ability

This first chapter serves to introduce the concept of metaphonological ability, its nature, development and relationship with other developmental abilities and factors, within the framework of metalinguistic ability in general.

The chapter is divided into six main sections. The first section describes the nature of metaphonological ability within the context of metalinguistic abilities [1.1.]. Evidence relating to the development of metalinguistic abilities is examined in the second section, focusing specifically on the development of phonological awareness [1.2.].

The following sections describe the relationship between the development of metalinguistic abilities and other associated factors in child development. The first of these deals with the relationship of metalinguistic ability with language development [Section 1.3]. The influence of social background on metalinguistic ability is discussed in the next section [1.4.]. Section 1.5. examines the relationship between metalinguistic ability and cognitive abilities and the final section [1.6.] looks at evidence concerning the relationship between metaphonological ability and the acquisition of literacy and educational implications which are of particular concern and motivation in the context of this study.

1.1 The nature of metaphonological abilities

1.1.1. Defining metaphonological abilities

Language is not only a means of communication, but also a system of representation (Sinclair, 1978). It is the awareness of language as a system of representation which is studied in the field of metalinguistics [see section 1.1.5.]. Within the field of metalinguistics, and the main focus of this study, is the area of metaphonological ability, the awareness of phonology of the language, and this will therefore be discussed first and in most detail. Phonology is the linguistic level concerned with the speech sound system of a language. That is the pattern of contrastive sounds in a language and the way in which these sounds combine to convey meaning.

With reference to definitions of metalinguistic ability [1.1.5.] the following statement defines metaphonological abilities for the purposes of this research.

> Metaphonological abilities are those which allow reflection on and conscious manipulation of the sound system of language.

1.1.2. Metaphonological abilities and phonological units

Metaphonological ability refers to the awareness of phonological units (syllable, onset, rime and phoneme). Many of the studies in the metaphonological literature seem to give contradictory evidence of children's metaphonological abilities. In many cases, the blanket term of metaphonological ability has been used as if the findings of each study related to all phonological aspects, when not every aspect has been investigated. This has led to some misleading conclusions about children's abilities. For this reason it is important to consider the specific phonological unit involved in each reported study of metaphonological ability.

The stream of speech can be divided into individual words and each word is further divisible into phonological units. There are three types of phonological unit: syllabic, intrasyllabic and phonemic as defined below.

1.1.2.1. Syllable

The syllable is the largest phonological unit and can itself be further divided into intrasyllabic units and phonemes. A word may consist of one or more syllables. In terms of phonemes, each syllable contains a vowel and may also have a consonant or cluster of consonants at its beginning and/or its end (Goswami and Bryant, 1990).

A syllable always includes the intrasyllabic unit of rime although it may not always have an onset, and may consist of one or more phonemes. [See Table 1 below for examples.]

1.1.2.2. Intrasyllabic units

The syllable can be divided into two intrasyllabic constituents: an onset and a rime (Goswami and Bryant, 1990). The onset and rime themselves can be further divided.

(i) Onset

The onset is optional and consists of the initial consonant or consonant cluster of the syllable (in the words 'stall' and 'wall' the onsets are /st/ and /w/ respectively, however in 'all' there is no onset only a rime, /ɔl/). Words with the same onset are said to be alliterative.

(ii) Rime

The rime is obligatory and is made up of a vowel nucleus in all cases and may be followed by a final consonant or consonant cluster, the coda, which is optional (the rime of the word 'soft' is 'oft' /ɒft/, the vowel nucleus is 'o' /ɒ/ and the coda is 'ft' /ft/; there is no coda in the rime of the word 'shoe', only a vowel nucleus /u/). [The term *rime* is used to label the phonological unit itself, while the term *rhyme* is used to describe the perceptual phenomenon between two words which share the same rime.]

[See Table 1 below for further examples.]

1.1.2.3. Phoneme

The phoneme is the smallest phonological unit. There are different classes of phoneme including vowels, plosives, fricatives, affricates and approximants. [See Table 1 below for examples.]

Table 1 Division of a selection of words into different phonological units - syllabic, intrasyllabic and phonemic units.

	SYLLABIC UNITS	INTRASYLLABIC UNITS		PHONEMIC UNITS
WORD	**Syllable**	**Onset**	**Rime**	**Phoneme**
all	all	-	ɔl	ɔ l
wall	wall	w	ɔl	w ɔ l
stall	stall	st	ɔl	s t ɔ l
install	in	-	ɪn	
	stall	st	ɔl	ɪ n s t ɔ l
soft	soft	s	ɒft	s ɒ f t
shoe	shoe	ʃ	u	ʃ u
caterpillar	ca	k	æ	
	ter	t	ə	
	pi	p	ɪ	
	llar	l	ə	k æ t ɔ p ɪ l ɔ

1.1.3. Distinguishing the terms *phonological awareness* and *phonemic awareness*

The distinction between the use of the term 'phonological' and 'phonemic' awareness is an important one, although it is one which has been inconsistently dealt with in the literature. In many cases the two terms have been used as if they were synonymous (Olofsson and Lundberg, 1983; Content, Morais, Alegria and Bertelson, 1982).

In the present study the term *'phonological awareness'* is used to refer to the awareness of the phonological units of syllable, onset and rime, and phoneme. *'Phonemic awareness'* is a subdivision of phonological awareness and is used with specific reference to the awareness of phonemes. Onsets (or less frequently rimes) which consist of a single phoneme however are a special case as awareness of a single phoneme onset can be defined as both phonemic and phonological awareness.

1.1.4. Examples of phonological awareness

Although children often find it difficult to express their awareness clearly, the following examples show that children display an awareness of speech sounds as they go about their everyday lives. The degree of awareness and the size of the phonological unit involved in the awareness, however, can be seen to vary from one example to the next. Some of the following examples have emerged as a result of the children's spontaneous interest in the form of language (e.g. cheese please) while others have been promoted by the language situation. [Unless otherwise stated, the following quotes are examples from observations made during the author's own work.]

1.1.4.1 Phonological awareness at the level of the syllabic unit

Child aged 3 years 11 months
"Bu-tter-fly....that's got three words."

1.1.4.2. Phonological awareness at the level of the intrasyllabic unit

(i) Rime

Child aged 4 years 1 month
"Well, /ɛ/ sounds a bit like '*ed*'"
"*Ten* and *den* rhyme"

In a group of four year olds talking about rhymes one child said:
"*Drink* the *sink*. That rhymes."
He was immediately followed by his friend saying:
"The *pink sink*."

Child aged 3 years 8 months
"*Race, lace* - its the same question"

An example of language play was given by a child aged 3 years 9 months:
"*Silly billy willy*".

Pratt and Grieve (1984) cited in Grieve and Hughes (1990) p166
give an example of a three year old child saying:
"Can I have a bit of cheese, please?....*cheese please* - that's a rhyme."

(ii) Onset

Child aged 4 years
"/m/ for Michaelangelo"

Having been given instructions to listen for words that begin with /s/, one girl aged 3 years 10 months produced this spontaneous example with /s/ initially:

"My mummy's name is Susan, you need a /s/ for Susan."

1.1.4.3. Phonological awareness at the level of the phonemic unit

Child aged 4 years 8 months

"I say /ʃoldə/ [soldier] the wrong way."

Asked if she knew what a rhyme was, after thinking she replied:

"It's something that begins with another word."

A child aged 4 years 3 months was presented with the auditory stimulus /s/ /k/ /u/ /l/ and commented:

"That was four words."

Child aged 4 years 1 month gave many examples of metaphonological abilities:

"*Kerry berry* - but that begins with /b/"

"/t/, /æ/, /m/, /i/ - that's his tummy"

Child aged 4 years 3 months during a sentence repetition task:

"I can say them much quicker than you, it makes them shorter"

Child aged 4 years 5 months

"My little sister goes quiet, but my brother goes .. noisy sound"

1.1.5. Defining metalinguistic ability

This section sets the previous discussion of metaphonological abilities in the wider context of metalinguistic abilities in general. The broader term for the awareness of all levels of language, metalinguistic awareness, has been defined in various ways. The following are examples of the definitions of metalinguistic awareness.

'..the ability to reflect consciously on the nature and properties of language'

Van Kleeck (1982) p 237

'Metalinguistic skills are language skills beyond those needed in using language to communicate. They are skills which allow the child to think about language, manipulate it and talk about its structure and parts.'

Estrin and Chaney (1988) p 78

'Metalinguistic ability enables one to reflect on and manipulate the structural features of spoken language.'

Tunmer, Herriman and Neasdale (1988) p 136

Metalinguistic abilities enable 'reflection at a level at which the individual is explicitly focusing attention on the language.'

Garton and Pratt (1989) p 127

In order to clarify the relationship of metalinguistic ability to language, Garton and Pratt (1989) make an analogy between language and a window. In this example, communication is analogous to the view observed through the window. Usually one does not focus attention on the glass (language) itself but rather on the view (communication) that can be seen through the glass. In the same way that one can choose to focus attention on the thickness and colour of the glass in the window or other blemishes which may distort the view, the intrinsic interest of an utterance or a speech error may precipitate conscious attention to language.

Understanding and producing language are primary linguistic skills. Metalinguistic skills are related although qualitatively different. Processes which involve metalinguistic ability are, Hakes (1980) believes, both logically and psychologically distinct from the processes involved in language comprehension and production. It is the awareness of the process of language, the 'structural features', which is involved in metalinguistic ability.

Metalinguistic abilities are those which allow an individual to focus explicitly on language and reflect upon and manipulate its structural features. Within this field, metaphonological abilities are those which focus specifically on reflecting and manipulating the sound system of the language. The other main linguistic levels are those of syntax, semantics and pragmatics. Awareness of language at these levels is referred to as metasyntactic, metasemantic and metapragmatic abilities.

1.1.6. Examples of other metalinguistic abilities

The following examples have emerged as a result of children's reflection on and manipulation of language. [Unless otherwise stated, the examples were observed by the author of this study.]

1.1.6.1. Syntactic awareness

Children exhibit metasyntactic abilities when they make explicit comments on the grammatical structure of language.

> An example of metasyntactic ability was given by Pratt and Grieve (1984), cited in Grieve and Hughes (1990) p166, of a two and a half year old child correcting a speech error :
>
> "Two footsies...no, two feetsies, I mean."

> Child aged 4 years 1 month
>
> In judging the acceptability of the sentence *Jacket your take off* she said "No it's *Take off your jacket*"

> A four year old child is cited by Gleitman, Gleitman and Shipley (1972) p 139:
>
> "Mummy, is it *an adult* or *a nadult*?"

1.1.6.2. Semantic awareness

Metasemantic ability is demonstrated in the following examples of children's comments on the meaning of language.

> After judging whether a sentence was good or muddled up, a child aged 3 years 5 months spontaneously reversed roles to produce the nonsense phrase:
>
> "Car the ear"

> In a task involving nonsense words a four and a half year old child said:
>
> "What does */chail/* mean?"

> Child aged 4 years 3 months
>
> "'Die' is not a nice word"

1.1.6.3. Pragmatic awareness

The following example provides evidence of a young child's metapragmatic skill in manipulating language with reference to its social context.

> Having found that her usual entreaties for attention are not working a three year old child tries an alternative and more adult way of getting her father's attention:
> "Daddy.....Daddy.....Daddy.....Gwym darling!"

1.1.7. Summary

This section has defined phonological awareness within the wider context of metalinguistic ability. The linguistic level (phonology) at which awareness occurs and the linguistic units (phonological and phonemic) of which the child becomes aware are described in this account of the nature of metaphonological ability. Particular attention has been drawn to the distinction between the terms 'phonological' and 'phonemic' in describing phonological awareness. Examples of children's spontaneous observations of and reflections on the structure of language at various linguistic levels have been given. Having established the nature of metalinguistic ability, and metaphonological abilities in particular, the following section will examine evidence of the development of these abilities.

1.2. The development of metaphonological abilities and other aspects of linguistic awareness

1.2.1. Views on the development of metalinguistic abilities

The age at which metalinguistic abilities develop has been the topic of much debate. There are three main views on the emergence of metalinguistic skills:

- metalinguistic abilities are concomitant with language acquisition
- metalinguistic abilities develop with the acquisition of literacy
- certain cognitive abilities acquired in middle childhood are prerequisites for metalinguistic development.

The first of these views is described in section 1.3.1. The second view is described in relation to the relationship between the acquisition of literacy and metalinguistic ability [see section 1.6.2.]. The view that the metalinguistic ability is dependent on the development of certain cognitive abilities is discussed in section 1.5.1.

1.2.2. Evidence of metaphonological development

Data on the development of metaphonological ability has been collected in two main ways. Many of the earlier studies used observational case study evidence of metaphonological ability (e.g. Clark, 1978; Slobin, 1978). More recently, however, research has focused on data obtained through experimental procedures (e.g. Bradley and Bryant, 1983, 1985; Chaney, 1992; Smith and Tager-Flusberg, 1982).

Hakes (1980) concludes that phonological awareness is a difficult and late developing skill for most children. There is, however, both observational and experimental evidence that metaphonological ability develops earlier than Hakes suggests.

1.2.2.1. Observational studies

Most research in this area has involved school-age children. Slobin (1978), however, cites case study evidence of early metalinguistic ability and Clark (1978) has documented

many examples of spontaneous phonological awareness in children as young as two years of age.

These studies suggest that children's spontaneous utterances can demonstrate metaphonological ability earlier than is indicated by some experimental studies. Although the extent of a child's awareness is not always clear from their behaviour (e.g. producing strings of rhyming words in spontaneous word play) more explicit evidence of metaphonological ability occurs when a child is able to comment on his awareness.

Clark (1978) regards speech repairs or corrections as evidence of early metalinguistic ability. This evidence has been disputed as there is some disagreement as to the level of awareness involved in making speech repairs. It has been suggested (Garton and Pratt, 1989) that reflective awareness is not necessary at this level of language processing and that only tacit awareness is involved in such automatic speech monitoring processes. Each example of speech repair must be taken in the context in which it occurred in order to determine whether metalinguistic or purely linguistic processing is involved. The communicative intentions of the child must also be considered. The researcher must be very careful, however, in inferring the presence of metalinguistic ability from this type of data when the child makes no explicit comment regarding his awareness.

The contentious issue here is one of *explicitness*. Does the child's behaviour clearly indicate awareness or can the awareness only be inferred from the behaviour? If the child is able to clearly and precisely express himself, leaving nothing to implication, then there is explicit evidence of metaphonological ability.

Pratt and Grieve (1984) [see 1.1.4.2.(i)] give the example of metalinguistic ability shown by Kate aged 3 years and 1 month who said:

"Can I have a bit of cheese, please?....*cheese please* - that's a rhyme."

Her ability to consciously reflect on language cannot be questioned as her remark is explicit. In this example, the intrinsic interest of her spontaneous utterance has triggered linguistic reflection.

Most of the observational data on children's awareness of language comes from free speech samples, so positive identification of metalinguistic ability is reliant on the child

being able to adequately express his thoughts verbally. With age, children's ability to express themselves clearly increases. As children mature and gain more experience with language, they also acquire more metalinguistic vocabulary - that is they can understand and use terms relating to the structure and function of language - thus making it easier for the observer to identify the occurrence of linguistic awareness.

A child saying "I say *sholder* [soldier] the wrong way" demonstrates her knowledge that her realisation of the word was unacceptable. In comparing the adult form or target with her own, she has employed conscious and reflective awareness of the way words sound, the phonology of language, so she exhibited metaphonological awareness.

Garton and Pratt (1989) comment on the use of explicit terms in identifying metalinguistic events. The distinction between a spontaneous speech repair and a repair which has involved or precipitated conscious language awareness is made unambiguous by the use of vocabulary such as "I mean", "I got it wrong" or "no" in addition to or rather than merely producing the repaired utterance.

1.2.2.2. Experimental studies

While observational data can describe the early emergence of certain metalinguistic skills of one or several children, experimental tasks are able to explore the abilities of a number of children and usually establish some criteria such as the percentage of children of a certain age being able to perform certain metaphonological tasks (van Kleek and Schuele, 1987). However, there are certain intrinsic problems in carrying out experimental studies of linguistic awareness. The types of assessments which are used, their validity and reliability, will greatly influence the conclusions which can be drawn from their results.

There are many factors which must be considered in the construction of metaphonological assessments [see also section 2.6.]. These include the tasks' cognitive complexity; the length of introduction necessary; the attention control required and the acceptability of the task to children. The tasks must be within children's linguistic capabilities and cognitive capacity if they are to understand what is expected of them.

Structured metaphonological tasks in many accounts of metaphonological assessment have often been complex in nature and found to be difficult to master (van Kleeck and Schuele, 1987). Metaphonological tasks have often given negative results of children's abilities while more positive data regarding phonological awareness is indicated in observational studies of children's speech production.

In experimental studies, the procedures which yielded more positive results of early metalinguistic ability (e.g. de Villiers and de Villiers, 1972; Fox and Routh, 1975; Smith and Tager-Flusberg, 1982; Chaney, 1992) limited or controlled the length and/or complexity of the linguistic input, avoided the use of metalinguistic terminology, and provided demonstration and practice trials. These most carefully designed studies have shown that children are able to focus on aspects of the sound system as early as two years of age.

Donaldson (1978) discusses the importance of children's motivation in task performance - the more 'human sense' the task makes the more comprehensible the task is. Metalinguistic tasks are disembedded tasks and therefore prove difficult for most young children [see section 1.5.2.2.]. The child's success with such tasks is related to their ability to accept the task as defined by the adult and choose to carry it out in that way. They will have to set aside their own intentions, purposes, experiences and expectations in order to be able to consider the task in its own right (Grieve and Hughes, 1990).

Liberman, Shankweiler, Fischer and Carter (1974) [see also 1.2.3.6] found evidence of an emerging ability to deal with syllabic and smaller units in pre-school children and Fox and Routh (1975) found a clear developmental progression in metaphonological ability from three year old children to seven year olds [see 1.2.3.5. and 1.2.4.1.]. Studies by Smith and Tager-Flusberg (1982) [see 1.2.3.4.], de Villiers and de Villiers (1972) [see 1.2.4.1.], Fox and Routh (1975) and Chaney (1992) have found that metalinguistic ability emerges gradually rather than abruptly.

As children grow older, they gain more experience with and information about language. The effect of the acquisition of language on metalinguistic abilities are discussed in a later section [see section 1.3.1]. As knowledge is acquired it is stored in the child's

memory. Each new piece of information about language can then be stored in relation to existing knowledge. The more knowledge a child has about language, the more 'hooks' he has on which to hang new information. During the course of development, children grow to know more about language and any new information they acquire is likely to be more meaningful and therefore more memorable [see reference to metamemory in section 1.5.1.].

1.2.3. The developmental sequence of metaphonological abilities

The following categories of metaphonological ability show the development of phonological awareness (based on Adams (1990), as cited by Chaney (1992), and Tunmer, Pratt and Herriman (1984)). The difficulty of the abilities has been ordered from least to most difficult and, in general, from the first to the last to develop.

The ability to:

- monitor and correct the speech of self and others
- comment on aspects of phonology
- know nursery rhymes and play with word sounds
- recognise and compare the onsets and rimes of different words
- segment and synthesise phonological units
- manipulate phonological and phonemic units.

1.2.3.1. Monitoring and correcting own speech and the speech of others

The earliest and most controversial evidence of metalinguistic ability cited by Clark (1978) are speech repairs. The extent to which children are aware of aspects of the language before they are able to repair it is disputed. Sinclair, Jarvella and Levelt (1978) believe that self-corrections and sound play may be considered at the border of awareness and are a type of language processing that does not require awareness of the linguistic structures which are generated.

On the whole, tacit phonological awareness is thought to be involved in monitoring and correcting speech regardless of whether it is the speech of oneself or others. However, that is not to say that some instances of speech repair do not involve conscious phonological awareness. In order that a conscious, explicit awareness of phonology be identified, the child must do more than merely repair an utterance, he must also make some kind of comment which shows that he has reflected on his knowledge of phonology.

1.2.3.2. Commenting on aspects of phonology

In Clark's view (1978) children's observations on their own and others' speech provide evidence of reflective awareness of language. These observations seem to occur when the child is either challenged, puzzled or intrigued by some aspect of speech. Evidence from children as young as 2 years 6 months has indicated that even in early childhood they can be aware of the structure of language, both as they and others produce it. When children's observations are explicit enough their awareness is exposed.

1.2.3.3. Knowing nursery rhymes and playing with word sounds

Many children are exposed to nursery rhymes in their pre-school years. Maclean, Bryant and Bradley (1987) found that those children who knew nursery rhymes at three years of age were more likely to have better metaphonological skills by the time they were five years old.

Clark (1978) noted that two year old children often engage in "sound substitution drills" to produce a series of rhyming sound patterns, however it is unclear whether they know they are producing rhymes. This type of nonsense sound play such as creating rhyming word strings (e.g. silly, billy, dilly) and also adding word endings (e.g. spoonie) is common in young children (Van Kleeck and Schuele, 1987). Children at this young age also rehearse and practice word pronunciation which is often accompanied by some comments on the child's own ability.

1.2.3.4. Recognising and comparing the onsets and rimes of words

Children have shown an early awareness of rhyme and alliteration [see the examples in section 1.1.4.2.].

Rhyming is the manipulation of phonemes following a rule or pattern. The process involves both segmentation and addition of phonemes.

For example producing the rhyme *pink sink* can be illustrated as the product of the following processes:

pink ----- - /p/ ----- (*ink*) ----- + /s/ ----- *sink*

In van Kleeck and Bryant's longitudinal study (1984) it was found that children as young as one and a half or two years of age exhibited rhyming play while overt and explicit comments on rhymes emerged at about three years of age. Smith and Tager-Flusberg (1982) adapted the rhyme judgement task implemented by Read (1978). In this task the children were asked to think of words which rhymed with 'bat' and 'hi' and then introduced to a puppet called Jed who loved words which sounded like his name. Subjects were given a series of words and had to judge whether the words rhymed with Jed or not. They were given feedback during trial items but not for the test items. Although they found it only minimally successful with three and four year old children they did find that children who were able to judge rhymes were also able to produce rhymes.

Kindergarten children, between the ages of four and five years, were successful in a rhyming test in which subjects were to produce one of two words which rhymed with a third (Knafle, 1973). Knafle (1974) showed that there is an increase in children's ability to discriminate between rhyming and non-rhyming word pairs from kindergarten to the third grade as the number of correct responses increased with successive grade levels. Bradley and Bryant (1983) found that most four and five year olds are able to detect rhyme and alliteration before they learn to read.

1.2.3.5. Segmenting and synthesising phonological units

Hakes (1980) states that four year old children are incapable of awareness of the phonemic structure of spoken words or syllables although they may be aware of the syllabic structure of words at this time. He believes that phonemic awareness develops much later although children may be able to use phonological differences between spoken words to signal differences in meaning at an age far younger than the age at which phonological awareness appears to emerge.

A child may be able to perceive that *cat* and *bat* are different words, but may not be aware that each of these words is composed of three individual sounds and that it is only in the first sound that the two differ (Hakes, 1980). However, the fact that a child does not explicitly comment on the difference, does not mean that he is unaware of that difference.

Fox and Routh (1975) found that by 3 years most children were able to segment the flow of speech into words and syllables. Segmenting syllables into phonemic units however was found to be much more difficult.

Liberman, Shankweiler, Fischer and Carter (1974) used a tapping task to mark the phonological units of a word. Four year old children are able to use this technique to show the number of syllables in a word (three taps would correspond to the three syllable of the word 'butterfly').

In a more crude measure of the number of syllables in a word, children's judgements about word length are also evidence of phonological awareness. A study carried out by Papandropoulou and Sinclair (1974) shows that children up to the age of five or six are still confused by the physical attributes of a word's meaning when instructed to make judgements about the length of the word itself. For example, the word 'train' would be judged to be a long word by young children. These negative findings however may be due to a lack of understanding of the task and what is required rather than a lack of metaphonological ability.

Treiman (1985) discovered that children found it much easier to segment syllables by the units of onset and rime than by phonemes which would break up the onset or rime.

Children between the ages of four and a half and six years were instructed to detect a target phoneme /s/. They were twice as likely to identify the phoneme at the beginning of a word when it occurred as the onset alone (e.g. '*sit*') than when it was part of the onset (e.g. '*slit*').

Many studies have incorporated an oddity task in order to assess children's ability to segment words (Bradley and Bryant, 1978; Bradley, 1980; Bradley and Bryant, 1983). The subjects are asked to judge which of three or four spoken words is unlike the others, that is, they have to find the odd one out. A study of five, six and seven year old children by Kirtley, Bryant, Maclean and Bradley (1989) using an oddity task (cited by Goswami and Bryant, 1990) showed that children find it much easier to identify onset and rime than they do individual phonemes unless the onset or rime is comprised of only one phoneme.

1.2.3.6. Manipulating phonemic units (adding, deleting or moving phonemes)

While children seem to do well in some phonological tasks before they learn to read most are unable to succeed in others. Hakes suggests that it is the nature of the phonemic units themselves which delays children's awareness of them until later in childhood, whereas words and syllables are more readily noticed. Catts (1991) explains that while the printed word gives the impression that words are composed of discrete units, the spoken word consists of phonemes which are "blended together at the acoustic level into a single unit about the size of a syllable". This makes it difficult to segment the stream of speech into phonemes.

In the following example a three and a half year old child demonstrates her phonological awareness (Slobin, 1978).

> Heida asks: "*Cookie*. What does *cook* mean?"
>
> When she was given an answer, she went on to ask:
>
> "What does */ku/* mean?"

Liberman et al (1974) found that the explicit analysis of spoken utterances into phonemes is significantly more difficult and develops later than analysis into syllables. Their study

produced negative results in phonemic segmentation tasks with young children using counting techniques. Van Kleeck and Bryant (1984) believe that most children require formal instruction to master skills associated with phonemic awareness while awareness of the larger phonological units develops earlier.

Using an instructional technique Zhurova (1963) was able to gain more positive results and Fox and Routh (1975) used an introduction where the children were asked to say *'a little bit'* of a given word. This proved more successful in terms of eliciting the ability to segment a word into phonological units. Over half the four year old children in their study were able to analyse words by phoneme. Their findings indicate the presence of these abilities in children younger than in studies by Zhurova (1963) and Bruce (1964). Fox and Routh suggested that they were able to obtain positive results (where before there were negative findings) because their tasks had lower cognitive requirements.

In the development of phonemic segmentation, Zhurova (1973) showed that children could more easily identify word initial sounds than they could medial or final sounds.

Bruce (1964) studied children's ability to delete phonemes and found that at five years of age children could not carry out this task. The performance of nine year olds, however, had few errors.

The tasks which Bruce used were complicated and the younger children's lack of success may have been due to cognitive rather than metaphonological inability. Van Kleeck and Bryant (1987) contradict Bruce's negative findings and give an illustration of a three and a half year old child's sophisticated ability to segment and delete phonemes from words:

> Mother: *If spellbinder stole the /d/ from ditch, what would you have?*
>
> Child: *itch.*

Content, Morais, Alegria and Bertelson (1982) found that five year old children obtained over an 80% success rate in deleting a word initial phoneme when it was a vowel. This task (for example in deleting the /a/ from 'apart'), however, should be categorised as syllable deletion - although the first syllable is a single phoneme. In the same study, the success rate for the deletion of word initial consonants was much lower.

In tasks where the final phoneme was to be deleted, Fox and Routh (1975) found that by the age of four the children were correct 60% of the time and increased to 85-95% for five to seven year olds. Goswami and Bryant (1990) believe that final phoneme deletion may be a special case as young children may be able to produce the syllable and stop before completing it without being aware of the phonemic units involved. They suggest that it is only after children begin to learn to read that they are able to manipulate phonemes.

1.2.4. The development of other metalinguistic abilities

In order to put the development of metaphonological skills in the context of the development of metalinguistic abilities in general, the following sections will briefly describe the development of metasyntactic, metasemantic and metapragmatic abilities.

1.2.4.1. Metasyntactic development

The general points below are made by Bialystok (1986) in describing the stages of metasyntactic development:

- judging syntactic correctness is easier than correcting the errors themselves
- morpheme tasks are easier than tasks involving syntax.

Children demonstrate their awareness of syntax in making judgements about the correctness of a phrase or sentence and by their ability to segment sentences into phrases and words.

Words and their constituent parts are not isolated in the acoustic signal. Language is a system of discrete elements which are not readily apparent to the listener. The awareness of word boundaries is illustrated by an example by Gleitman, Gleitman and Shipley (1972) of a four year old asking: *is it an adult or a nadult?*

Word substitution play (cited by Van Kleeck and Bryant, 1987) shows that a three and a half year old child is able to segment the sentence into smaller, word units. *That drives me bananas. That drives me nuts. That drives me gas stations...trees...cars...signs.* The

child's ability to change the pattern of the sentence in this way by substituting its component elements indicates at least a rudimentary awareness of the existence of words as discrete units of language.

In Fox and Routh's sentence segmentation tasks (1975) with three-, four- and five-year old children, a clear developmental trend was found. Although the three-year olds were the poorest, by the age of five-years the children were almost attaining ceiling scores in segmenting utterances word by word..

Research into the development of segmentation skills indicates that there is a hierarchical development: content words are more easily segmented than function words; and sentences can be segmented into words before words can be segmented into smaller units (Van Kleeck and Schuele, 1987).

Gleitman, Shipley and Alloway (1970), cited by De Villiers and de Villiers (1972), found that 2 year old children are able to judge the acceptability of word order (whether a sentence sounded "good" or "silly"). However the children in their study still made many mistaken corrections confusing semantic with syntactic errors.

De Villiers and de Villiers themselves modified the experimental procedures of Gleitman et al in their own study of two and three year old children. Their results suggest that only the older and more linguistically advanced children were able to correct ungrammatical word order. Children also found syntactic judgements more difficult to make than semantic judgements.

1.2.4.2. Metasemantic development

Tunmer and Bowey (1984) reviewed recent research and summarise three steps in the development of word knowledge:

- awareness that words are language units
- awareness that words are arbitrary labels
- comprehension of the term 'word' in a metalinguistic way.

The ability to make up new words and adapt others for a new use can be described as a metasemantic ability. The overextention of words in infancy, however, would not be interpreted as showing explicit awareness (e.g. labelling all adult males as *Daddy*).

Van Kleeck and Schuele (1987) cite an example from earlier work of a two-year ten-month old referring to a frisbee as a *ballkite*. They suggest that substantial development of word awareness occurs in the early years before school. This is also evident in children's comments on foreign languages (Slobin, 1978) and awareness of the arbitrary nature of words and their meanings. Smith and Tager-Flusberg (1992) showed that young children are able to interchange words and use nonsense words in demonstrating the arbitrary link between words and their referents - around half of the three-year olds and almost all the four-year olds reached criterion on this task.

1.2.4.3. Metapragmatic development

Although Pratt and Nesdale's (1984) review of the literature shows the paucity of metapragmatic studies, the following aspects have been investigated to examine the extent to which children have insight into the relationship between language and the social situation.:

- awareness of message adequacy
- evaluation of the comprehensibility of information
- awareness of themselves as speakers.

As children mature as listeners they increasingly ask for more information when they realise that the information provided by the speaker was inadequate. By the age of ten years children are adept at communicating their lack of understanding. It is not clear, however, whether younger children are unable to recognise the inadequacy of an utterance or simply that they choose not to do anything to remedy that inadequacy.

In considering children's awareness of themselves as speakers, Pratt and Nesdale (1984) cite a study by Shatz and Gelman (1973) which indicates that four year old children are aware of the need to alter their speech according to who the listener is i.e. a younger child, a peer or an adult. Bates' study (1976), cited by Pratt and Nesdale, found that

children become increasingly able to alter the degree of politeness of their requests from three to six years of age but that even three-year-old children are capable of changing their request forms on demand.

1.2.5. Summary

Different studies have offered contradictory evidence regarding the development of metalinguistic abilities. There is, however, an abundance of evidence to show that metalinguistic development begins in early childhood and emerges gradually rather than abruptly.

Development of awareness across all linguistic levels is simultaneous and progressive although certain skills are developed more easily than others (for example semantic judgements appear to be easier than syntactic judgements at the age of two or three years).

There is both observational and experimental evidence that development of metaphonological abilities has already begun in 3 year old children. Both the size of the phonological unit and the type of process involved in different metaphonological tasks determine the age at which different skills are acquired (for example it is easier to judge whether one word rhymes with another than it is to delete a phoneme from a word).

1.3. The relationship between metalinguistic abilities and language development

The view that metalinguistic development is concomitant with language acquisition is addressed in the first section [1.3.1.]. Further evidence of the relationship between metalinguistic ability and language development is presented in the following two sections. Section 1.3.2. addresses the relationship between language disorders and the development of metalinguistic abilities and section 1.3.3. presents data from studies of bilingual children.

1.3.1. The view that metalinguistic abilities develop alongside language acquisition

There is a strong body of evidence that pre-school children possess some metalinguistic abilities and that these are important in the acquisition of language as well as in the acquisition of literacy skills in middle childhood [see sections 1.6.2.2. and 1.6.2.3.]. It has been suggested that children acquire basic language comprehension and production processes before and independently of the development of metalinguistic abilities. However, when linguistic awareness does emerge it is believed to facilitate later linguistic accomplishments such as the secondary linguistic skills of literacy and learning a second language.

The interactive relationship between language acquisition and metalinguistic ability is supported by several types of evidence (Clark, 1978; Slobin, 1978; de Villiers and de Villiers, 1972; Gleitman, Gleitman and Shipley, 1972; Zhurova, 1973; Fox and Routh, 1975; Smith and Tager-Flusberg, 1982; Chaney, 1992). Clark believes that metalinguistic abilities develop in parallel with language development. In her account of metalinguistic development, awareness of language is an integral and essential part of language acquisition and develops at the same time.

This view, labelled the *interactive hypothesis* by Smith and Tager-Flusberg (1982) contradicts the view that metalinguistic ability is dependent on the development of certain cognitive abilities. Hakes (1980) claims that metalinguistic development does not occur until the age of 6 or 7 years in middle childhood and is independent of the primary acquisition of language (Hakes, 1980; Tunmer, Herriman and Nesdale, 1988) [see section 1.5.1].

Both observational and experimental studies provide compelling evidence that pre-school children have already developed many metalinguistic abilities [see section 1.2.2.] and that development takes place in early childhood before the period which Hakes (1980) suggests. Observational data of young children's ability to actively monitor their utterances, make spontaneous repairs and comment on their awareness of aspects of language contributes to the evidence supporting the interactive nature of the relationship between language acquisition and metalinguistic development (Clark, 1978; Slobin, 1978).

The findings of many experimental studies assert that the majority of three and four year old children can make some explicit metalinguistic judgements out of context and on demand (de Villiers and de Villiers, 1972; Gleitman, Gleitman and Shipley, 1972; Zhurova, 1973; Fox and Routh, 1975; Smith and Tager-Flusberg, 1982; Chaney, 1992). In a study which investigated language development and metasyntactic ability, de Villiers and de Villiers (1972) found that metalinguistic judgement abilities of children were linked with basic language development.

Smith and Tager-Flusberg (1982) demonstrated that pre-schoolers' metalinguistic ability is more extensive than had previously been acknowledged and that these abilities are closely related to other aspects of language development in this period of development. In an investigation involving children aged three and four, Smith and Tager-Flusberg established that metalinguistic ability was correlated positively with measures of language development in pre-school children and that this correlation was independent of age. They argue that this demonstrates the interlocking nature of linguistic and metalinguistic development. Their findings complement and support the de Villiers study.

1.3.2. Language disorder and metalinguistic abilities

Children's progress in acquiring language is dependent on some level of awareness that their initial and basic utterances are inadequate or incorrect and need to be changed. In order to progress they must be aware of when language fails. Language-disordered children are unable to make this progress. Studies into the relationship between delayed or disordered language and children's linguistic awareness provide further evidence concerning the possible relationship between language development and metalinguistic ability.

Kamhi, Friemoth-Lee and Nelson (1985) describe their study comparing the metalinguistic ability of language disordered children with those of normally developing children while Howell's (1989) comparison study involves phonologically disordered children in the investigation of metaphonological ability.

Kamhi et al (1985) compared the metalinguistic abilities of five and six year old language-disordered children with two groups of normally developing children. The first 'normal' group was matched for mental-age while the second was matched for language-age. The language-disordered subjects' performance was poorer than both other groups. Even the younger children, aged three and four years, with equivalent language-ages exhibited a higher level of metalinguistic ability than the older language-disordered children. The future risk of language-disordered children, particularly in learning to read is implicated. Kamhi et al suggest that intervention with these children should include metalinguistic abilities which target word, syllable and sound awareness as well as language comprehension and expression.

The study into metaphonological ability conducted by Howell (1989) compared normally developing with phonologically disordered children. She found that some although not all of the children with delayed speech sound acquisition had poorer metaphonological abilities. Her findings concur with the more general investigation by Kamhi et al.

Although studies have suggested that children with poor metalinguistic ability also have poorer language skills than children with well developed metalinguistic abilities, these studies do not provide evidence of a causal relationship. It is unclear whether children

with poor metalinguistic ability are unable to develop normal language abilities because their awareness of language is poor or whether it is their delayed or disordered language development which causes problems in the development of metalinguistic skills.

1.3.3. Bilingualism and metalinguistic abilities

Further evidence relevant to the relationship between language development and the development of metalinguistic abilities comes in the form of studies involving bilingual or multilingual children. Slobin (1978), for example, provides evidence of early language awareness in a case study of his daughter, growing up in a multilingual environment.

Vygotsky (1934), cited in Bialystok (1988), asserts that the arbitrary connection between forms and meaning is more apparent to bilingual children because they have experience of two linguistic systems that label the same conceptual system. In learning a second language a child's attention is consciously focused on language as an object, a means of conveying a message. This conscious attention is likely to raise linguistic awareness.

Bilingualism is linked with high levels of metalinguistic ability (Bialystok, 1988). In comparing monolingual, partially bilingual and fully bilingual six year olds, Bialystok found that the bilingual children obtained higher scores in tests of metalinguistic abilities than monolingual children. In addition, there was a further difference in these abilities between the two groups of bilingual children. The fully bilingual children were more linguistically aware than were the partially bilingual children.

Both the fully bilingual and partially bilingual children performed better than monolingual children on metalinguistic tasks requiring higher levels of cognitive control. However, on tasks requiring high levels of analysis of linguistic knowledge, while the fully bilingual children scored higher, the monolingual and partially bilingual children's performance was not significantly different.

Bilingual children are able to develop better and earlier cognitive control over their processing of language. Not only the exposure to a second language, but also the extent of that exposure, determines the development of metalinguistic ability (Bialystok, 1988).

The more experience a child has of language, or languages, the more linguistically aware he is likely to become.

1.4 The relationship between metalinguistic abilities and social and family background

In this section, the term 'family background' refers to the types of behaviour and activities which take place in the family environment. Many studies have used the term 'social background', their emphasis being on measures of parental educational level and employment rather than behaviours and activities.

1.4.1. Family background

The importance of the quality of mother-child interaction in establishing awareness of language is noted by Lloyd and Beveridge (1981). They emphasise the need for interaction in order to encourage the process of disembedded thinking. [For further explanation of disembedded thought see section 1.5.2.2.] In a paper cited by Howell (1989), Beveridge and Dunn (1980) refer to differences in family background and styles of socialisation in the encouragement of reflective skills.

The types of activity undertaken in the home will influence the child's development of metalinguistic ability. For example, a child who is exposed to nursery rhymes from an early age and other activities, such as being read stories and coming into contact with books, is more likely to be aware of language than a child whose environment is less linguistically stimulating. Awareness of language can be enhanced by books, discussion and shared reading. It is these types of activities and experiences, Wells (1981) believes, which increase children's awareness of language thus promoting metalinguistic abilities.

Experiences at home undoubtedly affect a child's awareness of the spoken word. For example if the family talk *about* words rather than merely *with* words, the child gains more experience of linguistic awareness (Donaldson, 1978). In this way the family's input is thought to be an important factor in the development of metalinguistic ability. An Italian study by Zucchermaglio, Pontecorvo, Tonucci and Blachowicz (1986) found a significant correlation between measures of children's metalinguistic ability on school entry and their mother's educational level.

Nursery rhymes are a cultural phenomenon (Goswami and Bryant, 1990). A two-year study of a group of 65 three-year old children found that there may be a causal connection between children's experience of their parents reciting nursery rhymes and singing songs and their awareness of rhyme (MacLean, Bryant and Bradley, 1987; Bryant, MacLean, Bradley and Crossland. 1990). The child's environment can play a part in his phonological awareness. In the study by MacLean et al (1987), children's knowledge of nursery rhymes was found to be strongly related to their later awareness of rhyme. The relationship between early childhood experience of nursery rhymes and later metaphonological ability held even after effects of the children's I.Q. and maternal educational level were partialled out in a multiple regression, thus suggesting an environmental effect.

1.4.2. Evidence of the effect of social background on metalinguistic abilities

There has been little research in this area, and what little data has been collected appears to be contradictory. The effect of social background on the metalinguistic ability of children seems to depend on the age at which the subjects have been studied (Raz and Bryant, 1990). The following two sections describe evidence of the effect of social background on the metalinguistic abilities of pre-school and school-age children.

1.4.2.1. Metalinguistic abilities and social background in pre-school-age children

In her study of three-year old children, Chaney (1992) found that family income as a measure of social environment had a negligible correlation with metalinguistic abilities. Similarly, Raz and Bryant (1990) studied the differences between middle class and disadvantaged backgrounds in the metaphonological abilities of children. They found that group differences in the pre-school years were small and insignificant. These findings were also reported in another study by Zucchermaglio et al (1986) which did not find a correlation between children's social class and their level of metalinguistic abilities on school entry at an average age of six years.

1.4.2.2. Metalinguistic abilities and social background in school-age children

In contrast to the findings with pre-school age children, however, Raz and Bryant (1990) found a marked difference in metalinguistic abilities of the two social groups with children between the age of five and six years after attending school for one or two years.

Wallach, Wallach, Dozier and Kaplan (1977) also studied certain linguistic and metalinguistic skills of school age children from both middle class and disadvantaged family backgrounds. They found that there was no difference between the two groups in the linguistic measure of auditory discrimination. However, the socially disadvantaged children exhibited significantly lower scores on the metalinguistic measures of phoneme recognition and phoneme identification, findings confirmed by Raz and Bryant's (1990) study of five and six year olds. This suggests that school-age children from lower socio-economic groups or impoverished family backgrounds are, generally, less linguistically aware than are children from middle class backgrounds. Raz and Bryant tentatively suggest that it is experiences at school rather that at home which determine these later differences in metaphonological abilities as the differences between social groups is evident only when children have been at school for a year or two.

1.4.3. Summary

Children's pre-school level of linguistic awareness is largely in the hands of their parents and carers. The experience they have of language during this time may have a lasting effect on their metalinguistic abilities. Studies have indicated that early knowledge of nursery rhymes has a positive effect on children's sensitivity to rhyme and other experiences such as being read stories influences metalinguistic skills in general.

It is not clear why pre-school children's metalinguistic abilities seem not to be influenced by social background while older children's abilities are. There have, however, been few studies which have investigated the influence of social background on metalinguistic ability in depth. More research is needed in this area to clarify the effect of social background on linguistic awareness of both pre-school and school-age children.

1.5. The relationship between cognitive development and linguistic awareness and metaphonological abilities in particular

Many of the early studies focused attention on the relationship between metalinguistic and cognitive abilities. The first part of this section addresses the view that certain cognitive abilities are prerequisites for the development of metaphonological ability [see section 1.5.1.]. The second part attempts to clarify the issues surrounding cognitive control, linguistic knowledge and disembedded thought [see section 1.5.2.].

1.5.1. The view that metalinguistic development is dependent on the development of cognitive abilities

Many researchers believe that the development of metalinguistic ability relies on cognitive development, in particular the development of concrete operational thought, including the ability to decentre, which is a cognitive skill acquired in middle childhood (Hakes, 1980; Tunmer, Herriman and Nesdale, 1988).

Middle childhood is thought to be the period for the blossoming of metalinguistic abilities: for detecting ambiguity; appreciating linguistic jokes; and discriminating rhymes and non-rhymes. Hakes' suggestion of such development occurring in mid childhood is consistent with changes in cognitive functioning described by Piaget (1959) and also changes in memory abilities.

The relationship between memory abilities in the performance of metalinguistic tasks is suggested by Flavell and Wellman (1977). They imply that the pertinent development in *metamemory* is in the ability to choose deliberately to engage in task-appropriate behaviours. A child may have the knowledge and skills required to carry out a certain task, but unless he is aware that he possesses these skills then he may not be able to fully cooperate or apply the skills in carrying out the task. The knowledge they require to perform a given task must be accessible and retrievable. Lack of response or an incorrect response to a metalinguistic task could reflect the child's rejection of metalinguistic

activity, because on that occasion they did not retrieve the necessary knowledge, rather than metalinguistic inability. This could account for intrasubject variability in the demonstration of explicit awareness of an aspect of language.

Van Kleeck (1982) also believes that cognition is a causal factor in metalinguistic performance as developments in metalinguistic ability appear alongside developments in cognitive development. She hypothesises that training studies with children at different cognitive periods would show whether children need to have attained a certain level of cognitive ability before they are able to make advances in metalinguistic development. If children functioning at the concrete operational level of cognitive development were found to benefit more substantially from metalinguistic training than preoperational children, then this would provide evidence that concrete operational children possess the prerequisites for metalinguistic ability while children functioning below this level do not. Van Kleeck cites the correlational data of Hakes (1980) showing significant relationships between cognitive and metalinguistic performance. However, Goldman (1982) states that a more powerful methodology than correlational analysis is needed if causal hypotheses are to be tested. There are additional problems in investigating such an hypothesis due to differences in age, general and linguistic experience of children at different stages of cognitive development.

Goldman (1982) believes that Van Kleeck's theory is very useful. The hypothesis implies that both metalinguistic and metacognitive skills are dependent on similar underlying processes. These processes are those of decentering and reversibility which also differentiate the thought processes of the preoperational and concrete operational periods. For example, during the concrete operational period children are learning to view the world from perspectives other than their own, they are becoming able to decentre. Van Kleeck, however, does not deal explicitly with the nature of the shared 'software' that might lead to the parallels between cognitive and metalinguistic performance.

Negative results from many studies of metalinguistic abilities with young children have led to conclusions that the ability to make metalinguistic judgements about aspects of

language is acquired relatively late in development, at the age of six or seven years. Evidence from such studies supports the view that linguistic awareness does not emerge until middle childhood. There is, however, a growing amount of evidence which contradicts such conclusions.

The age at which metalinguistic ability emerges is still in question. Although many studies have found that children find it difficult to make explicit judgements about language (Liberman, Shankweiler, Fischer and Carter, 1974; Bialystok, 1986), other studies using simpler and more accessible tasks, have found that this is not the case (de Villiers and de Villiers, 1972; Gleitman, Gleitman and Shipley, 1972; Zhurova, 1973; Fox and Routh, 1975; Smith and Tager-Flusberg, 1982; Chaney, 1992).

Smith and Tager-Flusberg (1982) also note that the construct of concrete operations (on which the cognitive based theorists have established their argument) has been queried by some developmental psychologists who claim that decentering should not be considered as a unitary ability which emerges at a particular developmental period. This would allow more flexibility in the timing of metalinguistic developments for individuals and is supported by evidence that metalinguistic development occurs before the transition between preoperational and concrete operational cognitive functioning which was thought to occur at around seven years of age (Hakes, 1980).

1.5.2. Cognitive abilities - some issues associated with linguistic awareness

1.5.2.1. Cognitive control and linguistic knowledge

In order to achieve linguistic awareness, children are required to control their thought processes, to direct attention on an aspect of language. They need to be able to focus their attention at a chosen aspect of language. The process of awareness can be divided into two separate components: cognitive control (the ability to focus attention) and linguistic knowledge (the aspects of language on which attention is to be focused).

Bialystok and Ryan (1985) believe that linguistic awareness entails the ability to analyse linguistic knowledge and the ability to focus attention (reflect) on the procedures

involved in selecting and processing specific linguistic information. They refer to these two dimensions as *analysed knowledge* and *cognitive control.* In a later article, Bialystok (1986) suggests that it is only when both of these abilities are exhibited that there is clear evidence of linguistic awareness. Allocation of attentional resources changes as the child develops (Lundberg , 1978).

In defining metalinguistic ability, Garton and Pratt (1989) too incorporate the degree of awareness (cognitive control) and linguistic level (analysed knowledge) involved in linguistic awareness. There are differences in the focus and degree of awareness in different metalinguistic activities.

In the literature, most of the controversy regarding metalinguistic ability revolves around the notion of awareness. Awareness ranges over a continuum: from tacit awareness to an awareness which is explicit and reflective. [See section 1.1.1. for definition used within the context of this author's research.]

The awareness that a child has of language may seem to be inconsistent when profiling awareness at different linguistic levels. Although children may be aware that speech consists of words which carry meaning (at the semantic level), they may not at the same time be aware that each word consists of a sequence of sounds (at a phonological level), so they may show some metasemantic ability without evidence of metaphonological ability.

Clark (1978, p34) puts forward six types/levels of language awareness ranging from monitoring one's own speech, with evidence from spontaneous speech corrections, to the ability to reflect on the product of an utterance. The degree of reflective awareness which children are able to exhibit is influenced by their ability to sustain specifically focused attention (cognitive control). Consciousness of a function is thought to be necessary if the function is to be controlled and control is central to the capacity for disembedded thinking (Hakes, 1980).

1.5.2.2. Disembedded thought

Children are, at first, egocentric creatures. Their ability to stand back from a situation and reflect upon it develops throughout childhood. In the early stages of language development, language is embedded in a 'flow of events': a context. The child interprets situations as wholes. Children become increasingly aware of language as a separate structure thus freeing it from it's embeddedness in events and seeing the means of conveying a message as well as the message itself.

Van Kleeck (1982) argues that the ability to decentre is critical in making clear one's knowledge of language as well as of other cognitive activities, while Goldman (1982) proposes that the ability to decentre is a description of what the child is doing rather than an explanation. She suggests that while there are certainly cognitive prerequisites to metalinguistic skills there are also certain symbolic representational skills associated with verbal coding that are a prerequisite to cognitive reasoning abilities.

Papandropoulou & Sinclair (1974), cited in Hakes (1980), investigated children's concepts of spoken words and found that four and five year old children have problems in treating sentences as linguistic objects. Their responses were content oriented as they found it difficult to distinguish between words and their referents. Most kindergarten-aged children were found to be unable to match long and short written words with their spoken forms. When children were asked to think of a long word they applied their semantic knowledge rather than metalinguistic knowledge in giving responses such as *train*.

Donaldson (1978) believes that awareness of language can only come about when the child learns to consider language independently of its everyday use and with his increasing control of his own thought processes. She uses the term "embedded" to refer to speech as it occurs spontaneously, within a context. Children must learn to be aware of language as an independent structure: to view the form of language itself as opposed to its content or use. She believes the increasing ability to notice and comment on language on request is accompanied by an increase in the ability to engage in controlled cognitive processing operations.

Those children who come to school with the ability to disembed language from its context "come with an enormous initial advantage." (Donaldson, 1987 p89) In order to achieve success in formal education, language must become independent of its use in the children's minds [see section 1.6.3.2.]. As a means of communication, written language does not have the non-linguistic context which accompanies most utterances. In making sense of the written word a child has to learn to consider and predict possibilities and manipulate symbols which are already disembedded. Children, Donaldson believes, should be taught in such a way as to enhance their reflective awareness of both language and cognition.

1.6 Metaphonological abilities and the acquisition of literacy

Section 1.6.1. defines literacy and the nature of the written form of language. The following section presents views on the relationship between metaphonological skills and reading ability [Section 1.6.2.]. Section 1.6.3. discusses the implications of metaphonological ability and learning to read in education and the final section [1.6.4.] is a conclusion.

1.6.1. Literacy

1.6.1.1. Defining literacy

Literacy is defined as not only the ability to read and write but also the ability to use language proficiently (Collins, 1987). Garton and Pratt (1989) believe that literacy should refer to "a mastery of the language, in both its spoken and written forms, which enables an individual to exercise control over its use". In order to exercise control over its use, an individual must become aware of language. Metalinguistic abilities and literacy are 'intricately interwoven' and have developed together (Garton and Pratt, 1989). This relationship between literacy and metalinguistic abilities is however a complex one.

1.6.1.2. The nature of written language

By its very nature, language in the written form encourages reflection. Written language is free of non-linguistic context, it remains constant and permanent allowing repeated examination and comparison. This permits more leisurely decoding of the information making the written form of language more easy to disembed.

Pre-school children possess a great deal of knowledge about the nature and functions of print (Hoffman, 1986; Bauers and Pettitt, 1990) even though they have not yet learned to decode the written stream of letters as they have the spoken stream of speech. Many discover that print is speech written down before they enter school. Van Kleeck and

Schuele (1987) cite the example of a girl under three years of age remarking *There's a /s/ in the Safeway sign, it sounds like the /s/ in my name.*

1.6.2. Metaphonological abilities and learning to read

Phonological awareness and its relation to reading and spelling has been investigated using correlational studies (Fox and Routh, 1975; Liberman et al, 1974); predictive studies (Bradley and Bryant, 1983; Bryant, Maclean, Bradley and Crossland, 1990) and training studies (Williams, 1980; Bradley and Bryant, 1983; Lundberg, Frost and Petersen, 1988; Cunningham, 1990; Lie, 1991; Byrne and Fielding-Barnsley, 1991). There is considerable disagreement in the literature about whether the ability to reflect upon language is an outcome of or a prerequisite for the acquisition of literacy (Garton and Pratt, 1989). The following sections present two opposing views followed by a third view that combines evidence from the other two: literacy causes metaphonological abilities [1.6.2.1.]; metaphonological abilities are a prerequisite for the acquisition of literacy [1.6.2.2.]; and metaphonological abilities and literacy skills are interwoven [1.6.2.3.].

1.6.2.1. The view that literacy causes metaphonological abilities

Donaldson (1978) suggests that the process of learning to read in school is responsible for the development of metalinguistic abilities including metaphonological ability, that reading is the trigger for the development of metalinguistic control. Studies of illiterate subjects seem to concur. Many studies have reported that adults who are unable to read an alphabetic orthography are less aware of phonemes (Morais, Bertelson, Cary and Alegria, 1986; Read, Zhang, Nie, Ding, 1986).

Kolinsky et al (1987) investigated metaphonological abilities of illiterate and unschooled adults and found that, when given the picture of the objects, half the subjects were unable to choose the longest of two words. They conclude that learning to read plays a

decisive role in the development of the ability of many individuals to focus on phonological length.

Mattingly (1972) suggests that children's ability to reflect on the phonology of a language may not be a skill which is sustained into adult life unless appropriately stimulated as it would be through secondary linguistic activity.

An Italian study (Cossu, 1988) supports the findings that alphabetic orthography leads to a greater awareness of phonemic segments. The extent to which children become aware of different aspects of language is influenced by the structure of their different languages (for example, Italian has a regular orthography with few vowels and open syllable structure and few monosyllabic words).

Mann (1986) investigated the metaphonological abilities of American and Japanese children whose orthographic systems are different. American children use an alphabetic system which represents phonemes while Japanese orthography represents syllabic units. She found that the differences in orthography seemed to influence the children's awareness of syllables and phonemes. At seven years of age, although most Japanese children were aware of syllabic units, relatively few were aware of phonemes. The American children, exposed to an alphabetic orthography, were more aware of phonemic units at this age (Mann, 1986).

These findings support the view that it is the process of learning to read itself, the acquisition of literacy, which causes metaphonological ability.

1.6.2.2. The view that metaphonological abilities are a prerequisite for the acquisition of literacy

Conscious knowledge of the properties of language are thought to be crucial to developing literacy (Liberman et al, 1974; Tunmer and Bowey, 1984). Cazden (1974) hypothesised that language play makes literacy easier to achieve because the child's attention has been focused on the means, the forms of language, whereas in normal communicative context his attention is focused on the end.

Having learnt that form and meaning of language are separable, awareness of the systematic nature of language is able to develop. This awareness enables segmentation and synthesis skills. The ability to segment sentences into words and words into syllables, intrasyllabic units and phonemes (metaphonological ability) is identified by van Kleeck and Schuele (1987) as a prerequisite for beginning reading while morphological and syntactic awareness are indicated in later stages in reading.

Tunmer and Bowey (1984) state that metalinguistic ability in general is an important prerequisite for beginning reading without which children would be unable to discover those properties of the spoken language that are fundamental to the correspondences between its written and spoken forms. Metalinguistic ability is, they believe, integrated in speaking, listening, reading and writing.

Metaphonological skills have been associated with learning to read more than any other metalinguistic ability. A two-year longitudinal study by Tunmer, Herriman and Nesdale (1988) suggests that phonological awareness, and also syntactic awareness, are more important in reading acquisition than pragmatic awareness. Mahoney and Mann (1992) found that early reading ability was significantly related to the correct resolution of phoneme and morpheme riddles but not to the correct resolution of control (semantic) riddles.

Both anecdotal evidence (Clark, 1978; Slobin, 1978; Hoffman, 1986) and simple experimental tasks (Smith and Tager-Flusberg, 1982; Chaney, 1992) have shown that metalinguistic abilities occur in pre-school children who are capable of reflecting on aspects of language *before* they are able to read and before any reading instruction. So literacy in itself does not cause phonological awareness.

1.6.2.3. The view that metaphonological abilities and the acquisition of literacy skills are interwoven

Most of the studies supporting the view that literacy causes metaphonological ability have focused on awareness of phonemes. Other studies have given evidence of children's awareness of intrasyllabic units in support of the view that metaphonological ability is a

prerequisite for literacy. Metaphonological abilities are involved in the awareness of both phonemes and intrasyllabic units as both are phonological units. The literature suggests that the discrepancy between the two seemingly conflicting views may be due to the conclusions drawn from the examination of different sized units [see section 1.1.3.].

Although certain metaphonological skills may be necessary for the acquisition of literacy, learning to read and write may in turn play an important role in developing the ability to reflect on language and the further development of metalinguistic skills. Metaphonological abilities may both help to develop reading skills and be developed by learning to read.

Bialystok and Mitterer (1987) found that good readers possess better metalinguistic skill than poor readers. Those children who scored higher scores on metaphonological tasks were more likely to attain a better reading score. It is however unclear from their results whether children's reading difficulties are specifically linked to a metalinguistic deficit. Metalinguistic ability improves markedly as children begin to read (Liberman, Shankweiler, Fischer and Carter, 1974).

Tunmer and Herriman (1984) cite a study carried out by Tunmer and Fletcher (1981) in which they found that there were children who had metaphonological abilities yet could not read; but none of the children who were able to read were without phonological awareness. No child who performed poorly on metaphonological testing also performed well on reading tasks.

Learning to read in itself, therefore, does not seem to be necessary for the development of metaphonological ability. However, teaching reading skills generally includes training linguistic awareness. This increased experience with metalinguistic activities would explain the marked increase in metaphonological ability that occurs around the time children enter school and begin to learn to read.

Weaver and Shonkoff (1978) are also cited by Tunmer and Herriman (1984) in suggesting that it would be better to train metaphonological skills before beginning to teach children how to read. In this way, children could be well prepared for learning to read as they would already have the necessary prerequisite metalinguistic skills on which

to draw in building up phoneme-grapheme correspondences. The importance of metalinguistic training before children learn to read needs to be further investigated.

Bowey and Patel's study (1988) indicates the need for training methodologies to investigate specific contributions to reading abilities. They found that after general linguistic ability had been statistically controlled, metalinguistic abilities did not predict early reading achievement. Bryant, Maclean and Bradley (1990) suggest that there may be an indirect route from general language ability to early reading through metalinguistic ability. In their discussion, Bowey and Patel (1988) point out the dangers of correlational research however and do not rule out the possibility that metalinguistic abilities contribute to the development of various aspects of reading acquisition in specific ways.

In a longitudinal training study by Bradley and Bryant in 1983, six year old children were given 40 individual training sessions over two years [see section 2.1.5. for further details]. Those children who were trained in both sound categorisation, and sounds and letters benefited most from the intervention (their reading and spelling scores on standardised tests significantly increased) while those given training which focused on semantic concepts rather than phonological awareness did not change significantly in relation to an untrained control group.

Programmes that facilitate phonological awareness in children can often reduce early reading difficulties in those children who are particularly at risk of having reading disabilities (Catts, 1991). Evidence from these training studies supports the view that the link between phonological awareness and reading is causal [see Chapter 2 for a review of metaphonological training studies].

Of the abilities tested in the study by Bryant, Maclean and Bradley (1990), rhyme and alliteration abilities withstood the effect of partialling out the differences in intelligence, social background and general language abilities and the alliteration score in particular was a powerful predictor of reading and spelling ability.

Children do not rely solely on a process of grapheme-phoneme conversion in order to read (Goswami, 1988) but rather they use analogy, relating clusters of letters to phonological clusters more consistent with onset and rime. In this way a child who, for

example may know the written word '*beak*' would be able to use that knowledge in reading the word '*peak*'. Stronger analogy effects were found between word rimes than other phonological units.

Rhyming ability can be acquired in early childhood and children make better progress in reading and spelling if they have this skill (Bradley, 1980). In her study, children with poor sound recognition skills made good progress when they were given specific training.

Skjelfjord (1987) concluded that phonemic segmentation must be the most important and the most difficult task in learning to read. Phonemic analysis skills were acquired only gradually throughout pre-school and early school years. Skjelfjord also suggests that training should involve children's awareness of their own articulation in facilitating metaphonological skills in the sequential analysis of phonemes. "Knowing the phonemic units in the spoken word, the child is then able, when confronted with the printed word, to accurately map the latter onto the former" (Nesdale, Herriman and Tunmer, 1984: p57).

An association between reading experience and the development of phonological awareness has been studied. In the acquisition of an alphabetic orthography, metaphonological skills correlate with children's reading ability (Fox and Routh, 1975; Calfee, Lindamood and Lindamood, 1973; Treiman and Baron, 1981). Morais, Bertelson, Cary and Alegria (1986) found that while sensitivity to rhyme and syllabic awareness can develop to some extent without it, the ability to analyse phonemic units does require the experience of learning to read.

Bryant, Maclean, Bradley and Crossland (1990) suggest that rhyme and alliteration affect reading at two different phonological levels, involving phonemic and intrasyllabic units. Sensitivity to rhyme develops as a precursor to phonemic detection. Both awareness of phonemes and intrasyllabic units have been found to play a considerable role in the acquisition of reading skills. Following a longitudinal study they found that rhyme and alliteration make a contribution to reading independent of phonemic awareness. Metaphonological skills of both phoneme and syllable awareness of pre-school children

can predict their subsequent reading abilities (Bradley and Bryant, 1983; Liberman et al, 1974; Stanovich, Cunningham and Cramer, 1984).

One of the most difficult concepts for the child to learn is that speech, words and syllables, are represented by smaller units in the alphabetic script. In speaking and listening, the child does not have to recognise this complex and abstract relationship. If children do not recognise differences and similarities between spoken words then each word which they learn to read will seem unique.

Treiman (1987) and Goswami and Bryant (1990) attach great importance to the consideration of not only the individual phonemic units but also the intrasyllabic units of words. The identification that *cat* and *hat* rhyme is a tacit acknowledgement that the words are built from smaller units than syllables, that although they have the same rime (*at*), the two words are distinguishable through their contrasting onsets (*c* and *h*).

Within the sphere of metaphonological ability an individuals' awareness of different units (syllabic, intrasyllabic and phonemic units) develops at a different rate. While awareness of syllables and intrasyllabic units is generally acquired in early childhood, children can often only be seen to acquire phonemic awareness in the process of learning to read. This awareness of phonemes is more highly correlated with reading non-words than with reading real words (Treiman and Baron, 1981). Younger children do better on syllabic tasks than they do on phonemic tasks in metaphonological testing (Treiman, 1987; Fox and Routh, 1975; Liberman, Shankweiler, Fischer and Carter, 1974).

Guthrie (1976) states that conscious awareness of phonemic units is required in the acquisition of written language comprehension. Familiar words are processed by fluent readers as wholes while unfamiliar words are processed letter by letter or by groups of letters which occur in recognisable patterns.

1.6.3. Implications for children's education

In the following section some issues concerning the acquisition of literacy and metaphonological ability are discussed with relation to implications for children's education. These issues relate to the differences between children in their metalinguistic experiences; the pre-school and primary curricula; cognitive ability and control; children with reading difficulties and language disorders and the acquisition of literacy.

1.6.3.1. Disparity of pre-school metalinguistic experience in children

Large individual differences in metalinguistic ability exist between children (Catts, 1991; Bradley and Bryant, 1983) and these differences influence their acquisition of literacy. For some children their capacity to reflect upon language will be more developed than others at the time they enter school.

Hoffman's observations of her son's precocious reading development without formal teaching indicate that differences in home environment can greatly influence a child's experiences with language and therefore his consequent abilities. (Hoffman, 1986) Being read to precipitated linguistic awareness and an early realisation that print represented the spoken word.

Zucchermaglio et al (1986) found a significant correlation between the level of linguistic awareness of children on school entry and the number of years which they had attended pre-school. This finding supports the view that pre-school experience is implicated in the development of metalinguistic abilities. Reading stories frequently occurs in the pre-school environment but some children may not have had these experiences during pre-school years. Metalinguistic ability may previously only have occurred spontaneously and the teacher will have to encourage deliberate reflection.

The positive effect of being read stories and nursery rhymes on the development of both specific literacy skills and linguistic awareness has been documented (Hoffman, 1986; Wells, 1982). Reading aloud to children is an important facet of the literate home environment and the best preparation for establishing pre-school literacy skills.

Rhyming is a natural way to generalise and learn about linguistic segments so each word a child meets is not entirely unique (Bradley, 1980). Children play with words, distort them, make them rhyme and this is part of learning to analyse speech units. If this is mastered before children come to school they should be able to learn to read and write more easily.

On entering school, learning to read in itself will focus more attention on language and for those children especially from homes which do not place much emphasis on language it may be the first time that they encounter reflective language awareness which has not occurred spontaneously.

In the formal teaching environment of literacy acquisition children gradually develop higher levels of control over focusing attention on language in order to carry out the metalinguistic tasks with which the teacher presents them. As children become progressively familiar with the written word, higher levels of cognitive control will develop which will enable them to focus attention on different linguistic units (Garton and Pratt, 1989).

A class of children beginning to learn to read do so from different starting points. Their metalinguistic experiences and awareness of phonology in particular may be very different. Those with better metaphonological ability will be likely to go on to develop better literacy skills (Bialystok and Mitterer, 1987). The disparity could be minimised by ensuring that children beginning to learn to read have the same awareness of phonology. In order to ensure that children attain similar levels of metalinguistic ability before they begin to learn to read, some form of pre-school training of linguistic awareness in general and phonological awareness in particular would be beneficial. To some extent, this would allow children whose metalinguistic ability had not previously been stimulated (either through a disadvantaged socio-economic background or lack of specific metalinguistic experience) to 'catch up' with those children who have been able to acquire adequate levels of metalinguistic ability during their pre-school years.

1.6.3.2. The pre-school and primary curriculum, literacy skills and metaphonological ability

In documents set out by the Scottish Office Education Department and Lothian Regional Council Education Department, guidelines for the curricula in pre-school and primary education are presented. There is a paucity of attention to metalinguistic skills in general and almost no mention of metaphonological skills in particular, although listening to poems and rhymes is advised.

The pre-school curriculum on listening skills refers to identifying and clarifying sounds and noticing their similarities and differences. These sounds, however, are non-verbal sounds and the emphasis is on music and rhythm. The literature on metaphonological ability suggests that these listening skills should be applied to speech sounds as well as musical and household sounds in order to prepare children for school when they begin to learn to read.

In "A Curriculum for the Early Years" (1992) produced by the Lothian Region Council Education Department, Dr Joyce Watt's research into the transition from pre-school to primary school is cited. She argues that the educational system should recognise the importance of the pre-school years and that pre-school and school education should have continuity. Within the context of metaphonological ability, this view supports the earlier introduction of awareness of the structure of language and speech sounds in particular.

The National Guidelines for English Language, Curriculum and Assessment in Scotland (The Scottish Office Education Department: 1991), sets out attainment targets for children at different levels of the education system. These targets during the first three years of primary education, for children aged five to seven years, make no mention of metalinguistic let alone metaphonological ability. There are a few indirect references to metalinguistic skills in the guidelines for later primary school stages.

It is only by the age of seven or eight that children are required to "know, understand and use the term *rhyme*" (p12). In reading, the first attainment target to mention phonological awareness is for the 11 to 13 year age group, where it is stated that they should know, understand and be able to use the term *syllable*. The only reference to

metaphonologically related terms in the attainment targets for writing is for the 7 to 8 year age group, at which stage they are expected to know, understand and use the terms *letter* and *word*. Even in the section on talking, attainment targets refer only to prosodic and non-verbal features of speech.

In a later section of the document it is stated that teachers are to "ensure that pupils acquire knowledge about language, and apply that knowledge in their own talking and writing" (p 21). It also endorses regular activities which incorporate the "three R's" of listening: repetitions, rhythms and *rhymes*.

The guidelines on reading emphasise a *top-down* approach (using the larger linguistic units such as content and context to make sense of the written word) which concentrates on the use and content of the written language before its form or structure. Phonic and blending skills are mentioned as secondary to initial sight vocabulary - whole word reading. Likewise, there is no mention of the introduction of phoneme-grapheme correspondences, which would be appropriate in a more *bottom-up* approach (using the smallest units of phonemes and graphemes to build onsets and rimes, words and phrases), or the importance of onset and rime in the acquisition of reading and writing.

If metaphonological skills (including segmentation and blending skills) were introduced in the pre-school years then school age children may be better able to develop their phonic skills in reading, already having a 'head start' by being aware and able to manipulate phonemes. While the guidelines admit that the present emphasis in the curriculum is on the ability to understand and use language by manipulating larger units such as the paragraph, it concedes that smaller units should not be neglected. The 'smaller units' to which they refer, however, are *words* and *phrases* and not of any smaller linguistic units which would be classified as phonological.

1.6.3.3. Cognitive ability and control

A major outcome of the development of linguistic awareness is the ability to extract meaning in a more controlled manner. In reflecting on the language the child is able to

choose the most appropriate interpretation of an utterance or text, especially those containing ambiguous words or phrases.

Reading and learning to read encourage one to stop and think about one's thinking. The written word is enduring and free of non-linguistic context. It gives time to stop and think and a chance for focusing attention on language and encouraging awareness of language. This, Donaldson (1978) believes, is related to the development of intellectual self-control which further leads on to logic and mathematical abilities.

Becoming literate is of huge practical importance for life in our society. But also the process of becoming literate is important for the growth of the mind and is related to the encouragement of intellectual abilities, self-awareness and self-control.

Garton and Pratt (1989) believe that the mastery of spoken and written language is based on skills derived from metalinguistic knowledge. These skills make choice and control possible - exercising this choice and control is central to literacy.

1.6.3.4. Children with reading difficulties

There is evidence that children with poor phonological awareness may have more difficulty learning to read than children with well-developed speech-sound awareness (Bryant and Bradley, 1985; Mann and Liberman, 1984; Stanovich, Cunningham and Cramer, 1984) Lack of phonological awareness, it has been suggested, is a primary causal factor in many early reading disabilities (Stanovich, 1988 cited in Catts, 1991).

Bradley (1980) used 'odd-one-out' tasks to measure children's ability to identify rhyming and alliterative words (e.g. red, fed, bed, *nod*; pen, pig, pup, *hat*) in a study which compared normal and backward readers. Ten year old backward readers made more errors than normal seven year old children matched for reading-age, they particularly found alliterative tasks difficult. The normal ten-year old children made no errors and were better able to organise and categorise sounds. Backward readers had similar difficulties in tasks in which they were required to produce rhymes, although they were able to detect visual similarities between written words.

Pre-school children are able to produce rhyme and there is little developmental change across age bands. However there is a clear developmental trend in the ability to recognise rhyme. Bradley (1980) suggests that skill at sound categorisation has a profound effect on children's progress in reading and spelling at school. This is supported by her findings that children who are skilled at categorising sounds at school entry do better at reading and spelling three years later, regardless of intelligence. Even short training sessions on sound categorisation were found to have a significant effect (Bradley, 1980).

Past research has found that reading non-words is particularly difficult for children with reading difficulties (e.g. Frith and Snowling, 1983; Baddeley, Ellis, Miles and Lewis, 1982; Snowling, 1980). It is suggested that this is due to their lack of awareness of speech sounds.

Bradley and Bryant (1978) strongly support the belief that a deficit in auditory organisation, especially in carrying out tasks involving auditory memory and rhyme production, is an important cause of reading difficulty. If this is the case then remediation of many children with reading difficulties could include increasing metaphonological awareness.

1.6.3.5. Language-disordered children and literacy

Even after therapy, many children with delayed or disordered speech and language encounter difficulties at school, especially with reading (Van Kleeck and Schuele, 1987). The primary aim of pre-school intervention has been to improve oral communication ability. Van Kleeck and Schuele suggest that speech-language pathologists should also be concerned with reading acquisition at this stage. Precursors to literacy begin to develop in the pre-school years and it is these skills which the language-disordered child often lacks.

Although, in the past, reading has been viewed more in terms of visual-perceptual skills, language based skills are now being given greater emphasis in teaching. The acquisition of literacy depends on both children's oral language comprehension and expression as well as their metalinguistic ability (Van Kleeck and Schuele, 1987).

Language-disordered children experience reading difficulties as a result of deficient language and deficient metalinguistic skills (Kamhi, Freimoth Lee and Nelson, 1985; van Kleeck and Schuele, 1987). The pre-school years have been implicated as a very important time for developing skills as precursors to literacy which are later refined in formal teaching.

1.6.4. Conclusions

The relationship between metalinguistic ability and literacy is a complex one. Metaphonological skills are implicated in the early stages of learning to read and learning to read in itself encourages further development of metaphonological ability.

The awareness of phonemes seems to be a special case in metaphonological ability. Phonemes are the units of which children last become aware. Children may be beginning to learn to read when they develop phonemic awareness although it is possible to develop this awareness without learning to read.

The importance of the early introduction to metaphonological skills within the educational setting is not reflected in the present curricula for either pre-school and primary education. Metaphonological abilities are mentioned only in the development of language and literacy skills of older children (seven or eight years of age).

The relationship between metaphonological skills and the acquisition of literacy has implications in children's education with respect to normally developing children with different metalinguistic experiences as well as children at risk of reading difficulty such as language-disordered children (Schuele and van Kleeck, 1987). The literature suggests that children at risk of reading difficulties (those children with less well developed metaphonological ability) should be given specific training to enhance their linguistic awareness before they begin to learn to read (Catts, 1991). Spoelders and van Damme (1985) argue that metalinguistic ability should be trained before decoding strategies are developed in teaching children how to read.

The acquisition of literacy and the development of metalinguistic ability are also central in the process of cognitive development in terms of intellectual abilities. So ensuring that a child is adequately prepared for learning to read and has the required metalinguistic skills is implicated in the overall cognitive development of that child.

1.7. Summary

Both observational and experimental evidence suggests that metaphonological abilities begin to develop in early childhood, around the age of two to three years. The metaphonological development of young children is thought to be influenced by family background (for example, the number of languages they encounter and the extent to which language is used and talked about in the home) and other experiences and aspects of development in their pre-school years (for example, their acquisition of language; their cognitive development; attendance at nursery; and their experience with nursery rhymes, being read to and their awareness of the written word).

Children are expected to be ready to begin to learn to read when they enter school (at the age of four or five years in the U.K.). However, differences exist in children's metaphonological experiences and the extent of their metaphonological development during the pre-school years. These disparate levels of metaphonological ability mean that not all children are equally ready to develop literacy skills when they start school. It is only much later in the primary school curriculum that any mention of metaphonological skills are made.

It has been suggested that some attempt to standardise children's awareness of language (metaphonological ability in particular) before children are taught to read would assist the acquisition of literacy, especially for those children with poor metalinguistic skills. In this way, the task of teaching a class of children to read could be facilitated by ensuring that pre-school children gain similar metaphonological experiences and are given the chance to develop the necessary metaphonological skills to support the acquisition of literacy.

Chapter Two

Review of studies which are precursors to the investigation

This chapter is divided into seven sections. The first section describes nine studies in which the effects of metaphonological training have been investigated in children while the following section summarises the findings of these studies. Sections 2.3. to 2.6. give a critical analysis of important methodological issues which emerge from the review of these studies. The issues relate to the specific aims of the studies, the choice of subjects, the experimental design and the particular assessment and training procedures employed. All these issues are pertinent to the design of the investigation reported in the thesis.

2.1. Descriptive accounts of studies closely related to the current investigation

This section describes studies which have investigated the effects of training metaphonological abilities in children. The studies differ in their design, the type of assessment and training procedures used and the focus of training.

2.1.1. Byrne and Fielding-Barnsley, 1991 (Australia)

Byrne and Fielding-Barnsley investigated the effect of a program to teach phonemic awareness involving 126 pre-school children with a mean age of 4 years 7 months (the age range was not given). Two groups of children, an experimental and control group, were matched for age, vocabulary acquisition and initial metaphonological ability (as assessed using a rhyme recognition task and a phoneme identity task).

2.1.1.1. Assessment

The Peabody Picture Vocabulary Test, used to measure vocabulary acquisition, and various metaphonological tests (rhyme recognition and phoneme identity [see section 2.3.1.]) were carried out as pre-training tests. The children's knowledge of book and

print conventions and their recognition of letter sounds and names were also assessed before the training programme was administered. The phoneme identity task and letter knowledge test were repeated in the post-training test phase along with a test of reading (choosing one of two spoken words to refer to a written word on a card) after the training period.

2.1.1.2. Training

The phonemic awareness training involved groups of four to six children who took part in a programme of 12 twenty-five to thirty minute weekly sessions. Each session targeted one of six phonemes /s, l, m, p, t, a/ with a session on a given consonant in initial position followed by the same consonant in final position in the next session. Activities included discussions of articulatory features of phonemes; finding the pictures of words which began or ended with the target phoneme on posters; locating and colouring targeted items on worksheets; card games which allowed the children to practise metaphonological skills such as matching pictures whose names began with the same phoneme in a variation of "snap"; and telling stories and jingles with repetitive emphasis on targeted phonemes. The associated grapheme would also be represented during the session targeting the associated phoneme.

The control group took part in an equivalent number of sessions over the same period of time but they concentrated instead on vocabulary and semantic activities such as story-reading; locating and colouring pictures from the same semantic categories on a worksheet; and playing another variation of the snap game matching semantically similar pictures.

2.1.1.3. Results and conclusions

There was no significant difference in the pre-test measures for the experimental and control groups. Both groups showed an increase in performance on the phoneme identity test from pre-training to post-training test, but the increase was significantly greater for the experimental group. A significant effect of phoneme position was observed on

children's performance of this task - they found judgements about initial phonemes much easier than final phoneme judgements.

The word choice reading task also showed a significant difference between the experimental and control groups - the trained subjects achieving a significantly greater mean score.

More children reached criterion scores (e.g. scoring 75% on 50% chance tasks) in the experimental group than in the control group in all the post-training tests. Of the children who reached criterion scores for both phoneme identity and letter knowledge post-tests, 80% also succeeded on the word choice task while, of the children who only passed the phoneme identity test and not the letter knowledge test, only 6% passed the word choice task. The authors conclude that this suggests that both letter sound knowledge and phoneme identity are necessary in acquiring the alphabetic principle for reading.

2.1.2. Lie, 1991 (Norway)

This Norwegian study followed 208 children through the first two years of school after children in the experimental groups took part in a phonemic training programme (the mean age 7 years 2 months at the outset, but no information about the age range of subjects was given). The children were divided into two experimental groups and a control group.

2.1.2.1. Assessments

Pre-tests included an intelligence test, test of linguistic ability (auditory sequential memory, auditory reception, auditory association and sentence imitation) from the Illinois Test of Psycholinguistic Abilities (ITPA) (Kirk, McCarthy and Kirk, 1968) and letter knowledge. The first and second post-tests consisted of a reading and spelling test (designed by Gjessing, 1968).

The groups were matched in terms of intelligence, linguistic ability and letter knowledge. Metaphonological tests were only administered to a subset from each group before,

during and after training. These comprised tests for initial phoneme analysis, sequential analysis and phoneme synthesis.

2.1.2.2. Training

The training programmes involved 10 to 15 minute daily sessions over the first term. The first experimental group was given training in "positional analysis" aimed at developing children's ability to identify the initial, final and medial phonemes in spoken words. The second training programme given to the other experimental group involved "sequential analysis" to develop the identification of phonemes in words in sequence.

The control group discussed pictures and stories without reference to phonemic awareness. The training for all groups was carried out by different teachers in different classes.

2.1.2.3. Results and conclusions

The sequential experimental group performed significantly better in reading tests than the control group at the end of the first year of school although the difference was only marginally significant by the end of the second grade. Although there was no significant difference in the metaphonological ability of the two experimental groups, they were both significantly better than those of the control group.

At the end of the first grade the sequential group performed significantly better than the positional group which in turn gained significantly higher scores than the control group for spelling. By the end of the second grade the two experimental groups were almost identical in terms of spelling ability and still performed significantly better than the control group.

The authors conclude that this study provides evidence that systematic phonemic analysis training facilitates literacy acquisition. They suggest that the long term effects of such a programme need to be investigated since there was still some difference between groups in their reading and spelling ability after a year and a half.

There was some evidence that the children with low intelligence scores benefited more from the training programme than did the others (which, the authors believe, cannot be entirely accounted for by ceiling effects). The evidence suggests that this sort of intervention would be valuable for children at risk of reading difficulties and has practical implications for the remediation of reading and spelling difficulties.

2.1.3. Cunningham, 1990 (California, U.S.A.)

This study involved the phonemic awareness of 48 children from each of two different age ranges: mean ages 5 years 11 months (ranging from 5;4 to 6;5 years) and 7 years 2 months (ranging from 6;3 to 8;1 years). For each age group the children were divided into three groups with equal numbers: two experimental groups and a control group.

2.1.3.1. Assessment

A reading achievement test and three measures of phonemic awareness were administered both before and after the training phase. The phonemic awareness tests included a phoneme (consonant) deletion task, a phoneme oddity task (initial, final and medial phonemes) and a phoneme discrimination test (a very complex task involving counting and colour coding phonemes as they occurred in isolated consonant patterns and syllable patterns) as used in previous studies (Bruce, 1964; Bradley and Bryant, 1983; Stanovich, Cunningham and Cramer, 1984; Calfee, Lindamood and Lindamood, 1973).

2.1.3.2. Training

The experimental groups targeted phonemic awareness while the control group received the same amount of training which instead involved listening to stories, answering questions and discussing the stories. The 15 to 20 minute training sessions took place twice weekly over a period of ten weeks with groups of four or five children.

The programmes for the two experimental groups had an identical core although they differed in their emphasis on the relation between phonemic awareness and reading. The

first experimental group - the skill and drill group - received instruction in phonemic segmentation and blending without any direct reference to the use or application of these skills. In addition to the segmentation and blending exercises, the second experimental group provided metalevel knowledge of phonemic awareness which encouraged the children to reflect on their own thinking about phonological skills and discuss the use of learning about phonemic awareness in the context of reading.

2.1.3.3. Results and conclusions

The experimental groups performed significantly better than the control group for both age groups in all three post-training measures of phonemic awareness. The older children performed significantly better in all the phonemic tests, both pre- and post-training. The effect of training was greater for the younger subjects although the authors believe this result may have been influenced by a possible ceiling effect on the older children's performance.

In general, the type of training did not make a significant difference to the children's phonemic awareness as measured in the post-tests. There was no significant difference between the experimental groups for most metaphonological tests, although the younger metalevel trained children did do better on the phoneme deletion task.

It was concluded that training in phonemic awareness significantly increased the reading performance of both age groups in comparison with the control groups. The type of training did make a significant difference in the post-test reading levels, the metalevel trained children did significantly better than the skill and drill trained group.

Phonemic awareness training was found to improve children's reading ability. These findings support the view that phonemic awareness is highly implicated in the beginning stages of reading development and may be a necessary component of reading achievement.

The level of phonemic awareness in the younger children following training outstripped that of the older control group. This study's findings suggest that young children are

capable of increasing the level of their awareness given stimulation from their environment.

The metalevel approach, which encouraged and motivated reflective strategies, was a more effective program for the older children than simply teaching skills without the context of reading. This difference was not, however, apparent in the younger age group.

2.1.4. Lundberg, Frost and Petersen, 1988 (Denmark)

In Lundberg, Frost and Petersen's large-scale training study, 253 children formed two groups (an experimental and control group) of six-year old, pre-school children (no age range was given). These groups were taken from different geographical areas.

2.1.4.1. Assessment

The following pre-test measures were repeated as post-tests after the training phase: pre-reading ability, letter knowledge, language comprehension, vocabulary acquisition and metaphonological ability.

Metaphonological ability was measured in various subtests of rhyme recognition; sentence segmentation by word; syllable synthesis, syllable segmentation; initial phoneme deletion; phoneme segmentation and synthesis of phonemes.

Further tests were administered approximately 3 months after the first post-training assessment. These were tests of metaphonological transfer and were administered in groups rather than individually (rhyme recognition; initial phoneme recognition; word length analysis, syllable segmentation and phoneme segmentation). These second post-tests all differed in format from the original metaphonological assessments. In addition to the metaphonological transfer tests a non-verbal intelligence test, Raven's Progressive Matrices (Raven, 1948), a mathematics test and a reading and spelling test were also carried out.

2.1.4.2. Training

The control group was given no extra training, while the experimental group was given training to increase their awareness of both intrasyllabic (onset and rime) and phonemic units over an eight month period. The training involved 15 to 20 minute daily sessions of games and exercises which progressed from easy listening games with verbal and non-verbal sounds to rhyming exercises. Further tasks involved segmenting sentences by words, then syllables and eventually by phoneme. No direct teaching about reading was attempted.

2.1.4.3. Results and conclusions

The effect of training on the children's phonological awareness and later reading skills was investigated by assessing various aspects of their linguistic awareness both before and after training. Analysis of variance showed that the experimental group's improvement in measures of metaphonological ability was significantly greater than that of the control group. These differences were maintained at significant levels for all the metaphonological tests in the second post-testing.

Within the assessment of phonological awareness, the experimental group showed more improvement in measures of phonemic awareness and less dramatic change in their awareness of rhyme. However the results of both groups of children show scores near "ceiling" in the rhyme post-test which may account for the less significant improvement in performance.

A positive effect of the training was found for the literacy skills of the experimental group. They were able to read and spell more words than could the control group, and, as no such effect was observed for the mathematical skills, the effect of metaphonological training was considered to be specific.

The study therefore provides evidence that this kind of training can increase children's awareness of phonemes in particular and enables more effective acquisition of literacy skills.

2.1.5. Bradley and Bryant, 1983 (U.K.)

Bradley and Bryant investigated the importance of phonological awareness and particularly awareness of onset and rime on the acquisition of literacy. A training study involving 65 six-year old children was carried out as part of a larger longitudinal study (no information about the subjects' age range was given). Children who had previously obtained poor scores on a rhyme oddity test at the ages of four or five years old were divided into four groups, two experimental and two control groups.

2.1.5.1. Assessment

The pre-tests were in sound categorisation. These involved phoneme recognition in initial, medial and final positions within a CVC word. Post-tests of vocabulary acquisition, intelligence (using the revised WISC) (Wechsler, 1967), mathematical ability and reading and spelling ability were administered after the metaphonological training.

2.1.5.2. Training

Over a two-year period, the intervention groups received forty 10 minute sessions. One of the experimental groups was given metaphonological training which involved awareness of rhyme and alliteration. The second experimental group had additional training in phoneme-grapheme correspondences using plastic letters demonstrating that sounds can be represented by letters of the alphabet.

The first of the control groups spent an equivalent amount of time in categorising pictures according to their conceptual and semantic characteristics while the other group formed an untreated control. Using pictures and familiar objects, metaphonological training included sound categorisation tasks which showed that words share common sounds (e.g. hen and hat; hen and pet; hen and man).

2.1.5.3. Results and conclusions

The difference between the post-training metaphonological ability of the first experimental group and first control group was not statistically significant due to

considerable intra-group variation. The first experimental group, however, did have a consistent three- to four-month advantage in reading and spelling over the first control group as measured after the training was completed.

In this study, Bradley and Bryant found that the second experimental group, given training involving letters, was significantly better than any of the other groups in reading and spelling. There was no significant difference in mathematical ability between the groups however.

This study provides evidence again that metaphonological training and training including sound-letter relationships bring about greater progress in reading ability than does semantic training or no training. There is not very strong evidence, however, that awareness of onset and rime units affects reading acquisition as the difference between the first of the experimental and control groups did not reach statistical significance.

Early knowledge of nursery rhymes at the age of 3 years in the Bradley and Bryant study was associated with the ability to detect rhyme in words. This was found to relate to the performance on the phoneme oddity task requiring the detection of individual phonemes, which correlated with reading scores at the age of 5 and 6 years.

Garton and Pratt (1989) cite Bradley's 1987 study which assessed the same children four years later at thirteen years of age. The results of this follow-up study suggested that the differences between the experimental and control groups had been maintained despite the fact that many of the children in the control group had received remedial help in the intervening years.

2.1.6. Olofsson and Lundberg, 1983 (Sweden)

Olofsson and Lundberg investigated the effect of a 6 to 8 week phonemic training programme involving 95 children with a mean age of 6 years 11 months (no age range was given). Their methodology used three experimental groups and two control groups. There was no socio-economic difference between the five groups.

2.1.6.1. Assessments

The effect of the training programme was measured using pre- and post-tests of the children's ability to analyse and synthesise three-phoneme words. For the synthesis test, children were presented with the three phonemes and had to recall each while pointing to one of three pegs in turn (left to right). Once they were able to do this they were instructed to think of the word that the sounds represented. The successful synthesis of the word was rewarded by the picture being turned over. [If the subject was unable to blend the phonemes he would be presented with a syllable and final phoneme and given further guidance until he was able to experience some level of success.]

The analysis task was a role reversal of the synthesis task. The child was instructed to segment a secret picture word to produce three phonemes from which the experimenter had to guess what the picture could be.

A reading test was carried out although no formal reading instruction had been given. The reading test was not used as an exclusion criterion as in other studies (Bradley and Bryant, 1983) but rather as an explanatory variable.

2.1.6.2. Training

The experimental groups differed in the degree of structure in the programme. The training program was carried out by different teachers, alike in training and experience. Group 1 took part in a highly structured training programme consisting of 3-4 weekly half-hour sessions. The Group 2 program was less rigidly structured and spent less overall time on the tasks with the teacher being guided mainly by written instructions. Group 3 children in yet another class were only involved in the metaphonemic tasks when the teacher found it convenient in the course of the normal kindergarten curriculum.

Tasks were introduced to the groups in an order designed to allow even the least able to achieve some success in the initial stages and then progress onto more difficult tasks. The tasks were: recognition of rhymes, rhyming, nonsense verses; segmentation of words into syllables; finding initial phonemes and metalinguistic discussions of speech sounds

and words; addition and deletion of initial phonemes; segmenting two-phoneme and then three phoneme words by phoneme; and blending phonemes to synthesise words.

The first control group was trained in non-verbal auditory discrimination (involving sound localisation, discrimination of sound sources, sound signals as symbolic cues for different actions) while the second followed the normal pre-school curriculum over 6 to 8 weeks and provided base-line data.

2.1.6.3. Results and conclusions

The authors accept that as it was impossible to randomise individuals into the different experimental and control groups in such a field experiment the conclusions which can be drawn from the results are limited and that data collected in this way must be interpreted carefully.

The highly structured experimental group showed the greatest improvement in their ability to segment and blend three-phoneme words. Children with poor pre-test measures of phonological awareness made more improvement than those with better metaphonological scores although, again, like other studies, ceiling effects did not allow any insight into the development of phonological awareness in more able subjects.

Olofsson and Lundberg make some claims as to the nature of the skills involved in the phonemic awareness tasks which produced bimodal distributions of the test scores. They suggest that, in order to produce a bimodal distribution, metaphonological ability must be determined by a single underlying skill which the child either has or does not have rather than a number of different skills.

Most of the subjects had either only a small degree of reading ability or no measurable reading ability. Olofsson and Lundberg therefore concluded that phonemic awareness can be developed in preliterate children outwith the context of reading instruction as non-readers were able to succeed at the phonemic tasks.

2.1.7. Content, Morais, Alegria and Bertelson, 1982 (Belgium)

Twenty-seven pre-school five years olds were divided into two experimental groups and a control group, each with a total of nine subjects of similar distribution of age and gender (mean age 5 years 7 months ranging from 5;1 to 6;1 years). The study involved pre-tests followed by a training programme of four sessions over two weeks and two post-tests. The second post-test was carried out 6 months later although the numbers had dwindled from 27 to 18 subjects.

2.1.7.1. Assessment

Metaphonological abilities were assessed both before and after training phonological awareness. In assessing their metaphonological ability the children were asked to delete the onset in a series of words in a game where puppets were speaking an invented language. One puppet would make a mistake and the other would have to correct it. After about 6 induction trials the child would have to take over as the second puppet and correct the first themselves. Feedback was given after each of the 15 test items. The onsets which were to be deleted were either vowels (representing a whole syllable), fricatives or plosives.

No tests for reading ability, alphabetic knowledge or general linguistic ability were included in the assessments. Only metaphonological assessments were carried out.

2.1.7.2. Training

The two experimental groups differed with respect to the phonemes which were used in the post-training tests. The first experimental group were tested on the same phonemes which had been used in training while the second experimental groups were tested on phonemes which were not used in training.

The tasks used in training were: discussion of tongue twisters (the last sentence of a story containing many words with the same onsets); picture classification by target onset; and graphic association and blending where a target phoneme has to be added to a depicted word.

2.1.7.3. Results and conclusions

The initial pre-test results for the three groups was not significantly different as assessed through analysis of variance. Initially children's ability to delete the initial phoneme varied according to the category of phoneme (vowels 81% correct; plosives (42%) and fricatives were the least easy (20%)). Syllable detection and deletion, as shown by the deletion of an initial vowel, was found to be much easier than onset or phoneme removal. Both experimental groups improved significantly in their ability to delete initial consonants. Following the training in phonemic manipulation and blending their performance improved by about 40% in each case for the consonants. However, due to near ceiling pre-test score for initial vowels, no significant improvement was found in initial vowel deletion. There was no significant difference between the two experimental groups.

The control group, who did not take part in the training, did not show such improvement.

The effects of training were still significant six months after training. The second post-test also included a deletion task where the initial phoneme formed part of the onset (e.g. deleting /p/ from /pr../ or /pl../). The results of this second post-test involving onset segmentation was not significantly different for the three groups.

Subjects improved their performance from the beginning to the end of tasks during the pre-tests which could be due to the feedback that was provided for each item. This could be viewed as training in itself and, the authors suggest, may have influenced the finding that plosives were more easily deleted than fricatives because the fricative test always preceded the plosive test.

The results show that pre-school, pre-literate children are able to carry out quite complex metaphonological tasks, such as deleting phonemes as word onsets, when they have been sufficiently oriented to the task following training. Content et al also found that the effect of the training was not transient and the skills gained in training were transferable to other untrained phonemes.

2.1.8. Williams, 1980 (New York, U.S.A.)

The study involved 87 learning-disabled children between the ages of 7-12 years with an average I.Q. of 83 from different classrooms and schools. They were identified by their teachers as children who would benefit from the training programme.

2.1.8.1. Assessment

The pre-and post-tests assessed phoneme analysis and blending abilities; knowledge of letter-sound correspondences; and the ability to read real and nonsense words. Intelligence test scores were taken from school records although these were not obtained for all subjects.

2.1.8.2. Training

Training took place over 18 weeks in which an experimental group was given an average of 58 half-hour sessions in phonological training. The training comprised segmenting words by syllable and later by phoneme, then blending phonemes to synthesise words, followed by letter-sound relationships. Children also received extensive practice of reading and spelling using letter squares.

The program was given to the children, either individually or in small groups, by different teachers with another member of staff observing. The teachers had previously attended a half-day introduction to the materials and procedures.

The control group was given no extra attention or training. The regular reading instruction for all children was described as "eclectic".

2.1.8.3. Results and conclusions

The experimental group gained significantly greater post-test scores than the control group for all measures except for one subtest (saying the initial phoneme).

When the children were assessed on reading real and non-words, the trained group were able to read significantly more words and non-words than the control group. In an

additional reading assessment to test the extent to which learning had been generalised the experimental group gained significantly higher scores than the control group in reading real and nonsense words and was almost as good at reading nonsense words as they were real ones (the performance on real words was significantly higher than non-words for the control group). The experimental group was significantly better at reading unfamiliar words than was the control group showing that transfer of skills had taken place.

2.1.9. Skjelfjord, 1987 (Norway)

Skjelfjord (1987) reports a study carried out in 1971 with 24 pre-school children between the ages of 5 years 8 months and 6 years 8 months.

2.1.9.1. Assessment

After each week of training, which lasted 22 weeks, the children were tested using phonemic segmentation tasks, identifying and producing taught and untaught phonemes in initial, medial and final positions in monosyllabic words.

2.1.9.2. Training

One of each of the 27 Norwegian phonemes was taught each day in 10 to 20 minute sessions. In training, a series of short stories were used to introduce particular phonemes in which words containing the phonemes in initial, medial and final position were depicted. Attention was drawn to the articulatory and acoustic features of phonemes. It is not clear, however, from this account exactly how the subjects were trained to perform positional analysis on the words.

2.1.9.3. Results and conclusions

It was found that the pre-school children's analytical skill was not confined to taught phonemes but was generalised to other phonemes.

The weekly testing of analytical skill also provides information about the rate of development of the ability during training. This showed a large increase after the first week followed by smaller increases thereafter. Over half of the subjects gained a perfect score on the final test.

The frequency with which children used their own articulation of words in carrying out the tasks was found to increase as the difficulty of the task increased. On questioning several children explained that they said the words so they could "feel it in the mouth". The results show that children were more easily able to find a word's initial phoneme than they were final and middle phonemes and finding the final phoneme was easier than finding the middle phoneme.

2.2. Summary of findings from above studies

Although the studies described have used a wide variety of methods in investigating the effect of training on metaphonological ability and its relationship with the acquisition of literacy, they do share many common findings. As they differ in their design, the type of assessment and training procedures used and the focus of training, it is difficult to compare the relative efficacy of the training procedures. However, general conclusions can be drawn regarding certain aspects.

2.2.1. The effect of metaphonological training on phonological awareness

The effect of training is established by comparing the extent of the difference between scores of pre-training and post-training metaphonological tests for experimental and control groups. The studies described in the previous section [see 2.1.] have all found that children who have taken part in metaphonological training programmes obtain significantly higher metaphonological scores than do control groups when re-tested after the training period (Byrne and Fielding-Barnsley, 1991; Lie, 1991; Cunningham, 1990; Lundberg et al, 1988; Bradley and Bryant, 1983; Olofsson and Lundberg, 1983; Content et al, 1982; Williams, 1980). Although the control groups may also show some improvement this could be attributable to normal development of metaphonological ability or familiarity with the test situation.

2.2.2. Maintenance of the training effect

The degree to which the training effect was maintained has been investigated in some of these studies by the administration of a second post-training test of metaphonological ability. All of these studies found that the experimental groups were still significantly better at metaphonological tasks some time after the training took place (Lundberg et al, 1988 - 3 months after first post-training tests; Content et al, 1982 - 6 months later; and Bradley, 1987 - four years after training).

2.2.3. Methods of training

It is difficult to compare different methods of training metaphonological ability unless two different approaches are investigated within a single study (Lie, 1991; Cunningham, 1990; Bradley and Bryant, 1983; Olofsson and Lundberg, 1983). There is no evidence that a difference in emphasis within the training of phonological awareness in different experimental groups (e.g. a positional versus a sequential analysis; skill-drill training versus a metalevel approach; metaphonological training alone versus training including phoneme-grapheme correspondences;) produces a significant difference between these groups in post-training metaphonological tests (Lie, 1991; Cunningham, 1990; Bradley and Bryant, 1983).

The level of structure during training sessions, as investigated in the study by Olofsson and Lundberg, did seem to effect the extent to which children's metaphonological abilities were accelerated. Children who took part in a more highly structured programme of metaphonological training showed greater increases in phonological awareness than did the experimental groups whose programmes were less well structured. In their study, however, they did not ensure that experimental groups were matched for initial measures of metaphonological ability, bringing into question the validity of their conclusions.

2.2.4 The effect of training metaphonological abilities on the acquisition of literacy skills

Children's literacy skills were not investigated in all the described studies. Where reading abilities were assessed following metaphonological training, the trained groups achieved higher mean scores than did the control groups (Byrne and Fielding-Barnsley, 1991; Lie, 1991; Cunningham, 1990; Lundberg et al, 1988; Bradley and Bryant, 1983; Williams, 1980).

There is evidence that training metaphonological skills has a specific effect on increasing phonological awareness while no change in other measures, such as mathematical ability, is observed (Lundberg et al, 1988).

2.2.5. The effect of the type of training on the acquisition of literacy skills

While the type of training seems to have little influence on the extent to which metaphonological ability itself can be accelerated, there is evidence that different types of training do have differing influence on the acquisition of literacy skills (Lie, 1991; Cunningham, 1990; Bradley and Bryant, 1983). Children who had received training in the sequential analysis of phonemes obtained significantly higher reading and spelling scores than those who were given positional analysis training (Lie, 1991). This suggests that the ability to analyse words by phoneme as they occur in sequence is an important skill in learning to read. The difference between the reading ability of Lie's two experimental groups was only marginally significant one year later and there was also no difference between their spelling abilities at that time.

Both training methods in Cunningham's study had the effect of significantly increasing children's reading ability in comparison with the control groups. However, there is evidence that the metalevel approach to training phonological awareness, involving reflection on and discussion about metaphonological skills in the context of learning to read, is significantly more successful in improving reading ability than the "decontextualised" skill and drill approach which focused on segmentation and blending skills without any explicit reference to the application of these skills.

Some studies, especially those involving older children, trained both metaphonological skills and letter-sound knowledge. These studies suggest that both knowledge of phoneme-grapheme correspondences and phonological awareness (phonemic awareness in particular) are necessary for the acquisition of literacy (Byrne and Fielding-Barnsley, 1991; Cunningham, 1990; Bradley and Bryant, 1983).

2.3. Comparison of training study aims

The studies reviewed in Section 2.1 fall broadly into two categories with respect to their stated aims. The design of a study is influenced by its aims. The following sections compare the aims and methodologies of two types of training study.

Metaphonological training experiments can fulfil two roles: one is educational and the other is to test causal hypotheses. Educational studies explicitly investigate the effects of one or more teaching methods on metaphonological skills and reading abilities while studies which test causal hypotheses may not necessarily contribute to educational methods. An hypothesis testing study aims to investigate possible causal connections between metaphonological abilities and other abilities.

2.3.1. Educational studies - studies which train phonological awareness and grapheme-phoneme correspondences

The "phonic" approach involves teaching children about sounds and their relation to alphabetic symbols and written words. In studying the effectiveness of such an approach children are taught about graphemes and phonemes.

Experiments which involve teaching about both phonemes and graphemes cannot investigate the causal connection between phonological awareness and the way children learn to read because of the inclusion of the grapheme component which may directly influence beginning reading. As a result no definite causal link can be proved. However, in attempting to establish the value of phonic teaching methods, any improvement in reading as a result of this method adds to the plausibility of the hypothesis that phonological awareness has a causal link with reading.

Of the nine studies described in section 2.1, four have employed training of phoneme-grapheme correspondences in the intervention phase (Byrne and Fielding-Barnsley, 1991; Cunningham, 1990; Bradley and Bryant, 1983; Williams, 1980). The aims of these studies were to evaluate a programme for developing metaphonological abilities and also to investigate the causal connection between phonological awareness and learning to read.

Of these four studies, Bradley and Bryant's and Cunningham's have also included experimental groups which have not been exposed to the written forms and so these authors are able to draw conclusions about the relative values of programmes which include grapheme-phoneme correspondences and those which do not in teaching children to read.

Byrne and Fielding-Barnsley and Williams, on the other hand, are unable to draw such conclusions as they investigated the effect of only one type of training programme. Although their studies support the belief that the phonic approach is effective in teaching reading, they are not, however, strong tests of the hypothesis that phonological skills influence reading progress. Since written material was included in the experimental methods it cannot be certain whether it was the phonological teaching or the training with letters which led to improvements in the trained groups' reading ability.

2.3.2. Studies which test the "phonological hypothesis" - employing metaphonological training only

Although these studies are in themselves quite artificial and do not provide strong evidence for effective teaching methods, according to Goswami and Bryant (1990), they do test the causal relationship between phonological awareness and reading ability - children's awareness of sounds affect their reading.

Of the nine studies described in the first section of this chapter, four can be said to test the 'phonological hypothesis' (Lie, 1991; Cunningham, 1990; Lundberg et al, 1988; Bradley and Bryant, 1983). They aim to evaluate the effect of training programmes for stimulating phonological awareness in children on metaphonological ability and reading ability. Lundberg et al and Lie investigate the effect of training metaphonological abilities on the development of reading and spelling. By using two different types of training programme, Cunningham and Bradley and Bryant, by comparison, aim to investigate the effect of training phonological awareness alone as well as training both phoneme-grapheme correspondences and phonological awareness on the acquisition of literacy

skills. These latter studies could be categorised as educational studies and studies which test the 'phonological hypothesis'.

Another three of the described studies [see section 2.1.], in which training of phoneme-grapheme correspondences is not involved, do not investigate post-training literacy abilities and so are not of direct interest in the acquisition of literacy skills (Olofsson and Lundberg, 1983; Content et al, 1982; Skjelfjord, 1987). These studies aim to evaluate the effect of metaphonological training programmes on metaphonological abilities alone. Although they do not test the phonological hypothesis because the relationship between post-training metaphonological ability and post-training reading ability cannot be established, they are, however, valuable in terms of acquiring knowledge about accelerating metaphonological abilities in children which in turn have been linked with the development of reading and spelling.

2.4. The subjects used in metaphonological training studies

In this section, the issues of age and number of subjects used in training studies are examined. Researchers encounter practical constraints in designing and carrying out their studies and various factors influence the criteria of age of subjects and number of subjects included in a study.

2.4.1. Age of subjects

Age criteria have been applied in each of the studies cited in Section 2.1. Each study has used children from different age ranges. In addition to the age criterion, investigations have also taken into account the level of schooling which the subjects have received since the extent to which children benefit from metaphonological training is likely to be influenced by their experience of structured literacy teaching. This type of experience does not usually occur before children attend school. The metaphonological ability of pre-school children is therefore not affected by the knowledge of grapheme-phoneme correspondences which school-age children are taught.

In Britain the school entry age is around five years of age and the majority of children attend pre-school from the age of three and a half or four years. In contrast the Scandinavian, Danish and Belgian studies have used older pre-school children because the school entrance age is higher, when children are six and seven years old.

A broad age range of pre-school and pre-literate children have been investigated in metaphonological training studies (see section 2.1.). These pre-schoolers range in age from 4 years 7 months (Byrne and Fielding-Barnsley, 1991) to 6 years 8 months (Skjelfjord, 1987). It is not clear whether there are qualitative and/or quantitative differences in the metalinguistic ability and response to training programs of children at different pre-school ages although there is evidence of general developmental trends. As no two training studies have used the same methods and no single study has investigated children from different pre-school age groups it is difficult to draw any firm conclusions regarding the effect of metaphonological training on pre-school children of different

ages. There is more scope for this kind of study in countries where the school entry age is higher.

Both pre-school and pre-literate, and school-age children have been investigated by these studies. Cunningham's study (1990) was the only one to have compared the effect of training programs on two age groups of children: pre-school and school-age. Although no significant difference was found between two training methods with the younger children this may have been due not to their age or developmental maturity, but more to the lack of opportunity to practice any skills which they may have learned as a result of the training. The influence of reading and spelling instruction which is given to the school-age children must be considered in drawing conclusions about the extent to which phonological awareness can be accelerated and also the extent to which literacy skills are enhanced by metaphonological training. Pre-school children are not engaged in a formal reading programme as are most school-age children.

No previous published study has obtained information about the effect of metaphonological training on children below the age of four and a half. The facilitation of metaphonological abilities during this period of development is of particular interest as it is at around this age that children in the U.K. enter school.

2.4.2. Numbers of subjects

There has been a great deal of variation in the numbers of children involved in the different training studies. In general, the larger the number of subjects in a study, the greater is the reliability of results obtained from that study. The total number of subjects in the studies previously described ranges from 24 (Skjelfjord, 1987) to 235 (Lundberg et al, 1988).

The number of subjects within each of the experimental and control groups must also be considered. Of the nine studies described in section 2.1, the median number of subjects in each group is 16.5 although the average number is more than double this figure due to the large scale studies carried out by Lundberg et al and Lie.

Both time and practical constraints influence the number of subjects which any one study can involve. These considerations include: the availability of subjects, the number and size of school and nursery classes and the number of researchers gathering data and carrying out training procedures. [See section 2.6.4. for further discussion.]

2.5. Issues of experimental design

This section examines various issues of experimental design which have arisen from the review of the previous closely related studies [described in Section 2.1]. The first of three sub-sections explores the need for experimental and control groups and the second examines the criteria for allocating subjects to groups used in the reviewed studies. The final section describes the different pre- and post-training measures used in assessing any change which may have been brought about by the different intervention programmes.

It could be argued that any change in children's metaphonological awareness could simply have been brought about by interacting with the researcher and taking part in group activities, regardless of what these activities may have been. An increase in ability may also be due to spontaneous development. To ensure that any change is due to the intervention programme, the experimental design must also incorporate control groups.

The allocation of children to experimental and control groups has, in many studies, not involved rigorous group matching criteria (Lie, Lundberg et al, Olofsson and Lundberg, Content et al, Williams). The abilities which are assessed before training constitute a base-line for comparison with the post-training tests as well as determining the relative starting points for all subjects. In order to investigate the influence of an intervention programme, measures of the subjects' abilities must be obtained both before and after the programme has been administered.

Those studies which have assessed a wide range of children's abilities and matched the experimental and control groups have gone a long way towards ensuring that the groups can be seen to come from the same population.

2.5.1. Experimental and control groups

All the studies reviewed in Section 2.1. have used at least one experimental group (Byrne and Fielding-Barnsley, Lundberg et al, Williams, Skjelfjord) and most have used more than one. Lie, Cunningham, Bradley and Bryant, and Content et al have used two

experimental groups and Olofsson and Lundberg used three in their investigations of different types of training programme [see Section 2.3. for further details].

Control groups have been incorporated into the experimental design in order to compare the effect of a metaphonological training programme on children with children who have not received such intervention. Only Skjelfjord's paper (1987) reports a metaphonological training study which did not involve a control group. As a result no conclusive evidence is provided as to the positive effect of the training study on children's metaphonological ability. Any increase could have been due to normal metaphonological development.

All the other studies have used at least one control group. Six of these studies (by Byrne and Fielding-Barnsley; Lie; Cunningham; Lundberg et al; Content et al; and Williams) have used just one control group. The role of the sole control groups varies in these studies. Lundberg et al; Content et al; and Williams made use of an untreated control group in order to compare the development of treated experimental groups with spontaneous development or familiarisation with the test situation and activities. Byrne and Fielding-Barnsley, Lie, and Cunningham, on the other hand, used control groups which took part in a training programme themselves although the control programme focused on a different linguistic area. All the treated control groups involved training in semantic categorisation of words rather than phonological awareness.

Ideally two control groups are needed to ensure that the training programme brought about change which could not be explained by either spontaneous development or interacting with the researcher and other members of the group. An untreated control group would show the extent of spontaneous development over time to compare with the extent to which the experimental group has changed over the same period of time. In addition, a second control group which has been given some kind of intervention programme, of the same length, duration and frequency, but focusing on an alternative area of linguistic development, would show the extent to which the specific metaphonological activities have influenced metaphonological ability over the same time.

Only two studies have used two control groups, one untreated and another with an alternative intervention programme to the metaphonological programme to which the experimental groups were exposed (Bradley and Bryant, 1983; Olofsson and Lundberg, 1983). Both of these studies have used a very complex experimental design as they have incorporated multiple experimental groups in addition to the two control groups.

2.5.2. Group-matching criteria

The extent to which researchers have matched experimental and control groups varies widely (with the exception of Skjelfjord, 1987, whose experimental design did not make use of a control group). It is not clear in some of the studies whether any attempt was made to match groups with regard to children's abilities or characteristics (Lie; Lundberg et al; Olofsson and Lundberg; Williams).

2.5.2.1. Number of subjects

Within only two studies have the numbers of subjects allocated to the different groups been matched exactly (Cunningham, 1990; Content et al, 1982) although Byrne and Fielding-Barnsley's study uses an approximate match.

2.5.2.2. Age

Within all the studies it seems that experimental and control groups have been matched in terms of chronological age, however, they have no other single criterion for group-matching in common (Byrne and Fielding-Barnsley, 1991; Lie, 1991; Cunningham, 1990; Lundberg et al, 1988; Bradley and Bryant, 1983; Olofsson and Lundberg, 1983; Content et al, 1982; Williams, 1980).

2.5.2.3. Gender

Some studies have attempted to match groups for gender (Byrne and Fielding-Barnsley, 1991; Lie, 1991; Cunningham, 1990; Content et al, 1982), although with the exception of the study by Content et al, this criterion has not been explicitly stated. No mention is

made of gender statistics in three of the studies (Bradley and Bryant, 1983; Williams, 1980; Skjelfjord, 1987) and although some others have given the numbers of boys and girls involved in the study the extent to which the researchers have attempted to match groups in terms of the criterion of gender is unclear (Lundberg et al, 1988; Olofsson and Lundberg, 1983).

2.5.2.4. Initial metaphonological ability

Only two studies have used the measure of initial metaphonological ability as a criterion for group-matching (Byrne and Fielding-Barnsley, 1991; Bradley and Bryant, 1983).

2.5.2.5. General linguistic ability

Byrne and Fielding-Barnsley (1991) and Bradley and Bryant (1983) used children's vocabulary ability as a criterion for matching experimental and control groups. These were measured using the PPVT (Peabody Picture Vocabulary Test: Dunn, 1981) and EPVT (English Picture Vocabulary Test: Brimmer and Dunn, 1973) respectively. Although Lundberg et al (1988) measured vocabulary acquisition using a non-standardised test, other researchers made no use of general linguistic ability in their studies at all (Lie, 1991; Cunningham, 1990; Olofsson and Lundberg, 1983; Content et al, 1982; Williams, 1980; Skjelfjord, 1987).

2.5.2.6. Intelligence

Subjects' intellectual abilities were measured in studies by Lie; Cunningham; and Bradley and Bryant. No other studies investigated children's intelligence directly although those measuring the acquisition of vocabulary using standardised tests will have gained some measure of verbal intelligence (Dunn, Dunn, Whetton and Pintillie, 1982).

2.5.2.7. Initial reading ability

This was used as a group matching criterion only in as much as some studies excluded subjects who were already able to read (Bryant and Bradley, 1983;). Others merely used

this measure as an explanatory variable (Byrne and Fielding-Barnsley, 1991; Cunningham, 1990; Lundberg et al, 1988; Olofsson and Lundberg, 1983; Williams, 1980). Reading ability was not assessed at all by Content et al (1982) and Skjelfjord (1987) and was used as a post-training test measure only by Lundberg et al (1991).

The literature in this area generally agrees that the acquisition of reading and writing is associated with metaphonological awareness [see section 1.6.2.3.]. The easiest way to ensure that the influence of literacy is uniform across the whole subject population of this study would be to set a criterion of zero ability.

2.5.2.8. Socio-economic background

Although this measure is not mentioned in some of the studies (Byrne and Fielding-Barnsley, 1991; Lie, 1991; Cunningham, 1990; Bradley and Bryant, 1983; Williams, 1980; Skjelfjord, 1987) it has been used by Lundberg et al; Olofsson and Lundberg; and Content et al as a group-matching criterion.

2.5.2.9. Problems with group matching

There are, however, certain intrinsic problems in matching experimental and control groups with regard to a number of variables. The larger the number of subjects, the easier it is to ensure that groups are adequately matched. Nevertheless, it is important to match groups as nearly as possible because random allocation of subjects to experimental groups could inadvertently result in major differences between the different groups even before the intervention procedures are carried out. This would weaken the design of an experiment for testing the hypothesis that a specific intervention causes a change in behaviour. If the subject populations in each group were clearly different, the study would not be able to give conclusive evidence of the effectiveness or otherwise of the intervention. For example, the main experimental group may have contained children who were all younger than the mean or had significantly less mature language abilities. The extent to which the intervention affects the subjects may have more to do with their

age and linguistic maturity than with the intervention itself. Another group containing a more normal spread of ages may give different results.

An example of poor group matching is in Olofsson and Lundberg's study. The numbers and proportion of boys and girls in each group was not matched and the second control group, which was used as a base-line for the experimental and first control group, contained three times as many boys as it did girls. In addition to this, there were differences between the total phonemic pre-training test scores for the experimental and control groups. As a result, the groups could not be said to be matched for initial metaphonological ability and so the significance of any differences in pre- and post-training results between the groups is therefore questionable.

2.5.3. Pre-training and post-training measures

The assessments used in the various studies to measure children's abilities have been influenced to a large extent by the experimental design of each study. Those studies which have used assessments as both pre-training and post-training tests have been able to measure change in specific abilities, while the purpose of other pre-training assessments has been to match children in experimental and control groups or provide explanatory variables.

The interpretation of tests which have been used in post-training assessment only must be considered carefully. Any difference between experimental and control groups cannot be assumed to be due to the intervention if no initial performance measure was taken.

2.5.3.1. Metaphonological tests

None of the metaphonological assessments which have been used in the studies described in section 2.1 are standardised assessments. Many have taken assessments used in previous studies, either as they stood or made further modifications and adaptations.

Tests of phonological awareness have been used in the initial assessment of children's abilities in all of the studies (Byrne and Fielding-Barnsley, Lie, Cunningham, Lundberg et al, Bradley and Bryant, Olofsson and Lundberg, Content et al, Williams, and Skjelfjord).

Lie, however, did not administer metaphonological tests to all subjects but rather to a subset of each of the experimental and control groups before, during and after training. Some studies did not choose to repeat the metaphonological tests following the training phase, preferring to focus on the effect of the metaphonological training on literacy skills in particular as opposed to the effect on their phonological awareness (Bradley and Bryant).

Tests of phonological awareness have been used as both pre- and post-training measures to gain information on the effect of training specifically on metaphonological skills (Byrne and Fielding-Barnsley, Lie, Cunningham, Lundberg et al, Olofsson and Lundberg, Content et al, Williams, Skjelfjord) However, Byrne and Fielding-Barnsley did not repeat all the metaphonological tests used initially.

Some problems were encountered in the evaluation of change in abilities. Ceiling or near ceiling scores found in post-training tests may not show the full extent of the development of the measured ability. Results could therefore be skewed, as with the near ceiling post-training rhyme scores in the study by Lundberg et al. Lundberg et al concluded that the greater change in metaphonemic measures indicated that phonemic awareness plays a greater part in the acquisition of literacy. Had the intrasyllabic awareness tests been extended, a greater change in children's awareness of rhyme may have been found which would have implicated metaphonological as well as metaphonemic ability in the development of literacy skills.

2.5.3.2. Assessment of literacy skills

Various literacy skills have been assessed by different researchers. These skills include knowledge of book print, letter knowledge, recognition and recall of letter sounds and names, word recognition and reading words and non-words. Studies have varied in their use of standardised tests and many have developed their own assessments for measuring levels of reading and spelling ability.

Many studies have used assessments of literacy skills both before and after training (Lie, Cunningham, Lundberg et al, Byrne and Fielding-Barnsley, Bradley and Bryant,

Williams). The studies carried out by Byrne and Fielding-Barnsley and Lie used before and after measures of literacy skills although different skills were targeted in the pre-training and post-training tests. Byrne and Fielding-Barnsley assessed letter knowledge both before and after training and used an additional test in post-training assessment to measure reading ability. Similarly, Lie tested letter knowledge before training but did not repeat this assessment after the training phase, rather he used a test of reading and spelling.

Olofsson and Lundberg assessed children's reading ability in initial assessment only while neither reading nor spelling ability were measured at all in studies carried out by Content et al and Skjelfjord.

2.5.3.3. Linguistic abilities

The following measures have been used to assess different aspects of linguistic ability in the previous training studies described in section 2.1.

(i) Vocabulary acquisition

Vocabulary acquisition has been targeted as a pre-training test by Byrne and Fielding-Barnsley who used the PPVT (Peabody Picture Vocabulary Test: Dunn and Dunn, 1981) to measure children's abilities. The English Picture Vocabulary Test (EPVT: Brimmer and Dunn, 1973) was used by Bradley and Bryant only in post-training assessment.

Lundberg et al administered a non-standardised assessment of vocabulary acquisition both before and after metaphonological training. However, many researchers did not investigate children's development of vocabulary at all (Lie, Cunningham, Olofsson and Lundberg, Content et al, Williams, Skjelfjord).

(ii) Language comprehension

In addition to the vocabulary acquisition measure, a Danish language comprehension assessment was also used in both pre-training and post-training tests by Lundberg et al.

It is not clear, although Lundberg et al state that it is a widely used procedure, whether it has been standardised and by whom it was developed.

None of the remaining studies investigated language comprehension ability either before or after the training phase (Byrne and Fielding-Barnsley, Lie, Cunningham, Bradley and Bryant, Olofsson and Lundberg, Content et al, Williams, Skjelfjord).

(iii) Other linguistic abilities

Lie used four subtests from the ITPA (Illinois Test of Psycholinguistic Ability, Kirk, McCarthy and Kirk, 1968) to gain information about subjects' auditory linguistic abilities. Auditory sequential memory, auditory reception, auditory association and sentence imitation tests were administered although no other linguistic abilities such as vocabulary acquisition or language comprehension were included in the battery of tests. No other study investigated other linguistic abilities in their subjects.

2.5.3.4. Intelligence

Pre-training measures of intelligence were gathered in Lie's study using a Swedish group administered test (Lindahl, 1965). Although information of subjects' intellectual abilities was made available to Williams, she was unable to obtain measures of intelligence for all of the subjects in her study and no mention is made of how intelligence was measured.

Bradley and Bryant used the WISC (Wechsler, 1967) and Lundberg et al used Raven's Progressive Matrices (Raven, 1948) to investigate intelligence after the training phase of their studies. But the majority of previous research has not considered direct assessment of intellectual ability as important (Byrne and Fielding-Barnsley, Lie, Cunningham, Olofsson and Lundberg, Content et al, Skjelfjord).

2.5.3.5. Other abilities

Mathematical abilities were measured by Bradley and Bryant in their investigation and comparison of non-linguistic and linguistic abilities. No other study tested abilities other than those already described in section 2.5.3. (Byrne and Fielding-Barnsley,

Cunningham, Lundberg et al, Olofsson and Lundberg, Content et al, Williams, Skjelfjord).

2.6. Procedures used in assessing and training phonological awareness

In assessing metaphonological abilities the type of task and the difficulty of the task must be considered. The tasks and activities employed in the metaphonological training programs described in section 2.1. vary in the cognitive and linguistic demands which they place on children.

In the following discussion the terms 'task' and 'activity' are used as described below. A *task* involves a specific process (e.g. synthesising two phonemes to create a larger phonological unit such as an onset, syllable or word) while an *activity* is a procedure which creates the environment in which the task can be carried out (e.g. a game in which the child has to listen to a puppet, who can only say bits of words, and work out what the puppet meant to say by synthesising the individual sounds the puppet produced to create a whole word). A number of different tasks can be accomplished in one activity using slightly different instructions or materials.

2.6.1. Categories of metaphonological tasks and activities

The following are processes involved in metaphonological tasks as based on categorisation by Lewkowicz (1980). These processes can themselves involve different phonological units [see section 1.1.2.]. Metaphonological tasks can be categorised in terms of *analysis* (identification and recognition), *synthesis* (addition of a unit or combining a sequence of units) and *manipulation* (deletion and substitution). The following examples illustrate the different types of metaphonological task.

2.6.1.1. Recognition of a phonological unit alone or within a larger phonological unit or word.

e.g. Does fish start with / f /?

Does fish start with the same sound as feather?

Does fish rhyme with dish?

2.6.1.2. Isolation of a phonological unit within a larger phonological unit or word.

e.g. What is the first sound in fish?

What is the last bit of fish?

2.6.1.3. Segmentation of a phonological unit or word.

e.g. What sounds are in the word fish?

2.6.1.4. Counting phonological units.

e.g. Which word has more sounds in it? But or butterfly?

How many sounds can you hear in the word fish?

2.6.1.5. Synthesis, blending or adding phonological units to other phonological units or words.

e.g. / k / / a / / t / Are they the sounds in cat or hat?

What word does this make? / k / / a / / t /

When we add / s / to / ɪŋk / does it make sink?

2.6.1.6. Deletion of a phonological unit from a larger phonological unit or word.

e.g. Is /ed/ what is left after you take / t / from Ted?

Say fish. Now say it without the / f /.

2.6.1.7. Substitution of one phonological unit for another.

e.g. When we swap the / m / with a / f / does meat become beat?

Say meat. Now say it with a / f / instead of a / m /.

2.6.1.8. Identification of a phonological unit in specifying phonological differences between words or segments.

e.g. Feet, meat. How do these words sound different?

2.6.2. Dimensions of task difficulty

Golinkoff (1978) proposed three "dimensions" for classifying tasks and estimating their difficulty: (i) the type of unit to be analysed (sentence, word syllable, intrasyllabic unit or phoneme); (ii) the processing operation to be performed (increasing in difficulty from recognising the presence or absence of a unit to performing a deletion and recombining the remaining elements and then to substituting one element for another); and (iii) the number of elements contained in the unit which is to be analysed. The interaction between the type and number of phonological units involved in the task must also be considered in estimating its difficulty.

In addition to Golinkoff's dimensions of task difficulty, the position of the unit must also be taken into consideration. Tasks involving manipulation of medial and final phonemes are considered to be more difficult than initial phonemes (Skjelfjord, 1987). Initial phonemes are regarded as a special case as they are also onsets (unless they form part of a consonant cluster) [see section 1.1.2.2.]. Since manipulating phonology at the intrasyllabic unit level is thought to be easier than manipulation of phonemic units (Treiman, 1985), the manipulation of an initial phoneme, when it can also be categorised as an onset, is considered easier than manipulating phonemes in other positions within a word.

Substitution operations are likely to put a strain on memory as they involve both deletion and blending. An exception to this may be substituting an initial phoneme (onset) in the production of a rhyme (Lewkowicz, 1980).

Metaphonological tasks may also be presented in different ways which affect the demands on the subject. The cognitive demands on the child are determined in part by the type of response the child has to give. In the same way that closed questions are easier to answer than open questions, a multiple choice format (involving pointing to alternatives or saying *'yes'* or *'no'*) is easier to accomplish than having to produce a response without such guidance. For example:

> *"Does 'fish' start with* / f /*?"* is less complex and easier to respond to than
>
> *"What does 'fish' start with?"*

Another example would be where a child has to choose one of two possibilities, which has fewer cognitive demands than a task in which there were more alternatives.

Some assessments of metaphonological ability have used illustrations of stimulus words which seem to minimise the memory load and/or enhance motivation (Reid, Grieve, Dean, Donaldson and Howell, 1993). These strategies have led to better performances by young children in tasks invloving phonological awareness.

It is also important to consider the use of terminology in classifying tasks. Content et al, for example, classify one of their tasks as an initial phoneme deletion task. They use this description to refer to the deletion of the first phoneme of a word whether that phoneme constitutes the whole or part of an onset. So an activity which they consider to be homogeneous in fact requires two distinct levels of skill: onset deletion (a developmentally easier task) and onset segmentation (a skill which is normally acquired later in the developmental sequence).

2.6.3. Comparison of training procedures in studies reviewed in section 2.1.

In devising a programme to facilitate metaphonological abilities in children the researcher must consider which metaphonological abilities are to be targeted; the difficulty of the tasks and complexity of the activities employed to carry out those tasks.

In addition to these factors, the child's interest and motivation must also be considered. By starting with tasks which are beyond the child's skill, the child could experience early failure and so become less motivated more quickly. However, by building up the child's skills step by step with a series of successes, his motivation should be maintained. For these reasons, tasks which require only early developmental metaphonological abilities should precede those metaphonological tasks which require skills which are normally acquired later.

2.6.3.1. Metaphonological tasks and activities

Of the nine studies, four involve phonological training (Lundberg et al, Bradley and Bryant, Olofsson and Lundberg, Williams) while the remaining five studies concentrate on training phonemic awareness alone (Byrne and Fielding-Barnsley, Lie, Cunningham, Content et al, Skjelfjord) [see section 1.1.3. for the distinction between phonological and phonemic awareness]. Catts (1991) emphasises the consideration of task demands in training metaphonological skills by stating that "care should be taken not to begin with activities that are well beyond the child's capabilities" (p197). Those studies which deal exclusively with phonemic elements are at risk of beginning with tasks of which the children are not yet capable [see section 1.2.3.].

Catts (1991) suggests starting with sound play activities to draw the child's attention to the sound structure of speech (for example, reading, reciting nursery rhymes; finger plays, television jingles, poems and songs; and telling stories containing rhyming and alliterative words). Of the reviewed studies, listening games involving verbal and non-verbal sounds were used by Lundberg et al and an environment for further metalinguistic discussion of speech sounds and words was provided by Olofsson and Lundberg.

Activities should also encourage the child to play games, such as producing rhyming and alliterative words or nonsense sequences, for example "Say a little bit of...."; and making up nonsense words demonstrating the arbitrary nature of the spoken word. Judging whether a pair of words rhyme or contain the same number of syllables; categorising words according to onset or rime; and choosing the odd one out from a series of words "Which one doesn't rhyme?", are structured tasks which could be used in facilitating phonological awareness.

Garton and Pratt (1989) give examples of easier activities such as learning short poems and finding rhymes for both real and nonsense words, as well as later activities like finding words that begin or end with the same sound.

Rhyming games involving recognition of rhymes were used by Lundberg et al, Bradley and Bryant, Olofsson and Lundberg and Content et al. These included saying nonsense verses, tongue twisters and stories with common rimes. Onset recognition, matching and

identification were also tasks which Bradley and Bryant and Content et al used in alliteration activities.

Segmenting words and syllables into syllables and intrasyllabic units respectively was trained in a number of studies (Lundberg et al, Olofsson and Lundberg, Williams). Synthesis tasks were not targeted in those studies which concentrated on metaphonological rather than metaphonemic ability. Awareness of intrasyllabic units, as well as phonemic units, was trained by Lundberg et al.

In Lewkowicz's survey (1980) of the methods used in previous studies, she considers blending and segmentation "basic" phonological awareness tasks and suggests that, in preparing children for reading readiness, these skills should be the focus of training. Having prepared the child with the easier metaphonological tasks such as recognising rhyme and alliteration and isolating different phonological units, the researcher can then go on to introduce synthesis and segmentation skills. Segmentation activities could involve identifying, tapping out or counting syllables in words (Catts, 1991).

2.6.3.2. Metaphonemic tasks and activities

Treiman (1985) advocates segmenting words by onset and rime before introducing phonemic segmentation in order to establish whether children are able to carry out easier metaphonological tasks before the more developmentally difficult tasks are attempted. Once this has been established training can move on to awareness of phonemes.

Continuant phonemes, it is proposed by Lewkowicz, should be targeted first due to their relatively long duration and their versatility. They can be produced in isolation or prolonged for emphasis without altering the acoustic pattern of the sound and as a result are more easily segmented than other consonants (Marsh and Mineo, 1977). Zhurova (1973) used an iterative method to highlight non-continuants (e.g. /p p p pat/).

It is often helpful to provide children with further information about phonemic features Catts cites a program used by Lindamood and Lindamood (1971) which labels phonemes, for example labial plosives are known as "lip poppers" and alveolar plosives

are referred to as "tip tappers". These also give useful articulatory information which facilitates phonological awareness (Skjelfjord, 1987).

Articulatory features of phonemes were used in discussions by both Byrne and Fielding-Barnsley, Lie and Skjelfjord. Skjelfjord in particular emphasises the importance of the tactile and kinaesthetic feedback in developing awareness of individual phonemes. This awareness of articulation has been used in subsequent studies (Byrne and Fielding-Barnsley, Lie).

Visual cues can also be used in such activities. A line drawing, for example will help to maintain the word in the child's working memory during segmentation (Catts, 1991). Lewkowicz (1980) suggests using colour coding to represent sounds in order to heighten awareness of individual sounds within a word (for example, with different coloured blocks). She explains that, in the process of decoding the written word, the child must first be able to remember the phonemes or phonological units (syllabic or intrasyllabic units) which graphemes or a sequence of graphemes represent and then synthesise those phonemes or phonological units to produce a word. In reading a novel word the child must therefore not only know of letter-sound correspondences but also how to blend those sounds to form a word.

Stories or jingles were employed in increasing awareness of common targeted phonemes in initial or final position by emphasising and repeating words which contain the target phonemes in position (Byrne and Fielding-Barnsley, Lie, Skjelfjord).

Recognition of initial and final phonemes was brought about by Byrne and Fielding-Barnsley in activities where the children chose pictures from a poster or worksheet with the target phoneme in position. Card games like 'snap' were also used in matching pictures with the same onset or initial phoneme.

Lie's study involved training the identification of phonemes in initial, medial and final positions by articulating words with the phoneme in a particular position being stressed (e.g. /fffɪʃ/ or /p p p pɪt/). Olofsson and Lundberg also made use of the iterative technique in increasing children's awareness of plosives which are less easy to stress in

speech. Children were trained in the identification of phonemes either in sequence or according to their position in various studies (Lie, Olofsson and Lundberg, Skjelfjord) Segmentation of two- and then three-phoneme words was targeted by Olofsson and Lundberg and words and syllables were segmented into phonemes by Lundberg et al, Cunningham and Williams using different activities.

Content et al employed training in which children were to blend a given onset with a depicted word. Other blending exercises were carried out by Cunningham; Olofsson and Lundberg; and Williams. Olofsson and Lundberg also used activities which involved the addition and deletion of initial phonemes to and from words or syllables.

Unlike any other study, one of Cunningham's experimental groups was trained using a 'metalevel' approach in which children became increasingly aware not only of the targeted phonemes but also of why awareness of these units is useful in learning to read.

Only after segmentation and blending skills have been mastered should phoneme manipulation tasks, such as deletion and substitution of phonological units requiring the segmentation or isolation of phonemes before the units may be manipulated, be attempted (Lewkowicz, 1980).

2.6.3.3. Phoneme-grapheme correspondence tasks and activities

Some of the studies also involved training in phoneme-grapheme correspondences (Byrne and Fielding-Barnsley, Cunningham, Bradley and Bryant, Williams) and of these Cunningham and Bradley and Bryant exposed only one of their experimental groups to graphemes. The implications of the inclusion of phoneme-grapheme correspondences have been discussed in a previous section [see section 2.3.1.].

Lewkowicz suggests that segmentation and synthesis skills are of primary importance in learning phoneme-grapheme correspondences and that training should begin with phonemic segmentation. There is however evidence that beginning with segmentation at the phonological level of syllables and intrasyllabic units would be more beneficial as this precedes phoneme segmentation skills in the developmental sequence (Liberman et al, 1974; Fox and Routh, 1975; Treiman, 1987) [see section 1.2.3].

Blending activities are also deemed an important skill in decoding the printed word (Catts, 1991; Lewkowicz, 1980). As with the segmentation activities certain issues need to be considered such as the phonological level at which activities are begun (syllabic before intrasyllabic before phonemic) and the number of units which are to be blended.

Byrne and Fielding-Barnsley use graphemes to represent the phonemes which they target during a particular session. For example, the letter 's' is written on a sheet of pictures in an activity in which the children must colour all the pictures which begin with /s/.

Bradley and Bryant used plastic letters in their training of phoneme-grapheme correspondences. They used similar activities to those used by Byrne and Fielding-Barnsley. These included finding pictures of things starting with a given letter or sound, finding which pictures share common phonemic features and finding the odd one out.

2.6.3.4. Organisation of training sessions

The following section summaries data on the length, number and frequency of training sessions and the duration of training phase of the studies described previously [see section 2.1.] and the number of children taking part in each training session.

(i) Length of training sessions

The length of training sessions range from 10 minutes to half an hour. None of the studies employed sessions longer than thirty minutes and the average session was about 20 minutes in length.

(ii) Number of training sessions

The number of training sessions varied from 4 to around 140 and to a great extent depended on the duration of the study. The average number of sessions in the nine studies was approximately 50 and the median was 40 sessions.

(iii) Duration of training phase

The duration of the training phase varied from 2 weeks to two years. The average duration of training in these studies was about twenty weeks. This value, however, is influenced by the longest studies. The training in the longer studies by Lundberg et al and Bradley and Bryant took place over 8 months and two years respectively. When these two studies are excluded from the calculation then the average duration of the remaining studies is halved. The median duration was 12 weeks of training.

(iv) Frequency of training sessions

Sessions varied in their frequency in the different studies. The frequency ranged from daily sessions to sessions every 2 to 3 weeks. Both the average frequency and median frequency for the studies was 3 sessions per week.

(v) Number of children per session

The number of children taking part in each training session varied from one study to another. Four studies took a whole class together for each session (Lie, Lundberg et al, Olofsson and Lundberg, Skjelfjord), although only Lundberg et al state the numbers of children involved (15 to 20 children).The remaining studies have used either individual subjects or small groups of 2 to 6 children (Bradley and Bryant, Williams, Content et al, Cunningham, Byrne and Fielding-Barnsley).

Due to the large scale, intensive studies (Lie, Lundberg et al, Olofsson and Lundberg) which have involved training sessions with whole classes of children, the average number of children in each training group was around 10. However, the median was five children per group.

2.6.4. Professionals involved in conducting training studies

All the studies involving 84 subjects or more have used teachers and other professionals in administering assessment and training procedures and collecting data while the remaining three studies (Bradley and Bryant, Content et al, Skjelfjord) do not make it clear who carried out the procedures. The greater the number of teachers and other professionals involved in the study the greater the number of subjects which may be included. However, although increasing the number of subjects is an advantage this must be balanced with the need for an increase in the number of researchers. The greater the number of experimenters, the greater is the potential for experimenter variation and the possibility that a difference between groups may be caused by differences in experimenters rather than differences in the training procedures.

Many of the studies reviewed here do not make it clear who is responsible for assessing the children and carrying out the intervention procedures (Bradley and Bryant, 1983; Content et al, 1982; Williams, 1980; Skjelfjord, 1987). Different teachers have been used in the studies reported by Lie; Cunningham; and Olofsson and Lundberg to carry out the training phase with children in different classes in schools and pre-schools who have also been allocated to different experimental and control groups. Lundberg et al (1988) used different professionals (speech and language therapists, psychologists and reading specialists) as examiners in their study. The researchers themselves were involved in the assessment and training of the children in the study by Byrne and Fielding-Barnsley.

Speech and language therapists (SLTs) could play an important role using their skills and experience in the development and implementation of phonological awareness training programs for children (Catts, 1991). Children with speech and language difficulties have a high risk of educational difficulties once they get to school (Howell, 1989; Schuele and van Kleek, 1987). Most language impaired children encounter difficulties as they learn to read (Catts, 1991) which may be due to their relatively poor phonological awareness.

2.7. Summary

This chapter has reviewed nine studies. Whether their aims were to carry out an educational study, test the phonological hypothesis or simply investigate the effect of metaphonological training on the development of phonological awareness, they have all evaluated at least one programme for training metaphonological abilities. The methodologies used by the different researchers reflect the aims of the different studies.

Many methodological issues have arisen from the review of these studies. These have included issues relating to subjects and experimental design: the use of experimental and control groups, group matching criteria and pre- and post-training measures [see sections 2.4 and 2.5].

In addition, the procedures used in the various studies for both assessment and intervention have been examined [see section 2.6]. Issues of task difficulty and categorisation have been examined in order to clarify the optimum sequence of tasks used in both assessment or training procedures. The different ways in which the reviewed studies have organised their training programmes have been discussed. The training of the professional carrying out the assessment and intervention procedures differs both from study to study and within studies. Speech and language therapists, however, are uniquely qualified in both the assessment and training of metaphonological skills.

The literature suggests that metaphonological awareness is influential in the acquisition of both primary and secondary language (literacy) skills [see Chapter One]. These skills have been further investigated in the reviewed training studies. The findings of the studies suggest that phonological awareness can be accelerated in both school-age and pre-school pre-literate children over the age of four and a half years. There have been no studies investigating the effect of metaphonological training with children below this age. Given this evidence, the design and evaluation of a programme aimed specifically at facilitating the development of metaphonological ability in pre-school and pre-literate

children under the age of four and a half years (i.e. the nursery school age range in the U.K.) would significantly add to knowledge in this area.

The findings of the studies [reviewed in section 2.1] have implications for children's education and indicate the importance of investigating whether the development of metaphonological abilities can be accelerated in children at the nursery school age, especially children with poor metaphonological skills, before they enter school and begin to be taught to read.

Chapter Three

Method

This chapter states the aims of the study [section 3.1] and describes its method [3.2]. The subjects, design of the study, and the materials and procedures employed in both assessment and intervention phases of the study are described. In the final section [3.3] the methods employed in the statistical analysis of the data are described.

3.1. Aims

The primary aim of the study is to determine whether a specified programme of activities influences the metaphonological abilities of pre-school, pre-literate children. In addition, the study investigates factors which may influence children's response to this programme.

3.1.1. Hypothesis

The study aimed to test the following hypothesis.

A group of children who take part in an intervention program targeting metaphonological ability will show accelerated development in this area compared with two groups of control subjects:

(a) children whose intervention program does not target metaphonological ability,

and

(b) children who receive no program of intervention.

3.2. Method

3.2.1. Subjects

3.2.1.1. Initial selection procedure

Forty-eight subjects were selected from those enrolled at two nurseries run by Lothian Regional Council Education Department, 24 from each nursery. Ethical approval was given by Lothian Regional Council Education Department to carry out the study in the proposed nurseries. The involvement of two nurseries dictated that the study be carried out in two blocks. Initially children within the required age range (ages 3:6 to 4:6 years) were identified [see 3.2.1.2.]. Further selection criteria were then applied [sections 3.2.1.3. to 3.2.1.7. below]. In addition to these criteria for subject selection, two further measures were obtained for matching the subjects in the experimental and control groups [see sections 3.2.1.8. and 3.2.1.9.]. Standardised tests and published materials were used in the assessment of the measures described in section 3.2.1.5. to 3.2.1.9. [Data for the measures described in 3.2.1.2, 3.2.1.3 and 3.2.1.5. to 3.2.1.9. are presented in Appendix F]

The nursery teacher listed those children between the ages of 3:6 years and 4:6 years who were considered to be developing normally in terms of the acquisition of speech and language; they had not been referred for speech therapy. They were also judged by the nursery staff to be developing normally in terms of motor, cognitive and social abilities. An equal number of girls and boys who were monolingual and had English speaking parents were selected from this list.

The parents of these children were given information about the research study and asked to complete consent forms. Parents were asked to give information about their own education and employment (in order to gain a measure of social grouping) and also to fill out a separate questionnaire regarding their child's hearing. All those who were contacted were willing for their children to take part in the study. [See Appendix B for copies of the information letter, consent form and hearing questionnaire.]

3.2.1.2. Age of subjects

The ages of the children in the study ranged from 3 years 5 months to 4 years 8 months at the time of initial assessment (mean age 4 years 0 months). The subjects were initially selected to be between the ages of 3 years 6 months and 4 years 6 months at the time of initial assessment (the lower limit of the age range was set in order to include subjects who were sufficiently mature to understand the necessary instructions and the upper limit was set to exclude children who may have been exposed to the structured teaching of reading and writing of primary education).

All the children in the first block of the study satisfied this criterion. In the second block however, a further selection was made of two children nearest the given ages in order to substitute for two subjects who, after screening, were found to be unable to satisfy the criterion of vocabulary acquisition and expressive language ability. These two additional subjects were girls aged 3 years 5 months and 4 years 8 months. The substitution of these subjects had no effect on the block schedule as it was made in the initial assessment phase.

3.2.1.3. Gender of subjects

An equal number of male and female subjects was required in each block of the study in order that any gender bias be minimised. In selecting subjects at each nursery the researcher ensured that there were 12 male and 12 female subjects who satisfied the remaining selection criteria. From a total of 48 subjects, 24 were girls and 24 boys.

3.2.1.4. Hearing ability of subjects

Children were included in the study only if they had passed all routine screening tests of hearing to date. Parents were asked to complete a questionnaire which was designed to highlight any hearing difficulties. The questionnaire was adapted from that used by Howell (1989).

3.2.1.5. Vocabulary acquisition

The British Picture Vocabulary Scales (BPVS: Dunn, Dunn, Whetton and Pintillie, 1982) was administered to prospective subjects in order to exclude subjects at the extremes in performance on this test. Performance on this standardised assessment of vocabulary comprehension is regarded as correlating highly with general verbal and cognitive ability.

Subjects whose scores were ranked below the 10th and above the 90th percentile were excluded from this study. This measure was also used to match subjects in the experimental and control groups.

3.2.1.6. Speech sound acquisition

All the subjects achieved a standard score of 85 or more (not more than 1 standard deviation below the mean) on the Edinburgh Articulation Test (EAT), (Anthony, Bogle, Ingram, McIsaac; 1971) indicating that their acquisition of the speech sound system was developing normally. This measure was used not only as a selection criterion but also for matching subjects in the experimental and control groups.

3.2.1.7. Reading and spelling ability

The Schonell Test of Reading and Spelling (Schonell and Goodacre, 1974) was administered to prospective subjects. This is a standardised assessment of a subject's ability to read and spell, and any score on this test would indicate some degree of reading and spelling ability. A criterion of a zero score on this test was set for inclusion of subjects in the study.

None of the children assessed were able to read any of the words from the Schonell Test of Reading and many were even unable to recognise their own names. None of the subjects could write any of the words from the Schonell Test of Spelling although a few children were able to write their names.

3.2.1.8. Expressive language ability

As a measure of subjects' expressive language ability, a story retelling task (The Bus Story, Renfrew, 1969) was used in order to gain a speech sample. From this sample the mean length of utterance (MLU) in morphemes was calculated (Brown, 1973). [For details see Appendix C]

MLU was used to match subjects across the three study groups rather than as a selection criteria.

3.2.1.9. Social background

From data obtained from the children's parents regarding their education and employment, a measure of social grouping was calculated (Wells, 1982). All four social groups in Well's classification were represented in this study. This measure of social grouping was used for group-matching and was not applied as a selection criterion.

[See Appendix D for details.]

3.2.2. Design of the study

3.2.2.1. Experimental and control groups

Subjects were allocated to one of three study groups: Groups A, B and C.

Group A, the experimental group, took part in a programme specifically designed to facilitate metaphonological awareness;

Group B, the first control group, took part in a programme targeting semantic rather than metaphonological abilities; and

Group C, the second control group, received no intervention programme.

This design using two control groups was chosen in order to address the methodological issues discussed in the previous chapter [see section 2.5]

3.2.2.2. Allocation of subjects to study groups

Having compiled the information and completed the assessments in section 3.2.1.1. to 3.2.1.8. above, subjects were allocated to one of the three study groups. The groups were matched for age, gender, linguistic development (vocabulary, speech sound and language acquisition) and social grouping. [See Appendix F for analysis of group matching.]

In each block of the study there were 24 children. Twelve children attending the nursery in the morning session and twelve in the afternoon session. In each nursery session, the twelve children (6 boys and 6 girls) were allocated to one of the three groups (A, B or C). Each experimental group contained two girls and two boys thus matching all groups for gender. Groups were further matched for age, BPVS percentile rank, EAT standard score, mean length of utterance and social grouping as nearly as possible based on the results from the screening procedure. In addition, an effort was made to ensure that no one group contained more subjects with higher initial metaphonological scores than any other [3.2.3.3. to 3.2.3.6. below]. The pre-intervention combined metaphonological score was taken as the measure of initial metaphonological ability by which groups were matched.

3.2.2.3. The three phases of the study: assessment, intervention and reassessment

The table below shows the division of an eight week block of the study into an initial assessment phase, intervention phase and final assessment phase.

Table 2 Outline of an eight week block

PHASE	**Initial Assessment**		**Group Facilitation Sessions**				**Final Assessment**	
WEEK	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Activity	Twenty-four children were assessed individually using the battery of tests		Eight subjects are allocated to each of the three matched groups (A, B and C). Sub-groups of four children from experimental groups A and B received a programme of 8 intervention sessions, 2 half-hour sessions per week. Those children allocated to Group C received no intervention programme.				All twenty-four children were reassessed using a sub-group of the assessment battery	

The investigation began with an initial phase of assessment over the first two to three weeks. In addition to the screening and group-matching measures described in sections 3.2.1.5. to 3.2.1.8., further assessments were administered to gain information on other linguistic and metalinguistic abilities prior to the intervention phase of the study. These assessments enabled an evaluation of the effects of intervention on subjects' abilities. Those subjects allocated to Groups A and B took part in their respective intervention programmes while Group C subjects were left to their normal nursery routine. The intervention phase took place over four weeks following the initial assessment. Each block was concluded by a final phase of assessment where all the subjects, from Groups A, B and C, were reassessed using the same battery of tests. The reassessment phase was carried out in two weeks immediately after the intervention phase.

3.2.3. Assessment procedures and materials

During the assessment phase certain linguistic and metalinguistic abilities of all the subjects were assessed. Those assessments used as selection or matching criteria have already been described [3.2.1. above]. This section describes further assessment procedures which allowed subjects' behaviours to be compared before and after the intervention phase of the study [For further details see Appendices A and C]. These further tests are described below [3.2.3.1. to 3.2.3.7.]. The assessments were carried out in a consistent order (see Table 3 below) by the author, a qualified speech and language therapist trained in the administration of assessments.

Table 3 The order in which assessments were administered

ORDER	ASSESSMENT	See section
1	British Picture Vocabulary Scales, long form (BPVS)	3.2.1.5.
2	Edinburgh Articulation Test (EAT)	3.2.1.6.
3	Schonell tests of Reading and Spelling (RSp)	3.2.1.7.
4	Language sample using the Bus Story (BS)	3.2.1.8.
5	Auditory Memory test (AM)	3.2.3.1.
6	Auditory Discrimination test (AD)	3.2.3.2.
7	Phoneme Feature Analysis test (PFA)	3.2.3.3.
8	Onset Recognition test (OR)	3.2.3.4.
9	Rhyme Recognition test (RR)	3.2.3.5.
10	Word Synthesis test (WS)	3.2.3.6.
11	Metasyntactic test (MS)	3.2.3.7.

3.2.3.1. Auditory Memory test (AM)

This assessment involved sentence and digit repetition tasks (Terman and Merrill, 1960; Wechsler Pre-school and Primary Scale of Intelligence, 1967). This test was included because there is some evidence that children's metalinguistic ability is correlated with their short term memory (Mann and Liberman, 1984). The children's responses were tape-recorded in order to verify the written record taken at the time of the test. Target sentences and digit sequences were printed on the score sheet leaving sufficient space to note any deviation from each target.

3.2.3.2. Auditory Discrimination test (AD)

This test provided a measure of the subjects' ability to discriminate between two words which are identical except for the initial sound. For each pair of words the initial sounds differed from each other by only one phonetic feature. The AD test was included in the assessment battery because in order for children to be able to manipulate and demonstrate awareness of aspects of phonology they must first be able to discriminate between speech sounds. The assessment used was adapted from Howell (1989).

3.2.3.3. Phoneme Feature Analysis (PFA)

The Phoneme Feature Analysis test is a metaphonological assessment of the subjects' ability to judge whether a phoneme is voiced or voiceless. For each item of this test, the subject has to listen to a phoneme, which is presented twice, and judge whether the phoneme is voiced (noisy) or voiceless (quiet).

The stimuli for the four PFA trial items and twenty test items were tape-recorded to ensure that each subject was presented with exactly the same stimuli. The tapes were prepared in the Speech Research Laboratory, Queen Margaret College and were recorded in a sound-proof studio using a Neumann U47 condenser pressure-gradient microphone and a Sony 'Video 8' digital audio cassette recorder. A technician assisted in the recording sessions to ensure that the recording levels were within normal limits. The recordings were copied on to tapes for use in a Phillips D6350 audio cassette recorder.

Two copies of the PFA stimuli tape were made, one to be used in each block of the study to ensure the sound quality was the same for both blocks. Two reference pictures were prepared, representing Mr. Noisy and Mr. Quiet. These referred to voiced and voiceless sounds respectively. The subjects were required to point to the relevant picture rather than recall and state whether the phoneme was "quiet" or "noisy". In this way, the pictures minimised the cognitive load of the task.

3.2.3.4. Onset Recognition test (OR)

The Onset Recognition test is a metaphonological test of children's ability to segment and recognise a phoneme spoken at the beginning of a word. The subjects were oriented to the task by an instruction to listen for the word which began with the target phoneme and were then presented with two pictures for each item. The two words were spoken in turn as the experimenter pointed to each of the pictures. The subjects then had to judge which of the pair began with a target phoneme.

For each of the twenty items in the test, pictures were prepared to represent minimal pairs (two words whose spoken forms are the same except for one speech sound e.g. *pan, man*). Four onsets were targeted, with five items for each one. In the introduction to the test the children were given two trial items which comprised of minimal trios (three words which differ only by one sound e.g. *lip, pip ship:* /lɪp, pɪp, ʃɪp/).

3.2.3.5. Rhyme Recognition test (RR)

This metaphonological assessment investigated subjects' ability to recognise rhymes. For each of the twenty items a word was presented for comparison with a constant word, a teddy bear's name. The children had to listen to the two words (the test item and the constant referent) and judge whether or not they rhymed. In addition to the twenty test items there were eight trial items.

3.2.3.6. Word Synthesis test (WS)

The metaphonological ability to synthesise words from orally presented sub-word units of different sizes and number was assessed using the Word Synthesis test. For each item, the children had to listen to the segments presented on a audio-tape and synthesise the segments in sequence to produce a word.

As with the PFA test, audio-tapes were made of the stimuli [see section 3.2.3.3. for tape-recording equipment and conditions]. In addition to the audio-tapes, pictures were prepared which represented the words in each of the eight trial and twenty-four test

items. No feedback was given to subjects for these items. After the subject responded to the auditory stimulus the picture was shown in order to maintain the subjects' motivation.

3.2.3.7. Metasyntactic test (MS)

This test involves awareness of language at the level of syntax. That is it taps metalinguistic ability in relation to a different linguistic level from the metaphonological assessments in sections 3.2.3.3. to 3.2.3.6. above.

The children's ability to judge the grammatical acceptability of sentences was assessed using this test. For each item a puppet was used to present a sentence and the subject was required to say whether the puppet had told a *good* story or a *muddled up* one.

Following the intervention phase all of the above assessments (in sections 3.2.3.1. to 3.2.3.7.) were repeated in order that any change in each of the respective abilities could be measured. This allowed an evaluation of the effect of the intervention phase on children's abilities.

[For details of test procedures and record sheets see Appendix C]

3.2.4. Intervention procedures and materials

3.2.4.1. Intervention sessions for the experimental group - Group A

The subjects in Group A took part in a programme of activities designed to develop various aspects of their phonological awareness. A programme of eight twenty to thirty minute sessions took place over approximately four weeks. On average there were two sessions per week for each sub-group of four children and each session was tape-recorded.

Plans for the intervention sessions were followed as closely as possible. [For details of session plans and schedule of activities see Appendix E] If during the session it proved impossible to include all the planned activities then those omitted in one session were added to the activities for the following session.

The sessions were conducted by the author, a qualified speech and language therapist, who is experienced in working with pre-school children.

3.2.4.2. Intervention activities for the experimental group - Group A

Activities were carried out to promote general language awareness before more specific tasks were employed to develop awareness of speech sounds. General language awareness activities included discussions about *What do we do when we speak?* and *What is a word?* Specific metaphonological activities involved: identifying and producing deliberate speech sound errors; listening to and producing differences in the speed and manner of speech; discussing the auditory, tactile and kinaesthetic properties of certain individual non-speech and speech sounds and relating the sounds to visual referents.

Further activities were employed which were designed to promote reflective and conscious awareness of the intrasyllabic units of onset and rime. These included saying nursery rhymes together; listening to and producing rhyming and alliterative words; making judgements about whether words were rhyming or alliterative in comparison with another; sorting rhyming and alliterative words; and playing *I spy* games.

[For details of intervention activities for Group A see Appendix. E]

3.2.4.3. Intervention materials for the experimental group - Group A

The materials used in the intervention activities were designed to be interesting and relevant for children of three and four years of age. Picture cards were prepared to represent individual speech sounds (such as a *bee* for /z/) as well as for rhyming and alliterative words. Some pictures were black and white line drawings while others were coloured. Other materials were used throughout the intervention sessions such as counters and puppets in order to encourage turntaking and motivation.

[For examples of intervention materials for Group A see Appendix E]

3.2.4.4. Intervention sessions for the first control group - Group B

The subjects in Group B did not take part in a programme of activities designed to develop awareness of phonology. Rather than focusing on the linguistic level of phonology their programme focused on the level of semantics. In other respects every effort was made to ensure that the experiences of subjects in Groups A and B were similar: the programme for Group B consisted of eight twenty to thirty minute sessions which took place over the same four weeks as for Group A and on average there were two sessions per week for each sub-group of four children. Each session was tape recorded.

Plans for the intervention sessions were followed as closely as possible. If during the session it proved impossible to include all the planned activities than those omitted in one session were added to the activities for the following session.

The sessions were conducted by the same experimenter as carried out the intervention sessions with Group A, a qualified speech and language therapist experienced in working with pre-school children.

3.2.4.5. Intervention activities for the first control group - Group B

Each session concentrated on one particular topic. These included *animals; where you live; families; clothes and colours; shopping;* and *food.* Sessions usually started with a story and general discussion of the topic. Topical activities for the remainder of each session included describing specific items related to the topic; deducing the identity of something from its description; listing different items under a topic heading (e.g. animals, vegetables, flowers); and drawing.

3.2.4.6. Intervention materials for the first control group - Group B

The materials used in the intervention phase for Group B were mostly books and games involving different vocabulary topics. On the whole, published materials were used or adapted, although a few line drawings were prepared by the researcher for specific activities. Some of the pictures and attention holding games prepared primarily for use by Group A were also adapted for use in Group B activities, although the Group B intervention activities were devoid of all reference to speech sounds.

3.3. Method of analysis of results

Qualitative analysis of the data was carried out. The types of responses given by subjects to the different tests were examined and categorised.

The data obtained in the assessment phases was analysed using univariate, bivariate and multivariate statistical techniques in quantitative analysis of the results. *Microsoft Excel,* a statistical computer package, was used especially in the analysis of the results in terms of descriptive statistics. This included the calculation of measures such as the mean, variance, range, standard error and standard deviation of scores as well as assembling histograms. Another computer package *SPSS for Windows* was also employed. *SPSS* was useful in calculating correlation.

Non-parametric analysis of variance (ANOVA) techniques were used to test the hypothesis that means from several samples are equal. Non-parametric analyses were required as the distribution for all measures was not always normal. Different types of statistical calculations were employed (the Kruskal-Wallis; the Mann-Whitney U - Wilcoxon Rank Sum W; and Wilcoxon Matched-Pairs Signed Ranks test). The Wilcoxon Matched-Pairs Signed Ranks test was employed in making a pairwise comparison between the pre-intervention and post-intervention measures for each group in turn. The Kruskal-Wallis test was used to analyse the extent of the variance amongst the three groups, Groups A, B and C. The significance of any differences between Groups A and B; Groups A and C; and Groups B and C were calculated using the Mann-Whitney U - Wilcoxon Rank Sum W test as a follow-up test only where the Kruskal-Wallis calculation had showed a statistically significant difference amongst the three groups.

Chapter Four

Results

This chapter reports the results of the investigation. Statistical analysis of all quantitative measures is set out in four main sections. The first section [4.1] presents the statistical analysis of the pre-intervention battery test results. Section 4.2 details the results of post-intervention testing and the following section compares pre- and post-test results [Section 4.3]. Observational and qualitative aspects of the data are reported in the final section [Section 4.4].

[For data on individual subjects see Appendix F]

4.1 Results of the pre-intervention assessment battery

This section reports the results of those tests which were collected in the initial assessment phase before the intervention phase was carried out. The pre-intervention results for Groups A, B and C are described in the following sections for each measure in turn: the metaphonological tests (phoneme feature analysis, onset recognition, rhyme recognition and word synthesis); the metasyntactic test; and the auditory processing tests.

The phoneme feature analysis, onset recognition and rhyme recognition tests were also analysed in terms of the number of subjects reaching the *criterion score*. The criterion score is the score at which subjects can be judged not to have attained that score by chance at a given significance level. At a significance level of 95%, the criterion score is reached when subjects attain a score of 14 correct out of a possible 20 on a test in which there are two possible responses (i.e. yes/no or X/Y), that is where the probability of success is 50%. The criterion value was calculated using crit binom from the Excel

computer package. Scores at or below 14 out of 20 can therefore be judged to have been attained by chance at the 95% significance level. To summarise, if a subject achieves a score of 14 or more out of 20 on such a task, there is a 95% probability that that score has not been achieved by chance.

Differences amongst the three groups were calculated using the Kruskal-Wallis analysis of variance technique. Differences between each of the paired groups (Groups A and B; Groups B and C; and Groups A and C) were calculated using the Mann-Whitney U - Wilcoxon Rank Sum W as a follow-up test only when the Kruskal-Wallis test had shown a variance amongst the three groups.

4.1.1. Metaphonological tests

4.1.1.1. Phoneme Feature Analysis (PFA)

The scores for the initial PFA test ranged from 6 to 16 out of twenty. Of the three study groups, Group B had the highest mean value for the PFA with a mean of 11.4. This however represents a score at no greater than chance levels. Only 6 of the 48 subjects reached a score above the criterion value for this test while the remainder were operating at the level of chance.

There was no statistically significant difference amongst Groups A, B and C with regard to initial PFA scores ($p = 0.402$).

4.1.1.2. Onset recognition (OR)

The highest mean score of 11.1 was obtained by Group B out of a possible score of 20. Scores for all groups ranged from 8 to 18 with 6 subjects from all three groups reaching criterion levels on initial assessment.

Analysis of variance shows that there was no significant difference between the scores of the different study groups ($p = 0.442$).

4.1.1.3. Rhyme recognition (RR)

Group B had the greatest mean RR score with a value of 12.4. Nine of the 48 subjects (18.8%) were able to reach criterion score and four of these obtained maximum scores of 20/20 while scores ranged from 7 to 20.

The differences between Groups A, B and C were not significant when an analysis of variance was carried out on the results ($p = 0.572$).

4.1.1.4. Word synthesis (WS)

Of the 48 subjects, 18 (38%) were unable to produce any correctly synthesised words. Thirty children could synthesise at least one word correctly but less than half of these (13) were able to successfully synthesise three or more words out of a possible 24.

The range of scores was from 0 to 15 out of a possible 24. Group C had the highest mean WS score, averaging 2.8 correctly synthesised words per subject. The scores of the subjects in Groups A, B and C were not significantly different ($p = 0.897$).

4.1.1.5. Combined Metaphonological score

Total metaphonological scores for individual subjects ranged from 25 to 56 out of a possible score of 84. The mean scores for Groups A, B and C were 33.6, 36.9 and 35.8 respectively.

There was no significant difference between the scores obtained by subjects in different study groups as found using an analysis of variance technique ($p = 0.365$) [see section 4.1.3].

4.1.1.6. Summary of pre-intervention Metaphonological tests

No statistically significant difference was found between Groups A, B and C for any single metaphonological test or for the combined metaphonological battery at the 5% level ($p > 0.05$).

4.1.2. Other tests

4.1.2.1. Auditory Memory (AM)

Auditory memory scores ranged from 5 to 38 with half of the subjects obtaining a score over 20 out of a possible 57. Group A obtained the highest mean score of 22.4 although it was not significantly different from Groups B and C ($p = 0.731$).

4.1.2.2. Auditory Discrimination (AD)

Scores for AD ranged from 8 to 20. Over 70% of the subjects (34) obtained scores above the criterion. Group B had the highest mean AD score with a value of 16.0.

Analysis of variance showed that the experimental and control groups did not differ significantly in terms of AD scores ($p = 0.271$).

4.1.2.3. Metasyntactic test (MS)

Less than 30% of the subjects were able to succeed in this test. The criterion score was reached by 13 of the 48 subjects. The highest mean score of 13.5 was obtained by Group B.

There was no significant difference between the results of the MS test in the different groups ($p = 0.266$)

4.1.3. Summary of pre-intervention assessments

The mean scores and standard deviations of the metaphonological, metasyntactic and auditory processing (auditory memory and auditory discrimination) assessments [as described in Section 3.2.3] for each group are set out in the Table 4 below. Throughout these and following sections the combined metaphonological test results are highlighted to aid comparisons amongst the three groups for metaphonological ability, the specific area on which this research is focused.

Table 4 Group means and standard deviations for each pre-intervention measure

Group	Group A (experimental intervention)		Group B (control intervention)		Group C (control non-intervention)	
Test	Mean	St.Dev.	Mean	St.Dev	Mean	St.Dev.
Metaphonological tests						
Phoneme feature analysis (20)	**10.7**	2.1	**11.4**	2.0	**10.3**	2.1
Onset recognition test (20)	**10.3**	2.7	**11.1**	2.0	**11.0**	3.4
Rhyme recognition test (20)	**10.6**	2.0	**12.4**	4.2	**11.8**	3.6
Word synthesis test (24)	**1.9**	3.0	**2.0**	3.7	**2.8**	3.8
Combined Metaphonological score (84)	**33.6**	6.3	**36.9**	7.5	**35.8**	9.3
Other linguistic and metalinguistic tests						
Auditory Memory (57)	**22.4**	8.6	**20.3**	6.5	**19.3**	7.2
Auditory Discrimination (20)	**14.6**	3.2	**16.0**	2.9	**14.6**	3.3
Metasyntactic test (20)	**11.6**	2.4	**13.5**	3.6	**11.8**	2.4

A Kruskal-Wallis analysis of variance calculation was applied to the initial test results in order to assess the extent of any differences amongst the three groups of subjects. The p-values for each of the metalinguistic and auditory processing measures are given in Table 5 below.

Table 5 P-values obtained by a Kruskal-Wallis analysis of variance amongst Groups A, B and C for each pre-intervention measure.

PRE-TEST MEASURE	P-VALUE
Phoneme feature analysis (PFA)	.4015
Onset recognition test (OR)	.4420
Rhyme recognition test (RR)	.5723
Word synthesis test (WS)	.8969
Combined Metaphonological score	.3654
Auditory Memory (AM)	.7306
Auditory Discrimination (AD)	.2713
Metasyntactic test (MS)	.2661

The p-values for all of the pre-intervention metalinguistic and auditory processing measures were above 0.05 indicating that no statistically significant differences existed at the 5% level amongst Groups A, B and C for these measures before the intervention phase of the study. The lack of any statistically significant variance suggests that all the subjects were drawn from the same population.

4.2 Results of the post-intervention assessment battery

This section reports results of those tests which were carried out in the final assessment phase after the intervention phase was completed. As in the previous section, the post-intervention results for Groups A, B and C are described in the following sections for each measure in turn: the metaphonological tests (phoneme feature analysis, onset recognition, rhyme recognition and word synthesis); the metasyntactic test; and the auditory processing tests.

4.2.1. Metaphonological tests

4.2.1.1. Phoneme Feature Analysis (PFA)

The scores for the final PFA test ranged from 6 to 14 out of twenty. Of the three study groups, Group A has the greatest mean value for the PFA with a mean of 11.0. This score however is no greater than chance levels. None of the 48 subjects reached scores above the level of chance.

There was no significant difference in the final PFA scores amongst Groups A, B and C ($p = 0.334$) using the Kruskal-Wallis test for analysis of variance.

4.2.1.2. Onset recognition (OR)

Scores for all groups ranged from 8 to 20 with 7 subjects from all three groups reaching criterion levels on final assessment. The highest mean score of 11.8 was obtained by Group A out of a possible score of 20. Group A had the highest proportion of subjects reaching scores of 15/20 or greater (19%). In both Groups B and C only 12.5% of the subjects reached the same standard.

Kruskal-Wallis analysis of variance showed that there were no significant differences amongst the scores of the three groups ($p = 0.080$).

4.2.1.3. Rhyme recognition (RR)

Scores on the final RR test ranged from 7 to 20. Twenty-two of the 48 subjects (46%) were able to reach criterion scores and of these over half were in Group A. Group A had

the greatest mean final RR score with a value of 15.0. In Group A 56% of the subjects gained final RR scores of 15/20 or greater, while the proportion in Groups B and C reaching the same standard was smaller (25% in both Group B and C).

The differences amongst Groups A, B and C did not reach significance at the 5% level when a Kruskal-Wallis analysis of variance was carried out on the results ($p = 0.068$).

4.2.1.4. Word synthesis (WS)

In the final test of WS, 38 subjects were able to produce at least one correctly synthesised word and 25 of these were able to successfully synthesise three or more words.

The range of scores was from 0 to 19 out of a possible 24. Both Groups A and C had a mean WS score of 4.5 correctly synthesised words per subject while Group B obtained a mean WS score of 1.8 in the final assessment. The scores of the subjects in Groups A, B and C were not found to be significantly different ($p = 0.085$) in a Kruskal-Wallis analysis of variance calculation.

4.2.1.5. Combined Metaphonological score

The combined metaphonological scores for individual subjects across all groups ranged from 26 to 66 out of a possible score of 84. The mean scores for Groups A, B and C were 42.3, 36.2 and 36.4 respectively.

Statistically significant differences were found amongst Groups A, B and C using the Kruskal-Wallis analysis of variance technique ($p = 0.036$). This, however, does not give any indication of which of the groups differs from the others. The Mann-Whitney U calculation, used as a follow-up test, showed that there was a statistically significant difference between the experimental group A and control group B ($p = 0.038$) and between experimental group A and the second control group C ($p = 0.023$) while there is no such statistically significant difference between the control Groups B and C ($p = 0.449$).

4.2.1.6. Summary of post-intervention Metaphonological tests

The combined metaphonological score yielded a statistically significant difference amongst Groups A, B and C ($p < 0.05$). Although the control groups, Groups B and C, do not significantly differ from one another, a statistically significant difference was found between the experimental group, Group A, and each of the control groups.

4.2.2. Other tests

4.2.2.1. Auditory Memory (AM)

Auditory memory scores ranged from 4 to 46. Group A obtained the highest mean score of 25.5 although it was not significantly different from Groups B and C ($p = 0.441$).

4.2.2.2. Auditory Discrimination (AD)

Scores for AD ranged from 9 to 19. Of the subjects, 65% (31) obtained scores above the criterion. Group B had the highest mean AD score with a value of 15.2.

Analysis of variance showed that the experimental and control groups did not differ significantly in terms of AD scores ($p = 0.285$).

4.2.2.3. Metasyntactic test (MS)

Just over 30% of the subjects were able to succeed in this test. The criterion score was reached by 15 of the 48 subjects. The highest mean score of 13.6 was obtained by Group B.

There was no significant difference between the results of the final MS test in the different groups ($p = 0.598$).

4.2.3. Summary of the post-intervention assessments

The mean scores and standard deviations of the metaphonological, metasyntactic and additional linguistic assessments (as described in Section 3.2.3) are given in the Table 6 below.

Table 6 Group means and standard deviations for each post-intervention measure

Group	Group A (experimental intervention)		Group B (control intervention)		Group C (control non-intervention)	
Test	Mean	St.Dev.	Mean	St.Dev	Mean	St.Dev.
Metaphonological tests						
Phoneme feature analysis (20)	**11.0**	2.2	**10.5**	2.2	**10.0**	1.4
Onset recognition test (20)	**11.8**	3.0	**11.1**	3.6	**10.0**	3.1
Rhyme recognition test (20)	**15.0**	3.9	**12.8**	3.9	**11.6**	4.0
Word synthesis test (24)	**4.5**	5.4	**1.8**	3.0	**4.5**	4.9
Combined Metaphonological score (84)	**42.3**	9.4	**36.2**	8.5	**36.4**	11.0
Other linguistic and metalinguistic tests						
Auditory Memory (57)	**25.5**	8.6	**21.4**	6.5	**21.7**	7.4
Auditory Discrimination (20)	**14.9**	3.0	**15.2**	3.1	**13.4**	3.2
Metasyntactic test (20)	**12.9**	3.0	**13.6**	3.8	**12.5**	3.3

In order to evaluate the extent of any difference amongst Groups A, B and C a Kruskal-Wallis analysis of variance calculation was applied to the post-training results. Table 7 below presents the findings of these calculations.

Table 7 P-values obtained by a Kruskal-Wallis analysis of variance amongst Groups A, B and C for each post-intervention measure.

POST-TEST MEASURE	P-VALUE
Phoneme feature analysis (PFA)	.3335
Onset recognition test (OR)	.0797
Rhyme recognition test (RR)	.0667
Word synthesis test (WS)	.0854
Combined Metaphonological score	.0355 *
Auditory Memory (AM)	.4412
Auditory Discrimination (AD)	.2850
Metasyntactic test (MS)	.5983

[* denotes $p < 0.05$]

As the Kruskal-Wallis analysis of variance provided evidence that there is a statistically significant difference amongst the three groups for the combined metaphonological score, another analysis of variance calculation was applied in order to find which groups

specifically differ from the others. As a follow-up test to the Kruskal-Wallis calculation the Mann-Whitney U - Wilcoxon Rank Sum W test was used to calculate the statistical significance of any difference between Groups A and B; Groups A and C; and Groups B and C. The results of these further calculations are presented in Table 8 below.

Table 8 P-values obtained using the Mann-Whitney U - Wilcoxon Rank Sum W test in calculating the significance of the differences between Groups A and B; Groups A and C; and Groups B and C on post-intervention measures.

Post-intervention measures	P-VALUES		
	Groups A and B	**Groups A and C**	**Groups B and C**
Combined Metaphonological score	.0377 *	.0234 *	.4493

[* = $p < 0.05$]

Of all the final assessments carried out the only significant difference amongst Groups A, B and C was in the total metaphonological score ($p < 0.05$) using the Kruskal-Wallis analysis of variance calculation.

On further investigation, the Mann-Whitney U - Wilcoxon Rank Sum W test found that there was a significant difference between Group A and each of Groups B and C ($p = 0.038$ and $p = 0.023$ respectively) with regard to the combined Metaphonological scores for the subjects in each group. No significant difference was found between the control groups, Groups B and C ($p = 0.449$) for their mean combined metaphonological scores.

4.3. Analysis of the difference between results of the pre- and post-intervention measures for each of the groups A, B and C.

The results reported in the previous section emphasise comparisons amongst the groups following the intervention phase. They do not, however, show how much change there has been within each group relative to their initial results. The following sections describe the results in terms of the change from pre- to post-intervention scores for Groups A, B and C for each measure in turn.

4.3.1. Metaphonological tests

4.3.1.1. Phoneme Feature Analysis (PFA)

The mean changes in PFA scores for all groups were statistically insignificant. Mean changes range from -0.9 for Group B to 0.3 for Group A. None of these changes in PFA score reached statistical significance ($p > 0.05$) and there was no statistically significant difference amongst the three groups in the change from pre-training to post-training PFA scores ($p > 0.05$).

4.3.1.2. Onset Recognition (OR)

The range of mean change in OR from pre-training to post-training was from -1.0 for Group C to 1.5 for Group A. For both the control groups, Groups B and C, the extent of change did not reach a significant level ($p > 0.05$) while the difference between pre- and post-training OR scores for Group A did reach significance ($p = 0.015$) calculated by the Wilcoxon Matched-Pairs Signed Ranks test. Only the experimental group, Group A, showed a statistically significant increase in OR score following the intervention phase.

The Kruskal-Wallis analysis of variance calculation provides evidence of some difference in the extent to which the three groups had changed in OR ability from pre-intervention to post-intervention ($p = 0.026$). On further investigation, using the Mann-Whitney U calculation, while the difference between Group A and B did not quite reach statistical significance at the 5% level ($p = 0.058$), there was a statistically significant difference in

the extent of change from pre- to post training OR scores between Groups A and C ($p = 0.007$). The control groups, Groups B and C did not significantly differ.

4.3.1.3. Rhyme recognition (RR)

The mean change in RR scores ranged from -0.3, for Group C, to 4.4, for Group A. Only Group A reached statistical significance at the 5% level on the measure of change in RR from pre- to post-training testing ($p = 0.007$).

The differences amongst the three groups in RR change was statistically significant using the Kruskal-Wallis calculation ($p = 0.0108$). In following up this test of variance, the Mann-Whitney U calculation showed that there was a statistically significant difference at the 5% level between Group A and Group B ($p = 0.023$) and Group A and Group C ($p = 0.005$). No significant difference was found between Group B and C, the control groups ($p > 0.05$).

4.3.1.4. Word Synthesis (WS)

The mean change in WS scores ranged from -0.2, for Group B, to 2.6, for Group A. As with all the other metaphonological tests, Group A showed the greatest increase in score from pre- to post-intervention assessment. On the Wilcoxon Matched-Pairs Signed Ranks test, both Group A and Group C have a statistically significant increase in WS score ($p = 0.01$ and $p = 0.006$ respectively).

The Mann-Whitney U - Wilcoxon Rank Sum W test showed that there was a statistically significant difference between Group A and B ($p = 0.0029$). Due to a significant increase in Group C's mean change in WS score, however, there was also a significant difference between the two control groups, Groups B and C ($p = 0.0103$) while no statistically significant difference was found between the experimental group, A, and the second control group, Group C ($p = 0.7455$).

4.3.1.5. Combined Metaphonological score

The following table [see Table 9] shows the extent of the change in combined Metaphonological scores, from pre- to post-intervention metaphonological measures, in the experimental group, Group A, in comparison with both control groups. Although there was a significant change in scores on one of the metaphonological tests between pre- and post-intervention (the Word Synthesis test) for Group C, this change was not great enough to significantly influence the change in the mean combined Metaphonological score for this group.

Table 9 Mean pre- and post-intervention combined metaphonological scores and the increase in this score for each group as expressed as a percentage of each group's pre-intervention mean combined metaphonological score.

MEASURE	Group A	Group B	Group C
Pre-intervention mean combined metaphonological score	**33.6**	**36.9**	**35.8**
Post-intervention mean combined metaphonological score	**42.3**	**36.2**	**36.4**
Increase in mean combined metaphonological score following intervention	**8.7**	**-0.7**	**0.6**
Percentage increase in mean combined metaphonological score	**25.9%**	**-1.9%**	**1.7%**

Both control groups, Groups B and C, show little change in their combined Metaphonological scores from pre- to post-intervention. Group A, however, shows a substantial increase in the mean combined Metaphonological score, by over 25%.

4.3.1.6. Summary of change in Metaphonological scores

For all the Metaphonological tests, Group A have the highest mean increases in scores from pre- to post-intervention results. Although the change in the mean PFA score does not reach significance at the 5% level, the remaining three tests, OR, RR and WS all

reach statistical significance ($p < 0.02$). None of Group B's metaphonological test results, either individually or combined, achieve statistical significance for the extent of the change following intervention. Of the four metaphonological tests for Group C, only the results for the Word Synthesis task change significantly from pre- to post-intervention testing. This change, however, is not great enough to influence Group C's mean combined metaphonological score which does not show statistically significant change from pre- to post-intervention.

Neither of the control groups had statistically significant changes in their combined Metaphonological score following the intervention phase ($p > 0.05$ for both Group B and Group C). The only group to have achieved a statistically significant change in their combined Metaphonological score was Group A, the experimental group ($p = 0.001$).

4.3.2. Other tests

4.3.2.1. Auditory Memory (AM)

In all groups the mean Auditory Memory score increased following the intervention phase. The greatest mean increase was found in Group A (3.1) while the smallest change occurred in Group B (1.1). Both Groups A and C showed a statistically significant increase in mean score from pre- to post-intervention testing ($p = 0.016$ and $p = 0.007$ respectively) while the change in Group B's Auditory Memory score did not reach statistical significance as tested using the Wilcoxon Matched-Pairs Signed Ranks test.

In comparing the extent of the change in mean Auditory Memory score, no statistically significant difference was found amongst the three groups using both the Kruskal-Wallis analysis of variance.

4.3.2.2. Auditory Discrimination (AD)

No statistically significant increase in mean Auditory Discrimination score was found in any of the groups. Group C, however, did show a statistically significant *decrease* in mean score following the intervention phase of the study with a significance value of

0.034 (as calculated using the Wilcoxon Matched-Pairs Signed Rank test) and a mean decrease in score by 1.2 out of 20.

There was no statistically significant difference amongst the three groups with regard to the extent of change in Auditory Discrimination score from pre- to post-intervention testing using the Kruskal-Wallis analysis of variance technique ($p > 0.1$).

4.3.2.3. Metasyntactic test (MS)

Only Group A showed a statistically significant change in mean Metasyntactic score following the intervention phase with an increase of 1.3 out of 20 at the 5% significance level ($p = 0.023$) using the Wilcoxon Matched-Pairs Signed Ranks test. Neither Groups B or C had changed significantly in their mean Metasyntactic scores from pre-to post-intervention testing at the 5% significance level ($p = 0.950$ and $p = 0.169$ respectively).

Although Group A did show a statistically significant increase in mean Metasyntactic score the change was not great enough to show a statistically significant difference in the extent of change amongst the three groups. The Kruskal-Wallis analysis of variance technique did not find any statistically significant difference amongst Groups A, B and C at the 5% significance level.

4.3.3. Summary of the differences between pre- and post-intervention measures

The tables below [see Tables 10, 11 and 12] show the mean differences between initial and final assessment scores for each of the groups, A, B and C, in turn. The confidence interval for the mean scores for each measure is shown in addition to the significance value for the change in score, from pre-training to the post-training, as investigated using the Wilcoxon Matched-Pairs Signed Ranks test.

4.3.3.1. Group A

Table 10 The mean change in score from pre- to post-intervention, the standard deviation, confidence interval and significance of the change in each measure for Group A.

Group A measures	Mean	Standard Deviation	Confidence Interval	2-tail significance
Metaphonological Tests				
Phoneme feature analysis (20)	**0.3**	2.7	-1.1 to 1.7	0.641
Onset recognition test (20)	**1.5**	2.3	0.3 to 2.7	**0.015** *
Rhyme recognition test (20)	**4.4**	4.8	1.8 to 6.9	**0.007** **
Word synthesis test (24)	**2.6**	3.9	0.5 to 4.7	**0.010** **
Combined Metaphonological score (84)	**8.8**	6.8	5.1 to 12.4	**0.001** ***
Other linguistic and metalinguistic tests				
Auditory Memory (57)	**3.1**	4.4	0.8 to 5.5	**0.016** *
Auditory Discrimination (20)	**0.3**	2.3	-1.0 to 1.5	0.660
Metasyntactic test (20)	**1.3**	2.2	0.1 to 2.5	**0.023** *

[* denotes $p < 0.05$; ** denotes $p < 0.01$; *** denotes $p < 0.005$ on the Wilcoxon Matched-Pairs Signed Ranks test.]

Group A is the only group to gain positive values for all mean changes in score in all measures from pre- to post-intervention. There are, however, two measures for which the confidence interval embraces zero and the mean change from pre- to post-intervention is small, these are the Phoneme Feature Analysis and Auditory Discrimination tests. The remaining six measures all give positive confidence intervals which demonstrate the group's overall increase in scores for these measures following the intervention phase.

The change in Group A's Combined Metaphonological test score in particular shows the most positive confidence interval (from 5.1 to 12.4) compared with the control groups (neither Group B nor Group C show a statistically significant change after intervention in the Combined Metaphonological tests measure with their respective confidence intervals straddling zero). Group A has the lowest p-value on the Wilcoxon Matched-Pairs Signed Ranks test for the Combined Metaphonological measure ($p = 0.001$) indicating the most statistically significant change from pre- to post-intervention of not only all the measures for Group A but also for any of the measures for any of the groups.

4.3.3.2. Group B

Table 11 The mean change in score from pre- to post-intervention, the standard deviation, confidence interval and significance of the change in each measure for Group B.

Group B measures	Mean	Standard Deviation	Confidence Interval	2-tail significance
Metaphonological Tests				
Phoneme feature analysis (20)	**-0.9**	3.0	-2.6 to 0.7	0.334
Onset recognition test (20)	**0.0**	3.0	-1.6 to 1.6	0.756
Rhyme recognition test (20)	**0.4**	4.9	-2.2 to 3.0	0.784
Word synthesis test (24)	**-0.2**	1.6	-1.1 to 0.7	0.612
Combined Metaphonological score (84)	**-0.8**	7.1	-4.6 to 3.1	0.690
Other linguistic and metalinguistic tests				
Auditory Memory (57)	**1.1**	4.6	-1.3 to 3.6	0.268
Auditory Discrimination (20)	**-0.8**	2.0	-1.9 to 0.2	0.142
Metasyntactic test (20)	**-0.4**	3.9	-2.5 to 1.6	0.950

Group B are the only group who have no statistically significant difference between their pre- and post-intervention test scores. The values for the mean change in scores are small and the confidence intervals for each straddle zero.

4.3.3.3. Group C

Table 12 The mean change in score from pre- to post-intervention, the standard deviation, confidence interval and significance of the change in each measure for Group C.

Group C measures	Mean	Standard Deviation	Confidence Interval	2-tail significance
Metaphonological Tests				
Phoneme feature analysis (20)	**-0.3**	2.1	-1.4 to 0.9	0.673
Onset recognition test (20)	**-1.0**	2.2	-2.2 to 0.2	0.108
Rhyme recognition test (20)	**-0.3**	3.0	-1.9 to 1.4	0.689
Word synthesis test (24)	**1.8**	2.1	0.7 to 2.9	**0.006** **
Combined Metaphonological score (84)	**0.6**	5.2	-2.2 to 3.3	0.820
Other linguistic and metalinguistic tests				
Auditory Memory (57)	**2.4**	2.8	1.0 to 3.9	**0.007** **
Auditory Discrimination (20)	**-1.2**	1.9	-2.2 to -0.1	**0.034** *
Metasyntactic test (20)	**0.8**	2.2	-0.4 to 1.9	0.169

[* denotes $p < 0.05$; ** denotes $p < 0.01$ on the Wilcoxon Matched-Pairs Signed Ranks test.]

Group C have significant changes in their scores for three measures. There is a significant increase in mean scores for both the Word Synthesis test and the Auditory Memory test although their increases are not as great as for Group A for the same tests. Group C's results on the pre- and post-intervention tests of Auditory Discrimination show a statistically significant *decrease* in mean score with a negative band for the confidence interval. The five remaining measures show no statistically significant change following the intervention phase.

4.3.3.4. Variance amongst Groups A. B and C

The following section describes the analysis of variance between and amongst groups regarding the extent of change in each measure following intervention.

Differences amongst the groups in terms of change in scores between pre- and post-intervention for each measure was examined using the Kruskal-Wallis analysis of variance calculation. The results of these calculations are presented in the table below [see Table 13].

Table 13 Significance levels, obtained using a Kruskal-Wallis analysis of variance calculation, for the difference between each of the pre- and post-test measures amongst Groups A, B and C.

MEASURE	P-VALUE
Phoneme feature analysis (PFA)	.5242
Onset recognition test (OR)	**.0215 ***
Rhyme recognition test (RR)	**.0108 ***
Word synthesis test (WS)	**.0060 ****
Combined Metaphonological score	**.0012 *****
Auditory Memory (AM)	.4380
Auditory Discrimination (AD)	.1771
Metasyntactic test (MS)	.7934

[* denotes $p < 0.05$ ** denotes $p < 0.01$ *** denotes $p < 0.005$]

Three of the individual metaphonological tests, the Onset Recognition, Rhyme Recognition and Word Synthesis tests, show statistically significant differences amongst Groups A, B and C for the change in scores from pre- to post-intervention testing ($p = 0.0215$, $p = 0.0108$ and $p = 0.0060$ respectively).

There is a highly statistically significant variance amongst the three groups for the mean change in the Combined Metaphonological score at the 5% level ($p = 0.0012$) following the intervention phase.

4.3.3.5. Variance between Groups A and B; Groups A and C and Groups B and C

Although the Kruskal-Wallis calculation provides evidence that there are statistically significant differences amongst the three groups for certain measures it does not give specific information about the differences. In order to gain more detailed information, a

follow-up test was required. The Mann-Whitney U - Wilcoxon Rank Sum W test was used to analyse the significance of any differences between Groups A and B; Groups A and C; and Groups B and C [see Table 14 below] where a significant difference amongst the three groups was found using the Kruskal-Wallis calculation.

Table 14 Significance levels of inter-group difference between Groups A and B; Groups A and C; and Groups B and C for the change in scores between the pre and post-intervention measures obtained using the Mann-Whitney U - Wilcoxon Rank Sum W test.

Measures	P-VALUES		
	Groups A and B	**Groups A and C**	**Groups B and C**
Onset recognition test (OR)	.0581	**.0070 ****	.4434
Rhyme recognition test (RR)	**.0231 ***	**.0048 *****	.5668
Word synthesis test (WS)	**.0029 *****	.7455	**.0103 ***
Combined Metaphonological score	**.0016 *****	**.0015*****	.6917

[* = $p < 0.05$ ** = $p < 0.01$ *** = $p < 0.005$]

Group A shows a significantly greater change in its mean score for Rhyme Recognition than either of the control groups, Groups B and C ($p = 0.0231$ and $p = 0.0048$ respectively), while there is no significant difference between the control groups themselves ($p = 0.6917$) using the Mann-Whitney U - Wilcoxon Rank Sum W test.

Groups A and C also differ significantly at the 5% level on their mean changes in Onset Recognition scores ($p = 0.0070$) although the difference between the two control groups, Groups B and C, do not reach statistical significance. The value for the variance between Groups A and B for the same measure just failed to reach statistical significance at the 5% level, however ($p = 0.0581$).

The variance between Group B and both Groups A and C is statistically significant for the change in Word Synthesis score at the 5% level ($p = 0.0029$ and $p = 0.0103$ respectively). Groups A and C do not significantly differ in the extent to which their mean scores on the Word Synthesis test have changed ($p = 0.7455$) at the 5% level.

There is a highly significant difference between Group A, the experimental group, and each of the control groups, Groups B and C, for changes in the Combined Metaphonological test score ($p = 0.0016$ and $p = 0.0015$ respectively). The difference between the two control groups for the change in Combined Metaphonological score does not, however, reach statistical significance at the 5% level ($p = 0.6917$).

4.4. Observations and Qualitative Results

The analysis of data collected during the assessment phases of the study provided information not only about the number of items correct for each test [analysed in sections 4.1 to 4.3] but also about the types of responses and additional comments made by the children during the tasks and during the introduction and trial items of the assessments. Most of the tests used in the pre- and post-intervention assessment battery, required an X/Y type response giving limited scope for qualitative analysis of responses unless the subject remarked spontaneously on some aspect of the test. Both the Auditory Memory test and the Word Synthesis test allowed a greater scope for qualitative analysis. The Auditory Memory task was to some extent limited as the task required repeating sentences or sequences of digits. The Word Synthesis task, however, gave the greatest scope for qualitative analysis as the type of response was more open, allowing responses which make use of more complex processing (blending elements to create a word) rather than simply making an X/Y judgement or repeating the stimulus verbatim. There were a few shy children who although co-operative up to a point, did not make many further comments on the task beyond the minimum required, for example Subjects 6, 17, 19, 21, 31, 40, 46, and 47.

[See Appendix G for key of abbreviations.]

4.4.1. Examples of comments made by subjects during the assessment procedures

4.4.1.1. Phoneme Feature Analysis test (PFA)

Not many children commented on this test. Subject 33 (B:PFA1) did however remark that "My little sister goes quiet, but my brother goes ... noisy sound". Another (32:A:PFA2) repeated some of the stimulus items and substituted his own which seemed to confuse rather than improve his performance.

4.4.1.2. Onset Recognition test (OR)

The *I spy* game was used as an introduction to the test itself and many of the subjects had already been exposed to this or similar games. An introduction with the stimulus *I spy with my little eye something beginning with* / t /, elicited comments such as: "tap" and also "/t ʔa m ʔi/, that's his tummy" (25:A:OR1) and Subject 33 (B:OR1) produced the following words "television", "tell", "till" and "Tim". Another child (42:C:OR1) was able to produce many words with the / t / initially, "tape, table, tea, tapes". Subject 32 (A:OR1) reflected "Me", as his own name begins with 'T', another reflected "and train as well" (43:C:OR1).

Not all the comments during the introduction reflected a full understanding of the task, Subjects 27 (A:OR1) and 35 (B:OR1) assured the researcher that "teddy bear...and pencil", "Tap.....and dripping" all shared the same initial phoneme while a third child (Subject 45:C:OR1) informed the researcher that it was "/ t / for snake".

During the test itself children showed that they were able to reflect on the stimuli. In saying "Race, lace. It's the same question" subject 48 (C:OR1) refers to the rhyming nature of the word pair and Subject 25 (A:OR:2) stated "Den and ten rhyme", "boat and note". This particular subject (25:C) often used a strategy of repeating two words over again in choosing which began with the target phoneme, perhaps to aid her reflection on the phonological structure of the words.

Another strategy which subjects used was to elongate or emphasise the words' initial phoneme in deciding which picture to choose "sssea" /sssi/, "fffit, ss ssit" /fffɪt ss ssɪt/ (26:A:OR2), "sssew" /ssso/ (33:B:OR1), and finally Subject 34 (B:OR2) manipulated "nnnot" /nnnɒt/, "lllake" /lllek/ in a similar way before responding to the items. This strategy seemed to work well as long as it was followed through correctly. Subject 32 (A:OR2) had the right idea but perhaps required a little feedback which was not allowed during the testing as he produced "sss fit" in his effort to find the word with /s/ initially.

During the subset introduction for /n/, Subject 48 (C:OR1) repeated the phoneme and used it as if it were an initial syllable "/n/...(i)nside" /n said/. In other sections some children gave additional alliterative words using the target onset /s/ "snake" and /l/

"lemon" (35:B:OR1) and for Subject 38 (B:OR1) /so/ elicited the remark "Like /sssnek/ isn't it?", both examples showing their understanding of alliteration.

4.4.1.3. Rhyme Recognition test (RR)

During the introduction where subjects were encouraged to think of rhymes for their names the following comments were elicited: "Kerry Berry, but that begins with a /b/" (25:A:RR1); "Alison, Balison" (34:B:RR1); "Holly had a dolly" (41:C:RR1); "Hanna, bana, skana" and "Thomas, pomas" (45:C:RR2) and Subject 27 (A:RR1) enjoyed creating "Hector, mektor, putektor". Not all subjects, however, understood rhyming and were less successful, for example Subject 26 (A:RR1) produced "Jade, fish" as a rhyme for her name.

During the trial items and the test itself, which involved comparing sets of words with the constant "Ed": /ɛd/, many spontaneous examples of children's abilities and inability to form rhymes were encountered: "Well, /ɛ/ sounds a bit like 'Ed'", "Ed, ved" (25:A:RR2), Subject 33 (B:RR1) was prolific in her production of rhymes "Ned", "ped", "ked", "kebd", "te", "bed", "ted". Further examples include "Ed, said" (26:A:RR1), "Ed, ded. That's a rhyme" (32:A:RR2) and "Ed...Fred...led...ked.....said" (48:C:RR1). During the test itself Subject 34 (B:RR2) added additional rhyming pairs "Vaf, baf ... bomp, pomp". Occasionally subjects would perseverate on the previous item. In this way Subject 26 (A:RR2) chose the incorrect response for an item saying, "Yes, 'cos he said Ed, head" basing his judgement on the previous item.

Some subjects showed that they understand what rhymes are although they were often unable to express this understanding explicitly. In talking about what a rhyme is Subject 42 (C:RR1) said, "It's something that begins with another word" and then went on to give the following examples "Fred, Ed", "sed, eb", "elly, selly", "sara, parrots" and then "sara, parrots" and "elly, belly, jelly".

Subject 27 (A:RR1) demonstrated his metaphonological abilities in his remarks during and after the Rhyme Recognition test as follows: "But this would rhyme with his name - ped, bed, beddy, bed ... red", "But cheddar is a rhyme". At the end of the test he made up

a rhyme "Ed, bed, sea in a Ed, wouldn't you like to swim in a bed". Although able to produce rhymes and comment on them quite explicitly he also made judgements using semantic reasoning, for example that /ɛd, dʒen/ did not rhyme "because he's not a girl" and /ɛd, ʃip/ did not rhyme either as "He doesn't live in a field". In a similar way Subject 43 (C:RR1) judged /ɛd, ren/ to be a rhyme: "Yes, 'cos everything needs to be wet". Another example of semantic reasoning governing responses was with Subject 45 (C:RR1) /ɛd, haf/ "No, 'cos that's sad being chopped off" and /kɪg/ "I don't like kicking anybody" (RR2).

Most of the children did not explicitly comment on the use of non-words during this test. Subject 43 (C:RR1/RR2) did however comment on non-words which the others tended to ignore by asking "What is /jit/?" and "What does /tʃeɪl/ mean?".

Many subjects exhibited inconsistencies in their abilities. Subject 35 (B:RR1) produced all of the following in the attempt to give rhymes: "Cat, fat...sat a rat", "Coat, roat", "Ed, red the kred", "skip, pip", "Ed, crack" and "ed, ded". There was a broad range of abilities across all subjects.

4.4.1.4. Word Synthesis test (WS)

Responses to the Word Synthesis task can be categorised into the following types: (1) *no response or did not know*; (2) *stimulus repetition or partial repetition*; (3) *phonemic error in blending the units*; (4) *other errors* and (5) *correct response*. [For details of the correct responses for each group see sections 4.1.1.4, 4.2.1.4. and 4.3.1.4.]

A large proportion of the responses to the segmented words was simply to *repeat*, or partially repeat the stimulus as it was presented on the tape.

Giving examples of *phonemic errors* Subject 25 (A:WS1) responded to /v, ɛ, s, t/ by saying "est ... probably it's nest"; /z, ɪ. p/ "fib...bib or fib"; /kr, ab/ "kr ab... cramp" and to /tʃ, iz/ with "/ tʃ, iz /... it's trees".

The category of *other errors* were often made when subjects were not confident in their abilities and resorted to looking around the room and naming objects in their attempts to guess what the puppet was trying to tell them.

Other subjects reflected on the number of units into which the stimuli were divided. Subject 36 (B:WS1) commented "That was four words" for the stimulus /s, k, u, l/ and of /bʌ, tə, flai/ he said, "That was three words".

The proportions of the types of response changed following the intervention phase. Although the greatest proportion of responses involved either the whole or partial repetition of the stimulus at around 35% both pre- and post-intervention, the proportion of no responses or "Don't know" responses fell from 32% to 18% as the number of correct responses increased from 15% to 23%. The proportion of phonemic and other errors remained fairly constant at around 10% each both before and after intervention.

The type of response was influenced by the size and number of phonological units which were to be blended. The numbers of correctly synthesised words increased with unit size and decreased with unit number. The easiest section for the subjects involved the trial items, 2- to 4-syllable words which were presented syllable by syllable. The next level of difficulty was encountered in the following section, the first section of the test itself, in which monosyllabic words were presented in segments of onset and rime. In this section the number of correct responses decreased by half in both pre- and post-intervention assessments.

The same pattern emerged on examining the next section again. The second test section involved 2-phoneme words for which the stimuli items were presented by phoneme. There were half the number of correct responses in this section than there were for the previous one and one quarter of the number of correct responses as for the trial items.

The final section of the Word Synthesis task used 3- to 5-phoneme words which were presented by phoneme. This increased number of units as compared to the previous section proved more difficult and halved again the number of correct responses given as compared with the 2-phoneme words in the second section. This pattern in the proportions of correct responses was maintained following the intervention phase with the number of correct responses halving in successive sections although the numbers of post-intervention correct responses was greater than for the pre-intervention assessment.

4.4.1.5. Auditory Memory test (AM)

The type of errors encountered in both sentence repetition and sequenced digit repetition could be categorised as substitutions, omissions, additions, transpositions and perseverations.

Subject 39 (B:AM1) showed a degree of metalinguistic ability in commenting during the digit repetition task that "I can say them much quicker than you, it makes them shorter". Some children commented on the increasing difficulty of the items as the test went on, for example Subject 47 (C:AM1) commented that one sentence in particular was a "bit tricky" in expressing his difficulty with the task. In response to the digit repetition task Subject 34 (B:AM1) commented, "Don't know that number.... that one either".

4.4.1.6. Auditory Discrimination test (AD)

On being asked *who said tea* for the very first trial item, Subject 47 (C:AD1) replied "You", not having understood that he was to point to one of the teddy bears or showing that he knew the teddy bears could not talk. Another commented that "You're just saying it behind them" (25:A:AD1).

During the introduction Subject 29 (A:AD1) remarked "Jim and Tim, that's a rhyme" before any of the metaphonological tasks had been introduced in the pre-intervention battery of assessments.

The item requiring the discrimination of *thin/fin* seemed to give the children the most difficulty and produced more comments than any of the other items. Subject 39 (B:AD1) commented that "I don't know" but was then encouraged to choose one. Other examples of this are: "him and him said both of them" (25:A:AD1); "Both, 'cos they said fin, fin" (35:B:AD1); "you said fin, fin. Fin and fin."(33:B:AD1) and "They both said fin, fin" (41:C:AD1).

Further comments show the children's reflection on the task and metaphonological aspects of the words: "That begins with gun ... and bun, that begins with the same word" and "When he said lake and he said bake did she say that one and get it wrong?" (25:A:AD1/AD2); "These all rhyme" (36:B:AD2); Subject 34 (B:AD1) showed an

inability to discriminate between the word pair in an item by saying, "Both of them" and commented that "Die's not a nice word". Of the same item, Subject 42 (C:AD1) also commented that "That's a sad one" and of another item remarked that "tea, like T .. is a letter". Another subjects noted of /sea, tea/ "But they're both letters" (43:C:AD2) employing analysis at a semantic level.

4.4.2.3. Metasyntactic test (MS)

This task was often characterised by subjects changing and correcting the poor word order: "Take off your jacket" (25:A:MS2) and "Empty the kettle" (44:C:MS2). These corrections occured spontaneously and were not prompted in the metasyntactic assessment.

Incorrect judgements on the basis of semantic reasoning were often made for example, */sweet the suck/* "Bad ... he might eat it" (38:B:MS1); Subject 37 (B:MS1) responded to the stimulus */play the piano/* by saying "Bad, not play it too loud"; */open the window/* "Silly, you don't want to do it on a winter day"; and likewise Subject 32 (A:MS1) responded to */doll the kiss/* by informing the researcher "No, you don't kiss dolls".

After the test had been completed, Subject 25 (A:MS2) initiated swapping roles and produced the following for the researcher to comment on "cat bat", "ho li days: /hɒ lɪ dez/", "moon the light", "picture at". Another girl, Subject 46 (C:MS1) created "car the ear" as her own muddled up story, as did Subject 45 (C:MS1) with "Rub the face".

4.4.2. Analysis of the number of remarks showing evidence of phonological awareness in the three groups made during assessment

The different types of comments made by subjects during the assessment phases, other than the responses to the test items themselves, were noted and analysed. These comments consisted mainly of general remarks about the level of task difficulty and materials (for example, "I like doing this" and "You're just saying it behind them" where

the researcher spoke for the teddy bears in the auditory discrimination test) as well as specific 'metalinguistic' and 'metaphonological' remarks (for example, "He was going to say a bad word" where the stimulus for the PFA test was /f /).

For the purposes of this study, the term *metaphonological remark* is defined as a remark made by a subject, either spontaneously or in response to the assessment procedure, which shows some level of phonological awareness (for example, "That begins with gun and bun ... that begins with the same word" and "Kerry berry ... but that begins with a /b/"). Furthermore, a remark made in response to a trial or test item must be above and beyond that necessary to respond to the item itself.

Although a fairly crude measure of phonological awareness, analysis showed that Group A made considerably more of these metaphonological remarks in the post-intervention assessment phase than did either of the control groups compared with their pre-intervention levels [see Table 15 below].

Table 15 The mean number of metaphonological remarks made per subject in pre-intervention and post-intervention testing (elicited during the introduction of tasks or occurring spontaneously during the assessment) and the mean difference between pre- and post-intervention testing expressed both as the number of remarks per subject and the percentage change for each of the three groups.

	Group A		**Group B**		**Group C**	
	Mean	St.Dev.	Mean	St.Dev	Mean	St.Dev.
Mean number of remarks per subject before intervention	**1.94**	2.72	**3.31**	4.81	**3.06**	1.31
Mean number of remarks per subject after intervention	**4.31**	4.30	**2.31**	2.85	**2.19**	2.53
Mean difference in number of remarks per subject	**2.38**	4.82	**-1.00**	5.79	**-0.88**	2.83
Mean difference in number of remarks as expressed as a percentage of the initial number of remarks per subject	**122.7%**		**-30.2%**		**-24.4%**	

Moreover, in analysing the difference between the numbers of metaphonological remarks made during the initial and final assessments, Group A made over 120% more metaphonological remarks following the intervention phase than they had during initial assessment, while both the control groups showed a decrease of over 20% in the number of metaphonological remarks made per subject.

Although the number of metaphonological remarks made by the subjects was not originally targeted as a measure on which to assess change in ability, on analysing the children's responses to the tasks it was striking that most of the children in Group A exhibited more interest in the metaphonological tasks the second time around than did children from the control groups. This change in behaviour is reflected in the experimental groups' increased number of metaphonological remarks.

Chapter Five

Discussion and conclusions

The main aim of this study was to investigate whether the development of metaphonological ability could be accelerated in pre-school, pre-literate children. The hypothesis was tested that a group of children who took part in a programme of metaphonological activities would show accelerated metaphonological development compared with two control groups of subjects.

This chapter first discusses the results in relation to the hypothesis [see section 5.1.]. Further sections discuss more general aspects relating to the assessments which were used and issues raised in earlier chapters [see section 5.2.]. A critical review of the study is presented in the next section [5.3.] and is followed by a section which considers directions for future research [5.4.]. The final section of this chapter [5.5.] presents the conclusions drawn from this study.

5.1 Discussion of results in relation to the hypothesis

In the following sections the results of the study are discussed in relation to the hypothesis. Results which support the hypothesis are discussed in Section 5.1.1. and those which jeopardise the hypothesis are discussed in Section 5.1.2.

5.1.1. Results which support the hypothesis

On analysis of the change in scores from pre- to post-intervention testing, a significant variance amongst the groups was found in four of the eight repeated measures. Each of these four measures were assessments of metaphonological ability. None of the other measures, of auditory processing or metasyntactic ability, showed a significant level of variance amongst the groups.

The measures of mean change in onset recognition, rhyme recognition and word synthesis scores, in addition to the combined metaphonological score, varied significantly

amongst the experimental and control groups [see Table 13]. The four metaphonological measures which showed a significant difference amongst the three groups were then analysed for significant levels of variance between the experimental and each of the control groups in turn (Groups A and B, Groups A and C) as well as between the two control groups themselves (Groups B and C)[see Table 14].

The following sections discuss the interpretation of these findings in relation to the hypothesis.

5.1.1.1. Rhyme recognition measure

Group A showed significantly greater increases in score from pre- to post-intervention testing on the rhyme recognition test than did either of the control groups. There was a significant variance between the performance of Groups A and B ($p = 0.0231$) and between Groups A and C ($p = 0.0048$) on this test while the variance between the control groups did not reach significant levels ($p = 0.5668$). These results indicate that in Group A, which received the programme of metaphonological intervention, there was an acceleration of rhyme recognition ability beyond any spontaneous developmental change which may have occurred during the period of the study. This finding strongly supports the hypothesis.

5.1.1.2. Onset recognition measure

While neither of the control groups showed any statistically significant change in their mean onset recognition score following intervention, the experimental group, Group A, showed a statistically significant increase in mean score from pre- to post-intervention testing. This suggests that the intervention procedures to which the experimental group were exposed facilitated the change in the subjects' behaviour beyond any spontaneous development which may have occurred during the time of the study. The children's ability to recognise phonemes in the word initial position appears to have significantly improved for Group A.

Although there was a statistically significant difference between Group A and Group C ($p = 0.0070$) for mean change in onset recognition score, the variance between Groups A and B for this measure did not quite reach significance at the 5% level ($p = 0.0581$). This finding could be interpreted as indicating that while the metaphonological programme is more beneficial to onset recognition skills than is no intervention programme, it's influence may not be any greater than the programme which focused on semantic abilities rather than focusing explicitly on metaphonological ability.

However, it can be argued that variances within Group B may account for this lack of significant variance between the first control group and the experimental group. While no significant mean change in score for onset recognition was found for Group B [see table 4.9] the calculation for variance may have been influenced by an outlier. The difference in pre- and post-intervention scores for one of the Group B subjects [Subject 34] was significantly greater than for any other subject in any of the groups.

The absence of a significant variance between the two control groups ($p = 0.4434$) and the statistically insignificant changes for both Groups B and C in onset recognition scores from pre- to post-intervention, indicate that there is no significant difference between the effects of a semantic intervention and a 'no intervention' condition on subjects' ability to recognise word onsets. The findings in relation to this measure can therefore be regarded as supporting the hypothesis.

5.1.1.3. Word synthesis measure

The word synthesis results show a significant variance between Groups A and B ($p = 0.0029$). Group B showed no significant change from pre- to post-intervention testing at the 5% level of significance for this measure while the mean word synthesis score increased significantly for Group A ($p = 0.010$). This result supports the hypothesis that the metaphonological intervention programme would have a positive influence on word synthesis skills while a semantic intervention programme would not significantly effect the ability to synthesise words.

The variance between Group A and the second control group did not, however, reach significance. Since this finding seems to jeopardise the hypothesis, it is discussed in section 5.1.2.

5.1.1.4. Combined metaphonological measure

Each of the individual tests is comprised of 20 or 24 items while the total number of metaphonological items amounts to 84. By combining the scores for each of the individual tests, the greater number of items gives a more reliable and valid measurement of metaphonological ability. The combined score of all the metaphonological tests can be used with greater confidence than each of the individual metaphonological tests alone and greater emphasis will therefore be placed on the interpretation of the combined metaphonological results in relation to the hypothesis.

The change in combined metaphonological score, from pre- to post-intervention testing, showed a statistically significant difference between the experimental group, Group A, and each of the control groups in turn, Groups B and C. The group of subjects which had been exposed to the metaphonological intervention (Group A) had significantly increased their mean combined metaphonological score while the change in score over the same period did not reach significance for either of the control groups.

No significant variance between the control groups was found and neither Group B nor Group C obtained statistically significant values for the mean change in combined metaphonological score. No significant change in metaphonological ability occurred in subjects who simply took part in a small group programme targeting another linguistic area (as in Group B) and neither did any spontaneous development take place in subjects who did not take part in either of the intervention programmes (as in Group C). These results argue strongly that taking part in a specifically designed metaphonological programme can accelerate metaphonological ability beyond a level of change which can be accounted for by either spontaneous development or small group interaction. This finding strongly supports the hypothesis that the intervention programme targeting metaphonological skills would accelerate subjects' metaphonological abilities.

5.1.1.5. Other results which support the hypothesis

(i) A comparison of the mean changes in scores for each group

Group A was the only group to have increased all its mean scores from pre- to post-intervention testing. This suggests that the intervention which Group A received (that is, the experimental intervention focused on developing metaphonological skills) may have affected not only metaphonological abilities but also other abilities [see section 5.2.3.2. for further discussion]. Although there was a positive change in scores for phoneme feature analysis and auditory discrimination the change was not statistically significant. The intervention, therefore, can not be said to have significantly influenced these linguistic abilities over the six or seven weeks of the study.

The first control group, Group B, which received the linguistic intervention targeting vocabulary and semantic abilities showed no statistically significant changes, either positive or negative over the period of the study. Their intervention procedure therefore did not significantly influence the metalinguistic abilities tested and neither did it significantly influence their abilities in the area of auditory processing, auditory discrimination and auditory memory.

(ii) Number of "metaphonological remarks" made by subjects during assessment

In examining the mean number of "metaphonological remarks" made by subjects [for explanation see section 4.4.3.] first, during the initial assessment phase and second, during final assessment, Group A were found to make an increased number of remarks following intervention while neither Groups B nor C showed an increase. Interestingly, the control groups showed a decline in the expression of their phonological awareness, producing approximately 20-30% fewer metaphonological remarks than they had during pre-intervention assessments. In marked contrast, the number of metaphonological remarks made by the experimental group, who had been exposed to metaphonological activities during the intervening time between assessments, increased by over 120%.

This observation suggests that Group A subjects' interest and reflectivity at the phonological level was not only maintained but also enhanced by the metaphonological intervention programme. Control subjects, on the other hand, had not received such input and as a result they appeared to find the assessment tasks and materials less remarkable on repetition.

The results discussed in Section 5.1.1. above, strongly support the hypothesis that children who take part in a programme specifically targeting phonological awareness show accelerated metaphonological development beyond any spontaneous development which may have taken place over the period of the study and which can not be accounted for by simply taking part in small group activities.

5.1.2. Results which jeopardise the hypothesis

In order that the hypothesis be fully supported, the results should reflect an increase in Group A's scores from pre- to post-intervention testing while no such change should have occurred for either of the control groups. The results from Group B (the first control group) support the hypothesis in this way, although the second control group's results (Group C) seem to be inconsistent.

The results for Group C are more difficult to interpret than those of Group B. While Group B showed no significant change from pre- to post-intervention testing, there was a significant change in tests of word synthesis (WS), auditory memory (AM) and auditory discrimination for Group C. Both the WS and AM tests increased significantly while there was a significant decrease in score from pre- to post-intervention testing of auditory discrimination. Although these changes do not all reflect an increase in ability any fluctuation in scores found in a control group over the period of the study calls into question the validity and reliability of the increases in scores found in the experimental group.

The 'no intervention' control group, Group C, was incorporated into the methodology in order to provide a baseline for any spontaneous development which may occur over the period of study. The results for Group C should theoretically either be stable, reflecting no development over time, or show an increase against which any change found for the experimental condition could be compared. Any fluctuation in Group C's results makes the interpretation of results from the experimental condition more complicated. [See Section 5.2.2. for possible explanations of the anomalous Group C findings.]

5.1.3. Summary of the results and their relation to the hypothesis

The analysis of variance of measures amongst the three groups shows a significant variance in metaphonological measures only. This supports the hypothesis that the influence of the intervention procedures is specific in relation to the metaphonological abilities.

The measure of mean change in the combined metaphonological score for all the groups showed a significant variance between the experimental group and each of the control groups (Groups A and B and also Groups A and C) but no significant variance between the control groups (Groups B and C). This suggests that the experimental intervention programme significantly influenced metaphonological ability while neither of the other conditions had a significant effect on subjects' metaphonological abilities.

The number of metaphonological remarks made by subjects during the assessments was taken as a qualitative measure of their spontaneous reflectivity and interest in speech sounds. The results suggest that the metaphonological intervention programme proved not only beneficial in developing children's metaphonological abilities (as assessed in the test procedures) but also in enhancing their general awareness of and interest in phonology. Neither of the control conditions influenced the children's behaviour in this way.

The second control group, however, which received no intervention programme, gave some anomalous results. In the light of these Group C findings, all the results from the study must be interpreted with a degree of caution.

5.2 Further discussion of the results

5.2.1. Further discussion of the results from specific assessment tasks

5.2.1.1. Phoneme Feature Analysis test (PFA)

The lack of success which the subjects had with the phoneme feature analysis test raises some interesting issues. Only six subjects reached criterion scores in the pre-intervention assessment and none achieved criterion scores in the final assessment. This could suggest that judging the voiced/voiceless contrast in phonemes is too difficult a task for three and four year old children at this stage of development or that the test was in some way flawed (for example the instructions may not have been sufficient in explaining what was expected of the subjects).

There was also no statistically significant change in mean scores from pre- to post-intervention for any of the groups. This suggests that the experimental intervention made no impact on subjects ability to judge the voiced/voiceless contrast in phonemes. There were no specific activities which focused on phonemic features at this level in the experimental intervention procedures. Group A did however show the greatest increase in scores following the intervention phase although this change did not reach statistical significance. This may suggest that of all the subjects, the experimental group were the most focused on identifying and comparing differences in phonological features.

There are two possible explanations for the lack of post-intervention success on the phoneme feature analysis test. The first possibility is the absence of any specific activities specifically targeting voicing in the metaphonological intervention although other phonemic features were briefly discussed (for example the plosive/fricative contrast). The

emphasis of intervention was on facilitating phonological awareness in general rather than training specific abilities. Increasing awareness of certain phonemic features (such as duration) may not ensure that subjects become aware of other features (such as voicing). Another possible explanation for the lack of any improvement in the PFA test could relate to the developmental sequence of metaphonological abilities (Adams, 1990) [1.2.3.]. Phonemic features are components of the smallest of the phonological units encountered in this study. If syllables are easier to reflect on than intrasyllabic units of onset and rime and they in turn are easier than individual phonemes (e.g. Treiman, 1987) then perhaps it should follow that reflection on features of phonemes should develop after knowledge about the existence of phonemes as distinct entities has been established. The phoneme feature analysis test results call into question the appropriateness of using phonetic features in the metaphonological assessment of such young children.

The work reported by Howell and Dean (1987) has shown that young children with phonological disorders are able to make judgements about phonemic features. Metaphon intervention specifically targets awareness of these feature contrasts. On the other hand, the intervention implemented in the present study used observations about the features of phonemes to focus attention on phonology and was not able to devote so much time to developing awareness of phonetic features in particular. The Metaphon efficacy study (summarised in Howell and Dean, 1994) showed that, in most cases, the phonological processes which were not targeted held constant while those which were treated showed change. There were however two other groups of children whose pattern of phonological development following treatment did not conform to this simple model.

Voicing was not a feature which was targeted during the metaphonological programme and children showed no improvement on the phoneme feature analysis test which only assessed children's awareness of voicing. These findings suggest that in order to raise children's awareness of the phonemic feature of voicing, the intervention activities should specifically target that feature.

5.2.1.2. Rhyme Recognition task (RR)

Children's responses to the introduction of the rhyme recognition test and to the test items themselves provide interesting insight into the abilities which may be necessary in carrying out the different tasks. During the rhyme recognition assessment, the test introduction highlighted a discrepancy between children's ability to produce rhymes and their ability to recognise rhymes. Subjects' performances in both pre- and post-intervention assessment of the present study have shown that some children were able to produce rhymes during the introduction to the test but were unable to achieve criterion scores on the test itself which required making rhyme/non-rhyme judgements. However those who gained scores greater than chance were all able to give examples of rhymes and produce rhymes for different words.

Of those who were unable to reach criterion scores the majority either gave no examples of rhyme production or gave inaccurate examples. Only a few children who did not achieve scores above chance were able to produce 'good' rhymes in the introduction to the test. These results concur with previous findings (e.g. Reid, Grieve, Dean, Donaldson and Howell, 1993) that a child's ability to produce rhymes successfully does not necessarily mean that he will be able to judge rhyme.

This suggests that children may be able to produce rhymes before they are consistently able to judge whether a pair of words rhyme. Smith and Tager-Flusberg (1982) found, using a similar task, that it was the most difficult of the tasks they used to assess children's metaphonological abilities. They found that if subjects could judge whether two words rhymed then they could also produce rhymes [1.2.3.4.].

The nature of the rhyme recognition task may itself have caused this effect. The processing involved in rhyme production may be easier and under less conscious control while the rhyme recognition task requires a more reflective approach and more conscious control (Adams, 1990) and may also involve accessing the central lexical store thus complicating the task with semantic overtones. The rhyme production could merely involve the phonological output (not always the lexicon as children produced both words and non-words following my example). Bradley (1980) also determined that children can

produce rhymes from an early age but that there was a clear developmental trend in their ability to recognise rhyme. The results of this investigation support Bradley's findings.

The performances of individual subjects on the rhyme recognition test has raised some issues relating to the sub-skills required to carry out the task. The results could suggest that rhyme production employs different linguistic processes than rhyme recognition.

Smith and Tager-Flusberg (1982) [1.2.3.4.] found that their rhyme recognition task, which was similar to the one used in this study, was only minimally successful with three and four year olds as only around 30% of their subjects were able to reach criterion scores. The results of the present study concur with those of Smith and Tager-Flusberg. In fact, an even lower proportion of subjects, around 20%, reached criterion scores on the pre-intervention measure of rhyme recognition.

As with the findings of Smith and Tager-Flusberg (1982), the results of this study provide strong evidence that children's ability to make judgements about rhyme increases with age. More of the older subjects were able to correctly judge whether word pairs rhymed than the younger subjects in the initial assessment of rhyme recognition in this investigation. This evidence supports the developmental trend in the ability to recognise rhymes.

5.2.1.3. Onset Recognition test (OR)

The results indicate that children found the onset recognition task more difficult than the rhyme recognition task. Fewer children, from all groups reached criterion scores on initial OR assessment than for rhyme recognition. While Group A subjects showed a dramatic improvement in their ability to judge rhymes and non-rhymes, the mean increase in onset recognition score for Group A was less significant. This study therefore provides evidence in support of findings from the literature from observational data (e.g. Clark, 1978) that, in the developmental sequence of metaphonological ability, the awareness of rhyme precedes awareness of alliteration.

It was interesting that children used different strategies in carrying out the onset recognition test. While one subject (25) would repeat the stimuli out loud, others (26,

33, 34, 36) would emphasise the onsets of the stimuli to aid their analysis of the phonological structure of the words. The children who were able to use these kinds of strategies showed a fairly sophisticated awareness of phonology. They were able to manipulate the sound structure of the words and in doing so supported both their auditory memory of the stimuli and metaphonological processing of the information.

5.2.1.4. Word Synthesis task

The word synthesis task provides evidence of young children's abilities in manipulating phonological and phonemic units. The findings of this study contradict Hake's assertion (1980) that four year old children are incapable of phonemic awareness although they may be aware of syllables [see section 1.2.3.5.]. The evidence supports more recent experimental research which has found that younger children are able to reflect upon and manipulate phonology at the phonemic unit when the tasks are accessible enough (e.g. Chaney, 1992).

Treiman (1985) found that four and a half to six year old children find it much easier to manipulate syllabic units than they do onset and rime and phonemes. The findings of the word synthesis task of the present investigation support Treiman's understanding of the developmental sequence of metaphonological abilities although the children involved in her study were older. All the subjects in the present study were able to synthesise words by syllable and over 62% of the subjects were able to achieve some degree of success in synthesising a word given intrasyllabic units at the level of onset and rime divisions. The numbers of children who were able to synthesise words by phoneme were, however, much fewer [4.4.1.4.].

The initial results of the word synthesis test also concur with the findings of Liberman, Shankweiler, Fischer and Carter (1974); Fox and Routh (1975) and Van Kleeck and Bryant (1987) [1.2.3.6. and 1.6.2.3.] who found that awareness of larger phonological units developed before phonemic awareness as most of the children found it difficult to synthesise words given phonemes.

5.2.1.5. Auditory Memory task

The relative increases in auditory memory ability for the three groups poses some interesting questions in the interpretation of the results. As the activities in both the experimental and control intervention programmes involved listening skills, it could have been expected that Groups A and B would have shown a significant increase in auditory memory ability. Although the mean scores for all groups increased and the increase in scores for Groups A and C was significant, the changes in scores from pre- to post-intervention did not significantly differ amongst the groups. As a result no conclusion can be made about the extent to which the different experimental conditions influenced auditory memory ability.

All the groups showed some degree of improvement from pre- to post-intervention testing of auditory memory. This could be due to the relatively short time between the two assessment phases. Subjects may have had some residual memory of the sentences which they had to repeat which would have proved beneficial in their second exposure to the test. This could be applied to all the tests, however, in the auditory memory test the children are explicitly instructed to try to remember what the researcher has said and auditory memory is the primary skill being measured. Other tests focus the children's attention on other skills which are necessary in the successful completion of the tasks involving processes. Children are more likely to remember something which they are explicitly asked to remember (Flavell and Wellman, 1977) and so perhaps, over the relatively short time span of the study, remember the auditory memory task in more detail than the other tests.

5.2.1.6. Auditory Discrimination task

The results suggest that there was no significant change in auditory discrimination ability for any of the groups over the time of the study. None of the groups significantly differed from one another suggesting that neither the experimental nor control conditions contributed to subjects' abilities to discriminate between phonemes. The stability of the

AD scores suggests that auditory discrimination is not influenced by metaphonological intervention procedures.

The lack of change in auditory discrimination scores could be accounted for by the items in the test itself. Of the 20 items, three word pairs may have been particularly difficult for many of the children to discriminate (lake/rake; thin/fin; sip/zip). The initial phonemes are particularly difficult to discriminate and the test procedure eliminates any help that children may have been afforded by seeing the researcher's mouth as she spoke. The acoustic similarity of these word pairs may have lowered the ceiling of the test. The ceiling effect could possibly account for the lack of change in performance on this test.

5.2.1.7. Metasyntactic task

The metasyntactic test is a measure of children's ability to judge the correctness of word order in a phrase. The results show that only in Group A was there a significant increase in scores following the intervention phase. Although the intervention for Group A focused on phonological awareness it may have been that there has also been some additional effect on children's awareness of language more generally. Any interest which has been triggered by facilitating awareness of the sound system of language may also have been carried over into other areas of language [see section 5.2.3.2. (iii)].

In addition to the influence of increased general linguistic awareness, which may have been brought about by the metaphonological activities for Group A subjects, the results also show that scores for auditory memory increased significantly from pre- to post-intervention testing in Group A subjects. This increase suggests that the auditory memory capacity in these children has improved. An increase in auditory memory ability may also have influenced subjects' ability to store information (which in the case of the metasyntactic test would be a different phrase for each of the test items) and thus aided their ability to process that information (judge whether that phrase was in the correct or incorrect order).

However, the results only tentatively suggest the link between auditory memory and other abilities as the increase in Group A's auditory memory ability, although significant

within the group, is not great enough to have produced a significant difference amongst the three groups, A, B and C.

The comparison of the qualitative and quantitative data gathered during the assessment of the metasyntactic test provides some evidence to support Bialystok's statement (1986) that judging syntactic correctness is easier than correcting the errors themselves. Although the metasyntactic test did not require the children to correct the ungrammatical phrases, their spontaneous corrections and other comments suggest that while some three and four year old children are able to judge syntactic acceptability, even fewer are able to correct the errors.

Many of the corrections attempted by the subjects applied semantic rather than metasyntactic abilities. The results also support the findings of de Villiers and de Villiers (1972) [1.2.4.1.] in that many children of this age employ semantic rather than syntactic strategies in making judgements about the acceptability of an utterance. Content oriented responses suggest that children at this stage of metalinguistic development still find it difficult to distinguish between the words themselves and their referents (Papandropoulou and Sinclair, 1974) [1.5.2.2.].

5.2.2. Possible explanations for Group C's anomalous findings

Possible explanations for the significant decrease in the auditory discrimination measure and the significant increase in Group C's performance with both the auditory memory and word synthesis tests are explored in this section. The fact that Group C show a significant decrease in mean auditory discrimination score perhaps highlights the difficulty in interpreting the group's results. The extent of intra-group variance, within this group, may account for some of these surprising findings. The significant decrease in score on the auditory discrimination task on post-intervention testing suggests that on testing six weeks after the first assessment their abilities had decreased. This does not seem plausible unless the possibility of assessment fatigue influenced their performances. This, however, contradicts the suggestions put forward to explain the significant

increases in the other two abilities mentioned. Why would their motivation significantly influence a positive change in two of the abilities but a negative change in another? Perhaps it has more to do with the rewards of the tasks themselves than their abilities to carry out these tasks. This calls into question the validity and reliability of the tests used, if the influence of co-operation and motivation could be so great. This variable is, however, a problem which applies to all assessments.

The nature of the tasks themselves may also affect the relative influence which motivation can play in the performance of a test. The simpler the processing involved the more likely that motivation will play a greater part in the success or failure of the subject in carrying out the task. For example the processing involved in the auditory memory task does not involve central linguistic processing. In repeating a sentence or a sequence of digits the subject is not required to access the central lexical store. Likewise in the word synthesis test the knowledge of the actual word is not essential in order to carry out the task successfully. It does however seem to help on occasion if the subject is able to access his internal lexicon to aid his decision. On other occasions this strategy seemed to confuse rather than benefit the subject.

The less rewarding the task the more easily task fatigue sets in and motivation is lost. The auditory discrimination test was perhaps one of the least intrinsically rewarding tasks as it required the subject to point to one of two teddy bears. The scope for improvement was also less because the pre-intervention scores were approaching ceiling.

The significant increase in word synthesis scores for both Groups A and C following the intervention phase presents some problems in interpreting the data. It could be argued that the use of illustrations in this test may have caused some learning to take place which would produce an advantage for the subjects on re-testing. There is evidence, however, that learning has not taken place. If this visual and non-verbal information had contributed to learning then it would have been expected that both control groups would have shown similar patterns of post-intervention responses. This was not the case. Group B did not show any significant change from pre- to post-intervention testing.

Group C results showed a significant increase in scores for both the word synthesis and auditory memory tasks. This can not be as easily explained as for Group A subjects whose improvements could be accounted for by the acquisition of new skills or new phonological knowledge or alternatively the practice in focusing attention on phonological knowledge they had already possessed. Group C's apparent improvement could be accounted for by the spontaneous development of these skills during the time between pre- and post-intervention testing. However, if this were the case then it is likely that Group B would have shown a similar pattern of pre- and post-intervention results.

A subjective observation of the subjects during both assessment phases suggests that Group C children were more highly motivated to apply themselves to the different tests as they had not received any intervention in the intervening time. All of these subjects had seen the small groups of children being taken from the nursery and returning in high spirits. Many Group C subjects made remarks such as "When is it my turn?" and "You never take me with you" which suggests that they had wanted to join in. Perhaps, as a result of feeling left out, they may have been more highly motivated to please the researcher on post-intervention assessment so that they would not be left out in the future.

That motivation and therefore more attention and concentration on tasks should influence success to such an extent would show how important it is to ensure that test materials and procedures are as interesting and motivating as possible in order to measure subject's true abilities. The fact that Group B children did not change significantly in any of the measures suggests that their experiences during the intervention phase did not significantly influence their abilities or motivation. These Group B subjects could possibly be suffering from assessment fatigue. Unlike Group A they had not received the appropriate intervention to equip them with the necessary tools for improving their metaphonological skills and unlike Group C they were perhaps not quite as highly motivated and eager to please the researcher.

The issues raised above should be considered in the interpretation of Group C's anomalous results.

5.2.3. Further issues in the interpretation of results

5.2.3.1. Bimodal score distributions

The occurrence of bimodal distributions of scores for the metalinguistic tests which require a X/Y response, provide evidence that the assessments measure an ability which is either present or absent rather than one which can be acquired gradually. The first mode occurs at the 50% scoring rate. The phoneme feature analysis, onset recognition, rhyme recognition and metasyntactic (also the test for auditory discrimination) tests all require an X/Y response therefore giving the subject a 50% chance of giving the correct response by chance. Children who do not possess the necessary skills to make the appropriate metalinguistic judgements are likely to gain a score of around 10/20 (50%). This accounts for the first mode on analysis of the distribution of scores.

The second mode, between 70% and 100% of the possible score, indicates a level of metalinguistic proficiency where the score is likely to have been obtained because the subjects are able to put the necessary metalinguistic skills into practice.

5.2.3.2. Interpretation of change in scores following intervention

An increase in an individual's score from pre-intervention assessment to post-intervention score could be interpreted in various ways:

(a) as a measure of an improvement in the subject's ability;

(b) that the subject has acquired a skill which they did not previously possess;

(c) that the subject has chosen or is now able to apply the necessary cognitive control to successfully carry out the task;

(d) that during the intervention phase the subject may have been given the necessary phonological knowledge from which to draw information and although they may have previously had the necessary cognitive control they may now be able to apply this to the appropriate phonological knowledge;

(e) that the increase has occurred by chance.

The statistical analysis of the results strongly suggests that Group A subjects have accelerated their metaphonological development, and that the probability that this change has occurred by chance is negligible. While the experimental group showed a statistically significant increase in its mean combined metaphonological score from pre- to post-intervention testing, the results from both of the control groups shows no statistically significant change following the intervention phase. This lack of change in the control conditions indicates that the increased ability is specific to the experimental group. This strongly supports the hypothesis that a metaphonological intervention programme will accelerate the development of metaphonological abilities.

5.2.3.3. Inconsistency of performance

There were some inconsistencies in the performance of some subjects across all the groups. There is evidence that some subjects succeeded in the pre-intervention assessment but scored much lower than expected in the post-intervention assessment on certain tests. Some may have appeared initially to have understood the task and succeeded in the first part of the test but then tailed off towards the end. Although their scores may be lower than expected the subjective opinion of the researcher is that they should have been able to carry out the task successfully. In these cases children may possess the necessary abilities to perform well on certain activities but choose not to either consciously or unconsciously. Poor attention span and concentration seems to have influenced some of these subjects.

Observation of children's behaviour during tasks gives a subjective measure of their metaphonological abilities. The researcher believes that from many of the subjects' non-verbal behaviour it is clear when children appear to fully understand the task and possess the abilities to successfully carry out that task, while others are clearly just guessing in order to complete the test.

5.2.3.4. The extent to which children are able to demonstrate their phonological awareness

Awareness exists along a continuum from tacit to explicit awareness. Children's ability to focus attention on the particular aspect of phonology targeted in each task will vary both from child to child, as well as from time to time for any given child. These variations may depend on levels of cognitive control and linguistic knowledge (Bialystok, 1986) [these factors are discussed in sections 1.5.2.1. (above) and 5.2.2.1. (below)]. Cognitive control may be influenced not only by a child's cognitive development, attention span and concentration but also factors such as fatigue, interest and co-operation at the time of assessment. A poor performance on a particular test at a particular time suggests that the subject is unable to carry out a certain task. Alternatively the subject may have chosen not to co-operate or may have been too fatigued to apply the necessary cognitive control to access the relevant linguistic knowledge or process the relevant information at that time. The latter explanation would account for some of the variation in pre- and post-intervention scores for certain subjects who at first appeared to possess the necessary metaphonological skills but then failed to achieve criterion scores in final testing.

5.2.4. Discussion of results in relation to various theoretical issues

5.2.4.1. Cognitive control and linguistic knowledge

Both cognitive control and linguistic knowledge are necessary for the application of metalinguistic processing by an individual (e.g. Bialystok and Ryan, 1985; Garton and Pratt, 1989). This study provides evidence that the metaphonological intervention supplied subjects with the linguistic knowledge necessary for the development of metaphonological ability. It provided an environment in which children could be introduced to the form of language distinct from its meaning. The various activities enabled children to focus their attention on speech as a medium and not merely a communication. Linguistic knowledge is intricately associated with cognitive control

since a certain level of control must be exerted in order to focus on specific aspects of language (Bialystok and Ryan, 1985) [1.5.2.1.]. The metaphonological programme provided not only linguistic knowledge but also the opportunity for using that knowledge. Byrne and Fielding-Barnsley (1991) state that "knowledge .. can be supplemented by instruction in how to use the knowledge" (p455).

Children's responses to the activities involved in the experimental intervention provide valuable information about how children undertake metaphonological tasks. During the metaphonological intervention programme children were at first prompted into making specific judgements about words and their sounds (for example, having presented a pair of rhyming or alliterative words the children could be asked: "Were they the same at the beginning or the end of the word?"). Then when the children's attention was focused on to a particular segment the label for that phonological unit could be reinforced (e.g. "Yes, it sounded the same at the end of the word, *pin, chin*. That's a rhyme. Here's another rhyme, listen: *chair, pair*. That's a rhyme too."). This gave the subjects greater exposure to the metaphonological terminology and provided the opportunity to give further examples.

The more familiar the children became with the terminology the easier it was for them to understand and to use the terms to follow instructions and express their own observations. They were acquiring linguistic knowledge.

The subjects were prompted less and less specifically to reflect on metaphonology providing an opportunity for subjects to exercise more conscious cognitive control over their growing linguistic knowledge. Initially, subjects would require specific prompts to reflect such as "Did the words start with the same sound?". By using closed questions, specifying judgement types and exaggerating target segments within the words, for example "*Vvvvan, mmmman*", subjects' attention could be drawn to the pertinent phonological segments giving greater support to their cognitive control by aiding memory. These strategies all help to focus the child's attention on the task at hand and aid memory by increasing the perceptual salience of a particular phonological unit.

Later activities allowed more open responses and more independent analysis. In an example of an activity used towards the end of the metaphonological programme, by setting out four pictures and asking "Which is the odd one out?" children had to compare the phonology of the illustrated words themselves without any clue as to which segment to focus on. In order to successfully carry out the task they had to be able to control their own reflection, comparison, identification and decision making processes themselves - they had sole cognitive control and were no longer being led step by step by the researcher. This example requires fairly advanced metaphonological abilities and was an activity of which only the more able subjects were capable.

The development of cognitive control fostered in these sorts of activities could also influence other areas outside phonological awareness. This has implications for "knock on" effect on other metalinguistic areas, such as metasyntax as well as language more broadly and cognition in general [see section 5.2.3.2.]. Oloffson and Lundberg (1983) suggest that within phonological awareness, "phonemes might be especially powerful devices for developing conscious reflection and exploratory curiosity." A programme of pre-school intervention which targets metaphonological ability could be applied not only to the acquisition of literacy skills, but also to the broader scheme of education in general [see section 5.2.4.]. There is evidence that such programmes enable children to develop their cognitive control (Donaldson, 1987). In saying this, children must also be capable of a certain degree of cognitive control before they are able to carry out metaphonological tasks [1.5.2.1.]. This may serve as a possible explanation for why some children who were exposed to the metaphonological programme did not show any improvement in their metaphonological ability. Having been provided with the necessary linguistic knowledge, they were perhaps unable to use that knowledge because they did not possess the cognitive control required to reflect on language. Even taken through each metaphonological task step by step during the intervention phase, some children were still unsuccessful. They seemed unable to focus on phonological units, for example, when asked to compare a pair of words, these children would often reflect at a semantic rather than phonological level.

Children's poor performances during the metaphonological intervention sessions and assessment phases suggest that they may not yet have realised that language can itself be reflected on and is not merely a method of conveying meaning. Their insistence on analysing words semantically could indicate their inability to focus on phonology.

Bialystok (1986) suggested that it is only when both linguistic knowledge and cognitive control are exhibited that there is clear evidence of linguistic awareness. The degree of cognitive control necessary to achieve this may be lacking for a number of reasons such as fatigue, lack of motivation, concentration or attention span. In such instances the child will not appear to have metaphonological abilities whether or not he is capable of them.

As children get older, however, their ability to allocate attentional resources, to focus their cognitive control, improves (Lundberg, 1978). This may contribute towards an explanation of children's development of metaphonological ability. The results of the metalinguistic tests used in this study provide evidence to support this theory as the older children were more likely to reach criterion scores than were the younger children.

5.2.4.2. Generalisation of intervention effects

The metaphonological intervention programme was designed to be facilitative rather than simply being a training programme. The programme used different examples of phonological units for intervention compared with the ones used for the assessment procedures (for example, while 'ed' was the rime targeted in assessment, the intervention activities used alternative rimes such as 'in' and 'ie'). Any increase in scores, therefore, from pre- to post-intervention testing would indicate some degree of generalisation of learning.

There are various levels of generalisation: across linguistic units; across linguistic levels; and across different abilities. These are discussed in the following sections.

(i) Generalisation across phonological units

The assessment procedures used different onsets and rimes in the tests than were used in the structured metaphonological activities of the intervention programme. For example the rime / ɛd / was not used during the intervention phase by the researcher although some of the subjects remembered and used the example spontaneously. Yet despite this, although rhyme recognition was not "trained" (because different rimes were used in assessment and intervention), the experimental group showed that they had generalised their learning about rhymes from those used during the metaphonological programme to a different rime used during assessment. The results are consistent with a previous study carried out by Content et al (1982). This is the narrowest interpretation of generalisation, occurring across different examples of the same linguistic unit.

(ii) Generalisation of metalinguistic skill within the same linguistic level

In noting that certain words contain the same elements, one also emphasises the differences between words, highlighting the other phonological units as well. For example in identifying that *pin* and *chin* rhyme, one must tacitly acknowledge that the onsets of the two words are different. This tacit awareness can develop spontaneously into conscious awareness when the child's focus of attention shifts from one phonological unit to another. During a metaphonological activity in which the children had to find the odd one out given four pictures (*pin*, *tin*, *bin* and *pie*), a four year old girl (Subject 25) remarked: "These all rhyme, but *pin* and *pie* are the same as well". In doing this, she has not only recognised the rhymes but also the alliterative nature of words. When this occurs, a specific metaphonological skill has been generalised to another, although both are classified as metaphonological abilities.

(iii) Generalisation of metalinguistic skills across linguistic levels

The next level of generalisation involves learning across linguistic levels. This may be more as a result of increased cognitive control and the ability to manipulate language than of increased linguistic knowledge itself. Children's heightened curiosity about

language in general may be brought about by the metaphonological intervention. Evidence to support this can be seen in the results from Group A in their post-intervention scores on the metasyntactic test.

Group A showed a significant increase in metasyntactic ability [see section 4.3.3.1. Table 10]. Although only Group A increased their metasyntactic scores significantly, this increase did not contribute to a significant variance in the change of metasyntactic scores amongst all three groups on analysis of variance. Perhaps, had the intervention phase been longer, the improvements shown by Group A compared with the control groups may have become significant.

A similar finding is reported by Howell, Hill, Dean and Waters (1993) in their efficacy study of Metaphon therapy with young phonologically disordered children. As well as showing a highly significant improvement from pre- to post treatment in the metaphonological tasks, the children were also significantly better at segmenting sentences - providing evidence of change at an untargeted linguistic level.

(iv) Generalisation of skills in cognitive control across abilities

There is evidence the metaphonological programme resulted not only in accelerated metaphonological ability but also increased auditory memory. Group A significantly improved on their initial auditory memory scores on post-intervention testing although the increase was not enough to show as a significant difference amongst the three groups.

As children's cognitive control develops, their ability to focus their attention explicitly on a given target improves, whether that target is a linguistic unit or cognitive concept. This has implications for the wider application of a programme which facilitates phonological awareness [see section 5.2.4.2.].

5.2.4.3. The development and developmental sequence of metaphonological skills

Hakes (1980) concluded that metaphonological abilities were late to develop in most children, at around the ages of six or seven years [1.2.2.]. The initial results from this

study contradict his conclusion as children as young as 3:11 years were able to recognise units of onset and rime.

Children's performance on the rhyme recognition task [5.2.1.2.] during this investigation highlighted the developmental sequence of metaphonological abilities. Playing with 'word sounds' and producing rhymes [1.2.3.3.] was found to be easier than making judgements about whether a word pair rhymes. These findings support the developmental sequence advocated by Adams (1990) [1.2.3.].

Pre-intervention metaphonological test results in the present study provide evidence that more children were able to succeed at rhyme recognition than with any other metaphonological test as more reached criterion scores. This suggests that of all the metaphonological tasks carried out, rhyme recognition is the easiest and the first to develop. This evidence supports the literature which has shown that awareness of rhyme develops before onset awareness (e.g. Garton and Pratt, 1989).

The metaphonological intervention programme focused initially on syllables and then on intrasyllabic units, first rimes and then onsets, following the developmental pattern set out in Chapter One [1.2.]. Both the normal developmental pattern and the initial emphasis on rhyme in the programme may account for the dramatic increase in rhyme recognition scores for Group A while improvements in other metaphonological tests was less spectacular.

5.2.4.4. The relationship between speech and language development and metaphonological abilities

Smith and Tager-Flusberg (1982) found that metalinguistic abilities were positively correlated with measures of language development in pre-school children. The results from the pre-intervention metaphonological measures concur with Smith and Tager-Flusberg's findings [1.3.1.]. In the sections below the relationship between linguistic and metaphonological abilities are addressed with reference to the findings of this investigation.

(i) Speech sound acquisition

While the numbers of subjects are too small to make predictions about the population as a whole, the results amongst the subjects may give some indication as to the relationship between speech sound acquisition and metaphonological ability. Of the ten children with the highest EAT standard scores, 60% showed some level of metaphonological ability and three of these exhibited sophisticated metaphonological skills. By contrast, only 20% of the children with the lowest ten EAT standard scores showed any degree of metaphonological ability. The results suggest that children with poor articulation scores are likely also to have poor metaphonological scores. This finding supports that of Smith and Tager-Flusberg.

On examining the results from the sixteen Group A subjects, an interesting trend was found in relation to the degree of improvement of metaphonological ability and articulation scores. Of the eight subjects with the highest EAT standard scores seven were found to have made significant increases in their combined metaphonological scores following the intervention phase. Of the subjects with the eight lowest EAT standard scores half made no significant change in their metaphonological abilities.

The evidence suggests that children with well developed articulation have a head start in the development of metaphonological skills. The results also indicate that children with more mature speech sound systems seem to be more likely to gain greater benefit from a short term metaphonological intervention programme than those with poor articulation.

(ii) Vocabulary comprehension

There is evidence from the data that the extent of subjects' vocabulary comprehension is associated with their metaphonological ability. On examination of the initial metaphonological results from subjects across all the groups, eleven children exhibited some level of metaphonological ability. Of these eleven subjects, ten had BPVS standard scores above average. By comparison, of the eleven children with the lowest initial combined metaphonological scores, seven had BPVS standard scores below average. Over 90% of the children with a significant level of metaphonological ability on initial

assessment had better than average verbal intelligence, as measured using the BPVS, while the figure drops to less than 37% for those with low initial metaphonological scores.

There is also evidence that the measure of vocabulary acquisition is related to the extent to which children are affected by the metaphonological intervention programme. Of the five subjects in Group A with the highest BPVS standard scores four made a statistically significant increase in their combined metaphonological score. In contrast, of the five with the lowest BPVS standard scores, only one showed a statistically significant increase in metaphonological ability while the remaining four showed insignificant changes in score.

The results from this study suggest that children with well developed vocabulary comprehension for their age are more likely to have better metaphonological abilities. In addition, they may also show more improvement in these abilities than children with poor vocabulary development following a metaphonological intervention programme. This has implications for the implementation of such intervention programmes [see section 5.2.5.2.].

(iii) Expressive language ability

There is no clear evidence of a relationship between initial metaphonological ability and children's mean length of utterance (MLU) which was used as a measure of expressive language ability. There was little difference between the numbers of subjects exhibiting a significant level of metaphonological ability on initial assessment when subjects with the ten highest and ten lowest MLU's were compared. However, the two subjects in Group A with the highest MLU's were also two of the three children to possess a significant level of metaphonological ability on pre-intervention assessment.

There is no clear trend in the results to support any relationship between children's expressive language ability, as measured by their mean length of utterance, and the extent of change in metaphonological ability brought about by the metaphonological programme.

In general, this study does not provide any evidence that metaphonological ability is related to expressive language ability. The specific findings of initial metaphonological scores in Group A are not conclusive as the numbers of subjects are too small.

5.2.4.5. The relationship between metaphonological abilities and other non-linguistic developmental abilities and factors

(i) Age of subjects

The results of this study provide some evidence, which supports the literature, of a link between children's age and the extent of their metaphonological ability. Five of the oldest six children (over the age of 4;5 years) who took part in the study exhibited a significant degree of metaphonological skill on initial assessment while only one of the youngest ten children (aged 3;7 years) showed such ability.

The data support the general developmental belief that different metaphonological abilities develop gradually over time. The older a child is, the more likely he or she is of having some degree of metaphonological competence.

In Group A, of the six children who made no significant improvement in their metaphonological scores from pre- to post-intervention testing, four were below the age of four and a half years. The youngest child to have shown a significant improvement in ability was 3;7 years old at the beginning of the study. Of the nine children in Group A aged four years or younger on initial assessment, approximately 55% demonstrated a significant metaphonological gain while, of the seven children above the age of four years, a larger proportion, just over 71%, exhibited such improvements in metaphonological ability.

This suggests that children's age may influence the extent to which change can be brought about by a phonological awareness programme and that children over the age of four are likely to gain more benefit from a metaphonological programme than are younger children. It must be noted that the numbers of children providing this data is

small and that information on greater numbers of subjects is required before any firm conclusions can be drawn.

(ii) Social grouping

When the initial metaphonological scores of the ten children with the highest values for social grouping calculation were compared with ten children with the lowest values no significant difference was found between the two groups. The results suggest that factor of social background does not significantly influence children's metaphonological ability. These findings concur with those of Chaney (1992), Raz and Bryant (1990) and Zucchermaglio, Pontecorvo, Tonucci and Blachowicz (1986) [1.4.2.1.] that the social background of pre-school children does not seem to influence the extent of their metaphonological abilities.

The results from Group A do not provide any evidence of a relationship between social grouping and metaphonological skill. There does not appear to be any link between social grouping and the extent to which children benefit from the metaphonological intervention as no trend could be found in the data relating to social grouping and the change in the combined metaphonological scores of individuals in Group A.

(iii) Auditory memory ability

The results provide evidence of a link between auditory memory ability and metaphonological ability. Of the ten subjects with the highest AM scores, five exhibited significant metaphonological abilities while none of the lowest AM scorers showed any significant degree of phonological awareness in their initial metaphonological scores.

The results suggest that children with better auditory memory skills are more likely to have better metaphonological skills. One possible explanation for this finding might be that in order to analyse and manipulate metaphonological information one must first be able to hold it in one's memory.

On analysis of Group A's results, the three subjects who exhibited a significant level of metaphonological ability before the intervention also had better than average auditory

memory scores. The results show a slight trend in the relationship between auditory memory ability and the extent to which metaphonological scores have changed from pre- to post-intervention testing. Of the five children who showed no significant change in metaphonological scores, three had the lowest AM scores of the group. This suggests that children with poor auditory memory skills are less likely to benefit from such a short term metaphonological intervention programme as the one employed in this study.

(iv) Reading ability

This investigation supports the view that reading is not necessary for the development of metaphonological ability. All the subjects selected for the study were pre-literate and therefore none could have been influenced by the acquisition of literacy skills. Yet some of the children were able to carry out metaphonological and metasyntactic tasks as shown by their success in the pre-intervention assessments. These results support the findings such as those by Tunmer and Fletcher (1981) [1.6.2.3.] that there are children who possess metaphonological abilities although they are unable to read.

The results from the final sections of the word synthesis task showed that children were more able to synthesise phonemes following metaphonological intervention (post-intervention scores had more than doubled for Group A in comparison to the pre-intervention scores for the items presented by phoneme). This could suggest that specific stimulation or experiences may be required to carry out metaphonemic tasks as opposed to metaphonological tasks. The literature on the development of metaphonological abilities states that phonological awareness precedes phonemic awareness. As a more difficult skill, phonemic awareness may be less likely to occur in young pre-school, pre-literate children such as those involved in the present study.

Previous researchers have suggested that phonemic awareness only develops when children begin to read. However, there is evidence from this study that pre-literate children are able to develop metaphonemic skills given the necessary stimulation, and does not necessarily need to involve teaching about phoneme-grapheme correspondences.

5.2.5. Implications of the results

5.2.5.1. Implications for the development of metalinguistic abilities

The results strongly support the view that the development of metaphonological ability can be facilitated by a short term programme of metaphonological activities in small groups of children. The results of this study extend the findings of other similar studies involving older pre-school or school age children [2.1.] by demonstrating that the development of metaphonological skills can be accelerated in children younger than four and a half years of age.

Children who at first were unable to carry out even the simplest of metaphonological tests in the assessment battery showed some degree of ability on reassessment after the intervention phase. These findings have implications in the timing of undertaking a metaphonological programme and suggest that the introduction of metaphonological activities with pre-literate children in nursery school setting could be feasible.

5.2.5.2. Implications for the development of cognitive abilities

As can be seen from the literature [1.3. to 1.6.] metaphonological ability is not a discrete aspect of language, but overlaps with many other linguistic and cognitive areas. In Section 5.2.4.1, the results of this study were discussed in relation to the issues of cognitive control and linguistic knowledge.

There is evidence from this study that children with greater verbal intelligence (high BPVS scores)[see section 5.2.4.4. (i)], had better metaphonological abilities before intervention and also made greater improvements in their metaphonological abilities, following intervention, than did children with poor verbal comprehension. This would suggest that the children who would benefit most from metaphonological intervention are those children who least need the additional input. This study, however, employed only a very short metaphonological programme which was perhaps not sufficient for the less able children. Children with lower levels of intelligence may require more stimulation and more time to consolidate what they have learned than children with average or well

developed cognitive skills. More research is needed to investigate the extent to which cognitive abilities affect children's response to a metaphonological intervention programme.

The facilitation of metaphonological abilities has implications for the development not only of these specifically targeted abilities but also of other abilities. It is suggested that the ability to decentre and employ disembedded thought are invaluable in the development of higher cognitive functioning and in progression through the education system (e.g. Donaldson, 1978).

The more interest a child has in the world around him the more likely he is to want to learn about it. It is important that children should have an interest in language in general and become more aware of it if they are to use this knowledge in the formal education system. Success in the education system, is dependent on literacy skills in both the narrowest sense (in learning to read and write) and also in its broadest sense (in learning what to write and how to use language). A metaphonological programme would serve as an introduction to these issues and promote children's awareness both specifically and generally, sparking their interest in the linguistic world around them.

Power comes with the knowledge of the world around us and also with the understanding of how to use that knowledge. Awareness is the first step along that road.

5.2.5.3. Implications for the structure of a metaphonological intervention programme

The frequency, number and duration of the metaphonological sessions which make up the programme also need to be examined. This study used a very small number of sessions compared with previous similar studies [2.6.3.4.]. It would therefore be logical to assume that the benefits of the intervention will have been limited by the amount of information which could be conveyed; the number of activities in which the children took part; and the amount of practice they had of using their newly acquired metaphonological skills during these sessions. The longer the programme, the more children should gain from the intervention. Some children need more practice in order to acquire new skills while others are able to assimilate new skills more readily.

The findings of this study can be applied to the development of an appropriate nursery programme to facilitate metaphonological ability. Short, small group sessions would ensure that the children who are less able get the individual attention they require; that children's concentration does not deteriorate too much during each session; and that the nursery teacher's time is being used effectively. More research is needed to determine how many sessions would be the optimum for developing various aspects of phonological awareness in young children [see Sections 5.4.4. and 5.4.5. for directions for future research].

Perhaps an intensive approach in the nursery school setting would be appropriate, limiting the time between successive sessions in order to maximise carry over from one session to the next. In this way, less repetition of activities would be required and more metaphonological 'ground' could be covered more quickly. A quick screening test could be used to indicate those children who need more consolidation time and/or more experience with the tasks and activities. These children could then be seen together for additional sessions, while those who had already made sufficient developments in their metaphonological abilities need not be. The use of revision sessions could also be useful in ensuring maintenance of metaphonological skills learned during the intervention programme. These could be carried out after a few weeks (and then months) after the initial programme.

These suggestions regarding the length, number, frequency and duration of intervention sessions highlight the need for more research to investigate the structure of the 'ideal' metaphonological programme.

5.2.5.4. Metaphonological abilities and the primary and pre-school curricula

The evidence from this study suggests that children are capable of developing metaphonological abilities well before they enter school. The literature indicates the importance of phonological awareness in the acquisition of literacy in particular [1.6.3.2.]. There are many advantages in facilitating metaphonological skills before children enter school and embark on learning to read. The introduction of a pre-school

metaphonological programme would attempt to address the issue of continuity between pre-school and primary education. By introducing metaphonological skills, awareness of rhyme, alliteration and phonemes, as part of the nursery curriculum, teachers would be paving the way for the introduction of the phoneme-grapheme correspondences necessary for the development of literacy skills.

It is not only by phoneme-grapheme conversion that children read, they also use analogy (Goswami, 1988). In this way, children are able to relate clusters of letters to the corresponding syllabic or intrasyllabic units of onset and rime. Bradley (1980) and Bryant, MacLean, Bradley and Crossland (1990) [1.6.2.3.] view rhyming and alliterative skills as important in the acquisition of literacy. Facilitating the awareness of the larger phonological units, such as syllable, onset and rime, has therefore been implicated as well as the smaller, phonemic units which have, in the past, been more closely associated with the acquisition of literacy.

Children with better metaphonological abilities are likely to go on to develop better literacy skills (Bialystok and Mitterer, 1987). This would suggest that introducing a metaphonological programme in the pre-school curriculum would be beneficial for children when they come to learn to read.

In addition to ensuring continuity, a pre-school metaphonological programme would also go some way towards the issue of ensuring uniformity of ability on school entry. As discussed in a previous section [1.6.3.1.] children have different pre-school experiences in many developmental areas including language. The disparity of children's metaphonological abilities is likely to effect their ability to learn how to read and write (Catts, 1991; Bradley and Bryant, 1983). Teaching literacy skills may be easier if the development of the necessary metaphonological skills had already been introduced.

The literature [1.6.4.] suggests that the pre-school years are important in terms of developing skills which are precursors to literacy. It would therefore seem logical that metaphonological abilities should be targeted in the nursery school context.

5.2.5.5. Optimum age and educational stage at which to introduce a metaphonological programme

The youngest child to have shown a significant improvement in ability was 3;7 years old at the beginning of the study although, in general, fewer of the younger children in this small sample showed significant increases in metaphonological scores. A larger proportion of children above the age of four years who took part in the metaphonological programme exhibited improvements in metaphonological ability.

The evidence suggests that a programme of this type would benefit children over four years of age more than it would younger children. It must be stressed again, however, that the number of subjects from which these conclusions are drawn is small. A larger scale study would be required to investigate the relative gains made by pre-school children of different ages who are exposed to such a facilitative programme in order to more reliably answer the question of when to introduce an intervention programme. However, the data from this study indicate that it might be better to introduce a metaphonological programme to children over the age of four years.

The pre-school curriculum initially emphasises social interaction and daily living skills and most children would not yet be ready for the types of activities which a metaphonological programme would employ. Gradually, in the nursery, children are introduced to more structured activities in order to prepare them for the experiences they will have at school.

At school, children are taught to read and write. The acquisition of literacy skills and their relationship with metaphonological abilities has been discussed in an earlier section [1.6.2.]. The literature suggests that children with more highly developed metaphonological abilities are quicker to acquire literacy skills than those children with poor metaphonological skills (e.g. Byrne and Fielding-Barnsley, 1991; Lie, 1991; Cunningham, 1990; Bryant, Maclean and Bradley, 1990; Lundberg, Frost and Petersen, 1988). Furthermore, metaphonological ability can be developed before reading and independently of it (for example, Lundberg et al, 1988; Content, Morais, Alegria and Bertelson, 1983). This present study has not involved any investigation of the effect of

metaphonological ability on literacy skills. However, by excluding subjects who were able to read, the study has provided further evidence that some metaphonological skills can be accelerated before children are able to read.

Learning to read and write presents difficulties to many children. It is a function of not only the school but also the pre-school curriculum to ensure that children are as well prepared for this learning in order to minimise the likelihood of failure.

The earlier children are introduced to activities which involve phonological awareness the more time they have to assimilate skills of reflection on and manipulation of speech sound units before the activity is further complicated by the introduction of graphemes.

Some researchers have emphasised the advantages of employing phoneme-grapheme correspondences in developing metaphonological abilities and literacy skills (e.g. Bryant and Goswami). However, this does not dismiss the potential benefits of earlier introduction of metaphonemic skills alone before graphemes are themselves introduced.

By learning about the sound system that graphemes represent before the graphemes themselves are introduced, children could become familiar with the system and how it works within the framework of language as well as the more specific skills of phoneme manipulation. They have time to reflect on the sound system and have the opportunity to discover and learn about it for themselves as the programme fosters reflection and gives the necessary skills on which the children can build.

Donaldson (1987) emphasises the importance of metalinguistic skills in children's education and the great advantage children have if they are able to disembed language from its context by the time they come to school. This view advocates targeting metalinguistic skills in the pre-school curriculum. Donaldson also believes that teaching at this stage should aim to enhance children's reflective awareness not only of language but also cognition in order to maximise educational success [1.5.2.2.].

The literature suggests that the facilitation of metaphonological skills before children are taught to read would be beneficial and Catts (1991) suggests that, by facilitating metaphonological ability, early reading difficulties can often be reduced. Those children who are at risk of having reading difficulties need to be considered in planning the pre-

school curriculum. The results of this study would support the introduction of a metaphonological programme to facilitate phonological awareness, as it has shown that pre-school and pre-literate are able to benefit from such a programme.

While early pre-school intervention may be premature, by introducing a metaphonological programme much later, on entry to primary school, children may already have forfeited a valuable opportunity to develop reflective and analytical skills in relation to the speech sound system. In summing up his metaphonological training study, Lie (1991) states that educationalists are constantly searching for the most effective way of teaching and goes on to conclude that "it is probably best to conduct such training early in Grade 1 or even in kindergarten" (p 248).

The school entry age in Britain is around five years of age. This study has shown that metaphonological ability can be developed in children as young as 3;7 years although more children over the age of four benefited from the metaphonological intervention programme, before children begin to learn to read. The findings of a study by Torgesen, Wagner and Rashotte (1994) "have important implications for the idea that phonological awareness training prior to reading instruction may be one way to significantly reduce the incidence of reading disabilities amongst young children" (p285).

The evidence suggests that the optimum timing for the introduction of such a programme to facilitate phonological awareness would be between four years of age and going to school. At this later stage in the pre-school curriculum, children should be more receptive and more able to concentrate than when they first arrived at nursery and be ready for the structured metaphonological activities.

5.2.5.6. Implications for children at risk from reading difficulties

Blachman (1994) states that "phonological awareness training may be a necessary component" (p289) of prevention and remediation of reading difficulties in children, although training metaphonological ability may not be sufficient for some children who may require more explicit and intensive teaching (Torgesen, Wagner and Rashotte, 1994). Torgesen et al (1994) do, however, strongly recommend the use of phonological

awareness in remedial and/or preventative programmes for at-risk children or those who have already been identified as having reading difficulties.

In the same way that "normal" pre-schoolers would benefit from the early development of metaphonological skills, it is perhaps more important to ensure that those children who have particular difficulties with language are especially well prepared for the acquisition of literacy skills [see Section 1.6.3.3. and 1.6.3.4.]. Children with a language delay or disorder have difficulties in the acquisition of linguistic and metalinguistic skills (Van Kleeck and Schuele, 1987; Kamhi, Lee and Nelson, 1985) [see section 1.3.2.]. Their knowledge and therefore their experience of language is limited by the extent of their linguistic ability. In general, the less experience children have of their language, the less aware of it they are likely to be.

The primary aim of speech and language therapy is to improve these children's linguistic abilities. Some methods use linguistic awareness as a therapeutic tool for facilitating language development - making children aware of their own speech and language production for comparison with the adult target in order to highlight the differences and promote change to a more mature system. However, many speech and language disordered children come to school at a disadvantage with a view to learning to read (Van Kleeck and Schuele, 1987).

The language delayed/disordered child lacks the precursors to literacy that most children can develop through their experience with language. Kamhi et al (1985) advise the inclusion of metaphonological skills in addition to working on language comprehension and expression and Van Kleeck and Schuele (1987) suggest that speech and language therapists should not only be focusing on the speech and language delay or disorder itself, but they should also be considering reading acquisition at this point.

Speech and language therapists have specialised training in the assessment and treatment of speech and language problems in children, however these skills can be equally well applied to facilitating metaphonological skills in both the 'normal' and speech and language disordered pre-school population. A metaphonological intervention programme need not be the exclusive domain of the speech and language therapist, however.

Nursery teachers would also be able to carry out such a programme given suitable guidance.

5.3 Critical review of the study

The following section discusses various aspects of the study's design and assessment procedures and materials which may have influenced the data which has been gathered and the issues which have arisen as a consequence.

5.3.1. Time limitations and practical constraints

Practical constraints and limitations on time restricted various aspects of the study's design: the number of subjects, the number of assessments and the selection of abilities which were tested. These aspects in turn influenced the number of children within each the study groups; the degree to which groups could be matched for various factors and abilities; and the age range of subjects included in the study. Each of these aspects will be discussed in the following sections.

5.3.1.1. Numbers of subjects

The duration of the programme of investigation and the time available during the nursery day limited the number of children that could be involved in the research. The main limiting factor was the time available for both the assessment and reassessment phases. Although reassessment took less time than the initial assessment (as post-intervention assessment would not include the group-matching tests), it took over two weeks to assess twenty-four children on the battery of initial assessments which included subject selection tests and tests for group matching. Reassessment did not involve the repetition of the latter. This restricted the number of subjects per research block to twenty-four involving 12 children in each nursery session, which in turn provided three groups, Groups A, B and C, with four subjects in each.

During the nursery day, children usually attended either in the morning or the afternoon. The number of groups of children which could be taken was limited by the length of each nursery session. It would have been impractical for more than one experimental and one control intervention group, Groups A and B, to have been seen within one session.

In order to have increased the numbers of subjects, the duration of the assessment phases would need to have been extended and the numbers of subjects within each of the groups would also have needed to be increased. Had the numbers within the groups been increased it would have to have been by at least two (a girl and a boy) in order to maintain the groups' gender equilibrium. This would have meant assessing half as many subjects again, increasing the numbers of subjects from 24 to 36 in each nursery and apart from adding an extra two weeks to allow for the necessary assessment of these extra subjects, most nurseries do not provide for this number of children between the ages of 3:6 years and 4:6 years. It was therefore thought that 48 subjects in total was the optimum number of subjects to take part in the research which was carried out over two terms.

There are problems in making assumptions about the relationship between the subjects used in the study and the population as a whole. It would be difficult to generalise conclusions from this study of only 48 three and four year olds to all three or four year old children. But this study does provide pointers for future research [see Section 5.4.].

5.3.1.2. Selection of assessments

The limited time also had implications for the assessment battery. As the time set aside for assessment was limited to allow for four weeks between assessment and reassessment for the intervention phase, the assessment battery also had to be limited. This limited the range of children's abilities which could be investigated as well as the extent to which each ability could be assessed. While it would have been better to have included a wider selection of subject selection and group matching tests, as well as the metaphonological tests and assessments of other abilities which were to be repeated in the final assessment phase, the numbers of these tests and the numbers of items within these tests had to be limited.

Besides the time factor in limiting the number of items per assessment, the test length was also limited by children's attention span and ability to concentrate. An average of twenty items per assessment was found to be appropriate for most children in this age

group. The introduction of the next test would spark renewed interest and maintain the children's attention for the duration of that test, for the most part. Some of the younger children especially found even twenty items a strain on their concentration and would fatigue more easily. In these cases the number of assessments attempted per assessment session would have to be reduced. By comparison, children with greater attention spans would request to stay for yet another 'game'.

5.3.1.3. Group matching

The limited number of subjects made it more difficult to match groups for age and other factors and abilities and meant that the children within their individual groups during the intervention phase were of a more disparate ability. This may have effected the cohesiveness of the group and certainly seemed to influence the group dynamics with the older subjects taking more of a prominent role. However, it also had a positive effect in that the more able subjects would often act as "little teachers" to the younger and less able subjects which may have benefited the younger children.

Content, Morais, Alegria and Bertelson (1982) state that for practical reasons, in their study, it was impossible to randomise the allocation of individuals to experimental and control groups which limits the conclusions that can be drawn from the results and also forced them to be careful in the interpretation of their data. In the present study, however, allocation of subjects to groups was as random as possible within the practical constraints.

5.3.1.4. Age of subjects

The suggested age range put forward at the outset of the study spanned one year, from the age of 3:6 years to 4:6 years. It was not possible, however, to maintain this range due to the practical constraints of the study. The nurseries did not have sufficient numbers of children attending within this preferred age range to allow for the "wastage" following the subject selection and group matching assessments.

5.3.2. Critical review of assessment procedures

Experience of the tests and the data gathered using the these assessments during the investigation has highlighted some problems with the procedures and materials used. These difficulties are discussed with reference to the tests for phoneme feature analysis, word synthesis, expressive language ability, vocabulary comprehension and social grouping.

5.3.2.1. Phoneme Feature Analysis

The results of the study indicate that the phoneme feature analysis test did not contribute to any great extent to the information collected on subjects' metaphonological abilities. The inclusion of this test in the metaphonological assessment battery is of questionable value due to the low incidence of children attaining criterion scores (six in the pre-intervention assessment and none in post-intervention assessment). This could be explained in various ways. The quality of the audio-taped stimuli may have been poor. However, the same procedures were used in the preparation of the phoneme feature analysis test as were used for the other audio-taped stimuli with which children showed greater evidence of success. There are intrinsic problems, however, with preparing stimuli which consist of two phonemes (a consonant followed by an unstressed schwa vowel). Another possible explanation for the children's failure with this task could have been the degree of difficulty of the task. It may require skills which children of this age have not yet mastered.

The same tape was used in piloting the assessment procedure for the phoneme feature analysis test. Half of the ten pilot subjects were able to achieve criterion scores. This success rate provides evidence that both the quality of the stimulus tape and the speaker's distinction between voiced and voiceless consonants were sufficient for this test to be successfully carried out. The pilot findings also suggest that distinguishing between voiced and voiceless consonants is a skill which children around the age of four years old should be capable.

In order to improve the test more than one phonemic feature could have been used with different phonemes in the assessment and intervention procedures. In this way the intervention could have dealt with the feature of voicing while ensuring that the subjects were not "trained" as other phonemes would be used in assessment. Unfortunately, the number of phonemes in the English language is limited. This restricts the number of examples the researcher would be able to give both during the trial and test items of assessment as well as in the intervention as each would have to contain different phonemes. The number for each would be so small that it would not be practical.

5.3.2.2. Word Synthesis

Anomalous results from Group C posed questions about the design of the WS test. The inclusion of picture material to reinforce the task and help maintain subject's concentration and motivation may also have provided the means by which the test could be learned.

If learning had taken place, however, data from Group B should have shown a similar increase to that of Group C. This was not the case.

This procedure did not provide verbal feedback or any direct information about the phonological structure of the item other than the knowledge that the stimulus in its segmented form represented a real word. The picture was shown only after the subject had responded to the item. It could be argued that by showing a representation of the word learning would take place and subjects would associated the segmented phonological units with the picture and therefore have a greater advantage on re-testing.

In order to minimise any possible learning effects that the picture presentation may have caused, the pictures could have been shown only during the trial items and not throughout the test itself. However this would still leave the problem of maintaining subject motivation and co-operation throughout the remaining 24 test items.

An alternative means of maintaining the subjects' attention and cooperation with the test could have been by employing a parallel game of some kind. This, however, has the disadvantage of distracting the subject from the main activity - the metaphonological

task. Although using the picture material may not have been ideal, the alternatives do not seem any better.

5.3.2.3. Expressive language ability

Expressive language ability was assessed using the measure of mean length of utterance (MLU). Due to the practical constraints of the study, time did not allow for the collection of a free speech sample. However, the same opportunities for linguistic expression were given to each subject by employing a story re-telling task (The Bus Story: Renfrew, 1969).

Rather than using Renfrew's own measure of linguistic competence (mean number of words per utterance), the mean number of morphemes per utterance was calculated for each subject's transcription using the criteria specified by Brown (1973). The MLU by morpheme is considered to be a more accurate measure of expressive language ability than is the number of words per utterance.

The story re-telling task is not an ideal measure of expressive language ability, however, due to the practical constraints of the study, it was thought to be the best measure obtainable given the limitations. By increasing the amount of time over which data could be collected, a more valid and reliable measure of expressive language ability could be obtained.

5.3.2.4. Vocabulary comprehension as a measure of intelligence

No test of non-verbal intelligence was used in the study. Practical constraints of time contributed to the lack of data on subjects' intelligence. The test for vocabulary acquisition (BPVS) is however linked with verbal intelligence. There is evidence cited in Dunn, Dunn, Whetton and Pintillie (1982) (p 1) that the acquisition of vocabulary was found to be the best indicator of school success and is also one of the most important contributory factors in the measurement of intelligence (Elliott, 1982). There is only meagre data available from this study on the influence of verbal intelligence on the acquisition of metaphonological ability.

A measure of non- verbal intelligence would be needed to investigate more fully the hypothesis that intelligence is an important factor in both the acquisition of metaphonological skills and the acceleration of metaphonological abilities.

5.3.2.5. Social grouping

There are problems in using Wells' social grouping calculation in general [see appendix for details of Wells' calculation]. A proportion of the families in the first nursery school had single parents. The calculation does not account for single parents. As Wells does not specify how to calculate social grouping for children from single parent families, this study doubled the score for the single parent to gain a measure of social background as if the missing parent would have had the same score. This, however, gives a false impression of the social grouping of the subjects because the single parent was always the mother and as the primary carer was usually unable to go out to work, thus immediately reducing her possible score. In the families with two parents at home, it was more likely that the father worked when the mother did not and also that when both parents worked the father gained a greater score because his job was more highly rated than the mother's. With a larger proportion of single parents the calculation would have the effect of skewing the social groupings to the lower end, as has been found in the scores for one of the nursery schools.

In order to have avoided this problem entirely, only children from two-parent families could have been selected to take part in the investigation. This, however, would not have given a true picture of the population at large and would have influenced the validity and reliability of the results and further restricted the availability of subjects.

5.4 Directions for future research

The following section suggests some possible areas for further investigation of metaphonological abilities and the extent to which these abilities can be facilitated.

5.4.1. Investigation of the acceleration of metaphonological abilities in a large scale study

By using larger numbers of subjects, the validity and reliability of the study would be increased, as would be the confidence with which the results could be extrapolated to the general population of three and four year olds attending nursery school.

The number of subjects in this study was limited by practical constraints. A study which took place over a greater time scale could either repeat more blocks each involving twenty-four children or increase the number of subjects involved in each block of research. The limiting factor would still however be time.

The number of blocks repeated would depend on the number of pre-school terms over which the research could take place, if there were to be no interference from holidays. Also, as discussed in a previous section [see Section 5.3.1.], the number of subjects involved in each block would be limited by the number of weeks available in the term over which to assess the children then carry out the intervention procedures and reassessments. By increasing the numbers of researchers, and in particular the number of professionals carrying out the assessments, the time spent in the assessment phase could be reduced. As a result the effect of the different conditions could be investigated using more children.

Unfortunately, an additional variable would have been added by involving more than one professional in carrying out the assessment or intervention procedures. Differences in style, personality, recording and scoring may occur between researchers which could lead to discrepancies in the data. The effect of these differences could, however, be minimised by ensuring that the assessments were audio-taped and scored by both researchers rather than just by each individual. In this way the effects of age, linguistic

ability, social background, gender, initial metalinguistic ability and literacy skills on the acquisition of metaphonological ability could be investigated in more depth.

5.4.2. Investigation into the effects of a metaphonological intervention programme in groups of children matched for verbal comprehension and production, knowledge and awareness of print and non-verbal intelligence

The extent to which children are effected by the experimental conditions may be influenced by many variables. In order to reduce the number of variables more rigorous group matching measures could be applied. By ensuring that groups are more accurately matched, the number of alternative explanations for differences between group outcomes following intervention would be reduced. Any differences between the groups who had been exposed to the various experimental conditions could then be more readily attributable to the conditions themselves rather than to other variables.

As well as matching the groups for age, vocabulary development, articulatory maturity, expressive language development, initial metalinguistic ability, auditory memory and auditory discrimination ability, gender, social background, and reading and spelling ability, future research could also ensure that groups were matched for verbal comprehension, knowledge and awareness of print and non-verbal intelligence.

5.4.3. Investigation of the relationship between the acquisition of literacy and the acceleration and maintenance of metaphonological abilities

The present study investigated the immediate effect of metaphonological intervention on a group of children as the re-assessment phase closely followed the intervention phase. It would be interesting to further investigate the maintenance of any effect produced by the experimental conditions: whether the experimental group maintained its metaphonological advantage over a period of months or years.

The relationship between metaphonological ability and the acquisition of literacy skills could also be investigated during this time as the children are followed-up through the early school years. Would those children with better metaphonological skills also acquire

literacy skills more readily? Would the metaphonologically facilitated group show an advantage over the other groups in the development of reading and spelling abilities? Would any differences in the acquisition of literacy skills amongst the groups be maintained over time?

5.4.4. Investigation of the effect of the structure of a metaphonological intervention programme

As discussed in a previous section [see Section 5.2.3.4.] the extent to which children are effected by metaphonological facilitation may be influenced by the duration of the intervention and the frequency of the intervention sessions. The relationship between the extent of accelerated metaphonological development and the duration and frequency of the intervention would need to be investigated in order to find the correct balance of minimal intervention and maximum outcome.

Should many and frequent metaphonological sessions be required in order to achieve only a small gain in metaphonological skill then perhaps the intervention procedures would not be considered practical to introduce into the nursery curriculum. If, however, few intervention sessions were required over time to bring about a significant acceleration of metaphonological abilities then the intervention could be deemed worthy of introduction to the pre-school curriculum.

The effect of less frequent intervention sessions over a longer period of time could be investigated as well as of more frequent sessions which take place over a shorter period. In addition to the frequency and duration of the sessions, the number of intervention sessions over time should be investigated. While the present study employed only eight metaphonological facilitation sessions over a period of four weeks, the intervention phase could be lengthened and/or more frequent sessions carried out to investigate the change in metaphonological abilities from pre- to post-intervention testing. Children in the experimental intervention group who may fail to show any significant change in their ability over a shorter period of time, may perhaps need more time to consolidate what

they have learnt in order that they be able to implement the skills without feedback and guidance from the researcher in the post-intervention assessments.

By investigating the effect of the structure of the metaphonological programme, an optimum procedure for facilitating metaphonological abilities could be developed.

5.4.5. Investigation of the effect of metaphonological review sessions on the maintenance of metaphonological intervention

It would also be profitable to investigate the effect of revision on the maintenance of knowledge and abilities. In the process of learning and developing skills it is important to give children the opportunity to use their newly acquired abilities not only while learning is taking place but also after the skills have been acquired.

It seems logical then to suggest that in order to maintain the accelerated development revision sessions could be implemented. If the children were given structured activities which enabled them to put their skills into practice at a later date, they would be able to reinforce and build on the awareness developed during the initial metaphonological intervention. In this way the children's metaphonological competence could be maintained.

5.4.6. Investigation of the development of metaphonological abilities and their relationship with different stages of cognitive development

The literature suggests that children need to have reached certain levels of cognitive ability before they are able to carry out certain metaphonological tasks [see section 1.5.1.]. In order to investigate whether certain cognitive abilities are prerequisite to metaphonological abilities and whether they follow a developmental sequence, the relationship between metaphonological ability at different stages in children's cognitive development would need to be studied.

Various aspects of cognitive ability should be assessed: verbal and non-verbal intelligence in addition to children's ability to decentre. The latter could be assessed using

procedures such as Piaget and Inhelder's three mountains task (1956) and the hiding task (Hughes, 1975).

5.5 Summary and conclusions

In this section the purpose and findings of this study are summarised and conclusions are drawn from the results.

5.5.1. Purpose and design of the investigation

In the literature, previous metaphonological facilitation studies have focused on school age children; few have involved young pre-schoolers and none concentrated on children below the age of four and a half years. The aim of the present study was to investigate the extent to which metaphonological ability could be accelerated in three and four year olds. The hypothesis was tested that children who take part in a programme of metaphonological activities will show accelerated metaphonological development.

A total of 48 subjects were assessed to ensure they satisfied the selection criteria and allocated to one of three groups (Groups A, B or C) matched for age, gender, social background and linguistic ability. Group A took part in a metaphonological intervention programme consisting of small group activities. This was the experimental group. Two control groups were used to provide data on:

- the effect of taking part in small group activities, and
- the effect of any spontaneous change which may occur over the period of the study.

The first control group (B) took part in an intervention programme which did not target metaphonological abilities and the second control group (C) was given no intervention.

5.5.2. Results

In the pre- to post-intervention assessment of metaphonological ability, only Group A showed a statistically significant increase in the combined metaphonological measure. Neither of the control groups showed any significant change in this measure.

A statistically significant difference was found between Group A and Group B and also between Group A and Group C for the change in combined metaphonological score from pre- to post intervention testing. No statistically significant difference was found between the two control groups, Groups B and C, for this measure.

5.5.3. Conclusions

5.3.3.1. Conclusions in relation to the main hypothesis

Although this study employed only a short facilitation programme, there is strong evidence to support the hypothesis that a metaphonological intervention programme can accelerate the development of phonological awareness in three and four year old's beyond that which could be explained either by spontaneous development or by taking part in small group activities.

5.3.3.2. Conclusions in relation to speech and language development

There is evidence to suggest that children with more mature speech sound systems and better vocabulary comprehension will also have greater metaphonological skills. In addition, they are also more likely to gain greater benefits from a short term metaphonological intervention programme than children with poor articulation.

Findings from this study suggest that those children with immature articulation and poor vocabulary comprehension (who may also be more at risk from reading difficulties) seemed to benefit least from the metaphonological intervention programme. This evidence suggests that these children may need more explicit training and more intensive input than more 'able' children.

5.3.3.3. Conclusions in relation to the acquisition of literacy skills

There is evidence that the metaphonological development of three and a half to four and a half year old children can be accelerated by taking part in a metaphonological intervention programme. The outcomes of the study suggest that a metaphonological

facilitation programme would benefit pre-school, pre-literate children in preparation for school and their pursuit of reading readiness.

The study used simple and accessible tasks and found early evidence of metaphonological abilities in children as young as three and a half years of age on pre-intervention testing. Many previous studies have obtained negative results with young children which may have been attributable to problems with motivating children or considering task difficulty.

Previous studies have also shown that pre-school children have disparate levels of metaphonological abilities, having had different metaphonological experiences, so not all children are equally ready to develop literacy skills when they start school. Children with poor phonological awareness, especially those with a language delay or disorder, are thought to be at risk for future reading difficulties and may therefore particularly benefit from pre-school metaphonological intervention.

Appendix A

Summary of the Pilot Study

Many of the tasks which have been used in the investigation of metaphonological abilities in children were developed for older children than the age range that was to be targeted in this study. The test procedures used in this study have been adapted for use with young children taking account of their less well developed auditory memory, attention and comprehension skills. Trial items have been incorporated to ensure that subjects are oriented to the tasks.

The tests were based on the the sub-divisions of metaphonological ability suggested by Goswami and Bryant which include tasks designed to assess the awareness of intra-syllabic units, onset and rime, as well as phonemic awareness.

The pilot study was carried out by the researcher in a Lothian Region nursery school. Children were taken individually to a quiet room in the nursery. The time taken to carry out all the assessments with each child varied depending on the availability of the individuals in the nursery on the days that the researcher was present as well as the individual characteristics of the children. The assessments were carried out with each child with rarely more than a few days between the administration of the first and last tests.

Four metaphonological tests were used for the assessment of subjects' ability to:

- distinguish the voiced/voiceless contrast in single consonants; [PFA]
- identify initial phonemes in words; [OR]
- recognise words which rhyme; [RR]
- blend syllabic, intra-syllabic and phonemic segments of words. [WS]

In addition to the metaphonological tests an adapted version of a previously used auditory discrimination test (Howell, 1989) was piloted.

Phoneme Feature Analysis test (PFA)

A test of children's ability to analyse phonemes with reference to specific features was included because it has been found that even young children with limited metaphonological skills are able to make judgements based on phoneme feature analysis (Howell and Dean, 1991; Dean and Howell, 1986). The other metaphonological tests deal with units of whole and multiple phonemes, whereas this particular test was designed to investigate children's awareness of smaller units: features of the phonemes themselves. The phonemic feature of voicing was chosen as it has usually one of the first to be acquired in speech production and was thought to be the most straightforward to introduce and explain in a test situation.

This test was carried out with 18 subjects and the mean score was found to be 13/20. Five subjects gained a score of 15 or more. The PFA test seemed to be straight forward

and worked well, needing only minor changes in the wording in order to improve the clarity of the instructions.

Onset recognition test (OR)

Identification of both onset and rime are regarded as important in the literature in relation to the skills which children need for learning to read. This test deals with children's ability to recognise the initial phoneme (onset) of words and is adapted form the test used by Marsh and Mineo (1977).

Only single consonant onsets have been used as (1) they are mastered before consonant clusters in the phonological development of speech production; (2) the length of the test was limited due to time constraints so that the inclusion of both single and clustered consonants in the test would have made the test too long; and (3) the choice of minimal trios with single consonant onsets, rather than clusters, is greater therefore giving a larger range of words regularly found in the vocabulary of children this age.
The consonants /s/, /d/, /n/ and /l/ were chosen as their place of articulation remains constant (alveolar) although other features contrast (fricative, plosive, nasal, lateral approximant).

Having presented this task to nine children without any of the subjects achieving scores significantly above chance, both the introductory procedure and format of the test were improved. This was to ensure that the test reflected children's awareness of word onsets rather than their ability to understand the instructions. The introduction was altered so that it began by playing a game of *I Spy* with some explanation about how words start with different sounds. The same basic introductory sentence ("I spy with my little eye something beginning with ...") was used for each of the test items as was used for the game of *I Spy* in the main introduction, although the sound tagged onto the end was changed as appropriate during the test. This was in order to promote carry over and comprehension from the introduction and trial items to the test itself.

This procedure was long and tiring for most children and their attention seemed to fall off very rapidly. There are several explanations for this behaviour: (1) they had not understood the instructions; (2) they were unable to identify the onsets and therefore successfully carry out the task; (3) the test was too long; and/or (4) the cognitive load and pressure put on the visual and auditory memory was too great thus interfering with the test performance. Having considered these alternatives the format was changed so that a choice of two pictures was given, instead of the initial three pictures, thus decreasing the cognitive and memory loading and decreasing the overall time taken to complete the test. The revised version could be more easily understood and more swiftly administered.
The second version of the onset recognition test found that most subjects performed at levels of chance. However, two subjects were able to recognise onsets more successfully scoring significantly higher than chance.

Rhyme Recognition Test (RR)

This test was included to investigate children's awareness of rhyme which is an important skill involved in the acquisition of reading (Goswami and Bryant, 1990). This test was

adapted from the task used by Howell, 1989). In this test the subject was introduced to a puppet called Ed who only likes words which rhyme with his name. The wording in the introduction seemed to be confusing for some subjects, although those children who understood rhymes and could recognise them did not seem to be distracted by the semantic ambiguity of the wording (*like*). The introduction was ammended accordingly.

Only five of the sixteen subjects obtained scores significantly higher than chance, seeming much more reflective and certain about their responses than did the others. The results from this test showed a wide variation in subject abilities. One subject achieved 20/20 and another 19/20 where there could be no doubt that they were able to recognise rhymes. However most subjects obtained scores at levels of chance. The mean score on this test was 12.3.
The test procedure was altered to include more general introduction, saying a nursery rhyme to focus attention on rhyme, before using the subject's and experimenter's names and then Ed's name for the trials and the test itself. Caution was required in developing this test as a fine balance is needed in allowing the subjects to become acquainted with the tasks without actually teaching the children how to do them.

Word synthesis task (WS)

This test was adapted from the blending tasks used by Fox and Routh (1976). The stimuli for this task were tape recorded to ensure that each presentation was identical for all subjects thus eliminating inter-subject variability due to differences in experimenter presentation. In this way the scores obtained should more accurately reflect differences in subject ability. Segments of word were presented after it was explained that the puppet, who could not talk properly, had looked through a pile of pictures saying all the names. The child had to guess what the puppet was trying to say and was then shown the picture by the puppet. The pictures were used to reinforce the idea that the puppet was attempting to say real words. Without the pictures children were more inclined to be unresponsive. Subjects were curious to find out what it was that the puppet had meant to say and the pictures were a good method of conveying this. They seemed to motivate most children to respond even when they were unsure. It was also important for the subjects to see that I did not know what the puppet was supposed to have said either.

The use of pictures did cause some problems initially, however this was due to the materials rather than the concept. The pictures were printed on ordinary white paper and an image, although unclear, could be seen through the reverse side of the topmost picture. One of the first children found this distracting and tried to interpret each stimulus with reference to the picture. The way the pictures were presented was then altered so that they were completely hidden until after the subject had responded. An envelope was used to keep the pictures out of sight until each was needed.

The literature on metaphonological development shows that children are able to segment words into syllables before they can successfully segment into smaller units of onset and rhyme or phonemes (Treiman, 1987). The word synthesis task involves the reverse process of segmentation, that of blending, to synthesise a word. For this reason syllabic units were used in the trial items in order to introduce the subjects to the task. The syllables are presented with a clear break between each on the tape recording. The

subject was prompted if necessary to respond and then the illustration was shown. Following the eight syllable-segmented trial items the test is comprised of three more sections. Eight items present monosyllabic words which have been segmented into onset and rhyme; eight items are segmented into onset and rhyme but each segment has one phoneme only; and the final eight items are segmented phoneme by phoneme ranging from three to five phonemes in length.

The words *thermometer* and *cherry*, used as items initially were subtituted with more frequent words found in children's vocabulary at this age (ca-ter-pi-llar and chips). The middle section of the test contained only one item with a fricative phoneme while the remainder were all plosives. These were revised to contain a more representative sample of phonemes in the two-phoneme words (e.g. s-ea; two).

Auditory Discrimination Test (AD)

This test was adapted from the one used by Howell (1989). In her test 40 paired items were used, involving each of twenty paired items being presented twice. This would have been too time consuming, tiring and tedious for the subjects and so the total number of items was halved and some of the words altered. Twenty paired items were presented only once each. It was expected that this would provide a swift, valid and reliable test of auditory discrimination abilities. Four trial items were used to introduce the task. The trial items were pairs of unlike words (taken from a sample of the test words) for relatively simple auditory discrimination, while the test items were minimal pairs where accurate auditory discrimination depends on the perception that the two words presented in each item differ by only one phoneme.

The pilot study highlighted one area of procedure which could cause inconsistency. *When should an item be repeated?* In a situation where the subject has not heard or attended to the items presented (due to some distraction and consequent lapse in concentration) then the item should be repeated and scored as if it were their first attempt. However, if the subject is unsure and as a result is unwilling to respond then the item should be repeated and marked as repeated (R).

The mean score for the auditory discrimination test carried out on 18 subjects was 14.1/20. Ten of these subjects obtained scores of 15 or more, significantly higher than chance. Three of the subjects tested in the pilot study, who were unable to discriminate between some of the minimal pairs, thought that the two words presented were the same. When presented with words X and Y as spoken by two teddies and asked "Who said X" these subjects gave responses such as: *"Two of them"; "That one and that one"; "Both of them"*. All three subjects gave this kind of response for item 7 (thin, fin); two subjects for item 16 (wing, ring) and one subject for each of items 14 (sip, zip) and 18 (tie, dye). Items 7 and 16 contain the phonemes 'th' and 'r' respectively which are usually later to develop in speech, so perhaps it is not surprising that these caused the most problems.

Building up rapport between experimenter and subject

I would collect each child in turn from the nursery classroom myself, having been introduced by a member of staff, and start up a conversation to put them at ease as much as possible. Obviously all children are different and some of my subjects were more keen than others to leave the safety of their room to go with a relative stranger into the staffroom (a room in which they were not usually allowed). The pilot study highlighted the individual differences in sociability between subjects which is something which can not be controlled for. I would spend a little longer chatting to those children who were more shy and timid in order to get some kind of verbal interaction going. Most of the tests used in the pilot study (Phoneme feature analysis, onset recognition, rhyme recognition and auditory discrimination) do not require verbal responses, non-verbal yes/no answers or pointing would suffice. The only test which did however need verbal responses was the last to be administered and by this time the child's confidence and rapport with the experimenter had been sufficiently built up.

Appendix B

Parental letter and forms

SPEECH SOUND AWARENESS RESEARCH

Dear Parent or Guardian,

Your child has been suggested by your nursery teacher as a suitable candidate for this project. I hope that after you have read this information, you will agree that your child may participate.

An experienced paediatric speech therapist, I am now working as a research student in the Speech and Language Pathology Department at Queen Margaret College. In contrast to my previous work I am now gathering data on normal speech development and have already completed one block of research in another nursery.

The project looks into the normal development of children's awareness of sounds used in speech. This is a very important skill when it comes to learning to read.

I will be in the nursery for a block of seven or eight weeks. During the first two weeks I will be seeing the children individually to find out how they respond to various speech and language games. Then they will be randomly allocated to one of three groups. One group will be working on words and their meanings, and another will be concentrating on sounds. The emphasis in these sessions is on learning in a fun atmosphere in small groups of four children. Each of these groups will be seen for eight half-hour sessions over the middle four weeks. Then during the final two weeks, as in the first two, your child will again be seen individually.

Some of the activities may be video- or audio-taped. All the information gathered during the course of the study will remain confidential and will be used for research and teaching purposes only.

If you would like any further information please do not hesitate to get in touch with me at the above address. I will be happy to answer any queries.

SARA INNES (MRS)
RESEARCH STUDENT

SPEECH SOUND AWARENESS RESEARCH
CONSENT FORM

I consent to my child.....(name of child) participating in the research project being carried out by Sara Innes. I understand that any video, audio or written records will only be used for research and/or teaching purposes.

Name of parent/guardian: .....

Signed ..... Date.....

I require a small amount of information about the families of the children who participate in the study. I would be very grateful if you would answer the following questions by filling in the boxes below. All the information will remain confidential and no participants will be identified by name in any of my reports.

Child's date of birth:

Place in family: e.g. 2nd out of 3 children

Father's* current/most recent full-time occupation:

Father's* age of leaving full-time education (school, college, etc):

Mother's* current/most recent paid occupation:

Mother's* age of leaving full-time education (school, college, etc):

* if you are a single parent, you need not give information on the other parent

HEARING QUESTIONNAIRE

NAME of child.....DOB.....DATE.....

Please answer the following questions by circling YES or NO. There is a space under each question for you to add any comments, to ask questions or to give any examples if you like.

1. Does your child turn round if you say his/her name when s/he can't see you?

   YES NO

2. Does s/he come to find out what's happening or turn round if s/he hears sounds like the cups rattling or sweet or biscuit papers?

   YES NO

3. Does s/he let you know if the telephone or doorbell rings?

   YES NO

4. Can s/he find objects when asked to? e.g. "Where's your teddy?" or "Find you socks."

   YES NO

5. Does s/he respond differently to different sounds? e.g. cry at loud noises; look happy if someone laughs or sings.

   YES NO

6. Does s/he copy any sounds? e.g. make animal or car noises?

   YES NO

7. Does s/he copy other people talking?

   YES NO

8. Will s/he fetch things for you when you ask, even if you don't look at or point to what you want?

YES NO

9. Does s/he like being read to?

YES NO

10. Can s/he point to pictures in a book if you ask her/him?

YES NO

11. Does s/he like listening to nursery rhymes?

YES NO

12. Can s/he say or sing any songs or rhymes?

YES NO

13. Can s/he let you know when the ice-cream van comes, or s/he hears other noises outside?

YES NO

14. Does s/he have any favourite television adverts?

YES NO

15. Does s/he copy any TV adverts?

YES NO

16. Can s/he find you when you call from another room?

YES NO

17. Have you noticed that you frequently have to repeat what you say to her/him?

YES NO

18. Does s/he like listening to music or story tapes?

YES NO

19. Have you ever seen her/him move closer to people or look closely at them when they start talking?

YES NO

20. Does s/he ever turn up the TV louder than you find comfortable?

YES NO

21. Has s/he ever had sore ears?

YES NO

22. Has s/he ever been treated for any ear infection?

YES NO

23. If s/he has had ear infections, have they occurred frequently?

YES NO How often?

24. Do you think there is a problem with her/his hearing?

YES NO

Thank you for completing the questionnaire.

Appendix C

Assessment Procedures and Record Sheets

AUDITORY DISCRIMINATION TEST

MATERIALS:

Two small bears with one distinctive feature: one has a red bow, the other a blue tie.

INTRODUCTION:

"Here are two of my friends. They are nearly the same, aren't they?"
"This one is Tim and this one is Jim."
"Can you remember which one was Tim?" (Give corrective feedback as necessary)
"So which one is Jim?... That's right."

"They like playing word games. Tim says one word and then Jim says another."
"You listen and see if you can help me remember who said the words."

TRIALS:

Tester holds Tim up to mask mouth while saying word (i) and holds Jim up in the same way when saying word (ii).

e.g. "bin.....tea"
"Who said 'tea'?"

"Who said '.....'?" (Where '.....' is the underlined word of the pair.)

If the subject does not respond then prompt:
"You point to the one that said '.....' "

Repeat the presentation if there is still no response and give corrective feedback as necessary (for the trials only).

TEST:

Present the task as for the trials. See score sheet for order of items.
Repeat at the subject's request but note this on the score sheet as repeated (R).
Repeat if the subject was distracted (e.g. by a noise outside) and score as first attempt.
Circle the word corresponding to the puppet to which they pointed.
Do not give corrective feedback during the test itself.
Note any spontaneous comments which the subject makes related to the task.
If the same response is given to five consecutive items then remind the subject of the two alternatives. **"Remember that sometimes it will be Jim who said the word and sometimes it will be Tim who says the word. I wonder who it's going to be next."**

AUDITORY DISCRIMINATION TEST

NAME.....DOB.....AGE.....

DATE OF TEST.....SCHOOL.....

TRIALS: (a) bin *tea* (b) *lake* thin
(c) key *tie* (d) goat *sip*

No.	STIMULUS	COMMENTS
1	bin *din*	
2	ship *sip*	
3	*tea* key	
4	pan *man*	
5	*lake* rake	
6	*do* two	
7	thin *fin*	
8	*zip* dip	
9	*tie* pie	
10	key *pea*	
11	*dough* go	
12	goat *coat*	
13	bun *gun*	
14	*sip* zip	
15	pin *bin*	
16	*wing* ring	
17	*do* zoo	
18	tie *dye*	
19	*sea* tea	
20	toc *no*	
TOTAL		

AUDITORY MEMORY

ITTPA Sentences

INSTRUCTIONS:

Read slowly, distinctly with normal intonation.
Each item is read only once at a rate of two syllables per second.

If the child passes sentence 1 credit is given for A, B and C and test continues to sentence 2.
If the child fails 1 then present A, B and C.
If A is not repeated perfectly say "No, you say it this way" and present A again.
B and C are then to be presented without coaching.
The remaining sentences are then introduced by saying: "Listen, say just what I say. Ready? Listen.."

If the child does not respond or wishes to hear the sentence again then say, " Well, you just guess it."
Do not repeat any of the sentences.

Discontinue after three consecutive failures.

Errors in repetition can be classified as:

OMISSION
TRANSPOSITION
ADDITION
SUBSTITUTION

(see p. 42 in the ITTPA Manual for further details)

SCORING:

TABLE OF SCORES					
	Number of errors				
Sent.	0	1	2	3	4+
A - B	1	0	0	0	0
C	2	1	0	0	0
1 - 4	2	1	0	0	0
5 - 6	3	2	1	0	0
7 - 10	4	3	2	1	0

Maximum score = 34

AUDITORY MEMORY TESTS

T/M Sentences

I want you to say something for me. Say "big boy/girl".
Now say " I am a big boy/ girl". Now say:

1. **I like to eat ice-cream.**
2. **My watch has two hands.**
3. **Give me just one of them.**
4. **We are going to buy some sweets for Mummy.**
5. **Jack likes to feed the little puppies in the barn.**
6. **My baby brother wants Santa Claus to bring him a great big drum.**
7. **Fred asked his father to take hime to see the clowns in the circus.**
8. **Billy has made a beautiful boat out of wood with his sharp knife.**

T/M Digits

I am going to say some numbers, and when I have finished I want you to say them just as I do. Listen carefully, and get them just right.
Listen, say 2. Now say:

1/	**4 -7**	**2/**	**6 - 3**	**3/**	**5 - 8**
4/	**6 - 4 -1**	**5/**	**3 - 5 - 2**	**6/**	**8 - 3 - 7**
7/	**4 -7 - 2 - 9**	**8/**	**3 - 8 - 5 - 2**	**9/**	**7 - 2 - 6 - 1**
10/	**3 - 1 - 8 - 5 - 9**	**11/**	**4 - 8 - 3 - 7 - 2**	**12/**	**9 - 6 - 1 - 8 - 3**
13/	**4 - 7 - 3 - 8 - 5 - 9**	**14/**	**5 - 2 - 9 - 7 - 4 - 6**	**15/**	**7 - 2 - 8 - 3 - 9 - 4**

TEST	SCORE
T/M Sentences	
T/M Digits	
TOTAL	

AUDITORY MEMORY TESTS (cont'd)

ITTPA Sentences
I'm going to say something, and I want you to say it after me, just the way I say it. Ready? Listen..(sentence 1. first)

SCORE

A	**My house.**
B	**Cows are big.**
C	**We sleep at night.**
1	**Mary has a red coat.**
2	**The bad dog ran after the cat.**
3	**Tom found three blue eggs in his birdhouse.**
4	**Susie has two dolls and a brown teddy bear.**
5	**It is very nice to go to a camp in the summertime.**
6	**Peter would like to have new boots and a cowboy suit.**
7	**Eating too much toffee and ice-cream can give you a stomach ache.**
8	**The heavy rain which fell last night made many buses late for school.**
9	**The price of shoes and winter clothing is not as high as it was last year.**
10	**Next Monday our class will visit the zoo. Bring your lunch and be sure to be on time.**

TOTAL

PAGE 1	PAGE 2	TOTAL

PHONEME FEATURE ANALYSIS

MATERIALS:

PFA stimuli cassette; tape recorder; Mr. Noisy and Mr. Whisper pictures.

INTRODUCTION and TRIALS:

"Here are some pictures of my friends. Have a look at them. Can you see what's different? (PROMPT: Look at their mouths.) **One's got a big mouth and one has a tiny wee mouth"**
"One of my friends likes to say things very quietly like a whisper. Can you guess who it is? (Yes) He's called Mr. Quiet."
"What do you think about this one? (Yes) He likes to make big noisy sounds and he's called ..... Mr.....Noisy."

" I've got a tape of some sounds that Mr. Quiet and Mr. Noisy have made. It got all muddled up and I can't remember who said what. I need to sort them out - can you help me?"
"Let's do these together. Listen to the sound and see if you can tell whether it's a Mr. Noisy sound or a Mr. Quiet sound."
"Listen (PLAY TAPE) **Who made that sound?"**
(PROMPT: What do you think - was it Mr. Noisy or Mr. Quiet)
"(Yes) I think that was a noisy/quiet sound. (or give corrective feedback for trial items only)
"What about this one?" (PLAY THE NEXT SOUND ON THE TAPE)

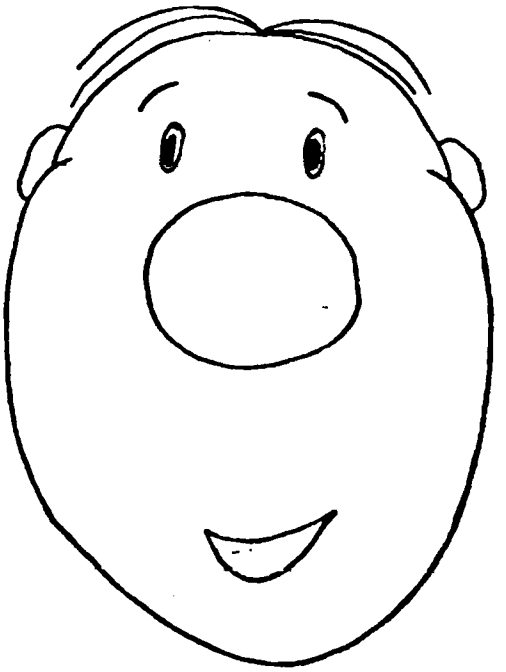
Continue with the trials giving corrective feedback as necessary.

TEST:

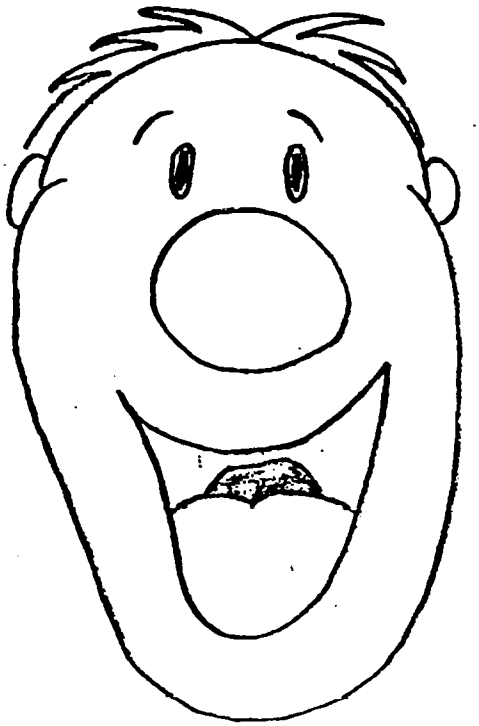
Each item is presented twice on the tape. No further repetitions are permitted during the test unless the subject is genuinely distracted during the presentation. No corrective feedback should be given throughout the test, although this is allowed during the introduction and trial period.

Before playing the stimulus for each item say:
"Listen. Tell me if it's a Mr. Noisy sound or a Mr. Whisper sound."
Prompt if necessary after the stimulus has been played and the subject does not respond:
"Was it Mr. Noisy or Mr. Whisper, do you think?"
Circle 'voiced' if the subject indicates Mr. Noisy and 'voiceless' if Mr. Whisper is indicated. If the same response is given to five consecutive items then remind the subject of the two alternatives. **"Here are some more sounds. Remember that Mr. Quiet did some and Mr. Noisy did some as well. I wonder if the next one was made by Mr. Noisy or Mr. Quiet. Let's listen and find out."** Mark where these further instructions were given.

Phoneme feature analysis test illustrations



Mr. Quiet



Mr. Noisy

PHONEME FEATURE ANALYSIS

NAME.....DOB.....AGE.....

DATE OF TEST.....SCHOOL.....

TRIALS: də tə
ʒə ʃə

No.	ITEM	RESPONSE		COMMENTS
1	kə	voiced	*voiceless*	
2	və	*voiced*	voiceless	
3	tʃə	voiced	*voiceless*	
4	bə	*voiced*	voiceless	
5	gə	*voiced*	voiceless	
6	sə	voiced	*voiceless*	
7	fə	voiced	*voiceless*	
8	bə	*voiced*	voiceless	
9	pə	voiced	*voiceless*	
10	dʒə	*voiced*	voiceless	
11	və	*voiced*	voiceless	
12	fə	voiced	*voiceless*	
13	zə	*voiced*	voiceless	
14	gə	*voiced*	voiceless	
15	tʃə	voiced	*voiceless*	
16	kə	voiced	*voiceless*	
17	sə	voiced	*voiceless*	
18	zə	*voiced*	voiceless	
19	pə	voiced	*voiceless*	
20	dʒə	*voiced*	voiceless	
TOTAL				

ONSET RECOGNITION

MATERIALS:

Minimal pair pictures

INTRODUCTION:

" Do you know how to play the *I Spy* game? It goes like this:
I spy with my little eye something beginning with ...t"
Give examples form around the room -table, teddy, toe...
"'Table' starts with a / t /. Listen, 'table', 'table'."
"Can you hear the / t / at the beginning?"
"I can think of another one: 'toe'." (Continue with examples as appropriate)

TRIALS:

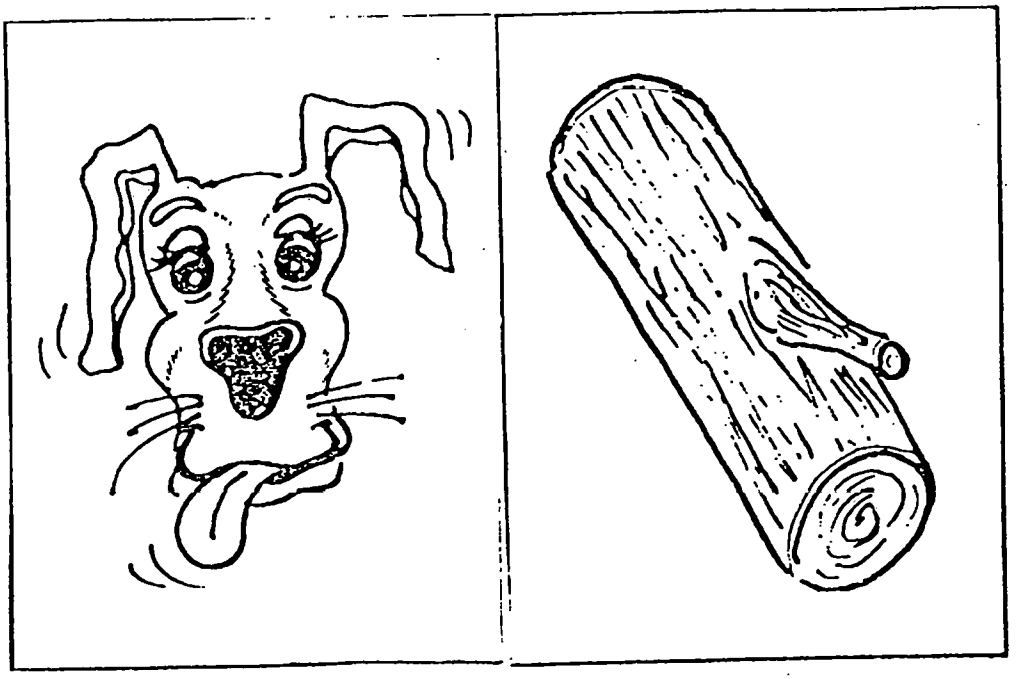
"Here's another *I Spy* game. In this game we have to listen out for a special sound at the beginning of different words. There are three pictures, but only one of them has the special sound at the beginning. You have to listen hard to find it."

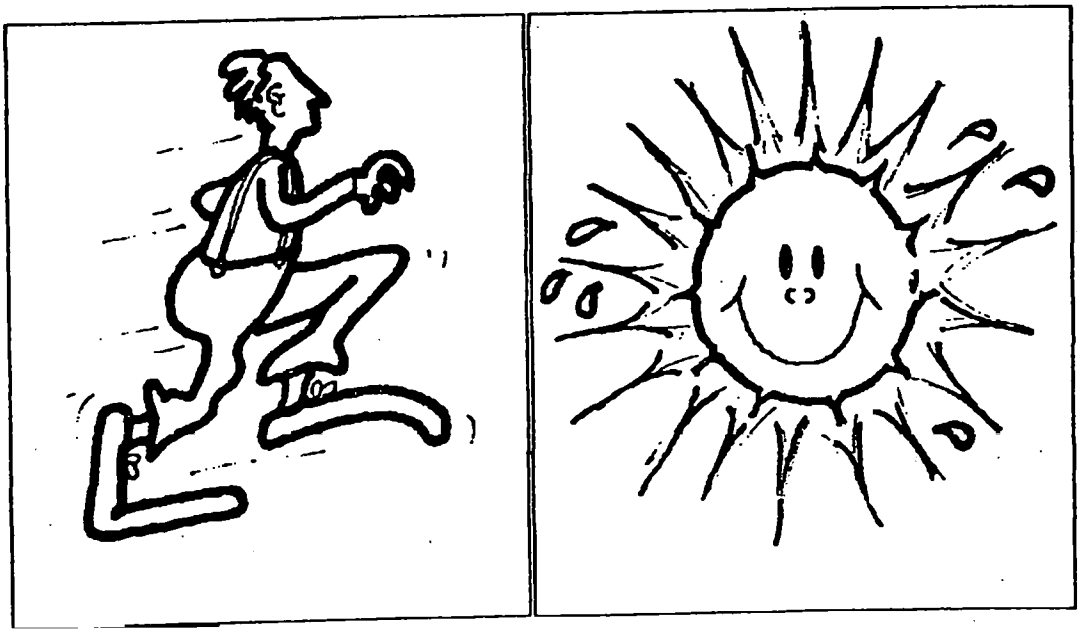
"Now listen."
"The special sound is / /. See if you can hear it in one of these words."
" I spy with my little eye something beginning with / /."
"Lip, pip, ship."
"Did you hear the / / sound? Listen again. Which one starts with the / / sound?"
"Lip, pip, ship." (Give corrective feedback as necessary)
"Here are some more words. Remember to listen out for the one that starts with the / / sound."
" I spy with my little eye something beginning with / /."
"Shoe, loo, two. Which one has the / / sound at the beginning? Shoe, loo, two."
Give corrective feedback as necessary in the trial items only.

TEST:

"This time the special sound is going to be different."
"The special sound is going to be / d /. Help me listen for the word that begins with the / d / sound."
" I spy with my little eye something beginning with / d /."
Substitute the / d / with the target sound for each section. Each of the target onsets (/ d /, / n /, / s /, / l /) have five stimulus items.
Present the minimal trios in the same way as for the trial items.
Do not give any corrective feedback.
Circle the word corresponding to the picture to which the subject points.

Examples of the onset recognition test illustrations





ONSET RECOGNITION

NAME.....DOB.....AGE.....

DATE OF TEST.....SCHOOL.....

TRIALS: lip pip ship
shoe loo two

No.	STIMULI	COMMENTS
1	*dog* log	
2	mine *dine*	
3	jeep *deep*	
4	*den* ten	
5	*Dan* pan	
6	*no* sew	
7	met *net*	
8	*nap* tap	
9	*knee* bee	
10	boat *note*	
11	run *sun*	
12	*sell* well	
13	tea *sea*	
14	*sit* fit	
15	thumb *sum*	
16	cake *lake*	
17	ram *lamb*	
18	*lip* tip	
19	race *lace*	
20	*lock* sock	
TOTAL		

RHYME RECOGNITION

MATERIALS:

Puppet called Ed.

INTRODUCTION:

"This is my friend Ed. He likes words that sound funny together - words that rhyme."
"Listen, this is what he thinks is funny."
"Ed, led. Ed, led."
"Can you hear how they are almost the same: Ed, led."
"Let's see if we can think of something to sound funny with your name....."
Use real words and non-words to rhyme with names.
e.g. Elizabeth.....Elizabeth Belizabeth.....Elizabeth Selizabeth

TRIALS:

"Let's try some more words with Ed."
"Ed, Ned. Yes, that's a rhyme, they sound funny together."
"How about this one?"
"Ed, nail. What do you think? Do they sound funny together? Do they rhyme?"
"No, I don't think they do, do they?"
"How about these ones..."
Try all the trial items, both real words and non-words.
Give corrective feedback as necessary during these trial items.

TEST:

Present the test items in the same way as the trials but without giving any corrective feedback.
Prompt if the subject does not respond by asking again:
"Did they sound funny together? Did they rhyme?"
If there is still no response, repeat the item again, making a note on the score sheet (R).
Circle the response.
If the same response is given to five consecutive items then remind the subject of the two alternatives. **"Remember that Ed will like some of the words but I don't think he will like them all. I wonder if he'll like the next one or not."**

RHYME RECOGNITION

NAME.....DOB.....AGE.....

DATE OF TEST.....SCHOOL.....

TRIALS: Ned nail /tʃɛd/ /tʃaɪl/
Fred frog /gɛd/ /gɒg/

No.	STIMULUS	RESPONSE	COMMENTS
1	feet	yes *no*	
2	/vɛd/	*yes* no	
3	head	*yes* no	
4	/kɪg/	yes *no*	
5	rain	yes *no*	
6	big	yes *no*	
7	/jɛd/	*yes* no	
8	/dʒen/	yes *no*	
9	sheep	yes *no*	
10	red	*yes* no	
11	fed	*yes* no	
12	/jit/	yes *no*	
13	/mip/	yes *no*	
14	/dʒɛd/	*yes* no	
15	half	yes *no*	
16	/mɛd/	*yes* no	
17	bed	*yes* no	
18	/vaf/	yes *no*	
19	/kɛd/	*yes* no	
20	shed	*yes* no	
TOTAL			

WORD SYNTHESIS

MATERIALS:

WS stimulus cassette; tape recorder; WS pictures; bird puppet.

INTRODUCTION:

"We are going to listen to the tape again. It's a tape recording of the bird trying to tell us about some pictures. He is very shy because sometimes his words sound funny. Let's see if we can guess what the bird was trying to say."

TRIALS:

"Let's listen to the word and then guess what it is supposed to be. We can check whether we were right because I've got the pictures that go with the words."
"Listen." (PLAY a trial stimulus item) **"What do you think that word was?"**
Show the picture.
If not correctly guessed say **"That was a funny one wasn't it?"**
Continue to play each item.
"Let's listen to another one." (PLAY another stimulus item)
"What do you think this time?.... Let's check it with the picture."

TEST:

Proceed with the test stimuli as with the trials, giving the pictures as visual feedback. Transcribe the subject's response and make a note of any spontaneous comments.

WORD SYNTHESIS

NAME.....DOB.....AGE.....

DATE OF TEST.....SCHOOL.....

TRIAL: o-pen la-dder mon-ster chim-ney
bu-tter-fly kang-ga-roo ham-bur-ger ca-ter-pi-llar.

No.	STIMULUS	RESPONSE	COMMENTS
1	r-oof		
2	fr-og		
3	m-ask		
4	st-ep		
5	ch-eese		
6	b-elt		
7	cr-ab		
8	pl-ate		
9	b-ee		
10	i-ce		
11	sh-oe		
12	p-ie		
13	s-ea		
14	t-wo		
15	e-gg		
16	h-oe		
17	d-o-g		
18	f-ee-t		
19	v-e-s-t		
20	z-i-p		
21	p-a-n		
22	s-ch-oo-l		
23	ch-i-p-s		
24	sh-a-m-p-oo		
TOTAL			

METASYNTACTIC TEST

MATERIALS:

Hand puppet or teddy and score sheet

PROCEDURE:

"This is Grover. He is learning to talk, but he quite often gets his stories muddled up."

SHOW A PICTURE OF A PERSON IN A CAR

"Here is a picture. Tell us the story, Grover. *Drive the car.* That was a good story Grover."

Tell us another one. *Car the drive.* Oh dear. That was a bit muddled up, wasn't it?

TAKE THE PICTURE AWAY

"Tell us another story, Grover. *Bicycle the ride.* What do you think? Was that one muddled up or was it a good story?"
GIVE CORRECTIVE FEEDBACK AS NECESSARY

"Try again, Grover. *Ride the bicycle.* Was that better? Was that a good story or was it muddled up?"
AGAIN GIVE CORRECTIVE FEEDBACK AS REQUIRED

"Listen to some more of Grover's stories. You tell him if they are good or muddled up."

PRESENT THE ITEMS IN THE ORDER SHOWN ON THE SCORE SHEET

If the subject gives the same response for five consecutive items then say:

"Remember sometimes he gets his stories muddled up and sometimes he says some good stories."

METASYNTACTIC TEST

NAME.....DOB.....AGE.....

DATE OF TEST.....SCHOOL.....

TRIALS: Drive the car — Bicycle the ride
Car the drive — Ride the bicycle

No.	SENTENCE	RESPONSE	COMMENTS
1	Fill the teapot	*good* bad	
2	Rabbit the pat	good *bad*	
3	Jacket your take off	good *bad*	
4	Put on your coat	*good* bad	
5	Door the close	good *bad*	
6	Wash your face	*good* bad	
7	Banana the peel	good *bad*	
8	Kettle the empty	good *bad*	
9	Chew the toffee	*good* bad	
10	Play the piano	*good* bad	
11	Sweet the suck	good *bad*	
12	Trumpet the blow	good *bad*	
13	Eat the apple	*good* bad	
14	Hands your dry	good *bad*	
15	Open the window	*good* bad	
16	Stroke the cat	*good* bad	
17	Doll the kiss	good *bad*	
18	Cuddle the teddy	*good* bad	
19	Cake a bake	good *bad*	
20	Make a pie	*good* bad	
TOTAL			

RENFREW BUS STORY

I'm going to tell you a story about a bus. When I'm finished you can tell me the story.

1
Once upon a time there was a very naughty bus.
While his driver was trying to mend him, he decided to run away.

2
He ran along the road beside the train.
They made funny faces at each other and raced each other.
But the bus had to go on alone, because the train went into a tunnel.
He hurried into the city where he met a policeman who blew his whistle and shouted "Stop bus!"

3
But he paid no attention and ran on into the country.
He said, "I'm tired of going on the road" so he jumped over a fence.
He met a cow who said, "Moo, I can't believe my eyes".

4
The bus raced down the hill.
As he saw there was water at the bottom, he tried to stop.
But he didn't know how to put on his brakes.
So he fell into the pond with a splash and stuck in the mud.
When his driver found where he was, he telephoned for a crane to pull him out and put him back on the road again.

Now you tell me the story.
Once upon a time there was a .....

Prompt by saying:
"Yes"
"So...."
"What happened?"
As a last resort - "What did the policeman do?"

Guidelines used for calculating mean length of utterance (MLU)

The Bus Story (Renfrew, 1977), a story retelling assessment, was used to collect a language sample as the practical constraints on the research would not allow the time to collect a sufficiently long spontaneous language sample.

Number of utterances
The sample was divided into separate utterances with reference to the following guidelines:

AND
The 'and' joining two verb phrases was counted as begining a second utterance
e.g. "and he was trying to stop and he went crash" = 2 utterances
'and' joining two noun phrases occurs within one utterance
e.g. "the bus and the driver stopped" = 1 utterance

THEN, SO, BUT
all start new utterances

Number of morphemes
The number of morphemes per utterance was then calculated using following Brown's (1973) guidelines.

Appendix D

Social background calculation and data

Well's (1982) Social Background Calculation

The numerical value for social background is calculated using the formula below:

Father's occupation + Mother's occupation + 2(Father's education + Mother's education)

Occupational rating taken from the Registrar General's five point scale in "Standard Occupational Classification" (1990)

Educational level taken as 1 (which denotes that further education was undertaken after leaving school) or 2 (denoting no further education after leaving school)

The bands of social grouping are as follows:

Band I	6<10
Band II	10<14
Band III	14<16
Band IV	16<18

Worked example for Subject 47:

Father is an electrician (occupational rating = III) who did not further his education after leaving school (educational level = 1)
Mother is a childminder/day carer (occupational rating III) who undertook further studies after leaving school (educational level = 2)

Apply data to formula to give:

$$3 + 3 + 2\,(1 + 2) = 3 + 3 + 2\,(3)$$
$$= 3 + 3 + 6$$
$$= 12$$

This puts Subject 47 in social grouping Band II

[See over the page for table of social grouping data for each subject]

Occupations, occupation ratings and educational levels for the parents of each subject and their combined social background calculation (Wells, 1982).

Subject	FATHER			MOTHER			COMBINED
	Occupation	Rating	Ed. Level	Occupation	Rating	Ed. Level	Soc. background calculation
1	*	*	*	scientific officer	I	1	6
2	*	*	*	secretary	III	2	14
3	kitchen/supervisor	IV	2	factory worker	V	2	17
4	ins/financial advisor	II	2	childminder	IV	2	14
5	*	*	*	none	V	2	18
6	storeman	IV	2	shop work	IV	2	16
7	labourer	V	2	none	V	2	18
8	*	*	*	kitchen /assistant	V	2	18
9	*	*	*	waitress	IV	2	16
10	*	*	*	admin. assistant	III	2	14
11	*	*	*	clerk	III	2	14
12	*	*	*	none	V	2	18
13	bus driver	III	2	crèche worker	IV	2	15
14	*	*	*	cleaner	V	2	18
15	factory worker	V	2	factory worker	V	2	18
16	under foreman /welder	III	2	none	V	2	16
17	*	*	*	clerical officer	III	1	10
18	op/pipecoater	III	2	voc. training	V	2	15
19	labourer	V	2	chambermaid	V	2	18
20	asst. bar manager	III	2	cleaner	V	2	16
21	none	V	2	none	V	2	18
22	none	V	2	none	V	2	18
23	*	*	*	none	V	2	18
24	scaffolder	IV	2	drugs project worker	II	2	14
25	bank project manager	II	1	dev/officer	II	1	8
26	motor mechanic	III	2	florist	III	2	14
27	restaurateur	III	1	sports promoter	III	2	12
28	development worker	III	2	none	V	2	16
29	accountant	I	2	accountant	I	1	8
30	butcher	III	2	clerk	III	2	14
31	*	*	*	architect assistant	II	1	8
32	maintenance painter	III	2	none	V	2	16
33	film director	II	1	artist	II	1	8
34	bank advances controller	III	2	legal secretary	III	2	14
35	charity director	II	1	community worker	II	1	8
36	insurance consultant	III	1	primary teacher	II	1	9
37	*	*	*	legal secretary	III	1	10
38	warder/welfare officer	II	1	house parent	II	1	8
39	instrument repairer	III	1	fine artist	II	1	9
40	factory foreman	III	2	none	V	2	16
41	*	*	*	cook	III	2	14
42	bronze caster	III	1	secretary	III	1	10
43	advocate	I	1	translator	II	1	7
44	assist. bank manager	II	2	bank official	III	2	13
45	freelance illustrator	II	1	residential care worker	IV	1	10
46	cook	III	2	none	V	2	16
47	electrician	III	2	day carer/childminder	III	1	12
48	artisan	III	2	nursery nurse	III	2	14

N.B.
(1) * Denotes information unavailable on one parent due to one parent family (2) Occupational rating I to V taken from the Registrar General's five point scale of occupation (3) Educational level: 1 denotes further education after leaving school and 2 denotes no further education after leaving school

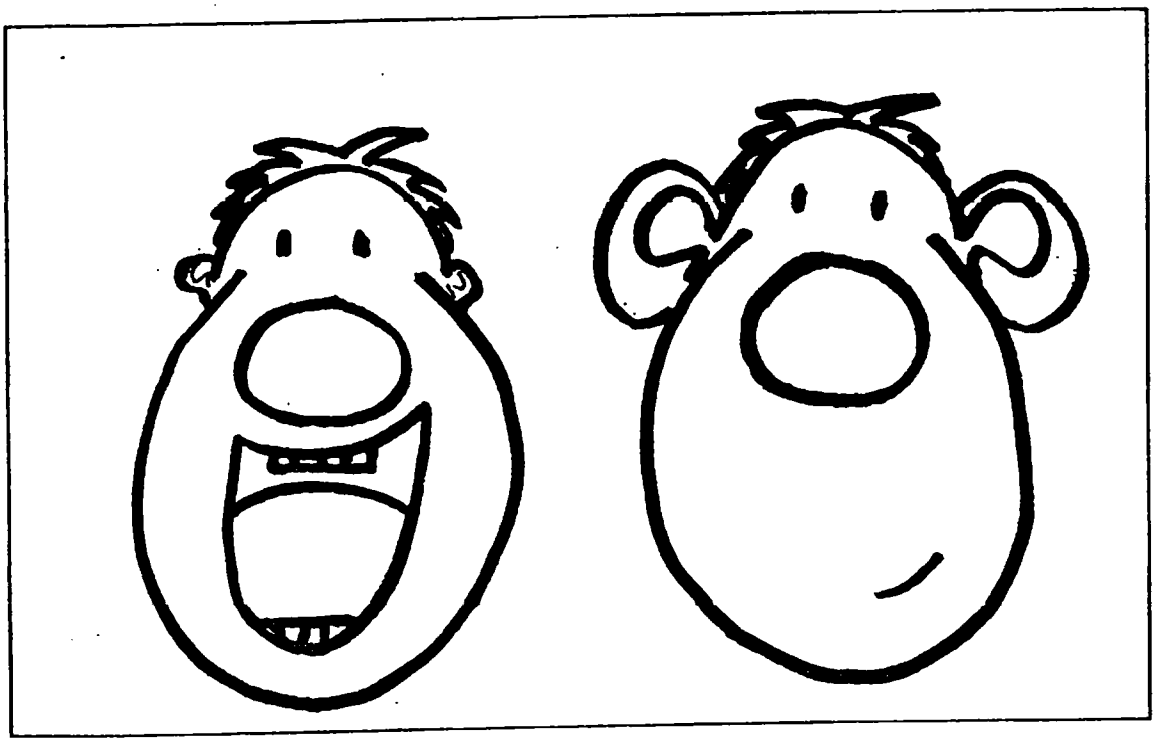
Appendix E

METAPHONOLOGICAL GROUP FACILITATION PHASE

General Discussion

Introduce concept of form of language as opposed to content.
What is a word / sentence?
What do words sound like?
What do phonemes sound like?
Encourage discussion / observations about language form.

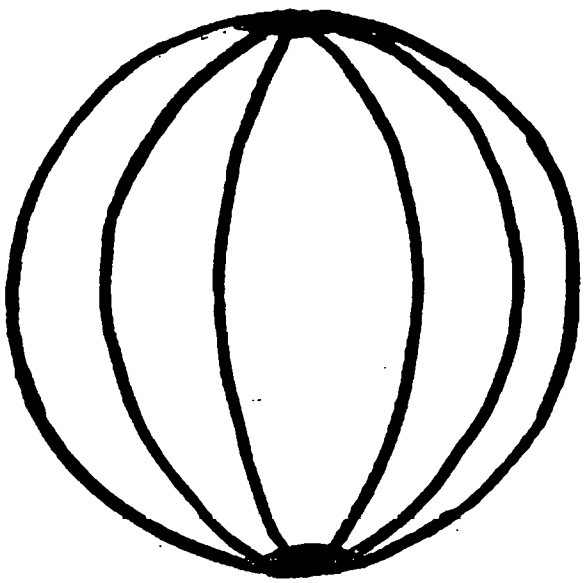
"What do we do when we want to say something?"
[Relate discussion to picture of person with a big mouth]
"When we talk we make special sounds to let other people know what we are thinking. These special sounds are words."
"We think about what we want to say and then move our mouths, our lips and tongue to make the sound come out."



"What comes out?"
[Relate this part of the discussion with picture of person with big ears]
"Words are made up of lots of different sounds. We remember how to put certain sounds together to make the words we want to say."

"Let's play a game to help us find out about words and sounds."

Use paired picture cards. Approximately four pictures are placed on the table in turn as we talk about what each one is.
e.g. "What is this one? Yes, you're right it's a duck. Can everybody see the duck?"
The pairs of each of the pictures are kept in a pile, face down, by the researcher. At this point the assistance of a puppet is required. The puppet helps the researcher to show how important sounds are in words and how a small difference in the way a word sounds can alter the meaning.
"Now the puppet is going to tell us which picture he has, and we have to find the matching one on the table."
The puppet picks up one of the picture pairs from the pile and tells the researcher what it is. The word for the picture has a deliberate phonological error creating both real words and non-words e.g. *wall* instead of *ball*. The researcher makes a funny face as if something is wrong and repeats the word to the children looking for the picture from the selection on the table.
"The puppet said *wall*, what do you think he meant to say?" "What did he say?" "How did he go wrong?"
Then give feedback as necessary. **"The puppet said *wall* but he meant to say *ball*. They sound almost the same don't they: *wall, ball, wall, ball*. He made the wrong sound at the beginning of the word, silly puppet."**
The game is repeated with each child taking turns to make the puppet talk. Some children will delight in making the puppet say the wrong word while others will merely say what the picture actually was. As long as appropriate feedback is given [**"Did the puppet get it right this time? He did, didn't he? All the sounds were right."** or **"What happened this time? Did the puppet say it right? He almost got it right but not quite"**] this exercise will be valuable in increasing the children's awareness of words, sounds within words, their use in communication, the importance of accuracy and the fact that errors can lead to a breakdown in communication.



Analysis of acoustic features

Increase awareness of phonemes through discussion of acoustic features.
"Have a look at these pictures. What is this one?.....
Each of these pictures has a special sound to go with it. The snake sound is /s/....."
After the first four are introduced go back over them. Then proceed with the remaining four pictures and their sounds.

/ s /	snake
/ t /	tap dripping
/ t /	train
/ v /	vacuum cleaner
/ z /	bee
/ m /	yummy, child with an ice-cream
/ k /	stick breaking
/ ʃ /	be quiet

Discuss what it is about the sound that makes it distinctive: acoustic features of duration/length, manner and place of articulation.

"Listen to the sounds for the snake and the tap. Listen. /s/, /t/.
Can you tell me how they sound different?.. One is a little short sound /t/ and the other is a long sound /s/. See if you can make the little /t/ sound. Now try the long /s/ sound .How long can you make it?"

"The / t / sounds a little bit like / k /. You make them in different places in your mouth. Try it and see - / t / is at the front and / k / is at the back of your mouth. If I open my mouth wide you can see my tongue moving at the back to make the /k/ sound."

Play listening games using these sounds.
For example a sound lotto game where each person listens in turn and places a counter on the picture which corresponds to the sound with which they are presented.
"In this game I want you to listen to some sounds and see if you can tell me which picture they go with."
Play with all the children together to build up confidence then with each individual taking turns.
"Everyone is going to take turns with this listening game. You have to listen to the sound I make and, when you are sure what it is, I want you to put a counter on the picture that goes with the sound."
Give an example before asking the children to respond.
Present a sound to each child in turn.
"This is your sound, listen, /.../."
"Put a counter on the picture that goes with the sound /.../."
"Do you all think this is the right picture to go with the sound?"
Give praise and feedback as necessary.

Alliteration

Contrast listening to the ends of words with listening to the beginning - the onset.
Use animal pictures cut in half to represent the word especially the members of the cat family, for example where the front half is needed to distinguish between a tabby cat and a tiger.

"Here are some animals. Look at what's happened to them - they have all been cut in half. Each animal has two bits. The front isn't much good on it's own is it? And the back end looks funny without the front end to go with it.
Words are like that. You can break words up into little bits and then put them back together again. Listen, c...at, c...at, cat, cat, c...at, c...at.
Let's see if we can tell what the animal is just by looking at one bit of the animal. You can't always tell what the animal is just by looking at one bit. Sometimes you have to guess.
The same thing can happen with words. Listen to this, see if you can guess what this word is if I only say a little bit of it: c....., c..... . What do you think? Now this time I'll give you both bits and we'll find out if you were right. C...ar, c...ar, car, car, c...ar c...ar. Did you hear that the first bit of 'car' sounded the same as the first bit of 'cat'?"

[This task can be used to encourage comprehension of the concepts of both onset and rhyme when using slightly different material. An example would be to concentrate on the back end of animals and words when working on rhyme.]

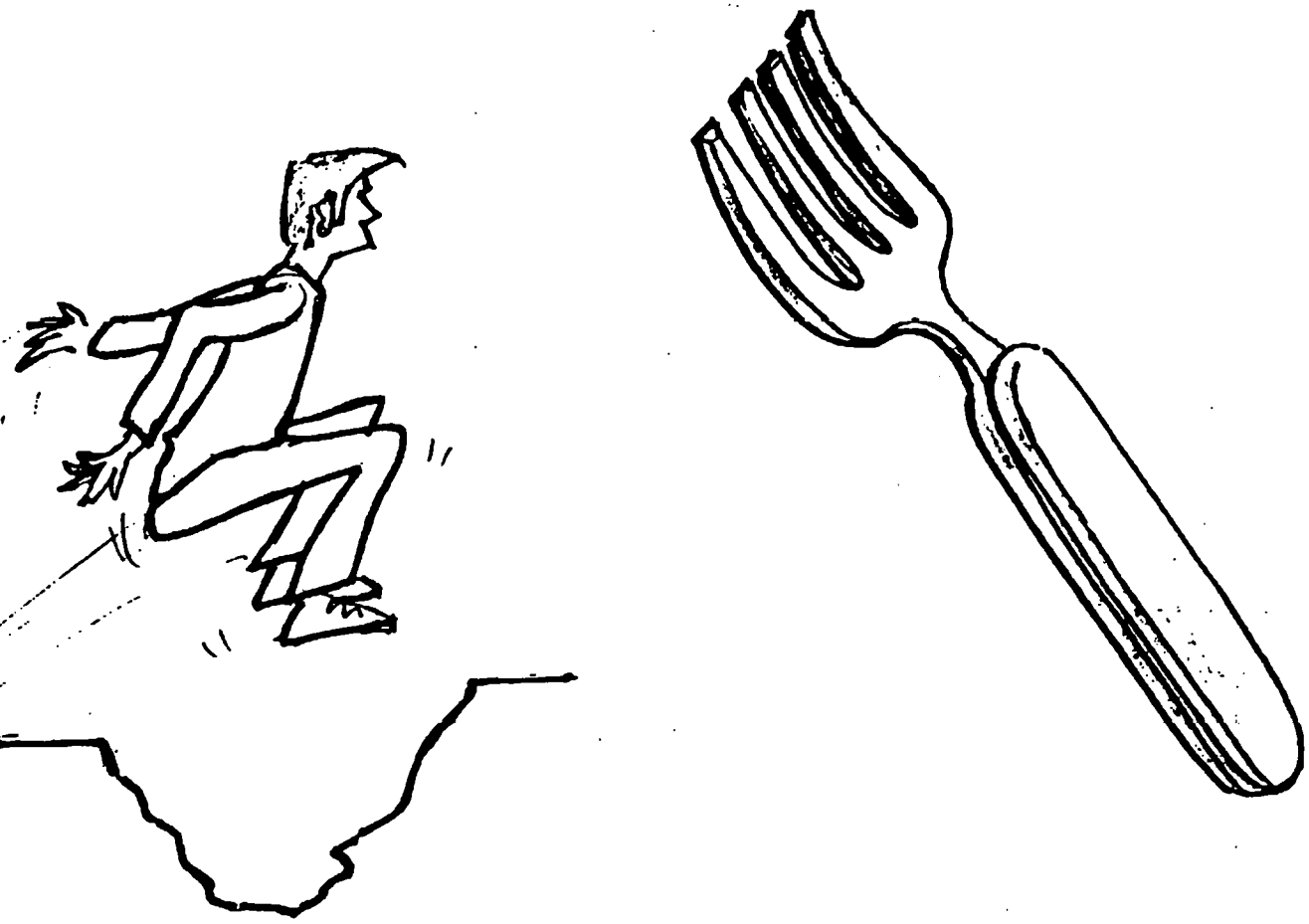
I Spy games and variations on a theme
Producing words which have same onset.
The selection can be made from looking around the room, composite pictures or from a selection of pictures or objects. The number of items from which the children have to select the word, given the onset, can be altered depending on the ability of the group and also depending on the ability of individuals within each group during the turn taking games.
Everyone looks at the same composite picture or selection of pictures.
e.g. Pictures of a wall, dog, sink and bed are presented.

"I spy with my little eye something beginning with / s /."
"Can you find the thing I'm thinking of? Something beginning with / s /"

Give feedback as necessary, for example if one had replied with dog:

"No, that begins with a different sound listen 'd..og', 'ssss..ink'."
"Can you hear that the sounds at the beginning are different."
"We are trying to find a word that starts with / s /."

Depending on how they are able to sound segment, the children can also take turns to pose the 'I spy' question.



Examples of illustrations for odd one out games

Read sentences or short paragraphs containing many alliterative words - encourage identification of the common word initial sound.

"Listen to my little story. Listen to the words and how they sound."
Two toy teddies tumbled off the table.
"Did you hear me saying lots of words that start with the same sound?"
"Listen *two toy teddies,* all those words start with the same sound. Can you think what the sound was?"

If no correct responses, read the stimulus over again.
"Let's see how many of the / t / words we can remember."

Two toy teddies tumbled off the table.

Murray the mouse mopped up the muddy mess he had made.

The panda pushed the poor pig in the pool.

Ben bought the big blue bus.

Diane dropped her doll into a deep dark dirty ditch .

Kate carefully cuddled her cat and her cute kittens.

Gavin got the goose and the goat in from the garden.

Lillian licked a lorry load of lovely lollies.

Robbie the robot really liked raspberry ripple.

Sid the snake said that Sarah's sand castle was silly.

A zebra called Zebadee was zig-zagging round the zoo.

Charlie ate his chocolate cheesecake with chopsticks.

In the jungle the giraffe jumped over the giant jelly.

Henry's horse had eaten the whole hat.

The white witch washed the whale with water from the well.

Composite picture for /m/ onset games

Play matching, sorting and odd-one-out games using picture cards. The following are some examples:

Noah's Ark game using animal pairs
Presenting various numbers of pictures depending on the level of skill
e.g. dog, cat, bird, snake, worm...
"The animals all have to go into the ark two by two so we need to find partners for all the animals that I have here." [indicating the pile of pictures]
The researcher picks from the face down partners.
"I've got one that begins with the / k / sound."
"Can you find another one to go with it?"
"Remember we are looking for one that begins with / k /."

Posting game
Pictures are presented beginning with one of two or more sounds depending on the level of the game. The children take turns to pick a picture. They have to decide which sound it starts with and post it into the appropriate box.
"We have to sort out all these pictures. Some of them start with a / m / sound and some of them start with a / f / sound. We'll take it in turns to pick a card and post it into the right box. All the words that start with a / f / go into this box and all the words that start with a / m / go into that box. Let's do the first few together."
"What's this? .. Yes, it's a feather, fffeather. Did you hear a / m / or a / f /? Listen, fffeather.... Yes. that's right, it starts with a / f / so we have to post it into the / f / box."

Again, give feedback as necessary, encourage comparison of word initial sounds.

Using a pile of word pictures face down the researcher picks one and provides the rhyme. The children have to guess what the onset is.

"This picture sounds like *ink*. Can you guess what it is."
Whether an answer is given or not, encourage the identification of the initial sound.
"It rhymes with *ink*, but it's not *think*. It doesn't start with *th*."
"It sounds like *ink* and it starts with *s*. So you were right, the word is *sink*."

This game would involve more complex segmentation skills and maybe better towards the end of the facilitation phase. This could also be classified as a rhyme game.

Rhyming

Discuss nursery rhymes using the nursery rhyme pictures.
Encourage anticipation of the rhyme by omitting the final word and prompting the children to replace it. If they are unable to give the rhyming word as a whole try presenting the onset and see whether they are then able to add the rhyme to complete the word.

"Do you know this one? This is the rhyme about Humpty ..... . (Yes), Humpty Dumpty, that's a rhyme, those words sound the same don't they? Humpty Dumpty Do you know how it goes?"

"Humpty Dumpty sat on a wall,
Humpty Dumpty had a great .....,
All the king's horses and all the king's men,
Couldn't put Humpty together ..... ."

"Did you notice the words that sounded the same. There was 'wall' and .....'fall'; and 'again' and .....'men'."

Repeat with other nursery rhymes.

Produce rhyming words and non-words given names etc.
Use the children's names and also prepared pictures to give more examples and to provide further stimulus for rhyme production and identification.

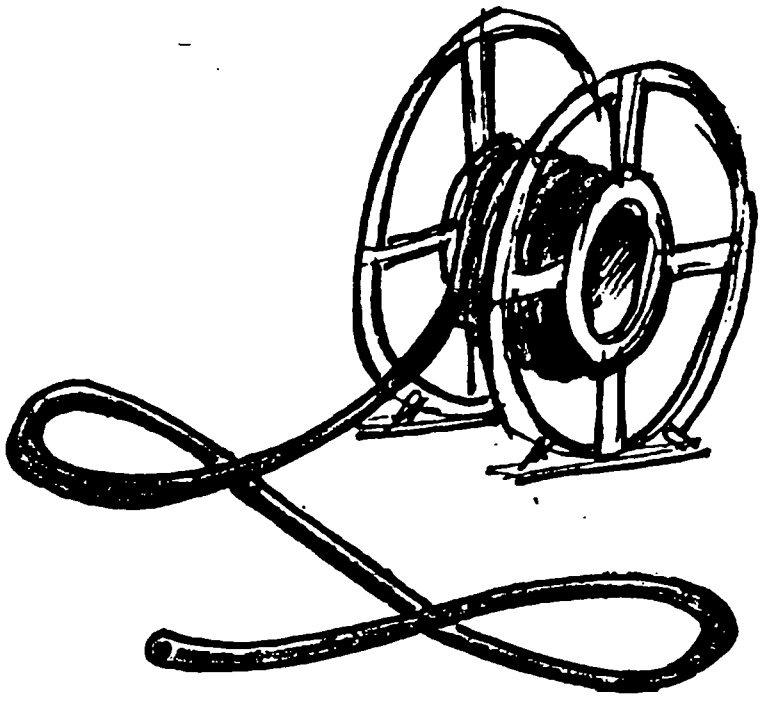
"My name is Sara. I know a funny rhyme about my name."
"Sara the Wara the big fat Para."
"Let's make up some silly rhymes with your names."

Repeat with every one's name. See if they can think of any more rhymes for their names.

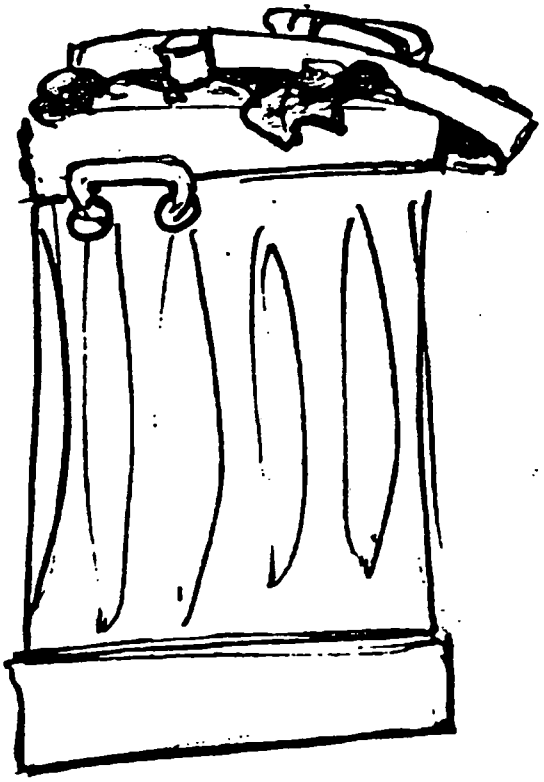
"I can think of some more silly names that sound like my name. "
"Sara Shara. That rhymes."

"How about thinking of silly name that sound like your names."....

Play matching, odd-one-out and sorting listening games using rhyming and non-rhyming word pictures.
"Here are some pictures. We have to sort them out so that all the rhyming words are together. We can make up a new nursery rhyme or story with the words when we have sorted them all out. I want to make a rhyme about ..... so we need to find all the other words that sound like ..... ."
Try the same games without giving the acoustic reference.



Examples of illustrations for odd one out games



Identify the rhyme having been read a sentence or short story containing many words with the same rhyme.

"Listen to some of my little stories. There are lots of words that sound the same. See if you can remember any rhyming words from the story, words that sound the same?"
Prompt as necessary.

The bear had to wear hair for a dare.

The duck took one suck and said "Yuck!"

The cop had to stop at the shop to swap his top for a mop.

The big pig with a wig wanted to dig for a twig.

The shy guy had to try to buy a pie to fry.

The fox locks all his socks in a box.

Jack liked to pack a snack in his sack.

The mole stole the coal in the hole.

The fat cat sat with a flat hat on the mat.

Use the composite pictures or selections of rhyming and non-rhyming word pictures to encourage identification of words with the same rhyme.

"In this game we have to look for words that rhyme / sound like ..... . "
"There are lots of words in this picture that sound like ..... , see if you can find them."

Word synthesis

Discuss how words can be broken down into smaller parts and the built back up again.
Materials from previous onset and rhyme games can be used.
Illustrate the concept as necessary using pictures which can be disassembled and then reassembled.
Segment the word according to the level at which the task is targeted.
e.g. intrasyllabic segmentation - onset and rhyme

"If we slow down the way we speak we can hear what all the different sounds are because we have more time to listen to each bit."
"You listen to the way I say this word really slowly, I'm going to stretch the word out: 'ca....ter....pi....llar'."
Use a stretching action [as if pulling ends of an elastic band] as a gesture to coincide with the *stretchy speech.*
"Could you still tell what I was saying?"
"Does it make it easier if I say the word faster: 'ca..ter..pi..llar' ....'caterpillar'?"

Use the puppet, who can't talk properly as he has stretchy speech, to pick a picture card and say what it is. Each child has to think what the puppet could be saying.
Give feedback. Copy what the puppet has said and slowly take the word through stages of reassembly, bringing the segments closer together to form a more normally sounding word.
"The puppet said 'S...ock, s...ock'. Do you know what the picture is?"
If there is no correct response then decrease the interval between the segments when presenting the stimulus.

The difficulty of the task can be varied by altering their choice of response.

(1) Using picture pairs, the researcher has half in an upturned pile while the other half is spread out on the table.
Pick one picture from the pile and present the stimulus word as above.
The difficulty of the task will vary depending on the phonological similarity between the pictures and the number of pictures used.
In this task the children are given the semantic information and visual referents of the alternatives.

(2) When there are no pictures on the table to chose from, as in (1) above, then the children will have to complete the task using only the phonological information.

Revision

Ongoing revision of skills using various activities in group games.
Many of the sections will invite reference to activities carried out in previous sections.

SESSION BY SESSION PLANS

GROUP A SESSION 1

- General discussion - *listening and speaking*; *what is a word*?
- Nursery rhymes and poems - *Jack & Jill*; *Humpty Dumpty*; *Hickory Dickory Dock*
- Puppet substituting word onset: *can you guess what he meant to say*? Take turns can you make the puppet say something, *maybe he'll make another mistake or maybe he'll get it right.*
- Phoneme-picture matching - intro. to all sounds with pictures; (turntaking) *can you remember what the sound is for this picture*?

GROUP A SESSION 2

- Talk about what we did last time
- General discussion - *what is a word*; *how do we say words*? Sometimes we make mistakes - *make up more words to rhyme with nursery rhyme words.*
- Phoneme-picture matching - revision of all sounds with pictures; (turntaking) *can you remember what the sound is for this picture*; given the sound *can you remember which picture goes with this sound*?
- Need to see the whole picture before you know what it really is (cat, tiger): need to listen to whole word before you really know what it is (hairbrush, toothbrush). *Can you guess what it is going to be*? Listen to the first bit of the word.
- *"I spy"* with continuants. Two pictures e.g. fairy, table - *listen out for the /f/ sound.*

GROUP A SESSION 3

- Talk about what we did last time
- General discussion - *what is a word*; *how do we say words*? Sometimes we make mistakes - *make up words to rhyme with your name.*
- Quick revision of need to see the whole picture before you know what it really is (cat, tiger): need to listen to whole word before you really know what it is (hairbrush, toothbrush). *Can you guess what it is going to be*? Listen to the first bit of the word.
- *"I spy"* with continuants. Two pictures e.g. fairy, table - *listen out for the /f/ sound, which one has the /f/ sound?*

GROUP A SESSION 4

- Talk about what we did last time
- Quick revision of phoneme-pictures
- Produce rhymes by substituting initial sounds using the phoneme-pictures as prompts e.g. wall - zall, kall, shall...
- Revision of making rhymes for each person's name
- *"I spy"* with continuants. Two pictures e.g. fairy, table - *listen out for the /f/ sound, which one has the /f/ sound?*

GROUP A SESSION 5

- Talk about what we did last time
- Quick revision of *"I spy"* with continuants. Two pictures e.g. fairy, table - *listen out for the /f/ sound, which one has the /f/ sound?*
- "I spy" game. Each given an A3 picture. *Have a good look. Can you find something that starts with a /f/ sound on your picture. Show everyone. Cover up the square with an I Spy card.* If this proves too difficult for some or all give examples e.g. *can you find a 'ffish', that starts with a /f/ sound, a 'fish'.*

GROUP A SESSION 6

- Talk about what we did last time
- Odd one out games - find non-rhyme from 3 pictures: e.g. bows, hose, rose, *bin* (increase number for more able children)
- Word stretching game - learning to manipulate the sounds as they are articulated
- Find the word that sounds like: e.g. / ɒp / or / m /.

GROUP A SESSION 7

- Talk about what we did last time
- Verbal jigsaw - give the onset and rime separately for synthesising "*What word does that make*?"
- Odd one out games - *find word that starts with a different sound*: e.g. jump, fork, juggle, giant
- Display a selection of pictures "*I can see something beginning with* / f /. *Do you know which one it is?*" or " *I can see something that sounds like* /ʌm /. *Where is it?*"
- Look at composite pictures to find as many rhyming/alliterative words as possible. Prompt if necessary. "*I can see a 'bin'. Can you see anything else that rhymes with 'bin'.*"

GROUP A SESSION 8

- Talk about what we did last time
- Stretchy speech game
- Odd one out games with onsets and rimes
- Composite pictures
- General revision of previous activities and tasks

Appendix F

1. Selection criteria and group-matching subject data

Selection criteria and group-matching data gathered in the first part of the assessment phase for each subject.

Subject Number	Age (months)	Gender (M/F)	Social Grouping 1, 2, 3 or 4	BPVS Percentile Rank	EAT Standard score	MLU No. of morphemes	Group Allocation A, B or C
1	52	F	1	34	120	7.1	A
2	48	F	3	78	85	7.9	A
3	43	M	4	12	121	5.8	A
4	48	M	3	58	140	4.8	A
5	43	F	4	32	93	6.1	A
6	45	F	4	13	111	4.9	A
7	47	M	4	11	111	5.3	A
8	53	M	4	70	129	6.6	A
9	52	F	4	14	103	9.4	B
10	43	F	3	34	121	4.0	B
11	45	M	3	24	111	6.8	B
12	53	M	4	20	112	6.2	B
13	48	F	3	32	133	6.9	B
14	47	F	4	66	137	5.6	B
15	53	M	4	68	98	6.9	B
16	42	M	4	26	125	5.6	B
17	43	F	2	40	109	6.1	C
18	46	F	4	42	95	5.5	C
19	42	M	4	14	104	4.7	C
20	53	M	4	89	129	8.4	C
21	45	F	4	34	117	6.3	C
22	48	F	4	11	113	7.4	C
23	50	M	4	30	121	10.4	C
24	48	M	3	28	107	9.6	C
25	49	F	1	82	149	9.2	A
26	52	F	3	14	98	7.2	A
27	51	M	2	80	115	8.6	A
28	49	M	4	66	115	7.2	A
29	42	F	1	82	96	6.8	A
30	50	F	3	16	93	5.7	A
31	43	M	1	74	101	7.9	A
32	48	M	4	34	107	4.0	A
33	53	F	1	72	115	4.0	B
34	51	F	3	55	140	6.8	B
35	48	M	1	80	110	4.9	B
36	51	M	1	77	100	6.9	B
37	45	F	2	63	117	4.3	B
38	44	F	1	20	130	5.9	B
39	51	M	1	77	109	6.8	B
40	43	M	4	28	106	4.3	B
41	53	F	3	55	103	5.3	C
42	56	F	2	68	130	5.7	C
43	54	M	1	90	122	7.1	C
44	43	M	2	26	115	4.8	C
45	49	F	2	52	121	6.2	C
46	41	F	4	40	113	6.2	C
47	46	M	2	42	120	4.5	C
48	44	M	3	68	153	6.9	C

2. Summary of selection criteria and group-matching results

This section reports the results of the assessments used to match Groups A, B and C before the intervention phase of the study. The table below contains descriptive statistics regarding the subjects' age on initial assessment; social grouping; vocabulary comprehension (BPVS); speech sound acquisition (EAT); and mean length of utterance in morphemes as an indication of expressive language acquisition. [See section 3.2.2.2.]

Age

The ages of the 48 subjects ranged from 41 months (3 years 5 months) to 56 months (4 years 8 months) with a mean age of 47.8 months (4 years). The mean ages for the three study groups A, B and C were 47.7, 48.1 and 47.6 months respectively. The Kruskal-Wallis analysis of variance calculation found that these values were not significantly different from one another ($p = 0.928$). Groups A, B and C, the experimental and control groups, were therefore matched in terms of age.

Social Grouping

The social grouping calculation values (Wells, 1982) ranged from 6 to 18. The smaller values reflect higher educational levels and higher ratings of occupation as categorised in the Standard Occupational Classification (Government Statistical Service, 1991).

The bands of social grouping are defined as the following:

Band I	$6 < 10$
Band II	$10 < 14$
Band III	$14 < 16$
Band IV	$16 < 18$.

Subjects ratings spanned all four of the bands of social grouping with mean values for Groups A, B and C are 13.6, 13.2 and 13.9 respectively.

An analysis of variance calculation found that the mean social grouping values for Groups A, B and C were not significantly different from one another ($p = 0.799$). The experimental and control groups were therefore matched in terms of social grouping.

Vocabulary comprehension (BPVS)

The British Picture Vocabulary Scale percentile rank values ranged from 11 to 90 with a mean value of 46.7 for all 48 subjects. The mean values for Groups A and B are both 47.3 and Group C has the lowest mean of 45.6.

Analysis of variance found that these values were not significantly different from one another ($p = 0.995$). The experimental and control groups were therefore matched in terms of vocabulary comprehension.

Speech sound acquisition (EAT)

The mean value for the Edinburgh Articulation Test standard scores for all subjects is 115.1. Subjects' standard scores ranged from 85 to 153. Groups A, B and C have mean standard scores of 111.5, 116.7 and 117.0 respectively, with Group C having the largest value.

An analysis of variance calculation found that these values were not significantly different from one another ($p = 0.488$). The experimental and control groups were therefore matched in terms of speech sound acquisition.

Expressive language ability (MLU)

The mean length of utterance of individual subjects varied from 4.0 to 10.4 morphemes. Group B has the highest group mean value for MLU (6.7 morphemes per utterance).

An analysis of variance calculation found that the mean group MLU values were not statistically significantly different from one another ($p = 0.103$). Although this measure produced the lowest p-value on the Kruskal-Wallis analysis of variance the differences amongst the three groups was nevertheless statistically insignificant at the 5% level. The experimental and control groups were therefore adequately matched for expressive language acquisition in terms of mean length of utterance.

Summary of analysis of group matching criteria

The previous sections present the results of each of the group-matching measures in turn for Groups A, B and C. The mean values and standard deviations for each group are summarised in the first of the tables below while the p-values obtained through Kruskal-Wallis analysis of variance calculations for each of the group-matching measures are presented in the second table below.

Means and standard deviations of group-matching measures for experimental and control groups.

GROUP	Group A (experimental intervention)		Group B (control intervention)		Group C (control non-intervention)	
MEASURE	Mean	St.Dev	Mean	St.Dev.	Mean	St.Dev.
Age (in months)	**47.7**	3.6	**48.1**	4.0	**47.6**	4.6
Social Grouping Calculation	**13.6**	1.0	**13.2**	1.0	**13.9**	0.9
BPVS (percentile rank)	**47.3**	28.9	**47.3**	24.4	**45.9**	24.4
EAT (standard score)	**111.5**	17.6	**116.7**	13.1	**117.5**	13.8
MLU (no. of morphemes)	**6.2**	1.3	**6.7**	1.4	**5.7**	1.1

In assessing the extent to which Groups A, B and C were matched a Kruskal-Wallis analysis of variance calculation was applied to the results. The statistical significance of the extent to which the three groups differed for each measure is shown in the table below.

P-values obtained by a Kruskal-Wallis analysis of variance of the three study groups (Groups A, B and C) for each group-matching measure.

GROUP MATCHING MEASURE	P-VALUE
AGE	.9278
SOCIAL GROUPING	.7992
VOCABULARY ACQUISITION (BPVS)	.9950
SPEECH SOUND ACQUISITION (EAT)	.4875
EXPRESSIVE LANGUAGE (MLU)	.1033

None of the p-values for the Kruskal-Wallis analysis of variance for the group-matching measures reached statistical significance at the 5% level ($p > 0.05$). All three groups can therefore be said to be matched for age; social grouping; vocabulary acquisition; speech sound acquisition and expressive language ability as no statistically significant differences were found amongst the three groups for each of these measures.

3. Pre-intervention assessment data

Pre-intervention assessment scores for each subject

Subject	PFA	OR	RR	WS	AM	AD	MS
1	10	9	9	0	30	18	10
2	10	10	8	5	38	14	12
3	12	8	8	0	17	15	10
4	7	6	11	1	16	14	10
5	14	12	10	9	21	15	13
6	11	8	13	0	8	11	9
7	16	10	10	0	23	10	11
8	10	10	10	1	28	15	14
9	11	11	13	1	18	15	10
10	10	11	10	3	12	16	16
11	12	9	10	0	7	12	10
12	15	9	12	0	19	15	12
13	15	12	10	2	14	18	17
14	12	17	10	15	23	18	13
15	10	10	20	3	23	17	20
16	9	10	10	1	13	9	10
17	15	8	10	1	14	13	10
18	10	10	9	0	20	10	9
19	12	10	12	0	5	10	11
20	10	18	20	8	28	18	14
21	12	10	10	1	9	12	10
22	7	12	7	0	13	12	10
23	11	8	14	1	18	16	11
24	10	6	13	2	20	18	12
25	11	17	10	9	30	18	19
26	9	13	11	1	12	8	10
27	11	14	16	1	38	16	10
28	9	9	9	1	20	17	11
29	9	10	11	1	24	17	12
30	11	9	11	1	16	14	13
31	11	8	10	0	20	12	10
32	10	12	13	1	17	20	12
33	12	10	20	3	27	18	11
34	10	12	16	1	24	18	16
35	9	11	10	0	27	17	10
36	12	11	10	0	28	18	15
37	10	12	11	0	23	11	9
38	14	9	10	0	16	17	15
39	13	13	20	3	30	18	20
40	9	10	7	0	21	19	12
41	6	9	10	0	24	17	12
42	8	16	19	13	25	15	15
43	11	17	10	6	32	18	14
44	10	9	9	0	18	13	10
45	11	12	15	4	22	17	18
46	11	10	10	1	12	17	12
47	10	9	10	7	25	9	11
48	10	12	11	0	23	19	9

4. Post-intervention assessment data

Post-intervention assessment measures for each subject

Subject	PFA	OR	RR	WS	AM	AD	MS
1	9	9	18	3	30	17	11
2	12	10	18	2	32	13	16
3	9	10	18	1	15	17	10
4	9	10	18	4	22	18	12
5	12	10	20	10	20	16	11
6	9	11	10	1	18	9	11
7	12	8	18	1	25	13	11
8	13	13	15	4	31	16	16
9	9	7	9	1	28	17	12
10	12	8	8	0	15	16	7
11	6	13	10	0	8	10	12
12	10	9	16	0	19	9	14
13	9	11	12	2	19	17	12
14	13	19	18	12	22	19	13
15	8	9	20	3	24	15	20
16	12	10	10	1	18	11	11
17	9	7	10	0	18	10	10
18	10	8	10	0	19	10	11
19	12	9	10	0	4	9	11
20	10	18	18	10	29	14	19
21	12	11	8	0	14	14	10
22	7	11	9	2	18	10	10
23	11	8	9	1	23	15	10
24	10	8	7	4	25	18	12
25	14	20	13	19	38	17	20
26	11	12	8	1	17	10	10
27	9	16	19	6	46	19	18
28	13	15	16	2	28	18	12
29	6	10	14	3	28	15	13
30	13	12	7	1	15	11	13
31	12	11	14	0	22	13	10
32	13	12	14	14	21	16	13
33	8	10	13	2	26	17	14
34	12	20	9	2	15	16	18
35	11	11	12	4	26	17	12
36	14	9	20	1	31	17	19
37	10	9	14	0	29	11	11
38	13	9	10	0	19	17	7
39	11	11	14	1	29	18	17
40	10	12	10	0	15	16	10
41	10	12	10	5	31	14	10
42	10	15	19	18	27	14	18
43	9	12	17	8	32	18	18
44	10	9	11	2	21	10	9
45	12	11	18	9	24	17	15
46	10	9	10	5	13	13	12
47	8	8	10	7	29	11	14
48	10	8	10	1	20	18	11

5. Differences between pre- and post-intervention data

Difference between pre- and post-intervention measures for each subject

Subject	PFA	OR	RR	WS	AM	AD	MS
1	-1	0	9	3	0	-1	1
2	2	0	10	-3	-6	-1	4
3	-3	2	10	1	-2	2	0
4	2	4	7	3	6	4	2
5	-2	-2	10	1	-1	1	-2
6	-2	3	-3	1	10	-2	2
7	-4	-2	8	1	2	3	0
8	3	3	5	3	3	1	2
9	-2	-4	-4	0	10	2	2
10	2	-3	-2	-3	3	0	-9
11	-6	4	0	0	1	-2	2
12	-5	0	4	0	0	-6	2
13	-6	-1	2	0	5	-1	-5
14	1	2	8	-3	-1	1	0
15	-2	-1	0	0	1	-2	0
16	3	0	0	0	5	2	1
17	-6	-1	0	-1	4	-3	0
18	0	-2	1	0	-1	0	2
19	0	-1	-2	0	-1	-1	0
20	0	0	-2	2	1	-4	5
21	0	1	-2	-1	5	2	0
22	0	-1	2	2	5	-2	0
23	0	0	-5	0	5	-1	-1
24	0	2	-6	2	5	0	0
25	3	3	3	10	8	-1	1
26	2	-1	-3	0	5	2	0
27	-2	2	3	5	8	3	8
28	4	6	7	1	8	1	1
29	-3	0	3	2	4	-2	1
30	2	3	-4	0	-1	-3	0
31	1	3	4	0	2	1	0
32	3	0	1	13	4	-4	1
33	-4	0	-7	-1	-1	-1	3
34	2	8	-7	1	-9	-2	2
35	2	0	2	4	-1	0	2
36	2	-2	10	1	3	-1	4
37	0	-3	3	0	6	0	2
38	-1	0	0	0	3	0	-8
39	-2	-2	-6	-2	-1	0	-3
40	1	2	3	0	-6	-3	-2
41	4	3	0	5	7	-3	-2
42	2	-1	0	5	2	-1	3
43	-2	-5	7	2	0	0	4
44	0	0	2	2	3	-3	-1
45	1	-1	3	5	2	0	-3
46	-1	-1	0	4	1	-4	0
47	-2	-1	0	0	4	2	3
48	0	-4	-1	1	-3	-1	2

Appendix G

Abbreviations

Metaphonological assessments

PFA Phoneme feature analysis test
OR Onset recognition test
RR Rhyme recognition test
WS Word synthesis test

Standardised assessments

EAT Edinburgh Aticulation Test
BPVS British Picture Vocabulary Test
MLU Mean length of utterance in morphemes

Other assessments

AD Auditory discrimination test
AM Auditory memory test
MS Metasyntactic test

N.B.
Where a reference is made to a test as above followed by a number, the number denotes the assessment phase in which it was carried out.
For example: 'OR2' refers to the post-intervention onset recognition test.
'AD1' refers to the pre-intervention auditory discrimination test.

In Section 4.4.1, abbreviations are used to denote the subject, the group to which they were allocated and the test during which their comment was made.
For example: (25:A:MS2) is used as a tag for a comment made by subject 25 during the post-intervention assessment of the metasyntactic test and who was allocated to Group A.

References

ANTHONY, A., BOGLE, INGRAM. D., & McISACC (1971) *Edinburgh Articulation Test.* Edinburgh: Livingstone

BADDELEY, A.D., ELLIS, N.C., MILES, T.R. & LEWIS, V.J. (1982) Developmental and acquired dyslexia: a comparison. *Cognition*, 11, 185-199.

BAUERS, A. & PETTITT, D. (1990) Exploring young children's language awareness. *Child Language, Teaching and Therapy*, 6, 3, 279.

BIALYSTOK, E. (1986) Factors in the growth of metalinguistic awareness. *Child Development*, 57, 498-510.

BIALYSTOK, E. (1988) Levels of bilingualism and levels of linguistic awareness. *Developmental Psychology*, 24, 4, 560-567.

BIALYSTOK, E. & MITTERER, J. (1987) Metalinguistic differences among three kinds of readers. *Journal of Educational Psychology*, 79, 2, 147-153.

BIALYSTOK, E. & RYAN, E.B. (1985) Toward a definition of metalinguistic skill. *Merrill Palmer Quarterly*, 31, 3, 229-251.

BLACHMAN, B.A. (1994) What we have learned from longitudinal studies of phonological processing and reading and some unanswered questions: A response to Torgesen, Wagner and Rashotte. *Journal of Learning Disabilities*, 27, 5, 287-291.

BOWEY, J.A. & PATEL, R.K. (1988) Metalinguistic ability and early reading achievement. *Applied Psycholinguistics*, 9, 367-383.

BRADLEY, L. (1980) *Assessing reading difficulties, a diagnostic approach.* MacMillan Education Ltd: London.

BRADLEY, L. & BRYANT, P. (1978) Difficulties in auditory organisation as a possible cause of reading backwardness. *Nature*, 271, 746.

BRADLEY, L. & BRYANT, P.E. (1983) Categorising sounds and learning to read - A causal connection. *Nature*, 301, 419-421.

BRIMMER, M.A. & DUNN, L.A. (1973) *English Picture Vovabulary Test.* Gloucester: Education Evaluation Enterprises.

BROWN, R. (1973) *A First Language.* Harvard University Press: Camb. Mass.

BRUCE, L.J. (1964) The analysis of word sounds by young children. *British Journal of Educational Psychology*, 34,158-170.

BRYANT, P. & BRADLEY, L (1985) *Children's reading problems: psychology and education.* Oxford: Blackwell.

BRYANT, P., MACLEAN, M. & BRADLEY, L (1990) Rhyme, language and children's reading. *Applied Psycholinguistics*, 11, 237-252.

BRYANT, P., MACLEAN, M., BRADLEY, L & CROSSLAND, J (1990) Rhyme and alliteration, phoneme detection and learning to read. *Developmental Psychology*, 26, 3, 429-438.

BYRNE, B & FIELDING-BARNSLEY, R. (1991) Evaluation of a program to teach phonetic awareness to young children. *Journal of Educational Psychology*, 83, 4, 451-455.

CALFEE, R.C., LINDAMOOD, P.O. & LINDAMOOD, C. (1973) Acoustic phonetic skills and reading - kindergarten through twelfth grade. *Journal of Educational Psychology*, 64, 293-298.

CATTS, H.W. (1991) Facilitating phonological awareness: Role of Speech-Language Pathologists. *Language, Speech and Hearing Services in Schools*, 22, 4, 196-203.

CAZDEN, C. (1974) Play with language and metalinguistic awareness: One dimension of language experience. *The Urban Review*, 7, 28-39.

CHANEY, C. (1992) Language development, metalinguistic skills, and print awareness in 3-year-old children. *Applied Psycholinguistics*, 13, 485-514.

CLARK, E.V. (1978) Awareness of language: Some evidence from what children say and do. In Sinclair, Jarvella and Levelt (Eds) *A Child's Conception of Language*. Berlin:Springer-Verlag.

COLLINS (1987) *The New Colins Dictionary and Thesaurus in One Volume*. William Collins & Co. Ltd.

CONTENT, A., MORAIS, J., ALEGRIA, J and BERTELSON, P. (1982) Acclerating the development of phonetic segmentation skills in kindergartner's. *Cahiers de Psychologie Cognitive*, 2, 259-269.

COSSU. G.(1988) Awareness of phonological segments and reading ability in Italian children. *Applied Psycholinguistics*, 9, 1, 1-16.

CUNNINGHAM, A.E. (1990) Explicit versus Implicit Instruction in Phonemic Awareness. *Journal of Experimental Child Psychology*, 50, 429-444.

de VILLIERS, P.A. & de VILLIERS, J.G. (1972) Early judgements of semantic and syntactic acceptability by children. *Journal of Psychlonguistic Research*, 1, 299-310.

DONALDSON, M. (1978) *Children's Minds*. Glasgow: Collins Fontana.

DUNN, L.M. & DUNN, L.M. (1981) *Peabody Picture Vocabulary Test - Revised Manual*. Circle Pines, M.N: American Guidance Service.

DUNN, L.M., DUNN, L.M., WHETTON, L. & PINTILLIE, D. (1982) *British Picture Vocabulary Scale - Manual.* NFER-NELSON: G.B.

ELLIOT, C.D. (1982) *The British Ability Scales Manual 2: Technical and Statistical Information.* Windsor: NFER-NELSON.

ESTRIN, E.T. & CHANEY, C. (1988) *Developing a concept of the word. Childhood Education,* 65, 78-82.

FLAVELL, J.H. & WELLMAN, H.W. (1977) Metamemory. In *Perspectives on the development of memory and cognition.* R.V. Kail Jnr & J.W. Hagen (Eds) Hillsdale, N.J: Lawrence Erlbaum Assoc. pp 3-33

FOX, B. & ROUTH, D.K. (1975) Analysing spoken language into words, syllables and phonemes: A developmental study. *Journal of Psycholinguisitc Research,* 4, 4, 311-342.

FRITH, U. & SNOWLING. M.J. (1983) Reading for meaning and reading for sound in autistic and dyslexic children. *British Journal of Developmental Psychology,* 1, 329-342.

GARTON, A. & PRATT, C. (1989) *Learning to be Literate: the development of spoken and written language.* Oxford: Blackwell.

GJESSING, H.J. (1968) *A Study of Reading Readiness in School Beginners.* Oslo: Cappelen.

GLEITMAN, L.R., GLEITMAN, H. & SHIPLEY, E.F.(1972) The emergence of the child as a grammarian. *Cognition,*1, 137-164.

GOLDMAN, S.R. (1982) Coincidence or causality in linguistic and cognitive skills: A reply to Van Kleeck. *Merrill Palmer Quarterly,* 28, 2, 267-274.

GOLINKOFF, R.M. (1978) Critique: Phonetic awareness skills in reading acheivement. In *The Acquisition of Reading: Cognitive, linguistic and perceptual prerequisites.* Murray, F.B. & Pikulski, J.J.(Eds) Baltimore, M.D: University Park Press.

GOSWAMI, U. (1988) Children's use of analogy in learning to spell. *British Journal of Developmental Psychology,* 6, 21-33.

GOSWAMI, U. & BRYANT, P. (1990) *Phonological skills and learning to read.* Lawrence Erlbaum Assoc Ltd: U.K.

GRIEVE, R. & HUGHES, M. (1990) *Understanding Children.* Basil Blackwell Ltd: U.K.

GUTHRIE, J.T. (Ed) (1976) Aspects of reading acquisition. *Proceedings of the Fifth Annual Hyman Blumberg Symposium on research in early childhood education.* The John Hopkins University Press: U.S.

HAKES, D.T. (1980) *The development of metalinguistic abilities in children.* Berlin/N.Y.: Springer-Verlag.

HOFFMAN, S.J. (1986) Look all of these words in a row start the same as me. *Opinion Papers.* Pennsylvania, U.S.

HOWELL, J. (1989) The metalinguistic awareness of phonologically disordered and normally developed children: A comparative study. *PhD dissertation.* Newcastle: Department of Speech, University of Newcastle-upon-Tyne.

HOWELL, J. & DEAN, E. (1987) "I think that's a noisy sound": reflection and learning in the therapeutic situation. *Child Language Teaching and Therapy* 3, 259-266.

HOWELL, J. & DEAN, E. (1994) *Treating phonological disorders in children: Metaphon - Theory to practice.* Far Communications Ltd, G.B.

HOWELL, J., HILL, A., DEAN, E. & WATERS, D. (1993) Increasing metalinguistic awareness to assist phonological change. In *Critical Influences on Child Language Acquisition and Development.* D.J. Messer & G.J. Turner (Eds) The MacMillan Press Ltd: London.

HUGHES, M. (1975) *Egocentrism in preschool children.* Edinburgh University. Unpublished doctoral dissertation.

KAMHI, A.G., FRIEMOTH LEE, R. & NELSON, L.K. (1985) Word, syllable and sound awareness in language disordered children. *Journal of Speech and Hearing Disorders,* 50, 207-212.

KIRK, S.A., McCARTHY, J.J. & KIRK, W.D. (1968) *Examiners Manual: Illinois Test of Psycholinguisitc Abilities.* University of Illinois Press, Urbana.

KNAFLE, J.D. (1973) Auditory Perception of Rhyming in Kindergarten Children. *Journal of Speech and Hearing Research,* 16, 482-487.

KNAFLE, J.D (1974) Children's Discrimination of Rhyme. *Journal of Speech and Hearing Research,* 17, 367-372.

KOLINSKY, R. & OTHERS (1987) Awareness of words as phonological entities: The role of literacy. *Applied Psycholinguistics,* 8, 3, 223-232.

LEWKOWICZ, N.K. (1980) Phonetic awareness training: What to teach and how to teach it. *Journal of Educational Psychology,* 72, 686-700.

LIBERMAN, I., SHANKWEILER, D., FISCHER, F. & CARTER, B. (1974) Explicit syllable and phoneme segmentation in the young child. *Journal of Experimental Child Psychology,* 18, 201-212.

LIE, A. (1991) Effects of a training program for stimulating skills in word analysis in first grade children. *Research Reading Quarterly,* 26, 3, 234-250.

LINDAHL, R. (1965) (Swedish) *Group test for school beginners*. Goetborg: Richard Lindahl.

LLOYD, P. & BEVERIDGE, M. (1981) *Information and Meaning in Child Communication*. London: Academic Press.

LOTHIAN REGIONAL COUNCIL EDUACTION DEPARTMENT (1992) *A Curriculum for the Early Years*.

LUNDBERG, I. (1978) Aspects of linguistic awareness related to reading. In Sinclair, Jarvella and Levelt (Eds) *The Child's Conception of Language*. Berlin:Springer-Verlag.

LUNDBERG, I., FROST, J. & PETERSON, O-P. (1988) Effects of an extensive program for stimulating phonological awareness in pre-school children. *Reading Research Quarterly*, 23, 3, 263-284.

MACLEAN, M., BRYANT, P. & BRADLEY, L. (1987) Rhymes, nursery rhymes and reading in early childhood. Special Issue Children's Reading and the development of phonological awareness. *Merrill Palmer Quarterly*, 33, 255-282.

MAHONY, D.L. & MANN, V.A. (1992) Using children's humor to clarify the relationship between linguistic awareness and early reading ability. *Cognition*, 45, 163-186.

MANN, V.A. (1986) Phonological awareness: The role of reading experience. *Cognition*, 24, 65- 92.

MANN, V.A. & LIBERMAN, I.Y. (1984) Phonological awareness and verbal short term memory. *Journal of Learning Disabilities*, 17, 592-598.

MARSH, G. & MINEO, R.J. (1977) Training preschool children to recognise phonemes in words. *Journal of Educational Psychology*, 69, 748-753.

MATTINGLY, I.G. (1972) Reading, the linguistic process and linguistic awareness. In J.F. Kavanagh and I.G. Mattingly (Eds) Language by Ear and by Eye. Cambridge, Mass: M.I.T. Press.

MORAIS, J., BERTELSON, P., CARY, L. & ALEGRIA, J. (1986) Literacy training and speech segmentation. *Cognition*, 24, 45-64.

NESDALE, A.R., HERRIMAN. M.L., & TUNMER, W.E. (1984) Phonological awareness in children. In Tunmer, Pratt and Herriman (Eds) *Theory, Research and Implications*. N.Y. Springer-Verlag.

OLOFFSON, A. & LUNDBERG, I. (1983) Can phonetic awareness be trained in kindergarten? *The Scandinavian Journal of Psychology*, 24, 35-44.

PAPANDROPOULOU, I. & SINCLAIR, H. (1974) What is a word? Experimental study of children's ideas on grammar. *Human Development*, 17, 241-258.

PIAGET, J. (1959) *The Language and Thought of the Child.* (3rd Edition) London: Routledge and Kegan Paul.

PIAGET, J. & INHELDER, B. (1956) *The Child's Conception of Space.* London: Routledge and Kegan Paul.

PRATT, C. & NESDALE, A.R. (1984) Pragmatic awareness in children. In *Metalinguistic Awareness in Children.* Tunmer, Pratt and Herriman (Eds). Berlin: Springer-Verlag.

PUBLICATION OF THE GOVERNMENT STATISTICAL SERVICE (1990) (1991) *Standard Occupational Classification Volumes 1, 2 and 3.* British Library Cataloguing in Publication Data. London: HMSO.

RAVEN, J. (1948) *Progressive Matrices.* N.Y: Psychological Corp.

RAZ, I.S., & BRYANT, P. (1990) Social background, phonological awareness and children's reading. *British Journal of Developmental Psychology*, 8, 3, 209-225.

READ, C. (1978) Children's awareness of language with emphasis on sound systems. In *The Child's Conception of Language.* Sinclair, Jarvella and Levelt (Eds) N.Y.: Springer-Verlag.

READ, C., ZHANG, Y., NIE, H. & DING, B. (1986) The ability to manipulate speech sounds depends on knowing alphabetic writing. *Cognition*, 24, 31-44.

REID, J., GRIEVE, R., DEAN, E., DONALDSON, M. & HOWELL, J. (1993) Linguistic awareness in young children. In *Proceedings in the Child Language Seminar.* J Clibbins and B Pendleton (Eds) University of Plymouth.

RENFREW, C. (1969) *The Bus Story* (Assessment for continuous speech). Oxford, U.K.

SCHONELL & GOODACRE (1974) *The Schonell Test of Reading and Spelling.*

SCHUELE, C.M. & VAN KLEECK, A. (1987) Pre-cursors to literacy: Assessment and Intervention. *Topics in Language Disorders*, 7, 2, 32-44.

SINCLAIR, H. (1978) Conceptualisation and awareness in Piaget's Theory and its relevance to the child's conception of language. In *The Child's Conception of Language.* Sinclair, Jarvella and Levelt (Eds) N.Y.: Springer-Verlag.

SINCLAIR, H., JARVELLA, R.J. & LEVELT, W.J.M. (Eds) (1978) *The Child's Conception of Language.* N.Y.: Springer-Verlag.

SKJELFJORD. V.J. (1987) Phonemic segmentation: An important subskill in learning to read. *Scandinavian Journal of Educational Research*, 31, 41-57.

SLOBIN, D.I. (1978) A Case Study of Early Language Awareness. In *The Child's Conception of Language*. Sinclair, Jarvella and Levelt (Eds). N.Y.: Springer-Verlag.

SMITH, C.L. & TAGER-FLUSBERG, H. (1982) MLA and Language Development. *Journal of Experimental Child Psychology*, 34, 3, 449-468.

SNOWLING, M.J. (1980) The development of grapheme-phoneme correspondence in normal and dyslexic readers. *Journal of Experimental Child Psychology*, 29, 294-305.

SPOELDERS, M. & VAN DAMME, L. (1985) Individual language awareness testing and early reading. *Scientia Paedagogical Experimentalis*, 22, 1, 127-134.

STANOVICH K.E., CUNNINGHAM, A. & CRAMER, B. (1984) Assessing phonological awareness in kindergarten children: issues of task comparability. *Journal of Experimental Child Psychology*, 38, 175-190.

TERMAN, L.M. & MERRILL M.A. (1960) Auditory memory tests in *Stanford Binet Intelligence Scale.*

THE SCOTTISH OFFICE EDUCATION DEPARTMENT (1991) *Curriculum and Assessment in Scotland. National Guidelines. English Language 5-14.*

TORGESEN.J.K., WAGNER, R.K. & RASHOTTE, C.A. (1994) Longitudinal studies of phonological processing and reading. *Journal of Learning Disabilities*, 27, 5, 276-286.

TREIMAN, R. (1985) Onsets and rimes as units of spoken syllables: Evidence from children. *Journal of Experimental Child Psychology*, 39, 161-181.

TREIMAN, R. (1987) On the relationship between phonological awareness and literacy. *Cahiers de Psychologie Cognitive*, 7, 524-529.

TREIMAN, R. & BARON, J. (1981) Segmental analysis ability: Development and relation to reading ability. In G.E. MacKinnon & T.G. Waller (Eds) *Reading research: Advances in theory and practice* (Vol. 3) N.Y: Academic Press.

TUNMER, W.E. & BOWEY, J. (1984) Metalinguistic awareness and reading acquisition. In *Metalinguistic awareness in children: Theory, Research and Implications*. Tunmer, Pratt and Herriman (Eds) N.Y.: Springer-Verlag.

TUNMER, W.E. & FLETCHER, C.M. (1981) The relationship between conceptual tempo, phonological awareness and word recognition in beginning readers. *Journal of Reading Behaviour*, 13, 173-185.

TUNMER, W.E. & HERRIMAN, M.L. (1984) The development of metalinguistic awareness: A conceptual overview. In *Metalinguistic awareness in children: Theory, Research and Implications*. Tunmer, Pratt and Herriman (Eds) N.Y.: Springer-Verlag.

TUNMER, W.E., HERRIMAN, M.L. & NESDALE, A.R. (1988) Metalinguistic abilities and beginning reading. *Reading Research Quarterly*, 23, 134-157.

TUNMER, W.E., PRATT, C. & HERRIMAN, M.L. (1984) *Metalinguistic awareness in children: Theory, Research and Implications*. Tunmer, Pratt and Herriman (Eds) N.Y.: Springer-Verlag.

VAN KLEECK, A. (1982) The emergence of linguistic awareness: A cognitive framework. *Merrill Palmer Quarterly*, 28, 237-265.

VAN KLEECK, A. & BRYANT, D. (1984) *Learning that language is arbitrary: Evidence from early lexical changes*. Paper presented at the meeting of the American-Speech-Language Association, San Francisco, C.A.

VAN KLEECK, A. & SCHUELE, C.M. (1987) Precursors to literacy: Normal development. *Topics in Language Disorders*, 7, 2, 13-31.

VYGOTSKY, L.S. (1962) Thought and language. Cambridge, Mass: M.I.T. Press.

WALLACH, L., WALLACH. M.A., DOZIER, M.G. & KAPLAN, M.W. (1977) Poor children learning to read do not have trouble with auditory recognition, but do have trouble with phoneme recognition. *Journal of Educational Psychology*, 69, 36-39.

WESCHLER, D. (1967) *The Weschler Pre-school and Primary Scale of Intelligence*. The Psychological Corporation: N.Y.

WELLS, G. (Ed) (1981) *Learning through interaction. The study of language development*. Cambridge, Mass. : Cambridge University Press.

WELLS, G. (1982) Influence of home on language development. In *Language and Learning in Home and School*. A. Davies (Ed). London: Heineman Educational.

WILLIAMS, J.P. (1980) Teaching decoding with an emphasis on phoneme analysis and phoneme blending. *Journal of Educational Psychology*, 72, 1-15.

ZHUROVA, L.Y.1(1973) The development of analysis of words into their sounds by pre-school children In *Studies of Child Language Development*, Ferguson & Slobin (Eds) 141-154. N.Y.: Holt, Reinhard and Winston Inc.

ZUCCHERMAGLIO, C., PONTECORVO, C., TONUCCI, F., & BLACHOWICZ, C.L.Z. (1986) Literacy and linguistic awareness: a study of Italian first grade students. *Reading Psychology*, 7, 1, 11-25.

Bibliography

BARRIE WETHERILL, G. (1982) *Elemantary Statistical Methods*. Chapman and Hall: N.Y.

BISHOP, D.V.M. & EDMUNDSON, A. (1987) Language-Impaired 4 year olds: Distinguishing transient from persistent impairmant. *Journal of Speech and Hearing Disorders*, 52, 156-173.

ERICKSON, B.H. & NOSANCHUK, T.A. (1992) *Understanding Data* (2nd Ed). Open University Press: Buckingham.

GOMBERT, J.E. (1992) *Metalinguistic Development*. N.Y: Harvester Wheatsheaf.

MILLER, J.F. (1981) *Assessing Language Production in Children. Experimental Procedures*. University Park Press: G.B.

PRATT, J.W. & GIBBONS, J.D. (1981) *Concepts in Nonparametric Theory*. Springer-Verlag: N.Y.

SIEGAL, S. & CASTELLAN, N.J. Jnr (1988) *NonParametric Statistics for the Behavioural Sciences* (2nd Ed) McGraw Hill Inc.

SPSS for WINDOWS. (1993) *Base System User's Guide*. Release 6.0: U.S.A.