

THE RELATIONSHIP BETWEEN MUSICAL ABILITY
AND LITERACY SKILLS

Sheila A. Douglas

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and Literacy Skills**

Sheila A. Douglas

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ABSTRACT

Many researchers have shown that a relationship exists between phonological awareness and literacy skills, and a recent study has shown a relationship between musical skills and reading. It has also been shown that a structured programme of musical activities can be used to help children develop a multi-sensory awareness and response to sounds, and that training in musical skills is associated with improved reading skills. This thesis reports on a two-year study to expand the previous work. Fifty one children in their fourth year at primary school took part in the first year of the study. Two groups of children, matched for initial reading ability, were seen weekly. One group (intervention) participated in musical activities, the other control group in verbal activities. In addition, two boys with specific learning difficulties were put on an intensive experimental regime. The remainder of the children formed an unseen control. The results showed similar trends to the earlier study, but the intervention did not lead to significant gains in reading. Because the outcome of the work with the two boys with severe reading difficulties proved to be particularly interesting, the second year of the study focused on children who had already been identified as dyslexic. The training programme in the second year of the study was similar to that used for the two boys with special needs in the first year of the project. While the results of the study did not support the hypothesis that musical activities in the classroom significantly improve literacy skills, there were indications that some improvements had taken place.

Chapter 1

INTRODUCTION

The relationship between aural skills and reading

The predominant view of how reading develops emphasises the acquisition of phonological skills. The introduction will begin by reviewing some of the literature concerned with phonemic and phonological awareness in reading before moving on to a discussion of phonological processes in reading. An argument for taking a wider view of the source of the difficulties encountered by dyslexics is developed taking into account evidence from a number of researchers who suggest that dyslexics may have problems of a non-phonological nature which may contribute to reading failure.

Finally, in linking the predominant view of the development of word reading with musical literacy, the literature concerned with music and reading is reviewed.

Phonemic awareness and reading

Children's awareness of sounds, or "phonological awareness" as it is often called, appears to play an important role in learning to read (e.g. Bryant et al. 1990; Goswami, 1990; Treiman, 1985; Bryant and Goswami, 1987; Morais, Alegria and Content 1987). Bryant and Bradley (1983) showed that pre-school phonological awareness skills predicted later reading development. They argue that there exists a continuum stretching from children who are particularly insensitive to phonological segmentation through to those who find no difficulty, and that backward readers have difficulty in breaking up words into their component sounds. Moreover, they claim that their research shows that backward readers can be moved up this continuum (Bryant and Bradley, 1983).

Bryant and Bradley's assertion that poor readers have difficulty in breaking up words into their component sounds is endorsed by Adams

(1990), who, in a review of the literature, suggests that reading achievement is dependent upon the ability to discriminate between phonemes; these are speech sounds which are smaller than a syllable and correspond roughly to the individual letters of the alphabet. She points out that it is not lack of ability in hearing the difference between two phonemes which is the problem, but rather the inability to segment them in words.

Long before going to school, children become thoroughly familiar with the phonemes in the language of their culture. Eimas, Siqueland, Juszyk and Vigorito (1971) have shown that infants as young as one month old make phonemic distinctions between sounds resembling speech. However, Adams (1990) suggests that children who make good progress in beginning to read are no more able at hearing the differences between phonemes than less successful beginners. The difference is that less able beginner readers have difficulty in analysing the sounds in syllables, i.e. explicitly segmenting the phonemes e.g. c-a-t. She contends that in order to achieve success in reading, it is necessary to become consciously aware of automatic processes such as the sound structure of syllables.

Bryant and Bradley (1985) have argued that it is possible to predict which children are likely to experience difficulty with reading even before they begin formal schooling. They base their claim on a number of studies, including one by Lundberg et al. (1981) which was conducted over a period of eighteen months with children who were first seen when they were in kindergarten. The study was designed to measure the relationship between pre-school children's awareness of sounds and their subsequent ability in learning to read and spell. When the children were first seen a few months prior to starting school, they were given a series of tests, many of which measured their ability at segmenting speech sounds. A year later, and again after a further period of six months, the children were visited at school, and those who had performed well in the pre-school phonemic awareness tests maintained their superiority over the others in tests to measure their progress at reading and spelling.

Bryant and Bradley (1983) conducted a large scale study, involving more than four hundred four and five year olds, to measure phonemic awareness in children who had not begun formal reading instruction. For this study they chose the "oddy task", in which children were asked to identify which word was different in a set of three or four spoken words. In each set of words the first, middle or final sound in one of the words was different from the rest (e.g. pig,hit, pin or give, pat, girl, get).

Three years later, Bryant and Bradley (1983) found a significant relationship between the children's reading ability and their earlier achievement in the oddity task. Bryant and Bradley (1983) realised that this result in itself was not enough to prove that differences in phonemic awareness caused the differences in reading achievement. Because the outcome of the study might have been influenced by some other factor, they took their experiment a stage further in an attempt to produce evidence to show that reading skills can be enhanced by phonemic awareness.

They selected sixty five of the children who had been most unsuccessful in the oddity task and divided them into four groups, giving each group forty individual tutoring sessions. The children in the first two groups were shown how to compare the first, middle, and final sounds of words. In addition to this, the children in the second group were taught how these sounds corresponded to alphabetic letters. The children in the third group were shown how to arrange words in semantic categories (e.g. hen and pig are farm animals). The fourth group had no special training.

When the children were tested after the training period, the first group, who had been taught phonemic awareness only, scored better in reading than the group trained in semantic categories and the group with no training, but the difference was not enough to be statistically significant. In contrast, the group trained in phonemic awareness and letter/sound correspondences scored far better than all the other groups. The results of the Lundberg (1988) study and that of Bradley and Bryant (1983) indicate that training in sound categorisation alone is not a particularly powerful method of

improving reading skills and that training in letter/sound correspondences is far more effective. Hatcher et al. (1994) have named this the "phonological linkage hypothesis" i.e. interventions to improve phonological skills need to take place at the same time as the teaching of reading to gain the maximum beneficial effect.

This hypothesis is reinforced by an earlier study by Bradley (1981) in which she attempted to show that a multi-sensory approach to teaching poor readers about written words was more successful than other methods. Bradley (1981) conducted a study to test the effectiveness of a method similar to one which was pioneered by Gillingham and Stillman (1956), known as "Simultaneous Oral Spelling". The children taking part in the study were taught to read twelve words. These were divided into three sets of four, with each set being taught by a different method. The first was Bradley's (1981) version of "Simultaneous Oral Spelling" and it involved three major elements - seeing the word, spelling out the letters and, thirdly, writing movements. The second method did not include spelling out the letters and the third method omitted the writing element. After four weeks the poor readers were considerably more successful at spelling the words taught by "Simultaneous Oral Spelling" than by the other two methods.

However, there is a debate about whether phonemic segmentation ability comes before or is the result of being able to read. Studies by Morais et al. (1979) and Read et al. (1986) showed that phonemic segmentation ability does not develop naturally, but is the result of learning to read an alphabetic writing system. Thus, Morais et al. (1979) showed that illiterate Portuguese adults were considerably worse at adding or deleting phonemes from words than adults who were able to read, but had not learned until late in life. Similarly, Read et al. (1986) showed that Chinese adults who had left school before the introduction of pinyin (alphabetic script) also had more difficulty in adding or deleting phonemes from spoken words than adults who had been taught alphabetic script.

The work of Morais et al. and Read et al. is not necessarily contradictory to that of Lundberg (1981), Bradley (1981) and Bryant

and Bradley (1983). It indicates that there may be more than one way of developing phonological awareness. It is also argued that the causation is reciprocal - phonological awareness benefits reading and reading benefits phonological awareness (Bryant and Goswami, 1987; Morais, Alegria and Content, 1987). Furthermore, it has become evident that there are different levels of phonological awareness, and that this has led to different views on how a phonological approach to reading should be taught.

Phonological processes in reading

Bryant and Bradley (1983) have shown that pre-school children with an awareness of onsets and rimes, e.g. m-at, become better readers than children who do not have this skill. Because preschool children are known to have problems with breaking up words into their component sounds, e.g. c-a-t, (Content et al., 1986), a view has emerged that it is preferable to teach children to read words in the first instance by analogy, showing that words which end with the same sound often share a common spelling pattern. This is highlighted in a study by Goswami (1989) in which the children taking part were told that they were going to play a game about "working out words". They were taught "clue" words which remained visible throughout the session. The test words could be read by analogy to the "clue" words (e.g. "peak", "weak"). Goswami (1989) found that children who had scarcely begun to read were able to use the spelling pattern of one word to help work out other words.

Bryant and Bradley (1985) made the inference that backward readers would find it difficult to make this kind of analogy and would be disadvantaged when presented with new words. In an attempt to show that errors made by poor readers are the result of difficulties in isolating speech sounds, Bryant and Bradley (1985) turned to the work of Frith and Snowling (1983) who compared mistakes made by a group of backward readers with a group of normal readers. Both groups had reached the same reading level, which meant that the backward readers were older than the group who could read without difficulty.

The children were asked to read a list of words which included "nonsense" words and meaningful words. An example of a "nonsense" word might be "hig" or "sanlud". It was anticipated that the backward readers would find it difficult to read the "nonsense" words because they would be unable to see the relationship between segments of words and sounds. As expected, the backward readers performed less well at deciphering the "nonsense" words than the other group of children. The meaningful words were divided into two kinds, regular and irregular. The meanings of the regular words could be worked out by sounding out the individual letters, as in the word "coffee", while the irregular words, such as "laugh", could not. The advantage of regular over irregular words was greater for the group of children who could read normally than for the backward readers. This provided further evidence for the view that backward readers are less able at working out relationships between letters and sounds than normal readers.

Further evidence of the effectiveness of training in letter/sound correspondences, highlighted in the studies of Bryant and Bradley (1983), Bradley (1981) and Hatcher (1994), appears in a study by Stuart and Coltheart (1988) which shows that children's phonological knowledge combined with letter/sound knowledge is a reliable indicator of later reading ability. Their study showed that when letter/sound knowledge was used to implement phonological knowledge, then phonological knowledge was a reliable predictor of reading ability when children were tested after only nine months of schooling.

Johnston and Watson (1997) showed that teaching letter/sound correspondences by themselves had no effect on reading and have shown that children's progress in reading can be affected by the method employed in teaching letter/sound correspondences. They conducted a study in which they compared 'analytic' and 'synthetic' phonics. In analytic phonics, a method much favoured in Scottish schools, children are taught to break words down into their component sounds. The method tends to be very gradual, with only initial letter/sound correspondences of words being introduced in

the early stages of reading and the middle and final letter sounds being introduced around the beginning of the third term. Johnston and Watson (1997) found that the children's skill in reading showed a marked improvement once they became aware of letters in words other than at the beginning. In contrast to this approach, synthetic phonics concentrates on teaching children groups of letters which can be put together to form words.

Johnston and Watson (1997) compared the progress of two groups of children of the same chronological age, a group of English children who were following a synthetic approach and a class of Scottish children who were taught by a gradual analytic approach. After two terms, the mean B.A.S. word reading score of the group taught by the synthetic approach was seventeen months greater than that of the other group. Acknowledging that success in reading entails more than the ability to read single words, Johnston and Watson (1997) also examined the long term effects of the two teaching methods. They compared the progress of two groups of children of the same chronological age and vocabulary knowledge who were at the end of their third year of schooling and who had been taught by the two different methods. The children taught by synthetic phonics were nine months ahead in reading comprehension.

Johnston and Watson (1997) have concluded from this study that it requires more than accelerated training in letter/sound correspondences to improve these skills. The teaching of blending skills is also essential.

Many recent studies have been concerned with comparing the effectiveness of different forms of intervention with poor readers. (Bosch et al., 1995; Hatcher et al., 1994; Gillon and Dodd, 1995). These studies highlight the accumulation of evidence that training in phonological awareness needs to be combined with other approaches, which involve literacy training, to have maximum effect.

Hatcher et al. (1994) conducted a study in which poor readers were given teaching in addition to their normal classroom activities. This additional teaching was given in four different experimental

conditions: Reading with Phonology, Reading Alone, Phonology Alone and a Control. Each group received an equal amount of time with the experimenter, which meant that the Reading plus Phonology group received less training in reading and less training in phonology than the Reading Alone and Phonology Alone groups, yet the Reading plus Phonology group improved most in reading. It is interesting that the Phonology Alone group made the most progress in phonological awareness, but the Reading alone group did not improve most in reading, reinforcing the importance of the need for underlying phonological skills in achieving success in reading, whatever additional training procedures may be applied.

The argument for an integrated approach is also taken up by Gillon and Dodd (1995) who conducted a study which investigated the effects of training phonological and semantic/syntactic skills on reading accuracy and comprehension performance. Training in phonological skills and letter/sound correspondences had a greater effect on reading accuracy than training in semantic/syntactic skills, but training in both phonological skills and letter/sound correspondences as well as in semantic/syntactic skills led to improved comprehension. The results of this study indicate that an integrated approach, focusing on underlying phonological, semantic and syntactic deficits can improve reading ability. Pupils who show delayed development in semantic/syntactic skills may fall behind in reading if intervention programmes are based solely on phonological processing tasks. The importance of developing the spoken language skills of children with reading disability needs to be recognised.

Evidence for problems in poor readers of a non-phonological nature

At this point in the discussion it is becoming clear that the "Phonological Deficit" theory alone, which was largely held accountable during the 1970s and 80s as the main source of difficulties encountered by poor readers, is being questioned. Additional factors are increasingly being taken into account as contributing to reading failure. Nicolson and Fawcett (1995), for example, point to the evidence from a number of sources that

dyslexics have difficulties with skills which are quite independent of phonological processing.

One of the alternative explanations suggested by recent researchers as a possible cause for reading difficulties suffered by dyslexic children is a deficit in temporal processing speed. Dyslexics have problems with rapid visual processing, as demonstrated by Lovegrove et al., 1990 who showed that dyslexic children have deficient transient visual processing skills. Dyslexia research has also identified difficulties in more general rapid performance. For example, Nicolson and Fawcett (1994) have shown that dyslexics take longer than normal readers to make decisions about given stimuli being real or nonsense words. Nicolson and Fawcett (1994) also found that dyslexic children showed reduced speed when asked to make a choice between two pure tones.

Van den Bosch et al. (1995) also draw attention to the evidence that failure to read words rapidly may lead to reading difficulty. They note the finding of Stanovich, (1980), that poor readers tend to avoid decoding words and rely on context instead of lexical sources of information, a tendency which can be overcome by using single pseudowords in training. Van den Bosch et al. set out to investigate whether a training programme in decoding skills is more successful under conditions of limited exposure than practice in reading words without limit of time. The children who participated in the study were divided into three groups. The first group of children were trained within time constraints, the second group were trained with no time constraints and the third group received no training. The results showed that poor readers can benefit from training in reading pseudowords provided they practise within time constraints. Without time limits training appeared to have a negative effect.

It is becoming increasingly apparent that the "Phonological Deficit Theory" no longer stands alone as the main cause of reading failure. The accumulation of evidence from different researchers who are offering a wider view of the problems experienced by poor readers is emerging.

Grogan (1995) highlights the importance of cognitive abilities related to reading which might have an effect on reading ability. With the effect of intelligence removed, the results of her investigation suggest that the auditory and visual sequential memory scores of children aged four can predict the reading scores of children aged seven. Both these tests measure verbal short term memory. While acknowledging that reading ability is affected by many factors, the data reported by Grogan (1995) suggest that verbal memory is the most important cognitive factor at age four in predicting reading at age seven.

Holligan and Johnston (1988) found that in addition to finding difficulty in carrying out an "odddity task" similar to the one described in the study by Bryant and Bradley (1983), poor readers also had a short term memory deficit in relation to their reading age. It is possible that the poor readers' performance may have been influenced by a general deficit in verbal short term memory rather than more specifically with difficulty in analysing the sounds in words.

Another important theoretical approach which is increasingly receiving attention is the "Automatization Deficit" hypothesis. - Nicolson and Fawcett (1995) tested two linked hypotheses: the "Dyslexic Automatization Deficit" hypothesis, that dyslexic children have difficulty in becoming automatically proficient in a skill, and the "Conscious Compensation" hypothesis, whereby dyslexic children are able to overcome or minimise a deficit by greater effort. They tested these hypotheses by administering a balance task. They used this test because it is a skill which requires a high level of practice and contains no phonological or reading component. Dyslexics did show marked balance difficulties but only when asked to carry out a secondary task, such as walking backwards, which Nicolson and Fawcett argued prevented them from making conscious efforts to compensate.

Of the theories available to account for the underlying cause of reading problems, the "Phonological Deficit" and "Temporal Processing" hypotheses were considered by Nicolson and Fawcett to

be too specific to explain the range of problems encountered by dyslexics, while the "Dyslexic Automatization" Deficit and the "Conscious Compensation" hypotheses were thought to be too general. Consequently Nicolson and Fawcett designed a range of tests which would examine not only phonological skills, but would also test 'primitive' cognitive and motor skills.

The results showed that dyslexics do show significant phonological deficits, but that these are accompanied by deficits in processing speed, motor skill and balance. Because the non-phonological skills cannot be readily linked to reading, Nicolson and Fawcett believe that the results confirm their view that dyslexics' difficulties go beyond phonological tasks. They found that the "Automatization Deficit" theory provides an explanation for difficulties which dyslexics have with any skill where conscious compensation is prevented. This is likely to happen in skills which require rapid processing or which include a combination of subskills. Reading is an example of a skill made up of subskills requiring automatic processing and deficits should show up in this area.

Nicolson and Fawcett suggest in their summary that it is necessary to look further than phonological tasks for the underlying cause of the difficulties experienced by dyslexics and while they propose that automatization difficulties provide a broader explanation, they propose that further research is necessary to try to establish the underlying cause of these deficits. Nevertheless, they have shown that dyslexia research should extend beyond the current tendency to focus mainly on reading and the description of dyslexia as a "specific learning disability". The "Automatization Deficit" points to a more general learning deficit.

Evidence for musical skills being impaired in poor readers

Music seems to show the same pattern of difficulties for poor readers as language, indicating that they have more general problems (as proposed by Nicolson and Fawcett, 1995), not just a phonological one.

In the process of learning to read, many factors are involved which are shared with other areas of learning. There are many things about reading which are similar to music. For example, music and written words use symbol systems. Success in reading words and music involves having the ability to decipher written symbols and to relate them to the sounds which they represent. As children progress with music they learn to group symbols and this is the same for grouping letters into words. Children who have difficulty with reading words may also encounter problems when learning to interpret musical notation (Smith,1988).

Hubicki and Miles (1991) subscribe to this wider view, drawing attention to the similarity of the problems which can be encountered in the teaching of the symbolic representation of musical notation, reading, spelling and mathematics. They emphasise the value of a multisensory approach in all teaching of notation and refer to the use of their scheme of "Colour Staff" where the pupil is able to touch physical representations of musical symbols in addition to seeing them. They note the long-recognised support for a multisensory approach in the teaching of literacy and the improvement in letter-sound correspondences which can be gained where pupils are encouraged to handle plastic letters (Bryant and Bradley 1985). Similarly, in mathematics a physical approach can be adopted by the use of apparatus such as Cuisenaire rods which can give children the experience of "doing" the calculation of adding, subtraction etc., thus gaining a greater understanding of the symbols "+" and "-" etc. They quote a passage from Brand (1984) which sums up the importance of the multisensory approach to learning. Although written from the context of teaching literacy, it is equally applicable to music and mathematics:

"Too much emphasis has been placed on learning to spell through visual methods. The ears and the mouth have been forgotten and the power of the hand ignored. If a child, or an adult, hears a sequence of sounds, sees them visually represented, feels the sequence in his mouth and reproduces the symbols with his hand, his awareness of the basis of written language is awakened."

Ganschow et al., (1994) describe the difficulties of seven dyslexic musicians in relation to the formal study of music. Among the difficulties which they reported, all seven acknowledged having difficulty in reading musical notation. Rhythm was also a major problem. Hubicki and Miles (1991) also suggest that difficulties which dyslexics experience with music are not all concerned with musical notation but also involve rhythm. They speculate that dyslexics' difficulties with musical notation and rhythm could arise from problems in processing information quickly, a difficulty which is encountered in the reading of words. Van den Bosch et al. (1995) point to the general consensus that "... for many children, reading difficulties are characterised by slow rather than inaccurate decoding." An observation by Oldfield (1987), a dyslexic flautist, reinforces this suggestion. "My sight reading is a bad point; I know it all but it's slow. Then eventually my fingers remember."

Miles and Miles draw attention to the research concerned with dyslexia and music. They note that evidence from a variety of sources has been put together in a booklet by Smith (1988) listing some of the difficulties encountered by dyslexics when dealing with music. This list includes remembering a melodic or rhythmic phrase and singing or clapping it back (Miles and Miles, 1990, p.49).

The difficulty which dyslexics have with memory is also reported by Ellis (1984). Ellis (1984) reports that many studies find dyslexics to have impaired verbal short term memory compared with normal readers. This deficit in verbal short-term memory might influence the ability to hold rhythmic patterns and pitched sounds in the memory long enough to make decisions about them.

In a major review of phonemic awareness and phonological approaches to reading Share (1995) also notes that poor readers have difficulty in retaining aurally or visually presented verbal material. Reduced memory span in poor readers leads to problems in a number of verbal materials e.g. digits, letters, word strings and sentences as well as in naming objects and pictures.

Bottari and Evans (1982) add a different slant to the question of memory in relation to music and language. They undertook a study in which visual-spatially oriented and verbally oriented students who had been identified as having learning difficulties on musical tasks were asked to listen to lyrics which were sung and/or spoken either with or without musical accompaniment. In tests of recall and memory of the verbal material contained in the lyrics, the students in the visual-spatial group obtained significantly higher recognition scores when the words were sung than when they were spoken. Bottari and Evans (1982) suggest that musically presented information might enhance the memory of this group.

The literature available to date which links impaired musical ability with poor reading skills is quite limited. Nevertheless, a number of recent studies have been undertaken which suggest that there may be a connection between these two areas.

A connection between music and reading has been made by Wisbey (1980) who suggests that working with sounds through music may be related to success in reading. Wisbey proposed that many intelligent children were failing to become literate because of undetected hearing problems during infancy or early childhood. According to Wisbey (1980), many children with early hearing problems either outgrow the symptoms or have them treated, so that when tested at a later date, no defect is apparent. As a result, the consequences of the early hearing problems are left untreated. She points out that early hearing problems may result in distorted sounds being learned, and that corrected hearing involves the learning of new sounds, a task which older children find difficult, due to less plasticity in the brain as it develops.

Hearing is regarded by Wisbey (1980) as a musical process, developing as a consequence of a baby's sensitivity to changes in pitch, duration and loudness levels of sound sources. Without adequate hearing, speech, proper function of the eye muscles and motor control are likely to be impaired, eventually giving rise to problems with reading and writing.

Whereas Bradley (1981) found that a programme involving a multi-sensory approach to reading and spelling was beneficial in helping poor readers to improve their literacy skills, Wisbey (1980) proposed that such difficulties could be prevented by using musical activities to help children develop a multi-sensory awareness and response to sounds, which would help to compensate for any earlier deficit caused by undetected hearing problems.

A study to investigate the relationship between musical ability and literacy skills is described by Douglas and Willatts (1994). A total of 78 children, drawn from two schools in the same area of a large town in central Fife, took part in the study. The only basis for selection was that they were in their fourth year at primary school. The results of the investigation showed that there was a significant correlation between rhythm and reading. Preliminary analyses indicated that perception of pitch was also significantly related to reading, but Douglas and Willatts (1994) realised that general intelligence may have been responsible for these correlations. When further analyses were carried out with the influence of intelligence removed, pitch no longer showed a significant relationship to reading.

Atterbury (1983) undertook a study to investigate possible differences in rhythmic ability between learning-disabled readers aged seven and eight and chronological age controls. The study was undertaken in response to the increased integration of special needs children into mainstream classes as a result of Public Law 94-142 in the United States. The rhythm section of Primary Measures of Music Audiation (Gordon 1979) was adapted for the reading-disabled children. She found that there were significant differences in rhythm pattern ability between the groups. The differences were greater between the two reading-ability groups at age seven than at age eight.

Hemisphere specialisation and musical ability

It seems evident that the areas of the brain responsible for the processing of music seem to have some overlap with those responsible for language (Sloboda, 1985). The traditional view that the right hemisphere of the brain is dominant for music has become open to question. Evidence from a number of studies appears to point to rhythmic awareness being a left hemisphere activity, and the mechanisms which control language are mainly concentrated in the left hemisphere.

Bentley (1966) states that sounds have a "meaningful relation" to each other in terms of pitch and rhythm, but this does not mean that pitch and rhythm are of necessity part of the same process. Springer and Deutsch (1984) make the suggestion that rhythmic processing is controlled by the left hemisphere of the brain, while the right hemisphere controls melodic judgements. A possible explanation for the significant relationship between rhythm and reading could be that they are processed by the same area of the left hemisphere. This hemispheric distribution of musical skills may also explain the apparent lack of significance between pitch and reading in the study by Douglas and Willatts (1994).

Highly trained musicians who have suffered left hemisphere brain damage provide evidence of the hemispheric distribution of musical skills. Springer and Deutsch (1984) describe how Ravel suffered a left hemisphere stroke, and although he was still able to recognise melodies and detect mistakes in musical performances, he suffered a substantial loss in his ability to identify written music and was no longer able to play or compose. His disorder showed that simple, perceptual abilities had been preserved, while abilities which involved any form of lexical operation had been lost. Ravel's musical deficit showed a distinct resemblance to his language disorder.

The hemispheric distribution of musical processes is illuminated further by Code (1987) who describes how Bever and Chiarello (1974) conducted an experiment with two groups of subjects, musicians who were currently playing an instrument or singing, and

non-musicians who had not participated actively in music during the previous five years. All the subjects were right-handed. They were asked to listen to a tape of specially prepared melodies, and had to decide whether each melody had been played before in the sequence. Beaver and Chiarello (1974) found that the non-musicians performed more accurately when the melodies were presented to the left ear, indicating a right ear advantage. The musicians, on the other hand, performed more accurately when the melodies went to the right ear, indicating a left hemisphere advantage. When the subjects were played a series of random notes, both groups showed a right hemisphere advantage.

Beaver and Chiarello (1974) explain these results by suggesting that trained musicians use an analytic approach in processing music, while non-musicians adopt a holistic approach, viewing music as a total entity rather than something to be broken down into its component parts. They support the widely held view, which was first proposed by Hughlings Jackson (see Taylor, 1932), that analytic processing is specific to the left hemisphere and holistic processing to the right hemisphere.

More recent research by Behne (1995) shows that musicians usually have a thicker corpus callosum than non-musicians and that the earlier in life musical activity begins, the thicker it becomes. The corpus callosum is a band of nerve fibres that connects the two hemispheres of the brain. Evidence that the corpus callosum is affected by the musical sophistication of an individual provides some explanation of the bilateral nature of pitch processing in trained musicians.

Just as music was traditionally viewed as a right hemisphere activity, language was considered to be dominated by the left hemisphere. More recent studies, however, have shown that certain language sub-skills are processed in the right hemisphere (Code, 1987). Ross and Mesulam (1979) noticed voice changes in pitch, volume and tone in patients who had suffered right hemisphere damage. It would not be relevant to the present study to examine these divisions of hemispheric activity in depth, but a broad,

general description would be to suggest that the left hemisphere encompasses language processes which are analytical and functional, whereas the right hemisphere is involved with automatic, overlearned language activities (Code 1987). These general descriptions can be applied similarly to music (Sloboda 1985), so consideration of these hemisphere skills supports the claim that music and language abilities may be related.

Effects on reading of training in musical skills

Douglas and Willatts (1994) carried out a pilot intervention study to show the practical application of the findings of their main study in which they found a significant relationship between rhythm and reading. Two groups of children, matched in reading ability, were seen weekly, one group participating in musical activities, the other in discussion. Because the pilot study took place in a small school, few of the children had severe reading problems. It was therefore decided to select children with a range of reading abilities. After six months, the reading scores of the musical intervention group had improved significantly over the scores of the control group.

In a recent Swiss study by Weber, Spychiger and Patry, (1993), 1200 children from all over Switzerland, aged between seven and fifteen had their music lessons increased to five each week, instead of two, for a period of three years. The time normally spent on maths, mother tongue, and one other main subject was reduced to accommodate the additional music time. No additional homework was given to compensate for the time lost in these subjects.

The hypothesis proposed that intensive occupation with music (singing, group music making, dancing, the teaching of the ability to read music and of listening to music) enhances concentration, memory and the ability linguistically and generally to express oneself.

The teachers of the children in the control and experimental groups had to be good practitioners. The teachers of the experimental

children had to be able to sing, to enjoy singing and be able to master an instrument. To ensure some level of uniformity of music instruction for the children, training seminars for the teachers, lasting a week, were held twice yearly.

At the end of the training period it was found that the children given extra music lessons were no worse at maths than the control group despite the reduction in maths time and that they showed significant improvements in their ability to retell the contents of a story which they had been told. Code (1987) quotes a study by Wapner, Hamby and Gardner (1981), in which right hemisphere-damaged patients were shown to have difficulty in recalling the main events of fable-like stories. It seems plausible, therefore, to suggest that practice in pitch activities may have helped to improve a language sub-skill also processed in the right hemisphere.

The teachers also reported that the younger children who had been given extra music learned to read more easily. It has already been stated that rhythmic awareness is a left hemisphere activity (Sloboda, 1985) and the mechanisms which control analytical aspects of language are mainly concentrated in the left hemisphere. Douglas and Willatts' (1994) study supports Bever and Chiarello's (1974) finding and adds evidence to the suggestion that musical training can enhance reading ability. They show that with musical training pitch can become bilateral and suggest that the ability to process melodic as well as rhythmic aspects of music analytically may help to stimulate a similar response to language. While the Swiss study (Weber et al., 1993) suggests that a relationship exists between musical skill and learning to read, the researchers did not use standardised tests to measure the children's reading ability before and after the intervention. They chose instead to use observation and qualitative interviews with class teachers, as a method of assessing the children's progress. An interesting and important feature of the study was that the differences between the control and experimental groups did not show until the third time of testing, i.e. in the third year of the study. Extended music lessons therefore required time to give maximum benefit.

Douglas and Willatts (1994) found a significant relationship between rhythm and reading. After a period of musical training the younger children in the Swiss study were reported to have learned to read more quickly than the children in the control group. It could be suggested that the rhythmic aspects of the musical training had a beneficial effect on the reading of the younger Swiss children. The improvement in the Swiss children's ability to retell the contents of a story also reinforces the outcome of the study by Wapner et al. (1981) who found that right hemisphere-damaged patients found it difficult to recall the main events of fable-like stories. If rhythm is a left hemisphere process (Bever and Chiarello, 1974) and pitch is mainly a right hemisphere process, it seems plausible to propose that the daily exposure of the Swiss children to pitch and rhythmic activities may have triggered a beneficial response in the language sub-skills attributed to each of the hemispheres.

The purpose of the first study reported in this thesis was to explore further the relationship between classroom musical activities and literacy skills. The activities undertaken by the children were similar to those of the previous study (Douglas and Willatts, 1994), but with larger groups of children involved. In addition, two children with specific learning difficulties took part in an observational study during the period of the intervention to examine the effects of a more intensive regime. In a final study, children with severe reading problems carried out musical activities to see whether this would enhance reading and spelling ability.

Chapter 2

A training study to see if accelerating musical skills enhances reading in Primary 4 children

Introduction

The school in which the first year of the study took place was selected by the researcher after consultation with an official from the Education Service in Aberdeen. The principle criteria for selection were that the Headteacher should be interested in educational research taking place within the school, that the school should be large enough to have two classes at Primary Four level and that the school be close to the College where the researcher was employed.

The reason for the first of the criteria is obvious. It is inevitable that conducting a research project over a lengthy period is disruptive to a school and therefore a supportive Headteacher is vital to its success. The second of the criteria may be less clear. The reason behind it was that the main study undertaken by Douglas and Willatts (1994) involved Primary Four children and the researcher wanted to work with children of a similar age; two classes at Primary Four stage were considered necessary to provide sufficient children with a range of abilities from which to select the intervention and control groups. The last of the criteria was simply a matter of convenience. The researcher's timetable included an allocation of one morning each week to undertake research, therefore close proximity to College was desirable in order to minimise travelling time.

Not only was the Headteacher of the chosen school interested in becoming involved in the project, but she was also keen to involve the Learning Support teacher and offered her services in any way which might seem appropriate.

The children's ability in reading and verbal understanding was tested before and after the study. Two groups of ten children, matched in these language skills, were selected to take part in the study and the children who did not take part acted as an unseen control. Most of the children selected had also been identified by their teachers as 'under-achievers.' The 'under-achievers' were equally distributed between the groups.

One control subject was dropped in week two because it was disclosed that he was frequently absent. The tables show the scores of the child who was chosen to replace him.

The musical activities were designed to mirror a phonics programme e.g. visual matching of rhythmic patterns with pictures of rhythms. In a phonics scheme, children are encouraged to make decisions about the sound values of letters as well as on visual discrimination. In the parallel music scheme devised by the researcher, emphasis was placed on activities moving frequently from visual to aural stimuli. Memory was also developed.

It was thought that the music scheme would help to reinforce the phonics teaching which had already taken place as part of the normal teaching of reading and that the children in the intervention group would show an improvement in reading and possibly in other areas of language development.

METHOD

Subjects

A total of 51 children, ranging in age from 7.6 to 9.6, with an overall mean age of 8.04, participated in the study. See Table 1.

Table 1 - Subjects participating in the study

Number of Subjects	51
Age Range	7.6-9.6
Mean Age	8.04 (0.38)

The only basis for selection was that they were in their fourth year at primary school. The school from which the children were drawn was situated in the city of Aberdeen and attracted pupils from a wide variety of backgrounds.

The children came from two separate classes, each with its own class teacher. Learning support was also available from a specialist teacher who sometimes worked in the classroom and who on other occasions withdrew children for individual and group help.

Summary of school's policy for the development of reading

Normal Classroom Programme

Oxford Reading Tree is the core scheme. It uses a "story method" whereby readers are encouraged to infer and predict from the context. The sequence of learning is:

MEANING - > SENTENCES - > WORDS AND LETTERS

Key words are reinforced through Sunshine Spirals and other readers to give a wide reading experience.

Phonics are taught through Letterland and Oxford Reading Tree resources.

Special Needs Children

Those pupils who are having difficulty with reading receive support from the early stages. Oxford Reading Tree is adapted to meet their needs by slowing the pace of learning and providing opportunities for consolidation.

Fuzzbuzz provides a fresh start for these children and a very structured approach. It consists of a phonic scheme which should force the child to take decisions on the sound values of letters and letter combinations, not just on visual discrimination. This enables some poor readers to acquire a very basic vocabulary. The learning support teacher does not use this scheme beyond Level 1 and prefers to move on to Wellington Square as it provides a richer and more meaningful context for reading. It has a useful range of worksheets and activities to support and extend reading skills.

Design

The study was based on a standard intervention and control design.

During October/November 1994, all 51 children were pre-tested on a number of language measures. Ten children were selected for the intervention and ten were selected as controls. The two groups were matched in reading ability and verbal ability. They were chosen either because their teacher had identified them as under-achieving, or because they had reading scores which were much lower than their verbal ability scores would suggest. Over the remainder of the school year, from the end of November until the end of May, the ten children in the intervention group were given a weekly training programme of musical activities. They were taken in two groups of five, each group being allocated thirty minutes. To ensure equal time was spent with the intervention and control groups, the researcher worked for the same length of time with the ten children in the control group, introducing them to spoken language activities. Time constraints made it necessary to take all ten children in the control group together for thirty minutes.

Two children from one of the classes, who had been identified as having special needs, were put on a separate, more intensive intervention regime. They also were seen together weekly for thirty minutes.

Apart from the testing, no social interaction took place between the remaining twenty nine children and the researcher during the period of the intervention. They formed an unseen control group.

A second assessment of the two boys with special needs was made at the end of January and all of the children were assessed again in June.

Assessment Materials

1. The British Ability Scales (BAS) Word Reading Test

The British Ability Scales (BAS) Word Reading Test A (Elliot et al., 1983) was used as a standardised measure of context-free word recognition. The test consisted of a list of 90 words of increasing difficulty which produced a score from which each subject's reading age was calculated. Standardised score equivalents of the raw scores were also calculated.

2. The NFER Nelson Primary Reading Test

The NFER Nelson Primary Reading Test - Level 2, (France, 1981) was administered to measure the children's reading comprehension and knowledge. Part of the test measures decoding: the subjects had to select one word from four as representing the meaning of each of eight pictures. They then had to select the correct word from a choice of four to complete a series of 48 sentences of ever-increasing difficulty. The raw score was calculated by adding together the number of correct answers.

3. The English Picture Vocabulary Test

The English Picture Vocabulary Test (Brimer and Dunn, 1968), was used to provide an independent measure of verbal ability. The EPVS was chosen for the speed and ease with which it could be administered and scored. Subjects had to select one illustration from four in each of forty sets of pictures. The researcher gave the following instructions. "As you look at each set of pictures, I will say a word and I want you to put a cross on the picture which shows its meaning." Standardised score equivalents of the raw scores were also calculated.

4. The Schonell Spelling Test

The Schonell Spelling Test was administered to estimate each subject's attainment at spelling. The test consisted of 100 words, divided into groups of ten words of ever-increasing difficulty.

5. Non-Word Reading Test

The Non-Word Test was used to assess the subjects' phonic skill. A list of 40 phonotactically legal non-words was presented to each child. The test was a mixture of one and two syllable non-words. It was explained to the children that although they looked like real words, they were actually "pretend" words which they would not know and they were to attempt to read these "pretend" words as if they were real. The score was calculated by adding together all the correctly-read words.

Full details of the non-word test are given in Appendix 1.

6. Regular and Irregular High and Low Frequency Word Reading Test.

This test consists of 56 words, divided into four lists of 14, each consisting of randomly ordered regular and irregular high and low frequency words. This test was administered to see if the children showed any advantage in reading regular versus irregular words. This measures whether a phonological approach to reading is taken, on the basis that the advantage for regular words stems from the fact that these items can be read phonically whereas the irregular words cannot.

See Appendix 2.

Procedure

As a starting point all 51 children were tested on three of the reading and language measures.

1. The British Ability Scales (BAS) Word Reading Test
2. The NFER Nelson Primary Reading Test
3. The English Picture Vocabulary Scale

The results of the tests were used to select two groups of ten children from the original 51 children, one to take part in musical activities, the other in verbal language activities. See Table 2 for means and standard deviations.

Table 2- Mean scores (standard deviations in brackets) of the intervention and control groups in November 1994

	Intervention	Control	Unseen
Chronological Age	8.31(0.59)	8.17(0.33)	8.20(0.34)
B.A.S. Word Reading Test (Reading Age)	7.87(1.38)	7.87(1.10)	7.97(1.09)
N.F.E.R. Nelson Primary Reading Test	6.85(0.99)	6.74(0.79)	6.83(0.67)
English Picture Vocabulary Scale Standardised Score (mean 100)	99.6(10.7)	95.7(7.17)	83.5(8.39)
Non-Word%	57.5(34.75)	64(26.25)	-
Spelling	7.52(1.33)	6.83(0.85)	-

The reading score and the E.P.V.S. were used as the criteria for allocating the children into two matched groups and for measuring any improvement. See Table 2 for means and standard deviations. The remaining children formed an unseen control group. This meant that there was an intervention group, a seen control group and an unseen control group. The seen control group were in contact with the researcher for the same period of time each week as the intervention group. Instead of musical activities in which the intervention group participated, they took part in language activities. The unseen control group comprised the remaining children from both the participating classes who were neither in the

musical intervention group or the control group. Apart from the assessments, they had no contact with the researcher during the period of the intervention.

The children selected for the intervention or control group had all scored reasonably to very well in the test measuring verbal ability. See Table 3 for means and standard deviations. The two groups included a range of reading skills including low achievers and more able readers, but most were performing below their verbal ability. The more able readers were included to provide a range of reading abilities comparable to those of a previous study (Douglas and Willatts, 1994). In addition, two boys with special needs were put on a separate, more intensive regime. All of the children were under-achievers in some way and the groups were carefully matched to take account of their difficulties. The reading scores of the subjects were matched on a one-to-one basis. This meant that all twenty of the children's reading scores were ranked from the highest score to the lowest score and were then matched into pairs to form the intervention and control groups. To avoid all the higher scores falling into one group, the allocation to one or other of the groups was staggered e.g.

<u>Intervention</u>	<u>Control</u>
Subject 1	Subject 2
Subject 4	Subject 3

As well as the three tests already described, the children selected for the two matched groups and the boys on the intensive regime were given the non-word test and the Schonell Spelling Test. The boys with special needs were also given the regularity task. The additional tests were used to give a more complete picture of the language abilities of the children who were to be involved in the intervention. See Table 4 for means and standard deviations of the non-word and spelling scores of the Intervention and Control groups in November 1994. Details of the scores of the two boys with special needs will be shown in Chapter 3.

Teaching Materials

Music Group

1. Extracts from "Oscar Moves On" (Holdstock,1990).
2. Flash cards, melodic and rhythmic, devised by the researcher.
3. Musical material devised by the researcher.
4. Percussion instruments - tuned and untuned.
5. Descant recorders.

Control Group

1. The Spoken Word by Richard Brown (1989), published by Oliver and Boyd : Harlow, Essex.
2. Story books selected by the class teacher and the researcher
3. Material about the Planets from the Science Department at Northern College Aberdeen. - to fit in with class project.
4. Extracts from a book of poems "I'd Like to be a Teabag."- B.B.C. Books, 1991.

Teaching Procedure

Intervention Group

The following section contains a brief description of each week's activities with explanations of the reasons for their introduction. A selection of appropriate activities can be found in Appendices 3, 4 and 5.

Week 1 (30:11:94)

- i) **Clapping round the circle.** This activity was introduced to aid the development of the ability to maintain a steady beat. Keeping a steady beat is not easy for most children (and adults), and so a range of games for this purpose was built up over the weeks of the intervention. The acquisition of this ability was considered to be fundamental to the entire music programme.
- ii) **Exploring Sound.** The children investigated the different sounds which they could make with the untuned instruments. Particular attention was paid to high and low sounds in order to build up an awareness of pitch. The children were encouraged to listen carefully not only to their own sounds but also to those of the other children.
- iii) Each child was given an instrument and in turn they echoed rhythmic patterns which were played to them.
- iv) Two chime bars were selected - G and the E below. Each of the children's names was then sung round the circle. They identified the number of "bits" in each person's name.
- v) To establish facility with the tuned instruments, a game was played which gave the children the opportunity to play all of the available instruments one after the other. This was a "follow my leader" game where all of the tuned instruments

were placed in a row. Using two beaters, one child investigated all the possibilities of the first instrument until alerted by a sound from the cymbal, which indicated that it was time to move on to the second instrument whereupon the next child started to play on the first instrument. This continued until every child had played all of the tuned instruments. The insistence that they use two beaters, alternating hands, was to give the children a feeling of balance and freedom in the body. If only one beater is used, tension and rigidity quickly set in.

Week 2 (7:12:94)

- i) To pursue the development of a steady beat and to introduce a visual element, a squared grid (16 squares in 4 rows of 4), with pictures of either hands or feet in the squares was used. The children had to "read" the squares from left to right and back to the left to begin each new line, either clapping or tapping feet. The grid was very economical as it could be moved round to provide four different combinations of sounds.
- ii) A second grid was introduced with circles in some of the squares, the remaining squares being left blank, introducing the concept of sound and silence.
- iii) The fun characters from "Oscar Moves On" (Holdstock 1990) were introduced. See Appendix 3. As a picture of each character was shown to the children its name was clapped by the researcher and echoed by the children. This activity required considerable reinforcement, indicating that memory might be a problem with some of the children.
- iv) The children were asked, one at a time, to place the four characters in any order they wished. The group first clapped the "tune", then played it on untuned percussion. This activity was chosen to introduce the association of a visual shape with a particular name and rhythmic pattern.

- v) The children were shown a drawing of a staircase with eight steps. Pointing, they each "climbed" the staircase, resting on each step. Two coloured circles were chosen and placed on the first and third steps. Everyone had a turn of playing the chime bars G and the E below while someone else selected the order in which they were to be played by pointing to the circles at random. This activity introduced the children to the idea of reading music. The staircase was used as a physical representation to establish the understanding that tunes go up and down.

Week 3

- i) **Warm-up** - Circles as already described.

Variations to reinforce reading from left to right.

Each child chose an untuned instrument. The leader clapped (or played the drum) at squares with circles and the partner played at the blank squares.

One child was made responsible for playing the top row only. Each subsequent row was played by a different child, each following on the previous one without a break.

When the children became competent at this activity, the card was played as a round.

As well as developing the visual element, the children's feeling for pulse was also being reinforced. In order to succeed it was essential that they maintained a steady beat.

- ii) Revision of staircase. Children took turns to play from low C to the C above.

Stickers were placed on the steps at random. The children picked out the correct notes on tuned percussion.

- iii) The "Oscar Moves On" characters were re-introduced. Flash cards to match the rhythm of each picture were shown. Only the heads of "notes" were represented to avoid confusion and to build up to traditional notation gradually (using red stickers).
- iv) Each child arranged the four pictures in the order of their choosing. Each tune was then played using untuned instruments.
- v) Using only G and E, rhythms were played to the children and they were asked to identify which "characters" were being played.

A new family was introduced, based on compound time rhythms. See Appendix 3.

The programme each week ensured that there was a constant shift of emphasis from visual to aural activities.

Week 4

- i) **Circles**, played as written working through the four lines. The top line was taken in isolation and played through several times. When this seemed secure, the pattern was played four times through, and each time the start was moved along one square. This involved the children in having to make very quick decisions for accuracy and extremely rapid eye movements from left to right. This exercise was also a good reinforcer for keeping a steady beat.
- ii) The "Oscar Moves On" characters were revised and matched to rhythmic patterns.

The new compound time family were also revised to reinforce names.

- iii) **Tuned instruments.** Using cards with the note B in various rhythmic patterns the children played separately and together.

Week 5

- i) **Pulse.** The children tapped feet and marched round the room. It was explained to the children that some tunes have a "walking" feel to them. They were shown the flash card with "taa" on it and this was held up while the children walked.
- ii) The rhythm card "taa, ta-te, taa, rest" was played starting on the 1st. 2nd 3rd and 4th beats. This was compared with the rhythm "ta-te, ta-te, taa" which only has three beats.
- iii) The children were shown the new family with compound time rhythm patterns again and the skipping rhythm of their names was demonstrated and compared to the simple time walking rhythm of the names of the character "Oscar" and the other simple time characters. They skipped or walked around the room depending upon the flash card which was held up.
- iv) The tuned instruments were used to play card A with the notes C and G. The children took turns either to play or to point to the notes. This ensured that they did not simply memorise the tune.

The children were very responsive to these activities. It was noticeable that one of the boys, M. M., had difficulty with pulse and that one of the girls, N. F., in the second group was very tentative with rhythm. M.M. was also low in reading attainment. This did not apply to N.F., but her spelling did not match her reading ability.

Week 6

- i) Work was continued to reinforce a steady beat, some of the children playing rhythmic patterns while the remaining children played a regular single beat. This was to make the children aware of something constant over which they could

play patterns like "Aberdeen", "Inverurie" etc. This seemed to be most successful when the children walked around the room.

- ii) Two almost identical rhythm cards were selected. The children took turns to turn round and guess which card was played. Each child had a turn of turning away or choosing. The children became very involved with this activity. It was repeated using three beat patterns.
- iii) Tuned percussion instruments were used to give the children practice in reading two notes spaced some distance apart - middle C and the G above. Particular emphasis was placed on ensuring that the children watched the music. They took turns at either pointing to the music or playing. The researcher felt that this would have been more successful if larger instruments had been available as the manipulative skills of some of the children were very poor.

WEEK 7

This session highlighted the kind of difficulty which beset the first year of the project. When the initial arrangements were made, no-one warned the researcher that from February until April the classes involved in the study would be timetabled for class music on the same morning as the research. In order to fit into the school arrangements, the groups had to have their "research" lesson immediately after the class music lesson.

- i) Rhythm cards were placed in a row. The children took turns and turned away while one or two rhythm cards were played by the researcher - the number of cards played being decided by the child. The child then had to decide which card had been played. When correct, everyone clapped the rhythm. If incorrect, it was played again, this time in view of the child who was guessing. This activity was designed to develop aural and visual memory and was used in various guises throughout the study.

- ii) Tuned instruments were used to set up a steady pulse using a beater in each hand and continuing use of the notes Middle C and the G above. The use of two beaters was used to develop the children's two-handed control. When a steady beat was established, a rhythmic pattern was introduced above the steady beat. The choice of the notes C and G had no significance other than to establish two sounds at some distance from each other so that the children could make a physical and visual connection.

Week 8

As a result of positive feedback on the reading progress of two boys with specific learning difficulties, who were learning to play the recorder in addition to percussion instruments, it was decided at this stage in the project to introduce the recorder also to the intervention group.

- i) The children were shown how to hold and blow the recorder correctly, introducing a specific routine which would be reinforced each week to establish habits which would lead to good playing. At this initial session the children played rhythmic patterns which they already knew from previous sessions. This is an example of the emphasis on building upon previously introduced activities allowing for skill development.

Week 9

- i) The introductory recorder lesson was revised. The researcher endeavoured to establish a basic routine which was followed carefully and augmented as additional skills were introduced and mastered. This was to ensure that eventually the basic skills would become over-rehearsed and automatic in the way that reading skills become automatic.
- ii) The note B was played using rhythm cards as a visual stimulus.

- iii) The note B was played again, this time using flash cards with the note B written in staff notation.
- iv) Working in pairs, the children put four of the flash cards in their preferred order. Each pair played their tune, then everyone played the same tune.

The purpose of this activity was to encourage the children to work from left to right and the constantly changing order of symbols ensured that they were either dividing the rhythms into the names of the "Oscar Moves On" characters or possibly reading the individual notes. The language equivalent would be syllables or individual letters.

- v) To show the children that reading music is a skill which can be transferred to other instruments, the children played a selection of the staff notation flash cards on the tuned percussion instruments.
- vi) To link with the class project on space, the names of different planets and their corresponding rhythm patterns were introduced e.g. Mercury, Venus, Earth etc.

Week 10

- i) The note A was introduced in addition to B. At all times the routine for holding the recorder was followed. It was interesting that in discussing the difference between lines and spaces, some children saw spaces as roads and lines as kerbs.
- ii) The children played flash cards with the notes B and A on them.
- iii) As the notes in the previous exercise were generally only one or two-beat notes, rhythms were also revised, using untuned percussion. This was to ensure that every aspect already

introduced was kept fresh in the children's minds. It also introduced a break from the recorder.

- iv) The recorder was re-introduced. The researcher played one of four very similar cards, a different one for each child. The children in turn had to guess which card had been played.

Week 11

- i) The notes B and A were continued as before and the note G was introduced. The lines and spaces of the "musical ladder" were discussed and it was noted that notes could rest in the spaces as well as on the "rungs" or lines.

The intervention group was taken in two groups of five children. The first group was noticeably better than the second. Perhaps it may have had something to do with the composition of the groups and the fact that they had to be changed to accommodate school activities.

S.M., one of the boys with special needs, joined the second group because he arrived too late for his session. His reading and playing were excellent. Having the opportunity to excel in an activity in front of his peers clearly gave him a considerable morale boost. It tends to indicate that careful repetitive teaching with plenty of reinforcement brings positive results. It could be that in general there is a need to slow down with the other groups as well, possibly reinforcing more and doing a smaller number of activities.

Week 12

- i) Compound time rhythms were introduced again. The theme of the "Fair" was used to illustrate the rhythms - "Boys and girls;" "Come to the Fair;" "Ride on the hobby horse." This seemed to make clear the idea of skipping rhythms which were introduced in week 9 for the first time. Comparisons were made between skipping rhythms and walking rhythms.

- ii) Recorder - An attempt to tempt the children with a real music book was a failure. The presence of words under the notes was confusing.
- iii) The notes B and A were reinforced with the game where the researcher plays the notes on one of four similar cards while standing behind the children and they have to guess which card has been played - a game which they enjoyed. This was a variant on making the children read the notes from left to right. This time the children took turns at reading from behind.
- iv) The three notes B, A and G were reinforced, first on the recorder and then on the xylophone. They were confused by this in a way that S.M. and J.G. were not, once again indicating that a more intensive approach is more successful.

Week 13

All ten children had to be taken together because of choir practice.

- i) Memory Game - Rhythm cards were spread around the floor with an untuned percussion instrument placed beside each card. The first child selected any instrument and played the rhythm on the card beside it. The second child played the first child's instrument and card, then chose a second instrument. This continued until all the instruments and cards had been played.
- ii) Work continued on recorder using notes B,A and B,A,G.
- iii) Revised compound time rhythms.

Week 14

- i) A long string of four-beat rhythm cards was set out. The children had to follow the notes while the researcher played and identified the stopping place. In a variant of this game they had to identify which individual card was played by the researcher.

- ii) Cards with G were revised.
- iii) The fingering for E was introduced. The children were given a problem to solve - match the recorder notes to the xylophone bars.

Week 15

- i) The lesson started as last time with the identification of the stopping places and the cards which had been played.
- ii) Patterns were played on the notes B, E and G and emphasis was placed on adding two fingers each time.
- iii) To continue the change of media, cards with only B and A were played on the chime bars.

Week 16

- i) The session began with revision of the rhythms from "Oscar Moves On." This was considered important because it was intended that the children would move on to more complex tunes and an automatic response to overlearned rhythm patterns would remove a hurdle which can often prove insurmountable to children endeavouring to read music.
- ii) The children were shown the cards with the notes BAG and BEG to reinforce the concept of adding first one finger each time, then two fingers each time. This was to help them to distinguish a stepwise progression from one which steps over a note each time. They found this very difficult and so it was repeated on tuned percussion both playing and listening. It was hoped that the visual element would help the learning process.

Week 17

- i) The children played almost identical tunes containing the notes low E and low D. They worked through three cards with recorder and tuned percussion.
- ii) To introduce more complex rhythm work the rhythms tafatefe, ta-tefe and tafa-te were introduced matching them to the names "Edinburgh", "Jedburgh" and "Aberdeen".

Week 18

A game was introduced to combine the reinforcement of rhythm through tuned percussion and recorder. As well as providing experience in the transfer of skills across media, it also provided different experiences in developing hand/eye co-ordination.

Format

- i) Chairs were placed in a semi-circle so that the seats of all the chairs were visible to the children. On each seat was placed a rhythm card, a staff notation card with one note drawn on it and a corresponding chime bar.
- ii) First of all the children clapped all of the rhythms from left to right making sure that they kept in time with the steady pulse which was tapped out by the researcher.
- iii) One child went out and chose a chair and after discussing the position of the note on the musical ladder and telling everyone about the letter name written on the chime bar, the rhythm was played on the chime bar against a steady pulse.
- iv) A second child played the same card as the first child, then chose another card and played the second pattern. All the time a steady beat was being tapped to help the children make sense of the music. This continued until all of the children had played twice, each time adding another card. The same system was

used with recorders. This was a useful method of revising individual notes and letting the researcher see which children were having problems.

- v) The children played tunes on the recorder which were very similar to each other to reinforce further the different notes. They also did it the opposite way e.g. where on the musical ladder would you find BAG etc and how many fingers would you need?

Week 19

This session was interrupted by the photographer.

- i) Chime bars were set out individually on the table, corresponding to the notes known on the recorder. The children played the memory game as described in week nineteen's notes, first with chime bars and then with recorders. The rhythms from "Oscar Moves On" were used.
- ii) The reading and the position on the staff of the notes BAG and low DE were revised in a game to develop auditory memory. One child stood with back turned away from the music. One of three short, very similar tunes was played. The child had to hold this tune in memory and then turn round and decide which tune had been played.

Week 20

- i) The children played short tunes based on BAG and DE. They played the memory game as described in the notes from week nineteen to continue practice in auditory memory.
- ii) They also played tunes based on BAG and BEG to reinforce their competence in distinguishing the difference between stepwise movement (line, space, line) and movement from line to line (stepping over a space each time).

- iii) The children revised rhythmic patterns using unpitched percussion. One card at a time, with a four-beat pattern, was used by the researcher starting at different places in the pattern each time e.g.

1st 2nd 3rd 4th
2nd 3rd 4th 1st
3rd 4th 1st 2nd etc.

This activity forced the children to follow carefully from left to right and to move rapidly back to the starting point. In addition they had to remember the location of the starting point, which required careful concentration.

Week 21

- i) The tune "Chinatown" from "Sing, Clap and Play" was attempted and enjoyed by all of the children. The benefit of familiarity with the rhythms from "Oscar Moves On" became apparent. The children were able to identify "Nicolas Oscar" as the two rhythms contained within the melody. The notes used were those recently learned - low D and E plus a note learned early on, G. The researcher started by teaching the melody from a series of A4 cards, building up to complete the melody and finally playing the tune from the book.
- ii) "Anna's Tune", arranged by the researcher was chosen to give the children the experience of playing a "real" tune with an attractive accompaniment. It was also felt that, having reached the end of the time available for working with the children experimentally, they could use their expertise with another teacher, should that be possible within the school organisation.

CONTROL GROUP

The seen control group were allocated the same amount of time each week with the researcher to ensure that any improvement in the reading skills of the intervention group was not influenced simply by the attention the children were receiving. A programme of verbal language activities was carried out for the duration of the project. The activities were designed to link with the class project whenever possible. To avoid the risk of making tenuous connections, the researcher varied the programme as much as possible to give the children a wide range of experiences and also moved with the children's preferences in order to retain their interest.

Week 1

The class teacher suggested a book about a fox which she felt would fit in with her class project, "Furry Freddy Fox". The researcher read to the children and in the time available it was possible to complete the story stopping frequently to ensure that the children were following the main points and to show them the pictures as the children did not have copies. The researcher read to the children using this session to assess the children's concentration and to become acquainted with them.

Week 2

One child was absent for the second time. It was disclosed that he is frequently absent and it became clear that a decision would have to be reached about whether or not another child should be selected to replace him. It was decided that he should be replaced by a boy with similar scores in word reading and word comprehension.

It seemed clear that the book chosen the previous week was a little easy for the children and did not produce much response. The new book selected was "The Magician's Nephew" by C.S. Lewis. Not all of the children were as yet prepared to respond. Time constraints compelled the researcher to take all ten

children in the control group together and from the start this proved difficult as one or two of the children were less than co-operative.

Week 3

The story by C.S. Lewis was continued and the children gradually became more involved and were prepared to discuss the content.

Week 4

This session began with a general discussion about the week's holiday in an attempt to encourage individual involvement. Where there was unwillingness, children were invited individually to make a contribution.

After a brief resume, the C.S. Lewis story was continued.

Week 5

The group completed the "Magician's Nephew".

To complete the session an excerpt was read from "The Spoken Word" - Oliver and Boyd (1989). This was a moral dilemma about a ball which landed in a neighbour's garden. This elicited a good discussion but they did become over-excited.

Week 6

Continuing to use ideas from "The Spoken Word", the researcher read an account of Mr. and Mrs. Green going to a desert island. What twelve items would they take with them? The children were asked to put themselves in this position and choose their twelve items. They worked successfully in groups. Even the one boy, who hitherto had been reluctant to show any involvement, was quite enthusiastic.

Week 7

The class project for the term was about the planets and to supplement the class work, at the suggestion of the teacher, some work cards on the subject of the planets were borrowed from Northern College Science Department. As a topic for discussion the researcher spoke about the Plough and how it points to the Pole Star. It was suggested that the children might like to look at the night sky to see if they could identify the Plough. A discussion followed about how sailors use the Pole Star to navigate.

The discussion from the previous week about going to a deserted planet was continued. It was suggested that perhaps the planet was not really deserted and that when walking on the new planet the children might see a strange creature. The children divided into two groups and tried to imagine what the creature might look like e.g. how many heads? They decided that they would draw their ideas, but this was not successful. They found it difficult to co-operate and argued about what was to be drawn, but at least this did lead to lively interaction.

Week 8

The children worked out "Riddles" from "The Spoken Word". This involved listening to a description of various items and trying to work out what was being described. They entered into the spirit of this activity with enthusiasm.

Working in pairs, the children were asked to "draw" a story. They seemed quite keen and were to tell their stories the following week.

Week 9

The children continued with the drawings of the stories and the story "Minpins" by Roald Dahl was introduced. The researcher felt that the correct level of approach had been found at which

to pitch a lesson which would hold all of the children together with their different abilities and personalities.

Week 10

Continuing the class theme, the researcher introduced "Rockets and Satellites" by Franklyn M. Branley - publisher Adam and Charles Black.

"Minpins" was continued, followed by discussion.

Week 11

"Countdown"

The children were asked to think of statements both positive and negative to make up a countdown poem e.g.

10 - I'm going to miss my rabbit and guinea pig.

9 - I'm going to miss my friends.

8 - I'm going to miss my family etc.

This was greeted with enthusiasm and some very thoughtful ideas emerged.

Week 12

Last week's session was continued and discussed. The children seemed enthusiastic about poetry.

The story of "Minpins" was continued.

Weeks 13,14 and 15

These sessions were devoted to poems from a B.B.C. publication "I'd Like to Be a Teabag." The children were very keen to listen and discuss the poems and quickly built up a repertoire of favourites.

Week 16

"Can you make a picture story?" The children were shown a series of pictures and were asked to make up a story from what the pictures told them.

The session was completed with a selection of the children's favourite poems.

Week 17

In this session the children were each given a copy of the pictures which were used the previous week.

A single picture was taken at a time and the children were asked to comment on what ideas came into their heads about each picture. This turned out to be a very successful session with some sensitive thoughts from some of the children.

Week 18

The researcher introduced a long poem about a boy who was afraid of the dark. The boy was visited by "Dark" who taught him to think of "turning on the dark" and showed him the wonders of the night. The children responded well to the thoughts and ideas which emerged from this poem and they showed a growing willingness to make contributions to the discussion.

Week 19

The introduction of poems about "night" was continued with the children composing their own poem. They offered words about "night" and these were put together to form a poem.

Week 20

The researcher began preparations for letting the children know that the sessions would shortly be coming to an end. As has already been pointed out, school organisation had been causing some interruption anyway. It was considered important to ensure that there should not be a sudden end to the sessions, especially since it had taken considerable effort to hold the ten very different children together throughout the time. One girl and two of the boys were quite dominating, with the result that quieter children were inclined to sit back. By the end of the sessions most children were participating willingly. For this session the children were encouraged to select favourite poems and this led to considerable discussion and interest.

Week 21

This session was used to round off the association of the last six months with general discussion and an expression of gratitude from the researcher to the children for giving their time.

RESULTS

Table 3 presents an overview of the results on literacy skills. The mean score and standard deviation are given for each measure and the number of subjects is given for each measure for the experimental and control groups.

Table 3 Means (standard deviations in brackets) for intervention and control groups on all assessments.						
	<u>Intervention</u>		<u>Control</u>		<u>Unseen</u>	
n =	10		10		31	
	Nov	June	Nov	June	Nov	June
Chron Age	8.31 (0.57)	8.94 (0.54)	8.17 (0.33)	8.81 (0.31)	8.04 (0.38)	8.83 (0.38)
B.A.S. (Word Reading Test)	7.87 (1.38)	9.05 (2.31)	7.87 (1.10)	8.95 (1.68)	7.97 (1.09)	8.89 (1.33)
Primary Reading Test	6.85 (0.99)	7.61 (0.97)	6.79 (0.74)	7.60 (0.94)	6.83 (0.67)	7.51 (0.97)
Non-Word	23 (12.9)	32 (8.06)	25.6 (10.5)	31.5 (6.85)	–	–
Spelling	7.52 (1.33)	8.28 (1.27)	6.83 (0.85)	8.48 (0.87)	–	–
E.P.V.S.	99.6 (10.7)	95.6 (9.28)	95.7 (7.17)	93.9 (14.9)	83.5 (8.39)	87.3 (11.7)

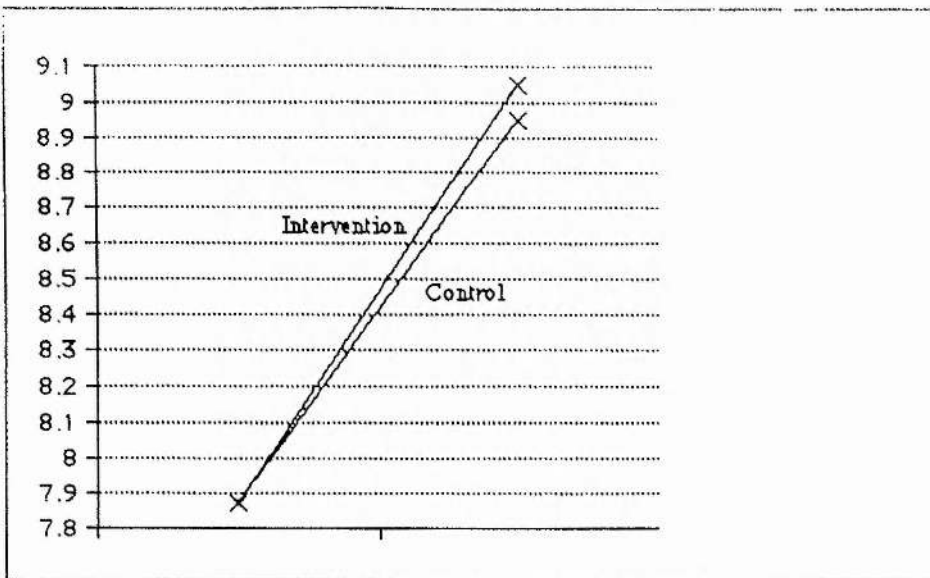


Figure 1: B.A.S. Word Reading

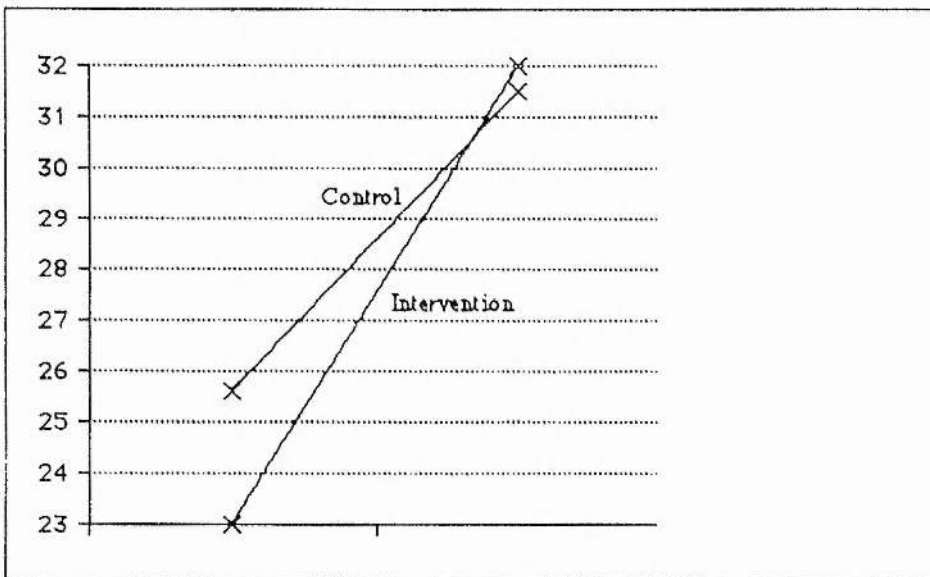


Figure 2: Non-Word Reading

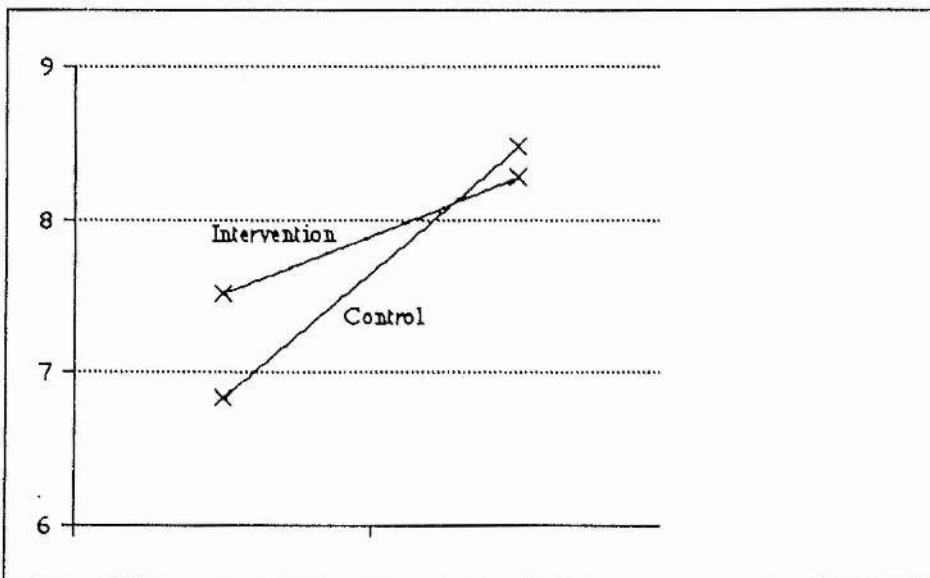


Figure 3: Spelling

Only the intervention and seen control groups were given the complete battery of tests both in November and in June. The word recognition test, the E.P.V.S and the Primary Reading Test were taken initially by all of the children as a means of selection for participation in the study. The children who were not selected provided an unseen control and were tested in these three measures again in June.

The reason for including data from the unseen control group was to allow for the 'Hawthorne Effect'. Having a comparison of scores from the three conditions (the musical intervention group, the seen control group who were engaged in language activities with the researcher and the remainder of the children in the two classes who were not seen by the researcher) might have shown that contact with the researcher could have led to an improvement in reading.

The intervention and control groups were, of course, matched on word reading and the E.P.V.S. at the outset. All the groups improved on the second reading tests independently of group membership.

Figure 1 shows the change in the mean reading scores for the intervention and control groups between November and June. Figure 2 shows the change in non-word reading scores for the intervention and seen control groups. Figure 3 shows the change in the spelling scores of these two groups.

Comparison of intervention and seen control groups

A two-way repeated measures of analysis of variance was carried out on the B.A.S. Word Reading scores. There was no main effect of experimental versus control groups, $F < 1$, N.S. There was a main effect of time on the reading scores overall, $F(1,18) = 31.70$, $p < .001$. This did not interact with groups, $F < 1$, N.S.

A two-way repeated measures of analysis of variance was carried out on the non-word scores. There was no main effect of experimental versus control groups, $F < 1$, N.S. There was a main

effect of time on the non-word scores overall, $F(1,18)=19.40$, $p<.001$. This did not interact with groups, $F<1$ N.S.

A two-way repeated measures of analysis of variance was carried out on the spelling scores. There was no main effect of experimental versus control groups, $F<1$, N.S. There was a main effect of time on the spelling scores overall, $F(1,17)=33.62$, $p<.001$. This did not interact with the groups, $F<1$ N.S.

A two-way repeated measures of analysis of variance was carried out on the Primary Reading Test scores. There was no main effect of experimental versus control groups, $F<1$, and no main effect of time, $F(1,18)=3.1$, N.S.

A comparison of the progress made by the most able readers showed that the intervention children tended to make the most gains (see Table 4). However, numbers were too small for a meaningful statistical analysis.

Table 4 Comparison of the B.A.S. Reading Scores of the Most Able Readers between the Groups (n=3 in each group)

Intervention	November	June
Subject 1	10.50	12.33
Subject 2	9.58	12.75
Subject 3	8.92	11.83
Mean	9.67	12.30
Mean Improvement	2.63	
Seen Control		
Subject 1	9.58	12.42
Subject 2	9.42	10.75
Subject 3	8.50	9.58
Mean	9.17	9.58
Mean Improvement	1.75	
Unseen Control		
Subject 1	11.58	12.33
Subject 2	10.00	11.58
Subject 3	9.58	10.1
Mean	10.39	11.36
Mean Improvement	0.97	

Discussion

Evaluation of Intervention

The main aim of the study was to assess the extent to which it is possible to enhance reading ability by engaging children in a multi-sensory programme of specific musical activities in the classroom outside the context of their regular music instruction. By comparing the average change in reading scores before and after the intervention of the experimental and control groups, it was hoped that the impact of the training would be assessed.

The mean B.A.S. word reading scores of the intervention and control groups were reasonably close to the mean chronological age scores at both test times. The scores of all the groups in the Primary Reading Test were, however, well below the mean chronological age scores both in November and in June, which supports the view that these children were under-achieving. The Primary Reading Test highlights a child's ability in comprehension as well as recognition of individual words.

The results showed no significant improvement in word recognition or comprehension skills of the intervention group over the seen and unseen control groups.

Although there was no significant improvement in the mean reading score of the intervention group over the control groups, the improvement in the reading scores of the most able readers in the intervention group was greater than the improvement in the scores of the most able readers in the control groups (see Table 4). The numbers are too small to allow statistical comparison, but a similar finding was made by Douglas and Willatts (1994), where the better readers were found to make the most progress.

The scores of the three most able readers in each group were examined because it was noted that the children with the three highest reading scores from the intervention group improved more

than the equivalent three children in the control group. It was therefore considered to be of interest to compare the scores of these children with the three highest scores from the unseen control group. Although the control group's improvement was less than that of the intervention group, it was greater than that of the unseen control group, an indication that the control group's contact with the researcher and the additional language activities may have had some bearing on the extent of the improvement in the reading scores.

Chapter 3

Case Studies of two poor readers in Primary 4 training in musical skills

Introduction

It has been noted by a number of researchers that dyslexics have difficulty in retaining aurally or visually presented material in memory (Share 1995; Ellis 1984). Furthermore, it has been suggested that difficulties which dyslexics have with musical notation and rhythm may be caused by difficulties in processing information quickly rather than by problems with inaccurate decoding (Ganschow, 1994; Hubicki and Miles, 1991; Oldfield 1987). In a review of the literature, Ganschow (1994) notes that both music and reading journals have focused on the therapeutic use of music to improve academic and personal development in pupils with learning difficulties. This approach seems to indicate a belief that musical ability is intact while reading ability is not. Ideas to promote the development of language skills have been proposed by Biggs and Bullock (1990), and McCarthy (1985). Gfellar (1986) has suggested that memory can be improved through musical mnemonics.

The main part of the present study was a replication of the pilot study by Douglas and Willatts (1994). In view of the indications that musical activities may be beneficial in improving language skills, and because of the suggestions that dyslexics' problems may be the result of memory problems and of difficulties in processing information quickly, it was decided that it would be useful to carry out an intervention study with children who had been identified as having difficulties in these areas. This would make it possible to find out if a more intensive music intervention would help to improve the language skills of children with special needs.

Two boys, identified by the learning support teacher, were selected for this intensive intervention. A comparison of their progress was made with a third boy who was a member of the large intervention

group. This was a random allocation to a group and not a matched control.

In retrospect, had the researcher been aware of the reading difficulties encountered by the third boy at the outset, he could have been more fully involved in the study e.g. he would have been tested with the same frequency as the other two boys. Nevertheless, it was useful to have someone in the large intervention group who was of comparable ability to the two boys undergoing the intensive regime. No comparable child was available in the control group.

S.M. had specific learning difficulties affecting reading, written language and number skills. He could not remember the names of his favourite television programmes or video games. He could not recite nursery rhymes or name the days of the week, the months of the year and the alphabet in order. He was described by the Educational Psychologist as a boy of average intelligence with a specific weakness in the area of short term auditory memory which underlay his learning problems. He recognised some printed words but showed little evidence of the use of strategies to decode unknown words. He had difficulty with blending letter forms and in spelling he showed evidence of confusing individual letter sounds and had difficulty in producing three letter blends correctly.

He appeared to have become "stuck" at the logographic stage of reading development as in Frith's model (1985). According to Frith, children learn to read in a series of stages and in the first stage they read words as logograms, and cannot decode words phonologically. He was able to recognise a few words by a visual route but he had not made the transition to efficient use of grapheme/phoneme conversion which is characteristic of the next stage - the alphabetic stage. In the last stage of Frith's model, the orthographic stage, it is suggested that children begin to move away from analysing words letter by letter and begin to recognise and use sequences of letters in words. Frith's model suggests that remediation at the point of arrested development must take place before a child can move on to a further stage of development and

that training in compensatory measures at the orthographic stage will have little effect if the earlier deficits have not been put right.

It was recommended by the school's Educational Psychologist that S.M. would need a programme of individual tuition in basic word recognition using multisensory methods following a structured progression.

J.G. was identified in Primary Two by his class teacher as having difficulty with reading and language. He had difficulty in concentrating and in discussion with his mother it was discovered that he suffered from intermittent hearing loss. In Primary Two, J.G. began a language and reading programme working with the learning support teacher. This centred round "Oxford Reading Tree" in an effort to develop his spoken language as well as building up word recognition. It emerged that J.G.'s visual recall was poor but he was able to "sound out" simple words, using phonics quite effectively. The Educational Psychologist has been involved because of the learning problems and also because of the behaviour difficulties which are causing considerable concern. It has been suggested that J.G.'s behaviour has been affected by his hearing problems. A programme of strategies to control his behaviour problems has been worked out with the class teacher.

M.M. This boy is included as a control for degree of intervention effects. A member of the large intervention group, M.M. was also a very poor reader. Although not as poor as S.M., he came nearest to him in ability. M.M. was on the same phonics programme as the other two boys. He joined the school at the beginning of Primary Four, but had been on a similar programme in his previous school. At the outset, like S.M., he was unable to read any non-words. As a member of the group of ten children in the main intervention group, M.M. was on a less intensive regime than S.M. and J.G.

Although the problems affecting the reading progress of the two boys, S.M. and J.G., were quite different, it was felt that they would benefit from working together on a multi-sensory programme of musical activities designed to develop visual, auditory, co-

ordination and memory skills. The important link between auditory sequential memory and visual sequential memory at age four as a predictor of reading ability at age seven is highlighted by Grogan (1995).

The music programme began on November 30th 1994 and the two boys were taken together for thirty minutes each week until May 31st, 1995. It had been decided that in addition to using the voice and percussion instruments (tuned and untuned), the boys would be taught to play the recorder, as a way of reinforcing the multi-sensory approach recommended for S.M. In order to play the recorder successfully it is necessary to combine a number of carefully controlled skills involving the tongue, breath control and fingering. The early sessions involved the establishment of a careful routine of activities to encourage the development of these skills while at the same time introducing visual symbols to match the sounds.

To reinforce the matching of sounds to symbols, pictures of fun characters which were matched to corresponding rhythmic patterns were introduced. The children were encouraged to play these patterns in a variety of ways using recorder, body and instrumental percussion as well as movement around the room in the hope that they would become internalised through repetition. This was the basis of much of the work throughout the programme. Considerable emphasis was placed on repetition and reinforcement. During each session, the children were introduced to a variety of "games", with frequent changes of emphasis from auditory to visual processes as well as a combination of both.

METHOD

Assessment Materials

The assessment materials used were identical to those used for the main intervention and control groups. In addition they were given a test which was designed to show their ability in reading high and low frequency regular and irregular words.

Procedure

The two boys who had been identified as having special needs began their musical activities one week later than the other children to accommodate the additional test.

Much of the programme followed by S.M. and J.G. was similar to that covered by the larger groups, but because they were given much more individual attention, it was possible to adapt the musical programme to suit the needs of the children as they worked through each of the activities. The intensity of the programme was much greater also because of the individual approach.

Intervention Activities

Week 1

- i) The boys were shown how to hold and blow the recorder following very carefully worded instructions which introduced them to a routine which remained constant throughout the programme. It was hoped that by this method the basic skills would become automatic, enabling the boys to concentrate on the musical activities.
- ii) The names of the characters in "Oscar Moves On" were introduced. This took considerable time because of memory difficulties, particularly those of S.M.
- iii) The researcher introduced an echo game in which the children copied a rhythm which was played to them. Unpitched percussion was used for this activity.
- iv) The xylophone placed upright to look like a ladder and the drawing of a staircase were used to illustrate sounds going up and down.
- v) To reinforce the the learning of the characters from " Oscar Moves On", the second activity was repeated.

This lesson was designed to combine activities to involve aural, visual, manipulative and memory skills - the multi-sensory approach recommended for S.M.

Week 2

- i) The routine of how to hold and blow the recorder was revised.
- ii) Rhythmic patterns were played on the note B, following the "echo" procedure introduced in Week One.
- iii) The characters from " Oscar Moves On" were re-introduced.

- iv) Each child arranged four flash cards with pictures of the characters in an order of their own choice, then clapped their composition.

Week 3

- i) The boys seemed to remember little from the earlier lessons and so the introductory recorder lesson was repeated.
- ii) The rhythms and flash cards from "Oscar Moves On" were repeated.
- iii) The musical ladder, using the upended xylophone and the drawing of a staircase, was revised.

Week 4

- i) The note A was introduced. S.M. had difficulty in detecting aurally whether B or A was higher. The "musical staircase" was used to illustrate this. Round stickers were placed on each step of the drawing of the staircase to show where notes come in the scale of C.
- ii) The children practised keeping a steady pulse with their feet. The researcher clapped the rhythm of the different characters from "Oscar Moves On" over the steady pulse. Each time the rhythm was changed, the boys had to identify the picture which matched the rhythm.
- iii) The rhythm card taa, taa, ta-te, taa was clapped several times over by the researcher. The children had to identify the stopping place.

Week 5

- i) S.M. still required prompting to remember the name of the instrument he was learning to play (recorder). Neither boy was

attentive on this occasion, so recorder was abandoned until later in the session.

- ii) The musical staircase was revised as before, using coloured stickers. The boys listened to the sounds of two notes and had to identify which one had been played. It still seemed difficult for S.M. to distinguish between high and low as a concept.
- iii) The researcher tapped a steady pulse while the boys clapped the rhythms from "Oscar Moves On" over the top.
- iv) The children identified which of two similar cards had been played and where the researcher stopped.
- v) Recorder was resumed. The holding routine was revised, followed by finger play on B and A. Green stickers were used to identify the position of B and A on a modified version of the musical staff - using only two lines. After playing the two sounds to enable the boys to establish the position of the notes on the staff in relation to the sounds, they were asked to identify which note had been played.

Week 6

- i) The reading and playing of B and A on the recorder continued.
- ii) The boys were asked to look at the rhythm cards and to identify rhythms which corresponded to the rhythms from "Oscar Moves On." This was followed by the boys taking turns to "hide", listening to a rhythm card being played and identifying the correct card.

Week 7

- i) The reading of B and A was continued using coloured stickers for notes. The difference in appearance of a note with a line

running through it and a note between two lines (in a space) was discussed. One of the boys thought that it looked like a "road". This discussion was designed to reinforce their awareness of the difference between lines and spaces. S.M. clearly found the concept of higher and lower sounds difficult. It seemed clear that that he had difficulty in distinguishing between sounds. He "read" the music and moved his fingers according to visual signals. Both boys were now able to read new tunes with B and A with ease.

- ii) The work on pulse was continued and the rhythms from "Oscar Moves On" were added above. The reinforcement of the connection of pictures to corresponding rhythms was reinforced. Having been shown a rhythm card, the boys had to select the correct picture to match.

Week 8

- i) Because of S.M.'s difficulty in aural discrimination, it was decided that this aspect of the work should be emphasised early in the lesson when he was likely to be most attentive. After identifying the two notes B and A, the researcher stood behind the boys and played short melodic sequences using the two notes. The boys had to identify the notes in the sequence and play them back.
- ii) S.M. and J.G. were asked to relate the sounds on the recorder to sounds on the chime bars. To do this, the researcher played either B or A as each note on the chime bar was played (upward scale). When the sound on the chime bars was the same as the sound on the recorder the boys had to raise a hand.
- iii) B and A were introduced in staff notation.
- iv) Each boy made up a "tune" on blank staff notation. This was a source of great interest. They then played their tunes.

Week 9

- i) The new note G was introduced.
- ii) The researcher played the "same" and "different" sounds for the boys to identify. S.M. clearly found this difficult.
- iii) The boys took turns at playing cards with the notes B and A. They repeated each card using chime bars.
- iv) Each boy selected four cards to make a tune.
- v) The boys clapped rhythmic patterns because they appeared to have forgotten earlier work in this area.

Week 10

- i) To reinforce the rhythms in "Oscar Moves On" and to establish the notes B A and G, the rhythm "Oscar Nicolas" was used with each of the notes. After discussing the position of the notes, each pattern was played.
- ii) Again to assist with the distinction between B A and G, a second rhythm was used to give practice in the recognition of notes - "Henrietta Oscar."

Week 11

- i) The note E was introduced. The boys were at this stage familiar with the notes on lines one, two and three. They practised moving from B to G to low E, putting down two additional fingers each time and lifting two fingers each time when moving up from low E to G to B. The boys were shown how this progression of notes looked on the xylophone and they played the same music cards on that instrument. This was intended to reinforce the multi-sensory approach, using the

fingers and hands in a different way and being aware that the music they were playing was not exclusively for the recorder.

Week 12

- i) The notes B A G and E were revised on the recorder.
- ii) To continue the transference of reading skills to another medium, they played the cards with tunes based on B and A on tuned percussion as well as on recorder.
- iii) Compound time rhythm patterns were practised. These were limited to "Boys and girls" "Come to the fair" and "Ride on the hobby horse."

Week 13

- i) Cards with the notes B A G and E were played on the recorder.
- ii) The tunes with B and A were played with one boy playing recorder, the other playing the xylophone.
- iii) The pictures and matching rhythms from "Oscar Moves On" were revised.
- iv) A tune from a recorder book was attempted, but the notes were too small and had to be enlarged in the style to which they had become accustomed.

Week 14

This session had to be shortened due to College arrangements.

- i) Using the rhythmic pattern "Oscar Nicolas", the boys were asked to play B A G and E, each pattern on a single note. The cards were changed around to give them practice in recognising the different notes.

Week15

- i) The session began with revision of the rhythms from "Oscar Moves On." These rhythms were central to all of the work which the boys did and because of memory problems, it was necessary to keep reinforcing them.
- ii) The boys were shown cards comparing BAG and BEG to reinforce the concept of adding one finger each time, then two fingers each time. It was hoped that they would learn to distinguish a stepwise progression from one which passes over a note each time. This was repeated on tuned percussion both playing and listening.

Week16

- i) The boys played the notes low E and D - comparing almost identical tunes. They worked through three cards with recorder and tuned percussion.
- ii) To introduce more complex rhythm work the rhythms of "Edinburgh", "Jedburgh" and "Aberdeen" were introduced.

Week 17

- i) S.M. and J.G. were introduced to the game which was described in Week 19 in the account of the Intervention Group. This activity was designed to combine the reinforcement of rhythm with tuned percussion and recorder.
- ii) The rhythms of "Edinburgh", "Jedburgh" and "Aberdeen" were revised.
- iii) The boys played and compared similar tunes based on B, A, G, E and D to reinforce the reading of the notes. This was also done the other way round. They were asked to identify where on the "musical ladder" the different notes could be found and how many fingers would be needed on the recorder.

Week 18

- i) The chime bars were set out on the table with the corresponding staff notation beside them. The boys played the cumulative memory game already described, first on chime bars, then on recorder and using the rhythms from "Oscar Moves On".
- ii) Sheets with tunes containing BAG and DE were played on the recorder.
- iii) A game to develop auditory memory was introduced. One child stood with his back turned to the music. One of three very similar tunes on a sheet of music was played by the researcher. The child with his back turned had to hold this tune in memory while scanning the three alternative tunes to decide which had been played.

Week 19

- i) The tune "Chinatown" from "Sing Clap and Play" was introduced. The benefit of becoming familiar with the rhythms from "Oscar Moves On" was apparent in the ease with which the two boys immediately recognised that the rhythm "Nicolas Oscar" was repeated throughout the tune. The tune was introduced using A4 cards with one bar on each card, gradually building up to the complete melody and finally the boys played the tune from the book.
- ii) Another "proper" tune was introduced to finish the sessions with something which would raise the boys' self esteem.

Results

Summary of findings, November to January

The extent of S.M.'s memory difficulties showed up immediately when the names of the characters from "Oscar Moves On" were introduced and his problem with long term memory was highlighted in that it was not until the seventh session on February 1st that he was able to name the instrument which he was learning to play (the recorder) without any prompting. It was also clear that he had great difficulty in distinguishing between different pitched sounds, although he quickly learned to recognise visual cues, placing his fingers correctly in response to the position of notes on the musical staff. By continually moving the emphasis from visual to auditory cues this aspect of his development improved and he gradually managed to distinguish between different sounds.

After the programme had been in progress for six weeks, the learning support teacher mentioned that J.G.'s reading had suddenly improved. She agreed to administer the word recognition, non-word and spelling tests again to see if any change had taken place. The reading age of both boys had increased by six months. J.G.'s non-word reading had also improved, but at this stage S.M. was still unable to read any of the non-words.

Table 5 B.A.S. Word Reading Scores and Non-Word Reading Scores in November 1994 and January 1995

	B.A.S. Word Reading		Non-Word Reading (%)	
	November	January	November	January
S.M.	5.42	6.00	0	0
J.G.	6.50	7.08	35	60

Summary of findings, January to June

Both boys continued to make progress in learning to read music and by the middle of March it was noticeable that they were producing a good sound. The quality of the sound was an indication that they had excellent control of fingers, tongue and breath and that they were responding to this multi-sensory method of teaching. J.G.'s tuition was interrupted when he had to enter hospital for an ear operation and the sessions continued for some weeks with S.M. on his own.

All of the children were tested again in the middle of June. It was noted that S.M. had made considerable progress in the B.A.S. Word Reading Test and also in the non-word test. As well as being able to read sixteen of the forty non-words, he had managed to sound out all of the other words more or less correctly, yet in November he had been unable to read any non-words or make any attempt at sounding them out and at the end of January he had still made very little progress. S.M. was successful in reading all of the one-syllable words and in examining what he actually said in his attempts at the two-syllable words, it was clear that he was using an analytical approach with these items as well.

J.G. also made considerable progress during the period of the intervention, with improvements in each of the measures. His spelling was particularly notable, improving by almost a year in six months.

By the end of the intervention period M.M., who, like S.M. had been unable to read any non-words in November, was able to read some, but not as many as S.M. His word recognition had also improved, but less than S.M.'s. This could be an indication that the intensive intervention was more successful. Also, M.M. had begun recorder tuition at a later date.

Table 6 S.M., J.G., M.M. - Word Reading (B.A.S.), Non-Word Reading and Spelling Scores in November 1994 and June 1995

	November 94	June 95
S.M.		
Chron. Age	8.33	7.67
B.A.S.	5.42	6.25
Non-Word %	0.00	40.00
Spelling	5.25	5.58
J.G.		
Chron. Age	8.17	8.75
B.A.S.	6.50	7.25
Non-Word %	40.00	77.5
Spelling	6.50	7.42
M.M. (less intensive intervention control)		
Chron. Age	7.75	8.42
B.A.S.	6.08	6.58
Non-Word %	0.00	30.00
Spelling	5.58	6.17

Discussion

S.M. made a considerable improvement in reading, having been a virtual non-reader when tested in November. He gained over nine months in reading age in seven months, which is an unusual rate of gain for someone with such severe reading problems. He also learned to read non-words reasonably well, which indicates the development of an important self-teaching skill.

The learning support teacher attributed S.M.'s improvement in reading to the music programme, as he had already been through the phonics programme with little success. It seems more plausible to suggest that the music programme may have enabled S.M. to gain access to the benefits of the phonics programme. The development of his ability to use analytical methods through learning to read music may have triggered off a similar response to reading. Although the methods used in the music programme were very similar to the phonics training, they were non-threatening and were accepted as something to enjoy, which is not often the case with reading once difficulties have been encountered.

Conclusion

The results indicated that a compensatory programme of musical activities may be beneficial to children who have difficulty with reading and that this line of enquiry merited further investigation. In the second year of the study the researcher decided to focus on children who had already been identified as dyslexic, in order to carry out an intensive programme of training in musical skills.

Chapter 4

The effects of training musical skills in dyslexic children

Introduction

The improved reading of the two boys on the intensive music regime in the first year of the study prompted the researcher to pursue this line of enquiry in the second year of the study and to investigate the effects of an intensive regime of classroom music activities on children already identified as dyslexic. Two groups of children from special learning units within large primary schools were involved. One of the special units was in Aberdeen and the other was twenty miles from the city. The units were set up to cater for the special needs of children who have been identified as dyslexic. Each unit has a maximum roll of six pupils and the children return to their former schools after two years of specialised teaching.

The settings of the two learning units are quite different. The intervention group worked in a very large closed classroom which allows the teacher plenty of space to set up the working areas and the only noise is generated from within the room. The control group was housed in an open-plan school with mainstream classes all around their working area. Consequently, in contrast to the intervention group's classroom, there was a great deal of noise.

The teachers in the two units operate schemes of work which are based on similar principles, although there are, inevitably, differences of approach in dealing with the children's difficulties.

In the unit where the intervention group were taught, the children are on individual schemes of work, but for spelling and maths they usually work in pairs, although nobody is held back for convenience. Paired reading was tried and abolished - the slower ones became demoralised. The children work through the various reading schemes which are available in the unit, Wellington Square, Trog Books and Flightpath to Reading. These are the main focus of reading, but in

addition, they are allowed to pick anything off the shelves. The teaching of phonics is aided by the use of plastic letters as described in Bradley and Bryant (1983). In an innovative method favoured by their teacher, the children are taught to use a mirror when trying to work out the spelling of words. They see the vowels in the shape of the mouth then pick out the plastic letters they need.

In the unit selected for the control group the approach is slightly different. Although reading schemes are used, the children move on to story books as soon as they can read. Their teacher believes that if schemes are followed to the letter, the children think they can read nothing else.

In the teaching of phonics very little time is spent on consonant blends. Instead the children are taught to build on something which they are doing e.g. 'top' and 'stop'. The children are taught to look for something they recognise e.g. 'clap'. If they are unable to blend, they look for the vowel 'a' and the letter after it 'ap', then 'lap' and finally 'clap'. This method is not dissimilar to the mirror method favoured by the teacher of the intervention group children.

The headteachers and the teachers responsible for teaching the children in the learning units were interested in the research and the links between the music programme and the teaching of phonics. Consequently, they readily agreed to become involved.

The children in both groups were assessed at the beginning of the year on a battery of tasks including measures of reading, spelling, vocabulary knowledge and aural awareness. The intervention group were seen for twenty weeks, being trained in musical skills, in sessions lasting forty five minutes. As in the previous study described in Chapter 2, the musical activities were designed to mirror a phonics programme. In a phonics scheme, children are encouraged to make decisions about the sound values of letters as well as on visual discrimination. In the parallel music scheme devised by the researcher, emphasis was placed on activities moving frequently from visual to aural stimuli. Memory was also developed.

METHOD

Subjects

A total of twelve children, ranging in age from 8.58 to 11.83, with an overall mean age of 9.88, participated in the study. See Table 7.

Table 7 -Subjects Participating in Year Two of the Study

Number of Subjects	12
Age Range	8.58 - 11.83
Mean Age	9.88 (1.06)

Design

This was based on a standard intervention and control design.

The children were pre-tested on a number of language measures in November 1995. The word reading, non-word reading and spelling tests were the same as those which were used in the first study and these were administered in November 1995 and March and June 1996. In addition, the Neale Analysis, Yopp-Singer, Fife Region Aural Awareness Test and the British Picture Vocabulary Test, all tests not used in the first year of the study, were used in this study, but were administered only in November and June. The additional tests were used to give a more complete picture of the language abilities of the children involved in the second year of the project.

Assessment Materials

1. The British Ability Scales (BAS) Word Reading Test (Elliot et al. 1983) - See Chapter 2 for details.
2. Non-Word Reading Test - See Chapter 2 for details.

3. The Schonell Spelling Test (Schonell & Schonell, 1956)
Graded Word Spelling Test.

4. Neale Analysis of Reading Ability (Neale, 1989).

This test was used as a measure of reading accuracy in context and of reading comprehension.

5. Yopp- Singer Test of Phoneme Segmentation (Yopp 1995).

This test is used to assess children's phonemic awareness e.g. 'd-o-g'

6. Fife Regional Council's Aural Awareness Test.

This test was used to measure specific aspects of musical ability - pitch and rhythm.

Table 8 Mean scores (standard deviations in brackets) for intervention and control groups on all assessments in November 1995

Chronological Age

Intervention	10.17(1.01)	-n=6
Control	9.59(1.10)	-n=6

B.A.S. Reading Ages

Intervention	7.25(0.43)
Control	7.23(1.17)

Non-Words

Intervention	22.83(5.70)
Control	20.33(8.36)

Spelling Age

Intervention	7.25(0.47)
Control	6.73(0.49)

B.P.V.S.

Intervention	89.33(10.23)	-
Control	102.50(10.56)	-

Neale Analysis (Accuracy)

Intervention	6.50(0.88)	-
Control	6.28(1.41)	-

Neale Analysis (Comprehension)

Intervention	6.96(0.86)	-
Control	7.20(0.86)	-

Yopp Singer

Intervention	12.17(7.73)	-
Control	16.67(3.33)	-

Aural Awareness (Rhythm)

Intervention	8.00(1.89)	-
Control	6.67(2.07)	-

Aural Awareness (Pitch)

Intervention	6.67(1.21)	-
Control	6.17(1.72)	-

Procedure

The training programme in the second year of the study was similar to that used for the two boys with special needs in the first year of the project. In the second year the researcher did not have to cope with the time constraints imposed by the need to take four separate sessions in a morning. She was able to allocate forty five minutes to each session, instead of thirty minutes, working with three of the boys in each session. This made it possible to develop a range of activities during the training period with ample time within each session for consolidation. The timescale also allowed for a preparation period before each session and time at the end of the morning to make an immediate evaluation of the sessions and to consider how to proceed the following week.

Apart from the assessment procedures, the children in the control group were given no special treatment during the period of the study. Time constraints prevented the researcher from undertaking a language programme with the control group as had happened in the previous year.

Week 1

- i) The researcher talked in general about the recorder and showed the children how to hold it and how to blow it.
- ii) The xylophone was placed sideways to resemble a staircase with only the notes B A G E and D on it. The researcher played short melodic fragments to show the difference between going up and going down. This activity was repeated on the recorder with the children copying the notes on the xylophone.
- iii) The children were introduced to the grid of squares which were a visual representation of sound and silence - empty squares were silent, those with circles indicated sound.

- iv) A game was introduced where the children sat in a circle and copied patterns of sound clapped by the researcher.

Week 2

- i) Routine of holding and blowing the recorder was revised.
- ii) The researcher set up a steady beat on the drum - a two beat pattern. Each of the boys' names was added beneath each two beat pattern e.g.

Ricky - rest | Richard - rest | Mark - rest | Mrs Douglas||

This activity formed the basis of a progression through the various stages of reading music during the period of the project. As with the rhythmic patterns from the characters in "Oscar Moves On", the children became thoroughly familiar with the activity described above using their own names so that each additional degree of difficulty started from knowledge already acquired.

- iii) Activities to develop a steady pulse were continued. The circles game described in Week One was continued with variations. The circles were replaced with drawings of hands and feet and the children responded according to the picture in each square. Another variation was for the children to place three different coloured and shaped stickers at random in some of the squares as well as leaving some of the squares blank. Each of the three different coloured stickers was to represent a particular untuned percussion instrument. The children then each chose an instrument and followed the squares from left to right, each child playing on the squares which showed their instrument. At first each line was played separately, but gradually the four lines were played one after the other. This activity received much prominence through later stages of progression because of the similarity of the skills needed for reading words e.g. left to right and moving the eye from line to line.

- iv) Recorder was resumed and the routine revised. At this stage short, frequent exposure to recorder techniques was deemed the most productive policy.
- v) The characters and rhythmic patterns from "Oscar Moves On" were introduced to the boys. They were given blank sheets of paper and were asked to practise "drawing" the sounds e.g.
- | | | | | | | | | | | |
|-------|-----------|--------------|-----|--|--|--|--|--|--|---|
| | | | | | | | | | | O |
| Oscar | Nic-o-las | Hen-ri-et-ta | Joe | | | | | | | |
- v) Note B was played on the tuned instruments - Right left right left (alternate hands). This was to reinforce the development of a steady beat and the transference of the sound already learned on the recorder, as well as the beginning of alternate hands in percussion playing.

Week 3

- i) Recorder
- Revised routine and played each boy's name on the note B.
 - The note A was introduced using a two-line stave and coloured stickers.
 - The above activity was reinforced on tuned percussion.
 - The five notes which were to be learned during the period of the intervention were played by the researcher several times to make the boys aurally aware of the sounds. The position of the notes was shown on the staircase.
- ii) Using claves and rhythm sticks, the boys tapped their names as described in Week Two. This was developed with one boy tapping a steady beat on the drum while the other two tapped the rhythms of the names.
- iii) The rhythms of the names from "Oscar Moves On" were tapped using the rhythm sticks.

iv) Finally, the recorder work was revised for reinforcement.

Week 4

i) Warm Up

The children clapped one after the other round the circle to establish a feeling for pulse - 1 clap first, then 2 claps. This was followed by adding a different number of claps for one boy only. This made them concentrate.

ii)

- The routine of holding the recorder was revised and the notes B and A. The name pattern already established was used. The boys enjoy this and by repeating it regularly they internalised the rhythmic patterns.
- The grid of squares was used with two lines in each square. One name per square appeared either on a line or in a space. Single notes of B and A were also used indicated by small coloured stickers. Each child in turn kept a steady beat with the drum while the other children played the notes on the grid.
- This activity was reinforced using glockenspiels.
- The musical ladder was shown again to the boys and the position of the sounds of the five notes to be learned during the project.

iii)

- The rhythmic patterns and pictures from "Oscar Moves On" were revised.
- Rhythm cards with combinations of the patterns from "Oscar Moves On" were introduced. This feature of combining a progressively difficult series of materials which the children came to know really well was an integral part of the teaching process.

Week 5

i)

- "Stairway to the Stars" - an idea which was introduced and developed throughout the rest of the project. The notes which the children learned were portrayed on a music staff using gold stars to signify the notes. This looked attractive and appealed to the children. At this early stage, they were shown the visual image while the notes were played by the researcher from left to right starting with the highest note and moving stepwise to the lowest note and back to the highest note again - C B A G Fsharp E D E Fsharp G A B C.
- Using flash cards with rhythmic patterns on them, the children clapped the patterns then played them using tuned percussion.
- Using only one card, they started on the first beat (1234), then the second (2341), followed by the third (3412) and finally the fourth (4123). This forced them to look rapidly from left to right.

ii)

- The recorder routine was revised using the notes B and A and the sound of G was introduced.
- Auditory games using flash cards with B and A were introduced - Four flash cards with three the same and one different were shown and the children had to decide which was the odd one out.

iii) Using cards with rhythm patterns on the note B, the children had to make up and play their own tunes.

- iv) The five note staircase - shown on the staff and also on the drawing of the staircase - was played. This was a further reinforcement of visual and auditory experience of the first five notes which the boys were to learn.
- v) The lesson finished with the "Stairway to the Stars" being played again to reinforce the link between the visual stimulus and the sound of the notes.

Week 6

- i) B A and G were revised, using rhythmic patterns.
- ii) The rhythmic patterns from "Oscar Moves On" were revised by placing pictures and rhythms in a row at random. This was to reinforce the rhythmic patterns with the fun pictures as a mnemonic. The idea behind this was that the rhythms from "Oscar Moves On" were to be used as something familiar to recognise as the work became more complex. It was hoped that relating these names and pictures to a rhythm pattern would strengthen and reinforce the notion that words can be split up into phonemes. French rhythm names are useful but more vague.
- iii)
 - A Christmas carol composed by the researcher was used as a basis for activities using B A and G. The tune contained two phrase endings moving in different directions - BAG and GAB. The notes BAG and GAB were also played on the glocks by the boys one at a time while the others guessed which notes had been played - did they go up or down? The children had to identify the difference aurally by turning their backs one at a time and listening while the researcher played.
 - Four cards, each with the notes of one bar of the carol, were placed in a row with the boys taking responsibility for one card (the researcher took the extra card). They were then

moved on one card each time the tune was played until they had played all of the cards. The cards were mixed up so that they did not become too familiar with the tune. As an incentive, the researcher finished the session by accompanying the boys', playing on the piano.

Week 7

- i) The rhythmic patterns and pictures from "Oscar Moves On" were revised - mixed up in a row. A steady pulse was set using the tambour so that the boys were forced to maintain a steady speed.
- ii) BAG were revised on the recorder using rhythmic patterns of names.
- iii) The cards GGBG and GGAG were compared. When the children seemed sure of the difference between the jump and the step, they were presented with three copies of one card and one of the other, listening without looking and deciding which one was different. This was repeated using the glockenspiel.
- iv) The children were asked to concentrate on the notes G and B and to note how two fingers had to be put down or lifted and also to be aware of the sounds being further apart than B to A. Four cards, with different rhythmic patterns on the notes B and G, were played and the researcher went on to play one of the cards which the boys had to identify.
- v) A game was set up - musical pelmanism - to develop memory skills. A selection of untuned percussion instruments was set out on a table, each with a different rhythm card beside it. One child selected an instrument and played the card next to it. The remaining children and the researcher clapped a steady beat throughout. The second child first of all played the same instrument and card as the first child and then selected a different instrument and card. This continued until all the instruments and cards had been used.

- vi) The session finished with the researcher playing "Stairway to the Stars."

Week 8

- i) The chime bars and the recorders were combined in an activity to reinforce the note names. The chime bars were placed in position like a ladder so that they resembled a recorder shape. The researcher played the notes BAGED on the recorder and the boys in turn played them on the chime bars. The chime bars and recorder were then played together.
- ii) The chime bars B A and G were placed beside rhythmic patterns of B A and G. The researcher moved the chime bars to different notes(the wrong ones) and the boys had to adjust the music to suit the chime bars and match them together. They then played the new pattern of notes.
- iii) Using the notes B and A four very similar patterns were played. the researcher then played one which the children had to identify.
- iv) The rhythm cards were used to develop rhythmic awareness. Two patterns were attempted simultaneously, then three.
- v) The chime bars E G B were set out and the children were shown the notation which matched.

Week 9

- i) Recorders - Flash cards were used to revise the notes B A G E and D.
- ii) The notes E G B - B G E were compared with G A B - B A G.

- iii) The children made up a "tune" with the rhythms from "Oscar Moves On" and then selected the pictures to match.
- iv) To extend the length of melodies to be read, three alternative but very similar eight beat tunes were played. The children listened without looking while one of the tunes was played and had to select the correct one.
- v) Pelmanism as describes in week eight was repeated.
- vi) "Stairway to the Stars" was played as far as low E. The children played on the recorder while the researcher pointed to the notes.

Week 10

- i) An extension of "Pelmanism" was introduced using tuned percussion and staff notation with the notes B and A.
- ii) Recorders - The notes E and D were played using "Staiway to the Stars". The tune "Chinatown" was used as an activity, breaking the music up into separate bars.
- iii) Rhythm cards were set out in a long row. The researcher then played them and the boys had to identify the stopping place. This activity was designed to reinforce reading from left to right.

Week 11

- i) Revised notes on recorder using the pattern taa ta-te taa taa in sequence G GG A A; A AA B B; D DD E E.
- ii) Chinatown was played, taken in stages as before.
- iii) Pelmanism - using untuned percussion as well as tuned percussion and using single note patterns on the notes G A B D and E.

- iv) The children had to select the "odd one out" of four almost identical melodies using G A and B.
- v) "Anna's Tune", composed by the researcher, was introduced - a melody with the notes G A B and C.

Week 12

- i) Each boy was given a card with a single note from those learned and was asked to play it. If any doubt arose, they could refer to the special recorder cards which were on display in front of them.
- ii) Each boy was given a sheet of thin A-4 paper on which was drawn the music stave. They were also given a rhythm card and were asked to place the the rhythm card underneath the sheet with the music stave so that it showed through on whatever note position was requested. This was to give the children the opportunity to identify notes by positioning them rather than by reading what was already there.
- iii) Repeated work on "Chinatown", using prepared cards.
- iv) The children had to identify which note was different between two cards, first of all while looking at the card and secondly after listening with the back turned.
- v) The second family from "Oscar Moves On" was introduced.
- vi) "Chinatown" and another tune from "Sing, Clap and Play", "All Alone" were played, one bar at a time until completed.
- vii) "Stairway to the Stars" was played to check and reinforce sight reading with something familiar.

Week 13

- i) Single note activity described in Week 12 was repeated.
- ii) Work with staff on thin paper placed over rhythm card as described in Week 12 was also repeated.
Extension - the children were asked to write a rhythm on a specific place e.g. the note 'B'.
- iii) The comparison game from the previous week was repeated with four cards instead of two.
- iv) The pictures of the compound time characters from "Oscar Moves On" were matched to the corresponding rhythmic patterns.
Extension - one card was taken from each set and the rhythms clapped. This meant moving constantly from simple to compound time.
- v) "Chinatown" and "All Alone" were revised, first with separate bars, then together.
- vi) The pupils invented a four card tune using the notes BAG. This was played on recorder then repeated on glocks.

Week 14

- i) Notes were revised as in the previous two weeks.
- ii) Aural exercise to give practice in recognising whether a sound goes up or down was introduced using the glock - GGG- followed by either AAA- or low EEE-.
- iii) Pictures of characters were matched to rhythms of names - compound time as in previous week.
- iv) As in previous week, tunes were made from four cards with the notes BAG.

- v) The children followed the notes on "Stairway to the Stars".

Week 15

This session was designed to take into account the evaluation of the work so far, highlighted in the interim testing. As S. has not grasped the Yopp-Singer Test, scoring 0/0 each time, the researcher decided that more rhythmic work delivered aurally might help.

- i) Using the drum the researcher tapped out all the simple and compound time names of the characters from "Oscar Moves On". Using drums and tambours the boys echoed each name.
- ii) The researcher played one of the names over and over, having named it in advance and stopped on one of the sounds in the name. The sound had to be identified. This involved a similar principle to the Yopp-Singer where the words had to be broken up into their sounds.
This activity was repeated adding the appropriate rhythmic pattern on a flash card.
- iii) As an extension of the above activity, two flash cards with Bs and As or low Ds and Es were selected. These were played one after the other several times. They were played again, this time stopping at random. The stopping point had to be identified.

Week 16

- i) All of the rhythmic patterns, both simple and compound time, which matched the pictures of the characters from "Oscar Moves On" were hung on the front of a table facing the children. Using a drum, the researcher demonstrated all of the rhythms.
- ii) She then selected two of the rhythms from the row and asked the children to identify which ones had been played.

- iii) One pattern was selected and played repeatedly. The children had to identify the stopping place.

These activities were designed to force the children into scanning rapidly from left to right as the patterns were played, first a long row, then even more quickly when one pattern was being repeated.

- iv) The children were shown the cards BAG and GAB and had to explain the difference. The card ABC was then produced and compared to the other two. The pupils noted that a new note was included. They were then taught to play the new note C.
- v) One card with four notes, from the those with variations of BA and G, was selected and played by the pupils. A picture from the characters in "Oscar Moves On" was placed beside the card and the rhythm of the picture was played on each of the four notes on the card. A different picture was placed beside the first picture and a child was asked to play as before but with the new rhythm on one of the notes (chosen by the child).
- vi) The above activity was also done in reverse with a child turning round and identifying which of the four patterns played by the researcher had the different rhythm.

Week 17

- i) A waltz melody composed by the researcher was introduced to the children on a series of flash cards. The melody was made up from a series of note progressions which were familiar to the children.

As the project was nearing completion, it was felt by the researcher that it was important to develop the work towards "real music" which they would find in music books. The final weeks were used to show a transfer of the activities to a more traditional form of presentation. The children found no

difficulty in making the connections, an indication that learning had taken place.

- ii) To reinforce the feeling for rhythms both simple and compound, a mixture of rhythms from the two families of characters from "Oscar Moves On" were played. Two were picked out for identification by the children.

Week 18

- i)
 - a) The music stands were set up with the full waltz melody, one for each child.
 - b) The researcher discussed aspects of the melody with the children - where does it go up or down? What happens at the end of the line?
 - c) The researcher played the first two lines stopping at different places which the children had to identify.
 - d) The boys took turns at playing one bar:
 - 1st player - bar 1
 - 2nd player- bar 2
 - 3rd player- bar 3
 - 1st player- bar 4
 - e) All played two lines.
 - f) They moved on to the middle section, playing one line each and they all played final line.
- ii) The rhythms of Inverurie, Aberdeen and Jedburgh were introduced.
 - a) The children tapped each card using unpitched percussion.
 - b) The cards were placed on the table and pairs of cards were selected to be played simultaneously.

c) Each boy selected one card and played it continuously while the remaining boys played a different rhythm.

iii) The waltz was revised to reinforce the teaching and learning.

Week 19

i) Revision of waltz - after two weeks as a result of closure day. Two of the boys had forgotten much of what had been taught, but quickly found their way again. This highlighted the difficulty with retaining information faced by some dyslexic children.

ii) A new melody was introduced which the children managed with no difficulty.

iii) Previously taught tunes were revised. When originally introduced the low notes posed problems, but the reading of these notes was much improved.

iv) Further revision of the rhythms of "Inverurie", "Aberdeen", "Jedburgh".

v) "Stairway to the Stars" was revised with the notes F sharp and C added.

vi) The waltz was played once again for reinforcement.

Week 20

In this final session emphasis was placed on fluent playing of the pieces of music which had been learned by the boys. When they were happy with their performance, the Class Teacher and the Headteacher were invited in to hear them play.

Results

Table 9 presents an overview of the results on literacy skills. The mean score and standard deviation are given for each measure for the intervention and control groups on all assessments. The word reading, non-word reading and spelling tests were administered in November, March and June. The remaining tests (Neale Analysis, Yopp Singer, Aural Awareness and the B.P.V.S.) were administered only in November and June.

Table 10 shows the mean improvement of the intervention and control groups in the B.A.S. word reading and the Schonell spelling test. The reference to T. is fully explained in the Case Study section (page 100). T. was a member of the control group whose improvement in reading during the period of the intervention was remarkable.

Table 9 Mean scores (standard deviations in brackets) for intervention and control groups on all assessments.

	Intervention n=6	Control n=6
November	March	June
Chronological Age		
Intervention	-	10.55(1.02)
Control	-	9.96(1.11)
B.A.S. Reading Ages		
Intervention	7.25(0.43)	7.60(0.50)
Control	7.23(1.17)	8.36(1.98)
Non-Words		
Intervention	22.83(5.70)	29.16(5.46)
Control	20.33(8.36)	29.83(7.54)
Spelling Age		
Intervention	7.25(0.47)	7.78(0.67)
Control	6.73(0.49)	7.62(0.63)
B.P.V.S.		
Intervention	89.33(10.23)	90.83(10.25)
Control	102.50(10.56)	100.67(10.80)
Neale Analysis (Accuracy)		
Intervention	6.50(0.88)	6.88(0.89)
Control	6.28(1.41)	7.72(2.11)
Neale Analysis (Comprehension)		
Intervention	6.96(0.86)	7.20(0.96)
Control	7.20(0.86)	8.60(0.96)
Yopp Singer		
Intervention	12.17(7.73)	12.50(4.72)
Control	16.67(3.33)	15.83(5.64)
Aural Awareness (Rhythm)		
Intervention	8.00(1.89)	7.00(1.79)
Control	6.67(2.07)	7.17(0.75)
Aural Awareness (Pitch)		
Intervention	6.67(1.21)	8.00(1.55)
Control	6.17(1.72)	7.17(0.75)

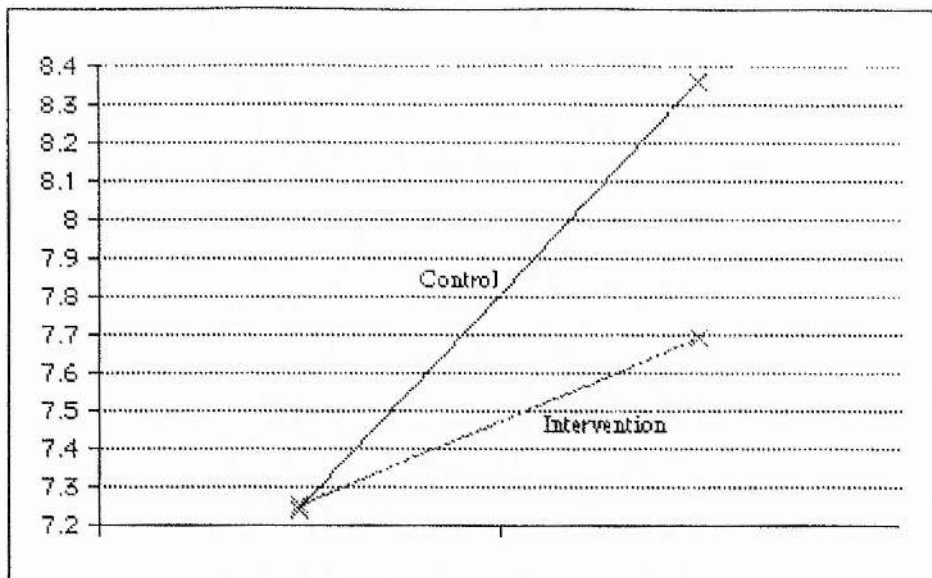


Figure 4: B.A.S. Word Reading

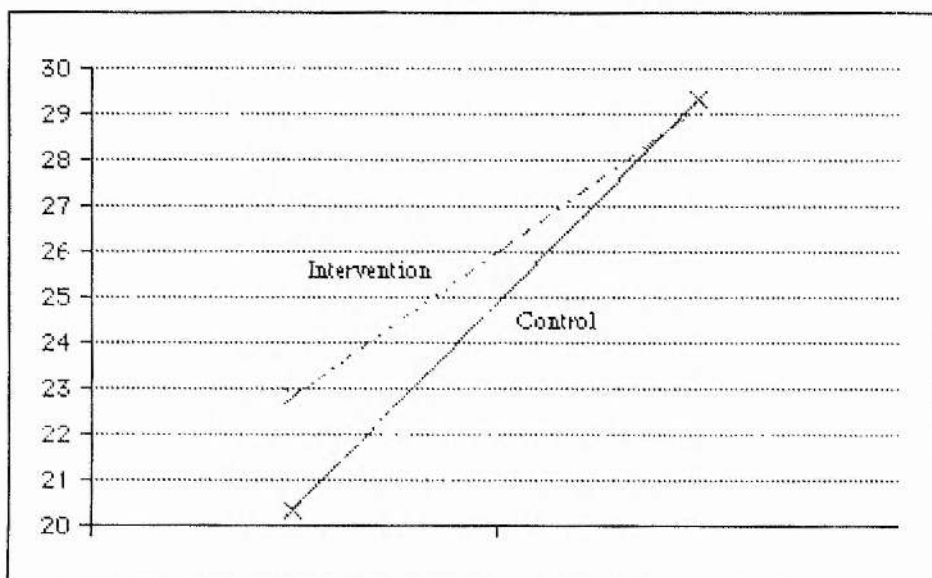


Figure 5: Non-Word Reading

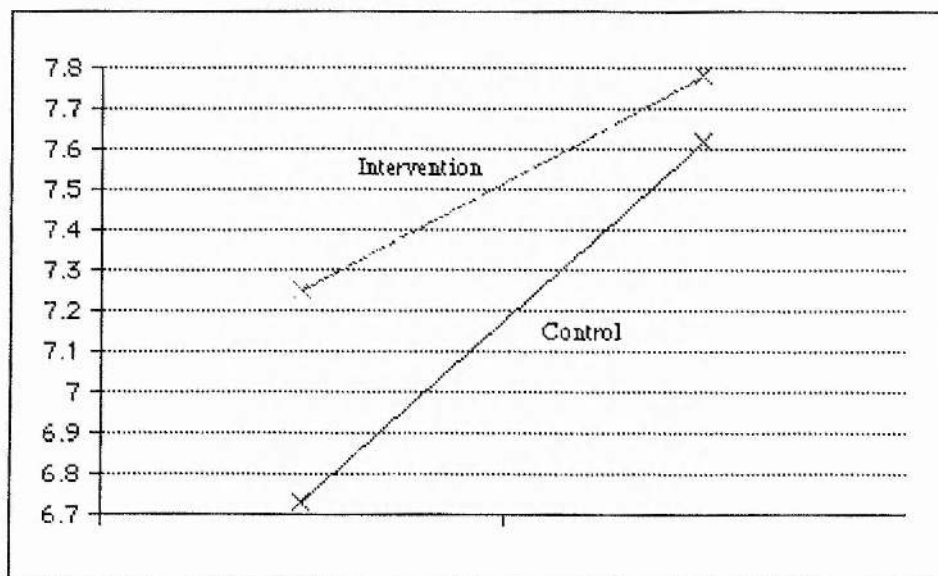


Figure 6: Spelling

Table 10 Mean improvement of intervention and control groups in B.A.S. Word Reading and Schonell Spelling Test between November and June

	B.A.S. (Years)	Spelling (Years)
Intervention	0.445	0.533
Control	1.18 (including T.) 0.77 (excluding T.)	0.76

The intervention and control groups were matched on word reading and B.P.V.S. at the outset.

Figure 4 shows the change in the mean reading scores for the intervention and control groups between November and June. Figure 5 shows the change in non-word reading scores for the intervention and seen control groups. Figure 6 shows the change in the spelling scores of these two groups.

Comparison of Intervention and Control Group

A two-way repeated measures of analysis of variance was carried out on the B.A.S. Word Reading scores. There was no main effect of intervention versus control group, $F < 1$, N.S. There was a main effect of time on the reading scores (B.A.S.) overall, $F(2,20) = 13.14$. $p < .001$. This did not interact with groups, $F < 1$, N.S.

A two-way repeated measures of analysis of variance was carried out on the non-word scores. There was no main effect of

intervention versus control group, $F < 1$, N.S. There was a main effect of time on the non-word scores overall, $F(2,20) = 19.47$, $p < .001$. This did not interact with the groups, $F < 1$, N.S.

A two-way measures of analysis of variance was carried out on the B.P.V.S. scores. There was no main effect of intervention versus control group, $F < 1$, N.S. There was a main effect of time on the B.P.V.S. scores overall, $F(1,10) = 0.02$, $p < 0.902$. This did not interact with the groups, $F < 1$, N.S.

A two-way repeated measures of analysis of variance was carried out on the spelling scores. There was no main effect of intervention versus control group, $F < 1$, N.S. There was a main effect of time on the spelling scores overall, $F(2,20) = 16.51$, $p < .001$. This did not interact with the groups, $F < 1$, N.S.

A two-way repeated measures of analysis of variance was carried out on the Neale Analysis (Comprehension) scores. There was no main effect of intervention versus control group, $F < 1$, N.S. There was a main effect of time on the Neale Analysis (Comprehension) scores overall, $F(1,10) = 51.18$, $p < .001$. This did not interact with the groups, $F < 1$, N.S.

A two-way repeated measures of analysis of variance was carried out on the Neale Analysis (Accuracy) scores. There was no main effect of intervention versus control group, $F < 1$, N.S. There was a main effect of time on the Neale Analysis (Accuracy) scores overall, $F(1,10) = 23.73$, $p < .001$. This did not interact with the groups, $F < 1$, N.S.

A two-way repeated measures of analysis of variance was carried out on the Yopp-Singer scores. There was no main effect of intervention versus control group, $F < 1$, N.S. There was no main effect of time on the Yopp-Singer scores overall $F(1,10) = 0.02$, $p < .890$. This did not interact with the groups, $F < 1$, N.S.

A two-way repeated measures of analysis of variance was carried out on the Aural Awareness (Pitch) scores. There was no main effect of intervention versus control group, $F < 1$, N.S. There was no

main effect of time on the Aural Awareness (Pitch) scores overall $F(1,10)=4.6$, $p<.057$. This did not interact with the groups, $F<1$, N.S.

A two-way repeated measures of analysis of variance was carried out on the Aural Awareness (Rhythm) scores. There was no main effect of intervention versus control group, $F<1$, N.S. There was no main effect of time on the Aural Awareness (Rhythm) scores overall $F(1,10) =0.17$, $p<.687$. This did not interact with the groups.

Case Study

One of the children in the control group, T., showed such a remarkable improvement in his reading scores during the period of the intervention that the researcher considered it important to find out about his background from the class teacher and report the information.

T. started school before the age of five when, in the opinion of his teacher, he was not ready. He made no progress in reading and writing during the first two years at school, but his parents were unaware of the extent of the problem because he was articulate. According to his teacher, he had built up a resistance to learning to read and had become very frustrated. Associated difficulties included dyspraxia, social problems and autistic tendencies. He can be hurtful to other children both physically and vocally and also to teachers. T.'s American father believes that the other children are violent to T. in the playground. In the relaxed situation of the Learning Unit T. had success, reading what he could read and not failing and in the first year he made gradual progress. On entering the Learning Unit he had very poor visual memory and had difficulty in recognising unfamiliar words. T. derives considerable pleasure from reading war stories.

T. produces most unusual drawings e.g. very detailed cross sections of planes. According to his teacher he appears to see things differently from other children. It has also been suggested that he can only concentrate on one thing at a time which could explain why his spelling has not improved along with his reading. In November 1995 T.'s reading age was 9.42. In March 1996 it had gone up to 11.83 and in June 1996 to 12.33. Bearing in mind that in February 1994 his reading age was 5.92, this is a remarkable improvement. The class teacher intends to take a new look at T.'s spelling to see if a concentrated effort in this area will bring about success. In T.'s case she believes that improved self esteem plays a major role in any improvement.

The researcher examined the attempts which T. made at completing the Schonell Spelling Test in November 1995, March 1996 and June 1996. On each occasion he attempted only forty of the one hundred words, whereas he always attempted all ninety words in the word reading test. He reversed b/d and p/q in all three attempts at the spelling test and clearly processed words by reproducing the individual sounds without applying any rules of spelling. In reading the non-words, T. did not appear to have any problem with reversals and read 32/40 in November, 37/40 in March and 40/40 in June. T. clearly has difficulty with the physical process of writing which causes him to proceed very slowly. He appears to view words in a holistic way rather than analytically, which might explain the problems with spelling.

It is not clear if T. is dyslexic or if his difficulties are the result of other problems.

Some comparisons can be made between T. and one of the intervention subjects, D.A., a boy of average ability who, according to the Educational Psychologist, shows weakness in areas which involve short term memory. This has affected his reading and spelling in which he is four years behind his chronological age. During the course of the intervention, D.A.'s reading age improved by four months while his spelling age deteriorated very slightly. Like T., D.M. displayed aggressive tendencies towards other children, although, unlike T., he related well between violent episodes.

D.A. was very skilled at drawing and used this medium to express the sensitivity which also came out in his stories. During the period of the intervention he wrote a very moving story about a "magic recorder". He required a great deal of support from his teacher and made extensive use of the computer in the actual production and editing of his story, but the finished product showed that he had considerable ability at narrative recall, a language subskill which Wapner, Hamby and Gardner (1981) have shown is processed in the right hemisphere. D.A.'s teacher attributes his aggressive tendencies to the accumulation of frustration brought about by his lack of communication skills.

While T. has obviously found a way round his earlier problems with reading, this has not happened with D.A.

Table 11 Comparison of B.A.S. Word Reading, spelling and B.P.V.S. scores between November 1995 and June 1996 (T. and D.A.)

	T.		D.A.	
	Nov	June	Nov	June
Chronological Age	9.75	10.42	10.25	10.92
B.A.S. Word Reading	9.42	12.33	6.42	6.75
Spelling	6.50	7.30	6.60	6.50
B.P.V.S.	121.00	113.00	93.00	90.00

Discussion

Evaluation of the Intervention

The aim of the study was to assess the effect of a multi-sensory programme of specific classroom musical activities on the literacy skills of children who have been identified as dyslexic. The experimental music programme provided was in addition to the children's regular music instruction.

The results show no significant improvement in the scores of the intervention group over the scores of the control group in any of the measures.

Although the results of the observational case study of S.M. in the first study led to the suggestion that a programme of specific musical activities may be beneficial in assisting children with reading difficulties to gain access to previously taught phonics programmes, the proposal that dyslexic children might benefit from a similar programme of activities was not supported by the results. It is possible that this lack of significance was caused by a number of factors.

Although considerable thought was given to the design of the study, it was apparent from the outset that compromises would have to be made because of constraints outwith the control of the researcher. Because of the limited amount of time allocated for the field work necessary for the research, the choice of subjects taking part in the second year of the study was limited by the number of dyslexic children readily available in the Aberdeen area. Only six children are taught in each of the special language units at a time. This limited the choice of subjects. For ease of administration, six children from a unit within Aberdeen were selected to take part in the intervention, while six children from a second unit some twenty miles from the city formed the control group. In the previous year's study, a second control group was seen weekly for the same period of time as the intervention group, but time constraints precluded

this from happening during the second year. A third language unit in the area could have formed a seen control group had more time been available.

A design which might have been more satisfactory would have been having an equal number of intervention and control subjects, ensuring that the teaching regimes were held constant. Unfortunately, this would have taken more time than was available. In the first year of the study, it was possible to have an even distribution of subjects in each group from both of the participating classes because all of the children came from the same school. Nevertheless, even within one school, it was still very difficult for the researcher to accommodate several groups in the space of a single morning.

A multiple-baseline design, as described by Kazdin (1982) and Bratochwill (1978), was much favoured by the researcher, but was reluctantly abandoned because of the number of months within which the study had to be completed and because of the limited number of dyslexic children available within one unit. This design is often used in studies of behaviour modification to show how a behaviour pattern can be changed by an intervention which is introduced to groups of subjects at different starting points. In the present study the start of the music intervention would have been staggered, starting with only two children and adding two more at equally spaced intervals until all of the children were participating. To avoid the possibility that contact with the researcher might have been sufficient to affect the children's reading performance, the children not yet started on the musical intervention would have been seen by the researcher for the same length of time as the others, but for language activities as in the previous year's study. In a multiple-baseline design the children who were longest on the musical intervention should have made the greatest improvement. In addition to this, a marked improvement should have been apparent in children after commencing the intervention.

The teachers from each of the learning units were interviewed at the end of the study to ascertain their philosophy on teaching dyslexic

children and to compare their teaching styles. When the study was set up, the main concern of the researcher was to find a comparable control group in a second unit for dyslexic pupils. The added refinement of comparing the teaching styles within the units was highlighted by the results of the assessments in each group before and after the intervention. In addition, the researcher met the children in the control group and was given a resume of their backgrounds. This meeting could not have taken place before if they were to be an unseen control group.

The teachers in both of the units are clearly dedicated to the task of helping the children in their charge and while their working conditions are somewhat different, their basic philosophy is very similar. Both groups of children are carefully monitored and controlled, but within this carefully controlled structure, they are still given considerable freedom of personal choice.

In describing the children in the control group, their teacher gave a detailed account of their social problems, which certainly appear to be quite diverse. She also identified the disturbing effect which certain children had on each other. In addition to the effort made to improve the children's literacy skills, considerable emphasis was placed on helping them to solve their social problems, the inference being that this would help them overcome learning difficulties. Similarly, in the other unit where the intervention group were taught, consideration was also given to the social well-being of the class, as well as on a structured approach to learning.

It will be clear therefore that although the ethos within the two units was similar, it was inevitable that the teaching styles of the two teachers would be different. In addition, one of the boys in the control group, who has already been described in a case study, made such a remarkable improvement in his reading scores (nearly 3 years in 7 months), that the mean scores of his group were increased greatly.

Although it was not possible to assess the groups and chronological age controls to examine whether the dyslexics had impairments in

pitch and rhythm, there is evidence that they performed around the level of their reading age. The pitch and rhythm scores attained by the intervention and control groups at the outset of the study were at the same level as the Primary Four children in the correlational study undertaken by Douglas and Willatts (1994), who were around eight years old.

Table 12 shows the comparison of pitch and rhythm scores of the children in the correlational study (Douglas and Willatts, 1994).with the scores of the combined intervention and control groups in pitch and rhythm at the outset of the present study, and at the outset of the pilot study (Douglas and Willatts, 1994).

Table 12 Comparison of the Aural Awareness scores of the the Primary Four children in the correlational study and the combined scores of the intervention and control groups at the outset of the present study and the the pilot study (standard deviation in brackets)

	Primary Four Children n=78	Pilot Study Mixed ability n=12	PresentStudy Dyslexics n=12
Chronological Age	8.02(0.30)	9.15	9.88(1.05)
Pitch	6.40(2.28)	7.33(1.30)	6.42(1.44)
Rhythm	7.17(1.9)	7.50(1.62)	7.33(2.01)

The scores in pitch and rhythm of the dyslexic children in the present study are very close to those of the Primary Four children, but it must be taken into account that the mean chronological age of the dyslexic children is almost two years more. They should have been performing much better. The mean chronological age of the children in the pilot study is almost nine months less than that of the dyslexic children, yet their scores in pitch and rhythm are greater. It is likely that in terms of pitch and rhythm the dyslexic children's performance was below normal for children of their age.

It is unfortunate that because of time constraints, it was not possible to administer the aural awareness tests to the Primary Four children who took part in the first study reported in this thesis as this might have provided additional evidence for this suggestion.

The pilot study (Douglas and Willatts, 1994) and the present study have certain similarities. Both were conducted over a period of six months with two groups of six children. The age range of the children in the pilot study was 8.08 to 10.67 and in the present study 8.58 to 11.83.

Table 13 shows the mean scores in pitch and rhythm of the intervention and control groups at the start of each study and again six months later.

Table 13 Mean scores of the intervention and control groups in the pilot study (Douglas and Willatts, 1994) and the present study at the outset and six months later (standard deviations in brackets)				
	Pilot		Present	
	November/June		November/June	
Intervention				
Pitch	7.00(1.09)	7.50(2.07)	6.67(1.21)	8.00(1.54)
Rhythm	7.00(1.89)	8.00(1.41)	8.00(1.89)	7.00(1.79)
Control				
Pitch	7.67(1.51)	8.67(1.51)	6.17(1.72)	7.17(0.75)
Rhythm	8.00(1.26)	8.5(1.64)	6.67(2.06)	7.16(0.75)

The children in the pilot study represented a range of ability in reading unlike the dyslexic children in the present study who all had severe problems with reading and spelling. Table 13 shows that the pilot study intervention group improved in rhythm over the six month period, whereas the mean rhythm score of the intervention group in the present study deteriorated. This reinforces the studies by Douglas and Willatts (1994) and Attenbury (1983a) that ability in reading and rhythm are related.

Each of the aural awareness tests only contained ten items. It is possible that the test was not sufficiently sensitive to allow a significant improvement in these measures to show. In a future study it might be advisable to employ a lengthier test of progressive difficulty as in the other measures.

Recent findings from brain research indicate that verbal language is processed in the left hemisphere (Code, 1987) and that rhythm is also processed by the left hemisphere (Sloboda, 1985). This supports the suggestion by Atterbury (1983a) that children who have difficulty with reading may also experience problems with rhythmic processing. The mean scores show that between November and June the intervention group in the present study improved more in pitch than the control group, but in rhythm the intervention group's score was lower than that of the control group during the same period, a possible indication of the right hemisphere processing of pitch as suggested by Springer and Deutsch.

Although there was no significant interaction between the groups in any of the measures, the mean improvement in the the B.A.S. reading scores and the spelling scores showed that the intervention group had improved more in spelling than they had in reading. Without T., the mean improvement in the reading and spelling scores of the control group were almost identical, whereas the mean improvement in the spelling scores of the intervention group was greater than the mean improvement in the reading score. Most of the children taking part in the study had difficulties with consonant blends, together with poor auditory and visual processing. According to Frith (1985), when a child learns to spell the importance of temporal order takes on greater importance than the salient features of a word. It could be suggested that the nature of the intervention programme with its emphasis on the auditory and visual processing of musical patterns in a left to right sequence, plus the development of short term memory skills might have had some influence on improving the spelling skills of the intervention group (see Table 10 on page 89).

Chapter 5

General Discussion

Neither the results of the main study in year one of the project nor the results of the second year support the hypothesis that reading ability can be enhanced by a multi-sensory programme of specific musical activities outside the context of their regular musical instruction.

Nevertheless, there were some positive indications that musical activities may be beneficial in developing language skills which will be discussed in this chapter.

It is unfortunate that the progress of the study was impaired by a number of factors. The time constraints imposed upon the researcher meant that the study had to be designed to fit into only one morning each week and obviously any alterations to the host school's programme had to be accommodated. In year one, for example, the intervention group, which had been divided into two separate working groups, had to be re-organised after a number of weeks to suit class arrangements. This meant that one girl was obliged to move from a group where she was quite settled into a group composed of different children. The order in which the groups were taught had also to be changed. In addition to these major adjustments, the inevitable interruptions of school life had to be accommodated.

In year two, as described in Chapter 3, the weekly programme ran much more smoothly, as it was a feature of the learning unit that the children should work to an uninterrupted schedule whenever possible. The only problem was absence of subjects. Quite often one of the children would be absent, and indeed the researcher missed three consecutive weeks herself due to illness.

The children in the language unit must have had severe problems to be so poor at reading and it is unlikely that one lesson per week

could make much impact on their difficulties, particularly since they all had a deficiency in short term memory skills. Most of the children in the intervention group had major weaknesses that were highlighted by Grogan (1995) as being the cognitive abilities at age four which were the best predictors of reading ability at age seven. These weaknesses include visual and auditory sequential memory and sound blending. Such fundamental difficulties may not respond well to attempts to remediate them.

Table 12 also shows that the combined mean scores in pitch and rhythm of the two groups of dyslexic children at the outset of the study were at a similar level to that of normal readers who were two years younger. This may be an indication that dyslexic children have problems with pitch and rhythm - certainly, these skills did not improve in the intervention group.

In the case studies involving S.M. J.G. and M.M. in Chapter 2, a more personal, intensive course of musical activities coincided with a remarkable improvement in reading, particularly evident in the change in S.M.'s ability to read pseudowords. This indicates that there may be a link between music and improved reading ability in non-dyslexic children.

A feature of the approach adopted with S.M. and J.G. was the care which was taken by the researcher to use the same carefully worded instructions each week which remained constant throughout the programme. As a result of this approach, the skills appeared to become automatic, allowing the boys to concentrate on the music. Nicolson and Fawcett (1994) showed that dyslexic children can become automatically proficient in a skill provided they are not prevented from making a conscious effort to compensate. By keeping to a routine form of instructions throughout the period of the study, the researcher enabled the boys to develop their skills without being hindered by lack of understanding, thus overcoming their natural disadvantages.

An interesting post-script to the case study of S.M. is that when tested a year later, in June 1996, his reading scores were continuing

to rise, an indication that his improvement has become self-regulating. During the course of the first year of the study, S.M.'s spelling scores showed little improvement. However, he was followed up a year later after he left the school, and at this time his spelling score was at a similar level to his reading.

Table 14 shows S.M.'s B.A.S. Word Reading, non-word reading and spelling scores during the period of the study and one year after its completion.

Table 14 S.M.'s B.A.S. Word Reading, non-word reading and spelling scores in November '94, January and June '95 and June '96.				
	<u>Intervention</u>			<u>Post Intervention</u>
	November 94	January 95	June 95	June 96
BAS	5.42	6.00	6.25	6.75
Non-Word %	0.00	0.00	40.00	47.50
Spelling	5.30	5.10	5.60	6.70

An important outcome of the Swiss study (Weber, Spychiger and Patry, 1993) was that the children's language improvement did not show until the third year of the study, an indication that the music programme needed considerable time to be internalised before any improvement showed. It is important to note also that the Swiss children received music instruction every day, unlike the children in the Aberdeen study. Even taking into account music lessons with the visiting specialist, the classes involved in year one of the study only had class music during short blocks in the year. The children in the language unit in year two of the study had a more regular input from the music specialist, but it was far short of that received by the Swiss children.

Conclusion

While the results of the study did not support the hypothesis that musical activities in the classroom significantly improve literacy skills, there were indications that some improvements had taken place. In year one of the study, the reading ability of S.M. clearly improved as did J.G.'s reading and spelling (see Table 6, page 71). In year two, the spelling of the intervention group improved more than their reading. Table 11, (page 100), also shows that one year after the completion of the intervention, S.M. showed a delayed improvement in spelling. This improvement also ties in with the results of the Swiss study (Weber, Spychiger and Patry, 1993) where the improvements in language did not show until the third year of the study. The individual nature of the programme undertaken by S.M. and J.G. points to the possibility of designing music programmes to suit the particular needs of children with reading difficulties. Hubicki and Miles (1991) advocate a multi-sensory approach to learning and Smith (1988) has indicated that children who have difficulty with reading words may also have difficulty with musical notation. By breaking down musical rhythms and introducing these activities as "games", it may be possible to help children overcome problems with analysing words. The example of S.M., whose reading improved markedly after an intensive course of musical activities, may be an indication that this is possible.

The music intervention in the present study concentrated on encouraging the children to process information quickly e.g. activities with the flash cards were aimed at moving the eyes rapidly from left to right and moving back again quickly, often to a different starting point. Given that Van den Bosch et al. (1995) showed that for many children reading difficulties stem from slow rather than inaccurate reading, such training is likely to remediate a specific weakness which undermines the development of automatised reading skill.

The results of the Swiss study (Weber, Spychiger and Patry, 1993) indicated that daily music activities brought about an improvement in children's language performance, but the improvements did not

show until the third year of the programme. Taking into account the limited timescale allowed for the present study when compared to the Swiss study and the indication that musical activities might have been responsible for the improvement in the reading ability of S.M. and J.G., it seems reasonable to conclude that another more intensive study should be undertaken over a considerably longer period and involving a larger number of subjects.

Appendices

Appendix 1

Experimental items for the non-word test

hig	dep
muntal	ritney
nal	yonter
gantok	foy
kug	kun
gok	nurdal
sanlud	ged
bis	lar
renbok	daspog
minlan	jek
ludpon	libnol
lan	dal
mip	ped
sul	bantik
bosdin	lemfid
culgin	fik
pos	mitson
fambey	goklup
kesdal	lom
ruk	puklon

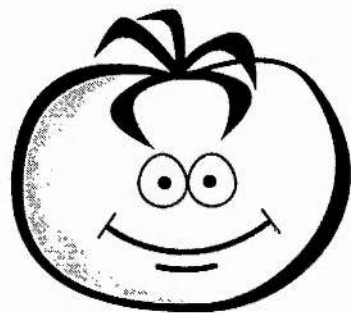
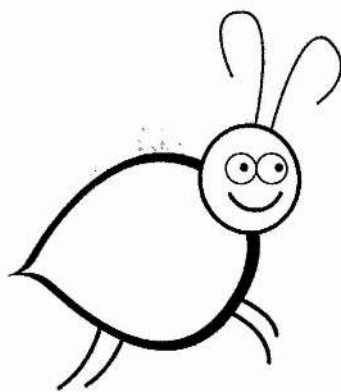
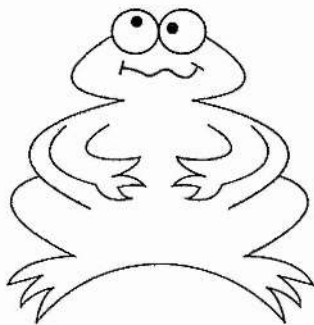
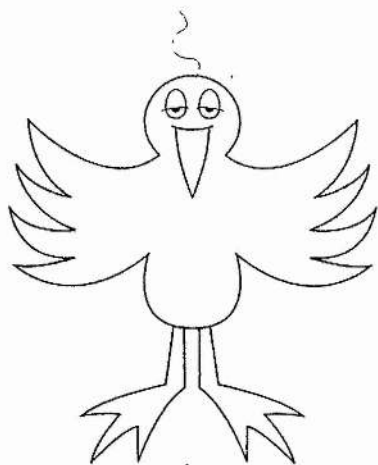
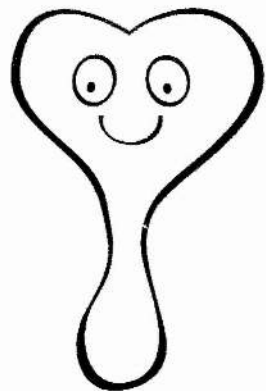
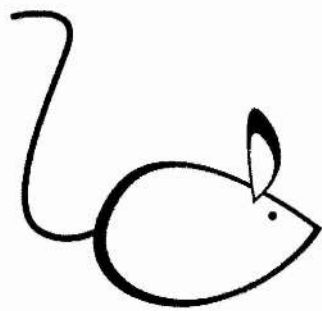
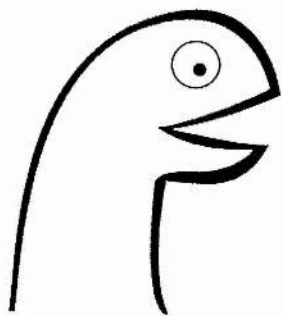
Appendix 2

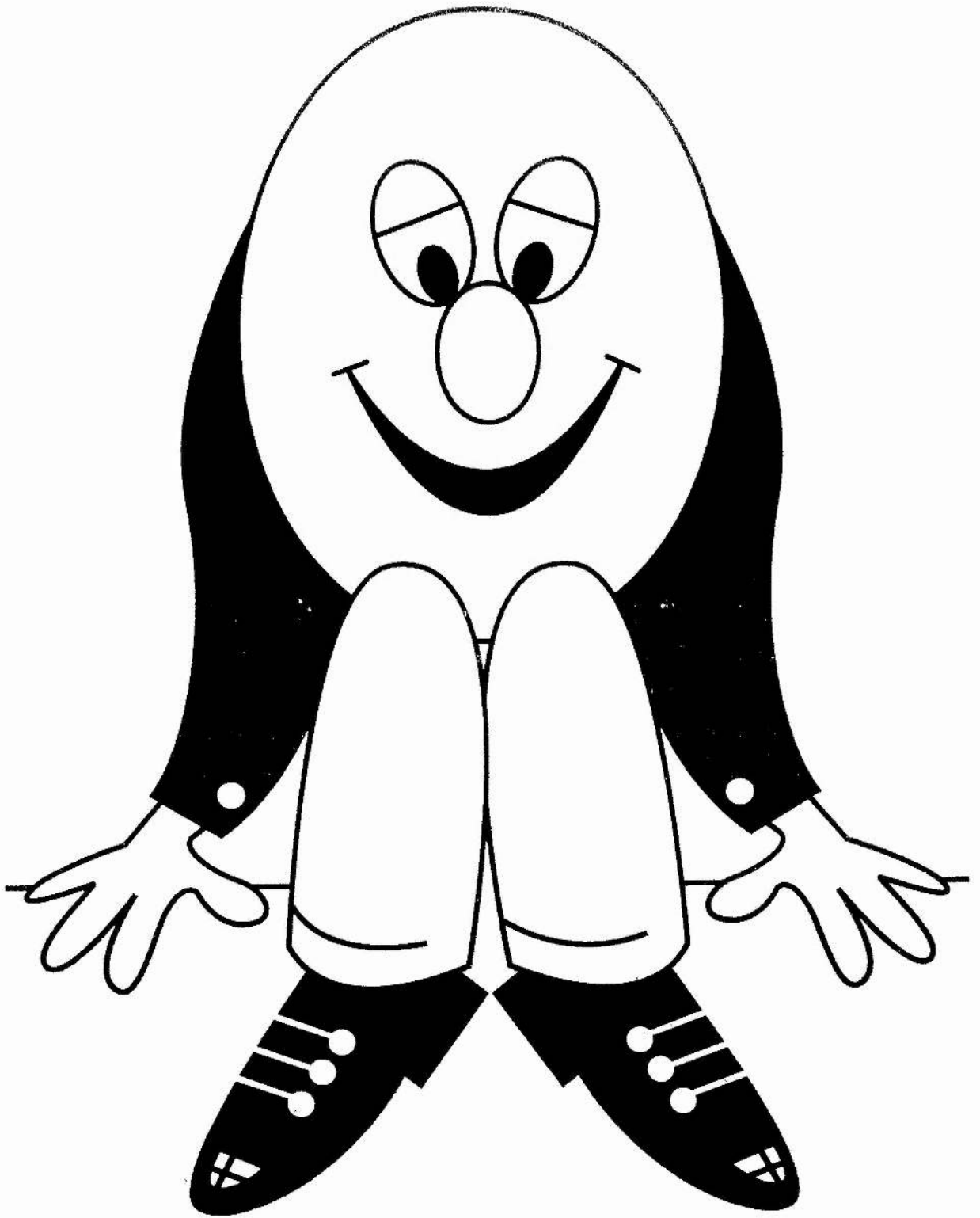
Experimental items for the regular and irregular high and low
frequency word reading test

heard	pint	green	slate
touch	great	bring	stuck
still	pest	best	wool
both	deaf	strong	dust
aunt	put	shall	lose
stick	down	gang	sew
luck	take	soul	rub
turn	doll	come	prove
gone	kept	love	base
foot	glove	dance	bowl
broad	good	went	bread
treat	hard	mile	bush
spade	give	spear	got
steak	does	dive	wake

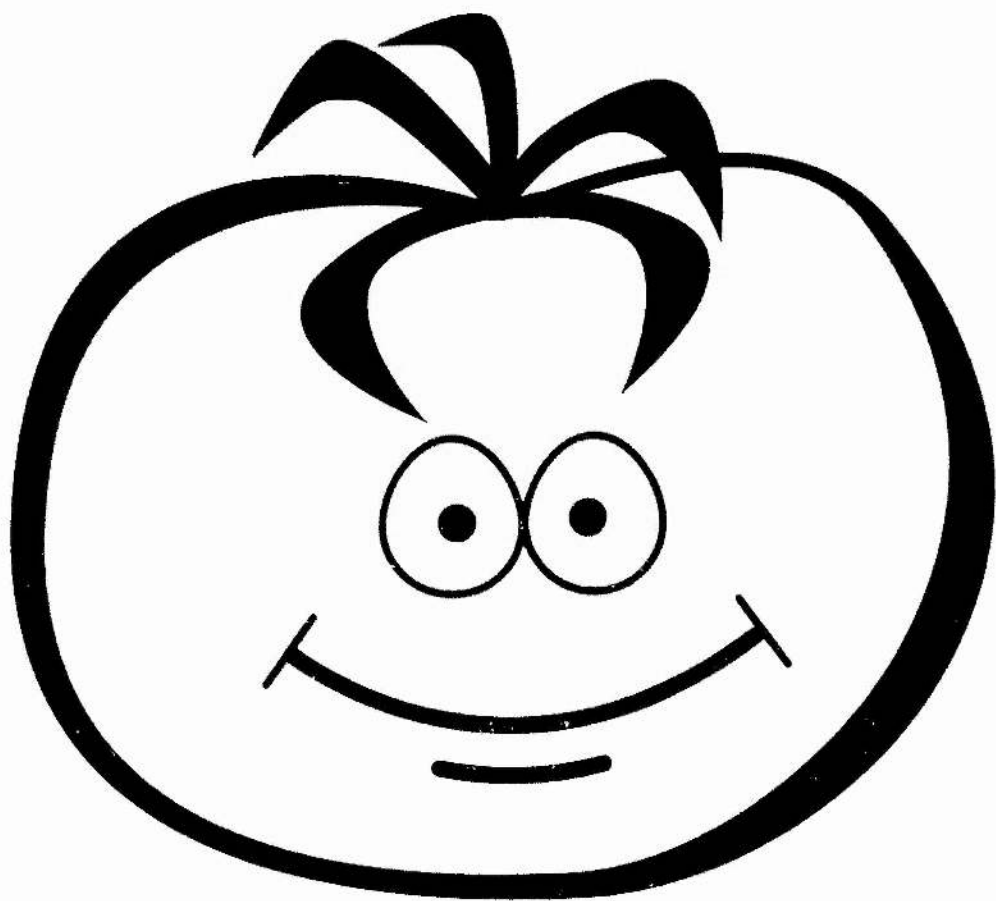
Appendix 3

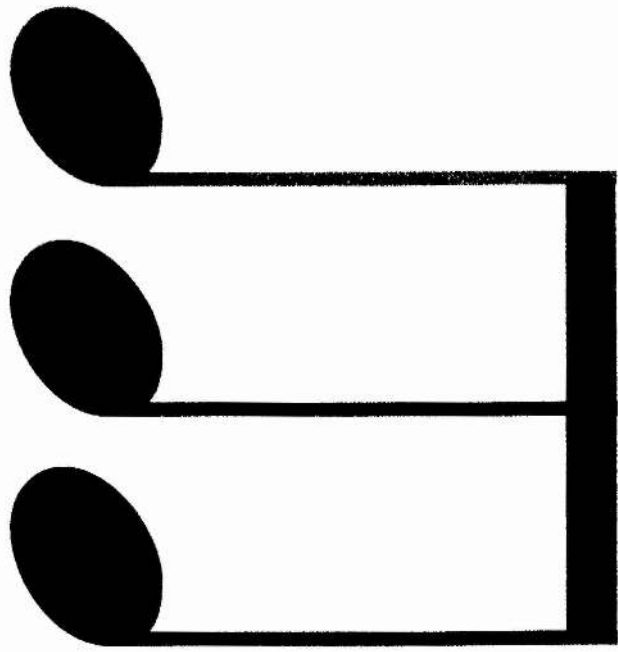
Pictures of fun characters from "Oscar Moves On".
(Holdstock.1990) with the rhythm patterns of their names.
Examples of full-size flash cards as used by the children are also
included.



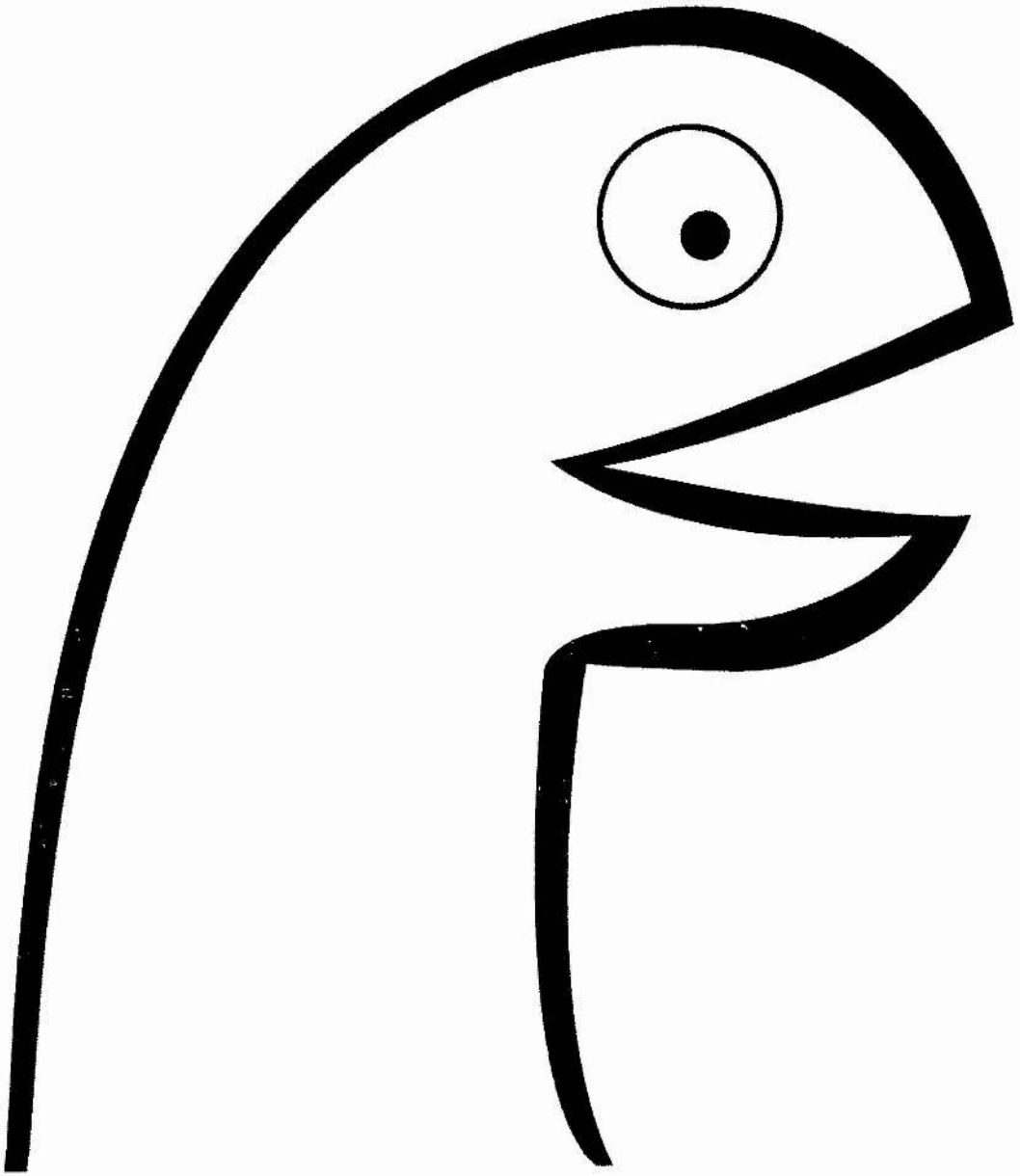


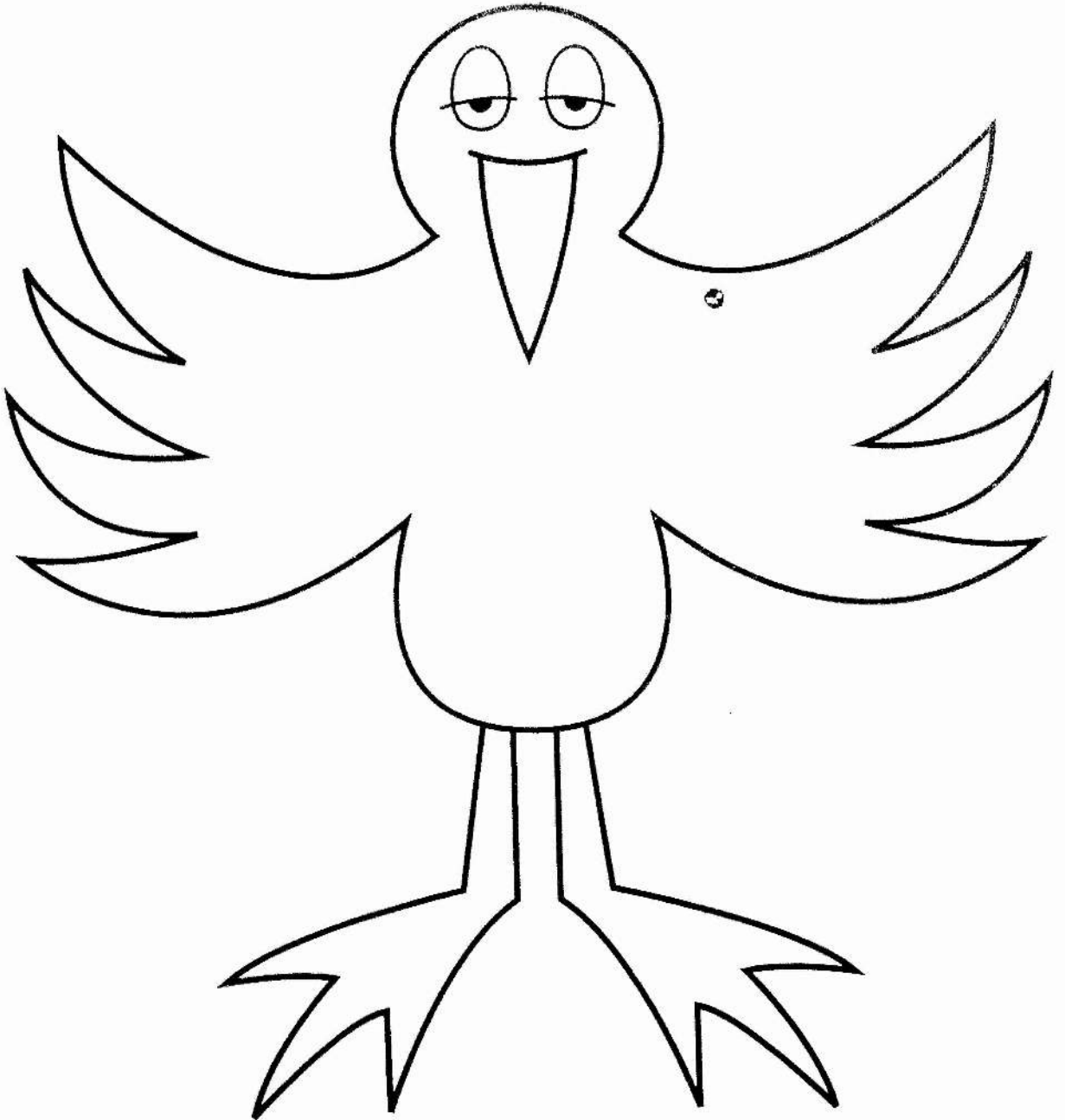


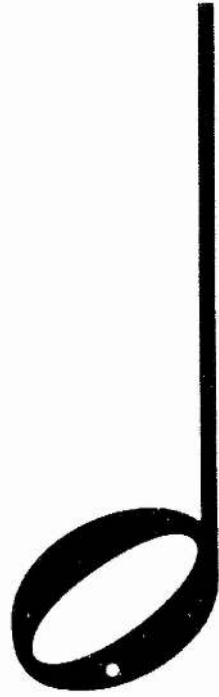










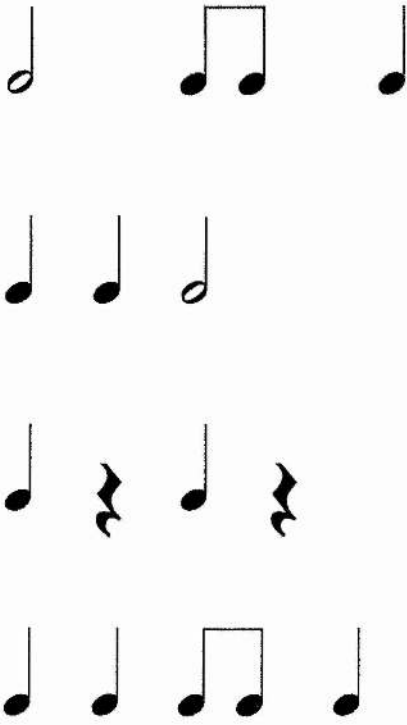


Appendix 4

Example 1 shows written rhythmic patterns which the children performed either by clapping or playing on untuned percussion instruments. Example 2 shows their progression to playing the same patterns on a single note on the musical staff.

Examples 3 and 4 show further progression with the gradual introduction of additional notes. In examples 3 and 4 only one and two beat notes have been used to avoid confusion at this early stage in reading music. Examples of the flash cards used by the children are also included.

1



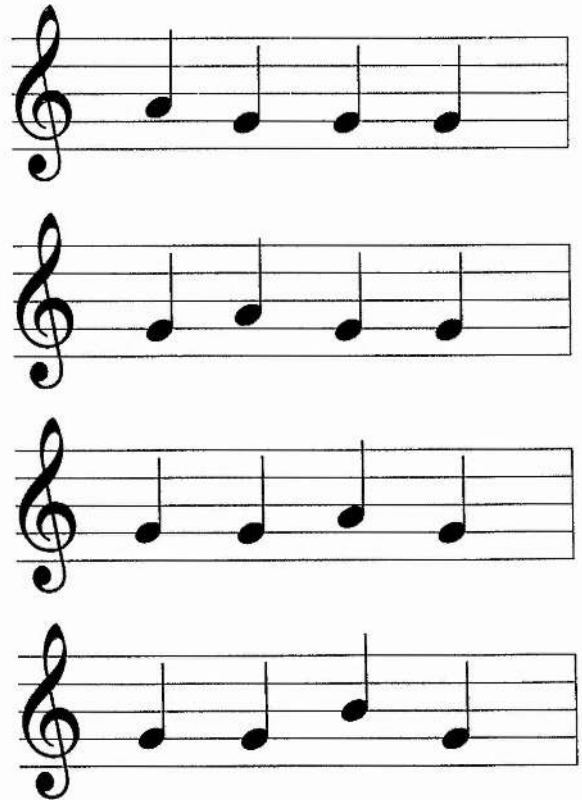
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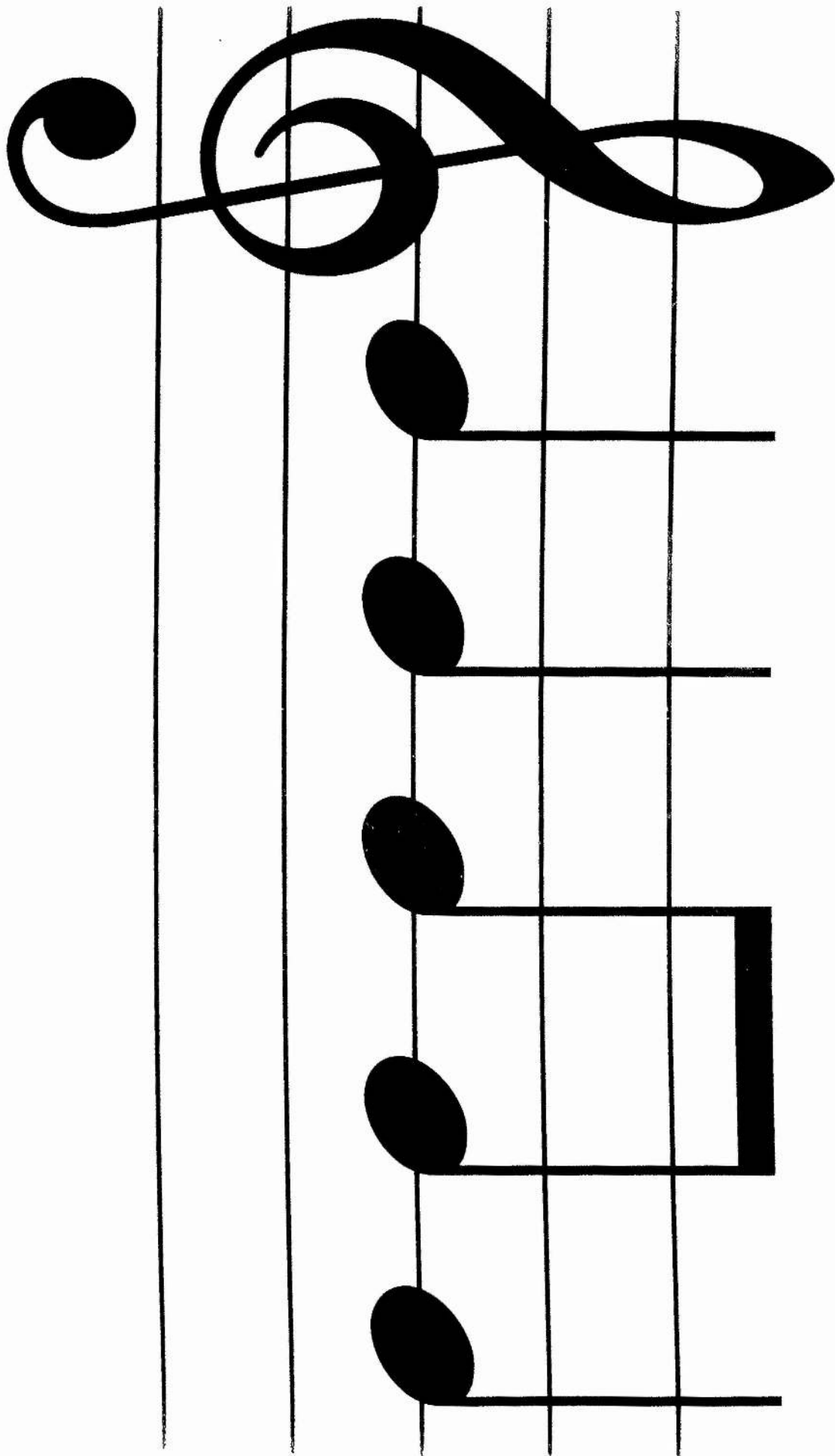
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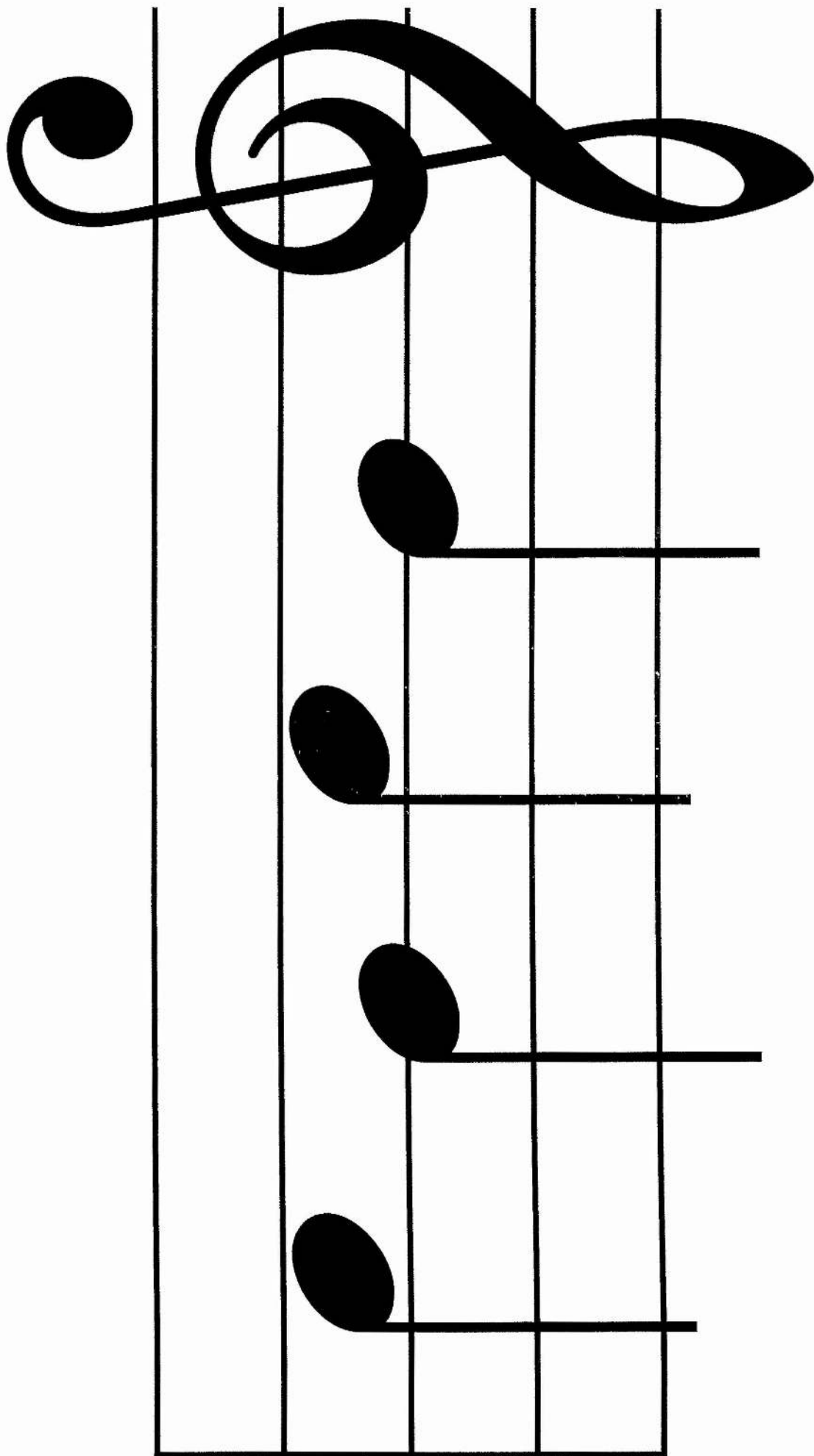


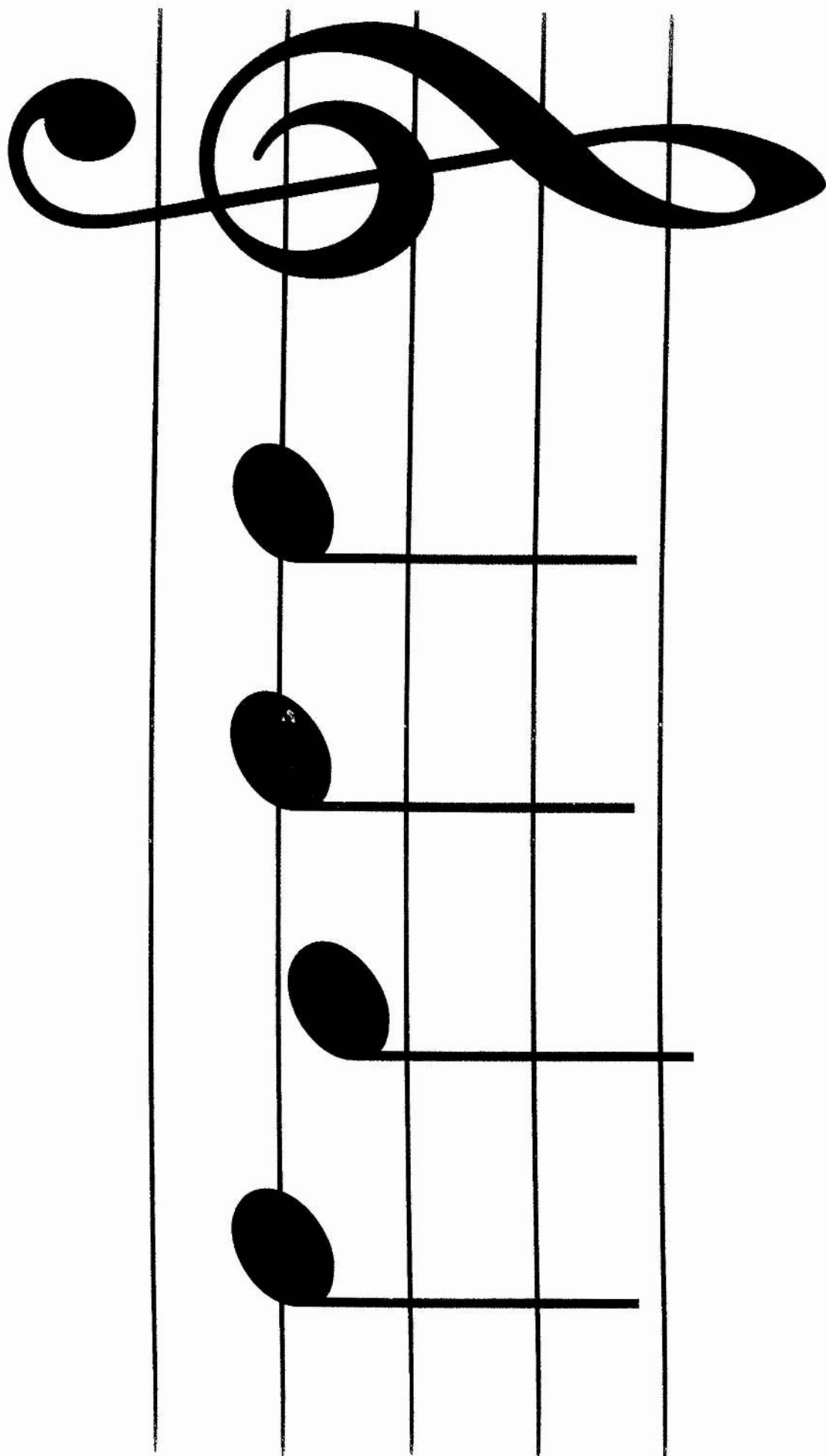
4





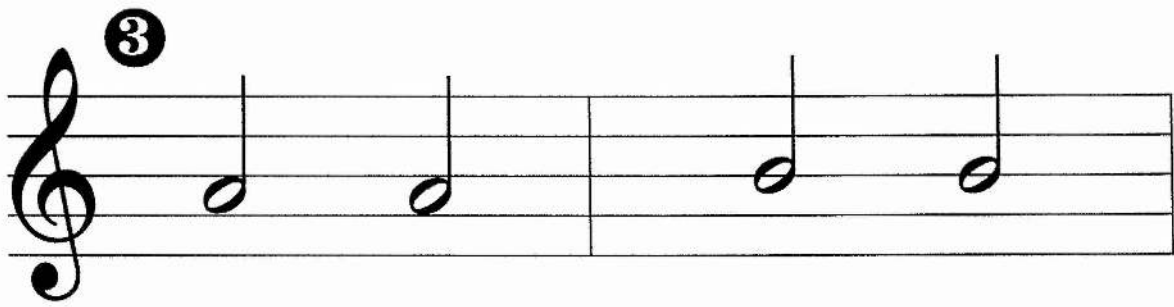
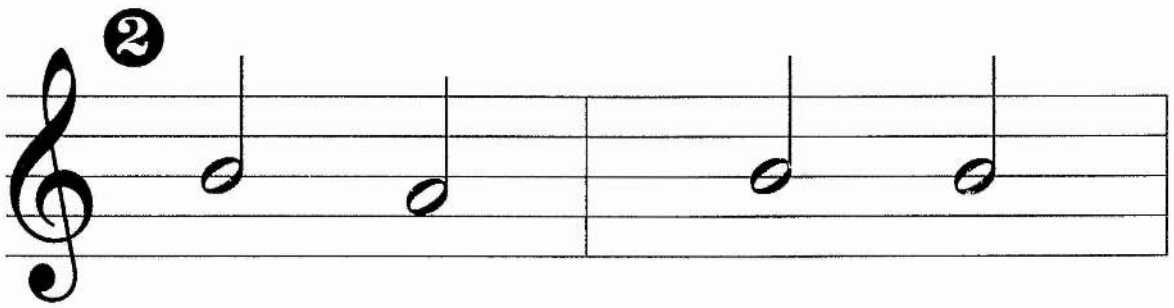
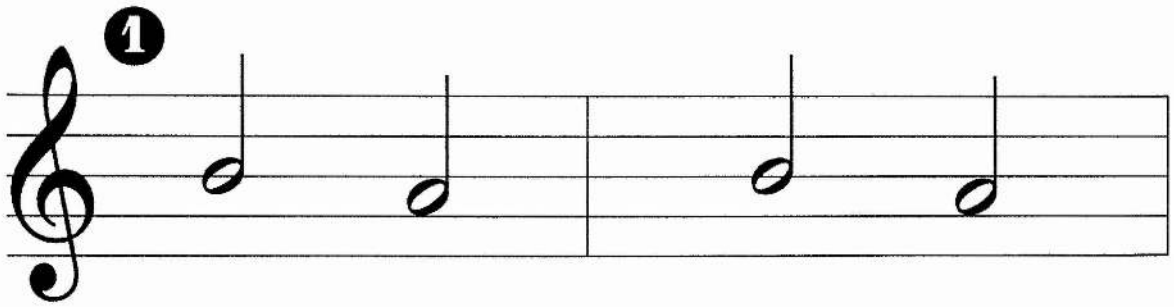


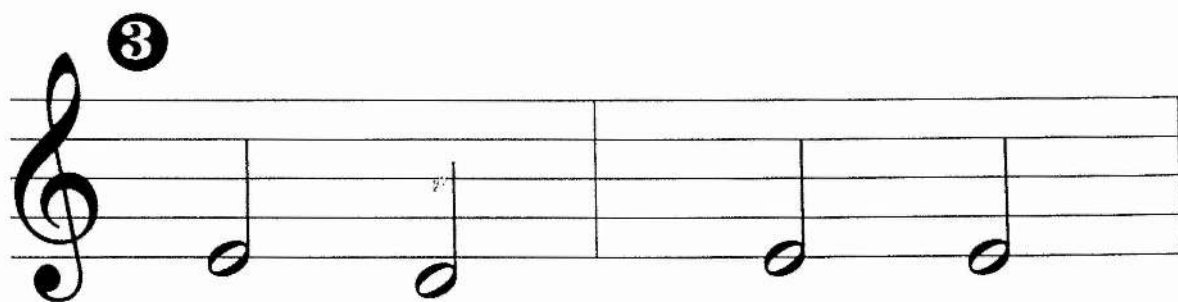
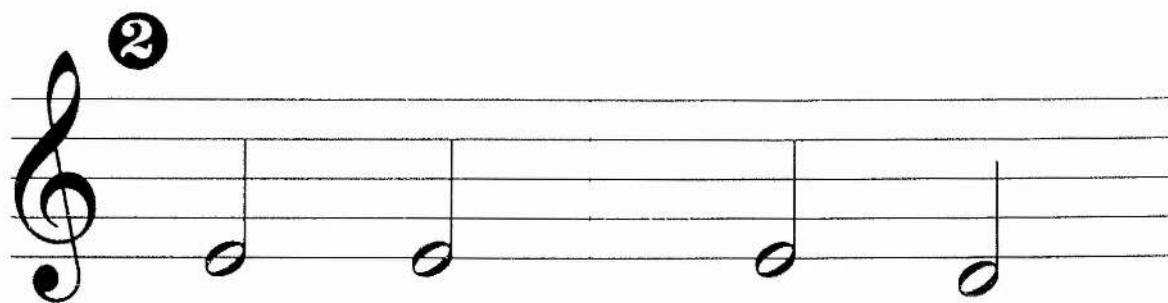
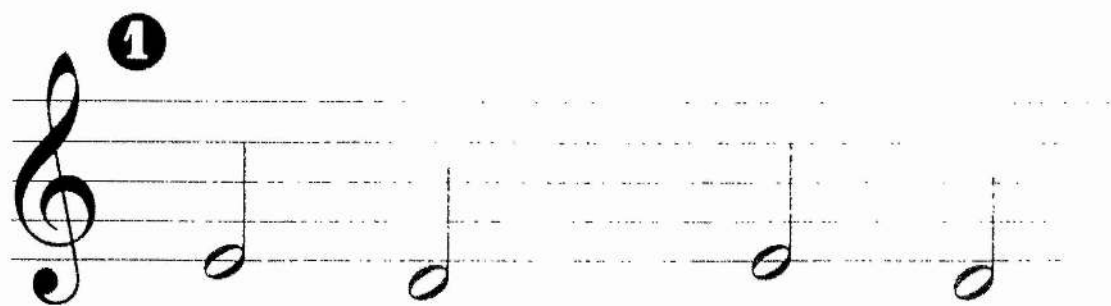




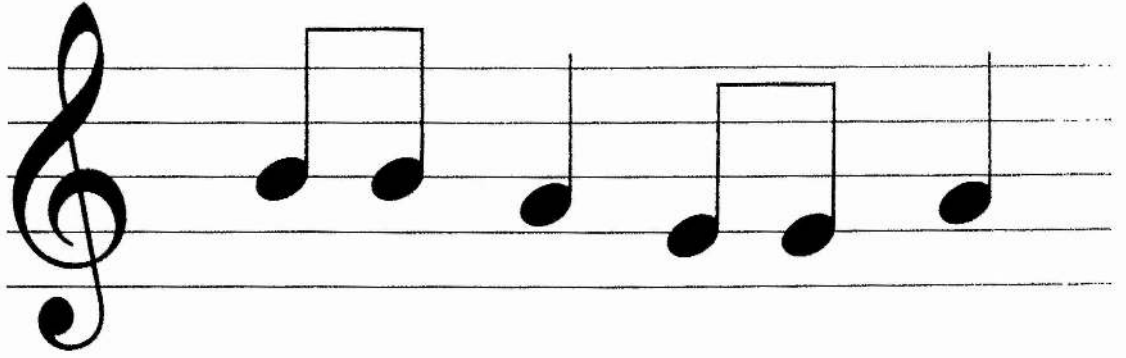
Appendix 5

Each card shows examples of short musical extracts which are almost the same. The children had to decide which of these similar tunes was played by the researcher.

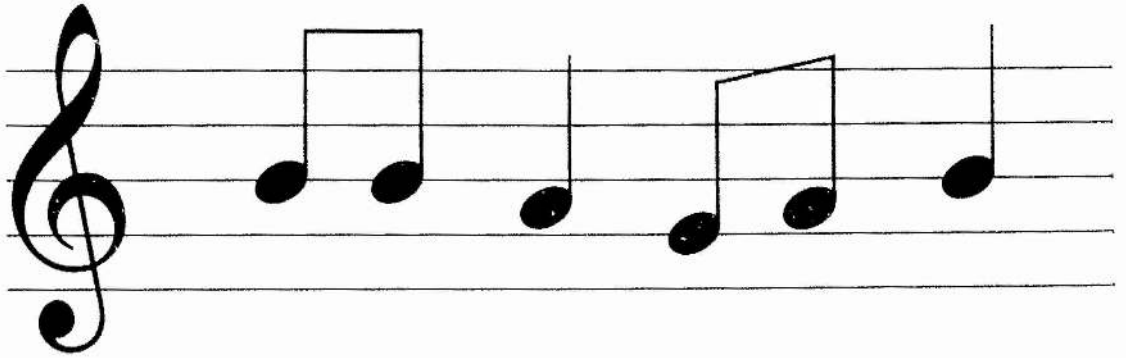




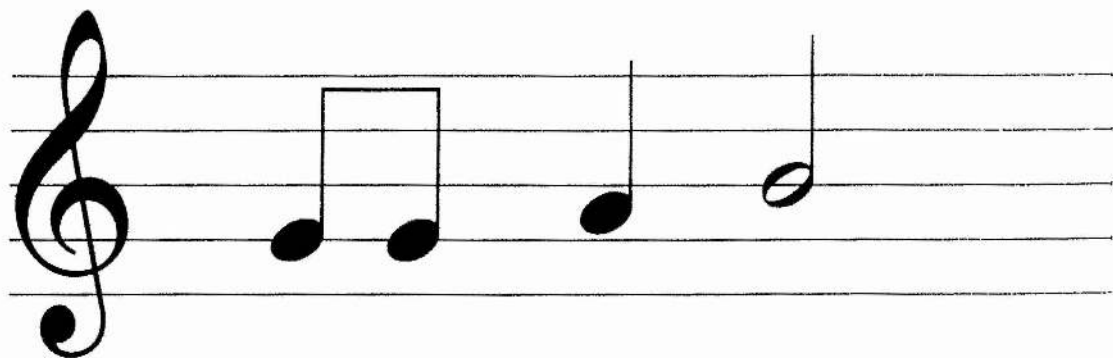
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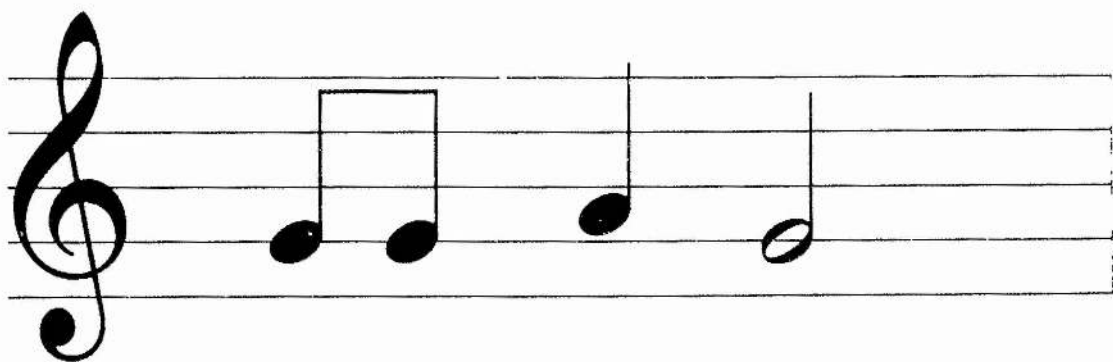
2



1



2



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