

Some Observations Concerning the Musical Education of
Blind Children and Those with Additional Handicaps.

Society for Research in Psychology of Music and Music Education

THIRTY-SECOND CONFERENCE ON RESEARCH IN PSYCHOLOGY OF MUSIC AND MUSIC EDUCATION

SATURDAY 22 OCTOBER 1988

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THIRTY-SECOND CONFERENCE ON RESEARCH IN PSYCHOLOGY
OF MUSIC AND MUSIC EDUCATION

AT THE UNIVERSITY OF READING SCHOOL OF EDUCATION
LONDON ROAD, READING

ON SATURDAY 22 OCTOBER 1988

P R O G R A M M E

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|----------|--|
| 10.00 am | Arrival & Coffee |
| 10.20 am | Welcome by Chairman |
| 10.30 am | A QUESTION OF RESEARCH: MUSIC THERAPY & AUTISM
Auriel Warwick |
| 11.40 am | SOME OBSERVATIONS CONCERNING THE MUSICAL
EDUCATION OF BLIND CHILDREN AND THOSE WITH
ADDITIONAL HANDICAPS
Adam Ockelford |
| 12.45 pm | Lunch at St. David's Hall |
| 2.00 pm | DEVELOPING VOICE SKILLS IN CHILDREN: RESULTS
WITH A NEW MICROCOMPUTER-BASED-SYSTEM FOR REAL-
TIME VISUAL FEEDBACK
Graham Welch |
| 3.20 pm | Tea |

Some Observations Concerning the Musical Education of Blind Children and Those with Additional Handicaps.

Abstract.

This paper is based on my experience as a music teacher at Linden Lodge, a school for the visually impaired. Attention is focused on those youngsters who have had little or no sight from birth, and many of whom have additional handicaps, which may be mental, physical or both. By presenting a number of case studies, I aim to show that the musical attitudes and abilities of a high proportion of the children I teach apparently differ from those displayed by their sighted peers, and the consequences of this assertion are discussed. It is my hope that this presentation may stimulate research into what appears to be a somewhat neglected area of music psychology, for I feel sure that a clearer understanding of the music educational needs of this tiny minority of children could be beneficial to a great many others.

Adam Ochalford

22. x. 88.

I would like to begin by playing you some music.

[Audio excerpt 1 - Anthony]

In itself, I'm sure you will agree, a quite unremarkable rendition of 'Take 5'. However, the recording takes on a new interest, I believe, when you consider that both the percussion and the saxophone parts were performed by Anthony, a ten-year-old boy, who was born both totally blind and with severe learning difficulties.

At the time of the recording, the extent of Anthony's handicap was such that he found it difficult to communicate verbally, and seemed to have little or no hope ever of becoming literate. His powers of reasoning were poor, and a good many elementary concepts were quite simply beyond his grasp. Perhaps it is not surprising, therefore, that Anthony found it hard to relate to people, and that, in trying to manage his day-to-day affairs, he suffered a good deal of frustration that would show itself in outbursts of eccentric behaviour, often culminating in temper tantrums.

Yet, at the age of ten, Anthony displayed musical abilities of which many professional musicians would be envious. Among his talents was a highly refined sense of perfect pitch, which held good right across the range of frequencies normally encountered in music, and which could judge everyday sounds just as effectively as instrumental timbres. (In fact, Anthony was later able to pour himself a cup of tea precisely to the rim, once he knew the right pitch to listen out for). Furthermore, he seemed to be able to identify at least ten notes at once played on the piano for only the briefest instant. His sense of rhythm, as I hope the recording showed, was

impeccable. And Anthony's memory never failed to amaze me. As one example of the many I could give: he learnt, after only two hearings, a piano piece by Frank Bridge entitled 'Heartsease', which, to give you a rough guide as to length and complexity, takes up two pages of print music and involves complex chromatic harmonies spaced over a wide range. More important, though, than all these things, in my opinion, was Anthony's sheer ability to communicate in sound; without necessarily being aware of his particular circumstances, people were often genuinely moved by his playing.

Now, I thought it would be especially fitting to use the example of Anthony to introduce this talk today, since it was hearing him play 'Take 5' that served as my introduction to the world of the visually impaired and music, some eight years ago. As a student at the Royal Academy, I was asked if there was anything that I could do to help Anthony and his teachers; initially, perhaps, by putting his abilities into perspective: how did they rate compared with those of the junior exhibitors at college, for example? Then, could I make suggestions as to how his musical education might best proceed? - and what hopes were there for the future? Above all, could Anthony ever become a professional musician?

Needless to say, I had little idea of how to answer these questions, although I did find getting to know Anthony and many of his friends at school such a rewarding experience that I decided to specialise in teaching music to the blind, and especially those who, like Anthony, were additionally handicapped, yet whose musical faculties were intact or even in some way, perhaps, enhanced. Towards this end, the obvious first stage, it seemed, was to familiarise myself with the relevant established educational practices, whether by reading, or, better still, through observation. However, despite many enquiries, I came across no such body of expertise. Unlike those

visually impaired children who were academically able, for whom a long and excellent tradition of music teaching was already in existence at institutions such as Worcester College (the equivalent of a grammar school for the blind), for youngsters like Anthony, there was apparently no such fund of knowledge from which I could borrow (or, indeed, later invest). Well-meaning people pointed me towards music therapy, but I considered that while Anthony may have derived some benefit from this, it wouldn't have begun to fulfil his music educational needs.

Eventually, when I came to look through the psychological literature (which I must confess was a completely new departure for me) I did at last find the occasional article that was of relevance. I learnt that the existence of people with an extreme combination of ability and inability like Anthony's had long been recognised by psychologists, who customarily referred to them as 'idiots savants'. Examples of recent research in this field, by the way, include that by Sloboda, Hermelin and O'Conner (1985) and Miller (1987), not to mention, of course, the paper given at the Spring meeting of this society last year. However, although I found it reassuring to know that Anthony was not alone, and whilst, naturally, it was informative to learn of others like him, from my point of view, the material I could find did not go far enough. It stopped short at the level of description, whereas what I needed for Anthony were not the criteria by which to gauge his talents, but advice on how to make the best use of them. In particular, I wanted to know whether it would be feasible to devise an educational programme that would somehow use his strengths to help develop his weaker areas.

In the absence of such information, though, there seemed to be no resolution to the increasingly unfortunate position in which Anthony was to find himself. For despite his musical abilities and aspirations, his lack of

independence, his tetchiness in relationships, and his almost total lack of theoretical knowledge, meant that, as he grew older, the world of classical music accepted him ever more grudgingly. Although for a number years he attended the I.L.E.A. Centre for Young Musicians at Pimlico, and, when given the chance, excelled in playing percussion with some of the best youth orchestras and bands in London, the capital's music colleges have now expressed little or no interest in taking him on. The field of popular music seems to offer no real hope either, for while literacy is not a fundamental requirement, a prepossessing personality indisputably is, and Anthony finds it almost impossible to promote himself outside the actual production of sound. So today, at the age of twenty, Anthony is still living at home, musically unfulfilled, and with no prospect of becoming so in the foreseeable future.

You could say, of course, that this is not a psychological problem but a social one, brought about by our extra-musical expectations of musicians - and there would be a lot of truth in this, no doubt. But I still feel as I have always felt, that Anthony's plight is less his failing than ours, and that with sufficient understanding it should be possible to help him. Not that such an undertaking would be purely altruistic: for reflecting on Anthony's musical talents, I have found, is rather like looking at one's own abilities under a magnifying glass, making them somewhat easier to see. For example, I had no idea that I had any sense of absolute pitch until hearing what Anthony could do made me think again. Then, with a little careful practice, and above all the feeling that if he could do it, so could I - at least to some extent - I discovered, at the age of twenty-one, that I could after all name notes played at random on the piano. In general, I can say that knowing Anthony has caused me to re-evaluate many of my previous

conceptions of musicality, and an awareness of just how he learns has radically altered the teaching strategies I use with other children.

I should point out that Anthony is far from being alone. A number of the children I have taught at Linden Lodge over the past eight years have to me seemed to have, even if not Anthony's extraordinary blend of talents, then at least some particular musical ability that makes them, in my mind, worthy of special interest. And by introducing some of these youngsters to you now - both on video and audio tapes and, later, in the flesh - I hope I may arouse a similar interest in some of you here today. Although the evidence I shall present is based purely on a few informal case studies, I shan't be able to resist drawing a few tentative conclusions from what we see and hear. However, I am no psychologist, and my aim, above all, in bringing your attention to this small, and not to say unusual, population of children is to plead for more research, largely to help them, of course, but from whose results I feel sure we would all benefit.

* * *

First, let me set the scene by giving you a few general facts and figures about the population of visually impaired children in this country. According to a discussion paper produced by the D.E.S. in 1984 concerning the future provision in special schools for children with visual handicaps, the number of blind and partially-sighted children is falling, and has been for some years. Although no exact figures are available, it was projected in the report that in 1987 there would be around 700 blind youngsters and 1,600 who were partially-sighted in England of school age. Note that these groups together represent a tiny proportion of the total population of schoolchildren - approximately 3 in 10,000.

Within this declining role, a further change has taken place in that the number of children with additional handicaps has increased. Ironically, it is medical advances that apparently lie behind this rise. For while some of the common causes of childhood blindness have been all but eliminated in this country today, other youngsters, who at some stage suffered a critical condition of which they would previously have died, are now surviving - but sometimes at the cost of two or more severe impairments, including the possibility of low vision. Take the case of premature babies, for example. In the fifties, the advent of incubators enabled infants to survive who were born well before their allotted nine months were up. At the time, however, it was not appreciated that the quantities of oxygen such children were given to keep them alive needed to be rigorously controlled, otherwise a condition that we now call 'retinopathy of prematurity' could ensue, causing anything from poor sight to complete blindness. Sure enough, medical and technological progress eventually eliminated these early problems. However, the same advances also permitted ever more premature babies to survive their initial period of intensive care, with the correspondingly increased risk, not only of a severe visual impairment, but of other difficulties, such as mental handicap, too.

For those of us who work in special schools, this fundamental shift in the nature of the children we serve has been compounded by changing social attitudes. On the one hand, for example, the Mental Health Act of 1974 acknowledged that children with even the severest learning difficulties had the right to be educated, while on the other, the 1981 Education Act (following the Warnock Report of 1978) facilitated the integration into mainstream schools of those handicapped youngsters who were more academically able.

Together, these factors have transformed the population of the schools for the visually impaired up and down the country. For instance, when I arrived at Linden Lodge some eight years ago, only one extra class was needed to cope with the small minority for whom a modified standard curriculum was not considered appropriate. Today, almost all the children have other problems as well as poor vision, and we now have four classes - approximately a third of the school - to cater for those whose learning difficulties are even greater.

That, I hope, gives you a general idea of the type of children we have at Linden Lodge. However, I do not intend to talk about them all today. Instead, we will concentrate on those who have been blind since birth or shortly afterwards. I take 'blind' to mean the range of vision between being unable to see anything at all and being able to distinguish a little more than light and dark. This means that I won't be talking about those who once had useful vision but have since lost it, or about the partially-sighted children that I teach. This is because, in my experience (and according to others I have spoken to), while those with limited vision may need some special adaptations to be taught music in the classroom, such as large print scores, for example, and while they may have to face certain problems such as not being able to see the conductor at band practice, as far as music education and music psychology are concerned, broadly speaking, they seem to differ little from their fully sighted peers. It is with those children who are blind that the educational differences really seem to tell, and it is those who have never, or hardly ever, been able to see that appear to be of most interest from a music psychological point of view.

Today, I have chosen to consider only the last fifty children to enter Linden Lodge who fall into this category. Note, by the way, that this total

includes all those with additional handicaps, including even deafness.

Admittedly, it is not a great number, and one that is potentially quite unrepresentative of the population countrywide; nevertheless, a figure that covers around ten years intake, and includes the youngsters that I feel best qualified to talk about. You will find these children listed by number on your 'hand-outs'; as an example, Anthony (whom we heard playing 'Take 5') is number 35. I will explain the significance of the ticks, crosses and other symbols as we proceed. For your interest, I have provided thumbnail sketches of each child, which are intended to give some indication of his or her musical attitudes and abilities. The information is culled partly from educational records and partly from my general working knowledge of the children. Where opinions are expressed, these represent a distillation of my own views, those of my colleagues, and, where possible, of the children themselves. I harbour no pretensions as to the scientific accuracy or statistical validity of this data. It must be treated purely for what it is: a series of observations, whose ultimate aim is merely to stimulate rather more rigorously controlled future research. Clearly, in the short time that is available to us now, it would be quite impossible to discuss all the points that even a brief survey of this table is likely to raise, so I will pick on one or two that seem to me to be particularly striking. As I intimated earlier, these will be illustrated with case studies.

* * *

I will begin by examining the question which I am asked most often, and which in a sense underlies all others, namely: "Is there a significant difference, generally speaking, in the role played by music in the lives of blind as compared to sighted people?". It goes without saying, of course, that a quantitative answer is hard to come by, an unsatisfactory state of

affairs, which a glance through the somewhat sketchy literature on the subject only serves to confirm. While writers from the middle of the last century right up to the present day talk, for example, of the "proverbial ... deep-rooted attachment of the blind to music" (Wood, 1853), and of the "conviction that music means a great deal in the life of the blind child" (Townsend, 1964), there appears to be a distinct lack of evidence to back such statements up. It is not enough to say, for instance, as does Bevans (1965), that music is important to blind children, since it is "the one form of art, the one area of creativity, available to [them] ... without limitation." What is really needed, it seems to me, is for a scientifically based comparison to be made between equivalent groups of visually impaired and normally seeing youngsters, that would in some way provide an objective measure of the relative degree of musical interest held by each.

Lacking the necessary expertise in psychological investigation, I feel quite unqualified to undertake such a study myself. However, in order to give you at least some idea of situation that exists at Linden Lodge, I have tried to assess, on a scale of 1 to 5, the part that music plays in the lives of the 50 children listed on your sheets; please refer to column 7. The extremes of each category are shown by a 'plus' or a 'minus'. A '1' denotes no apparent interest in music, or even positive dislike, while a '2' should be taken to mean a negligible level of involvement. A '3' indicates that, as far as I can ascertain, music is of 'average' consequence to the pupil concerned, coming midway between other diversions of greater or lesser significance. A '4' shows that music appears to be of great moment to that child - probably as important as any other single activity. Finally, a '5' is indicative of a passion for music, quite possibly to the exclusion of other things.

Looking at these figures, one could only conclude that, yes, music does play a major role in the lives of many of the children. For example, six of them - that is to say 12% - have a rating of '5', while over half the remainder are given a '4'. Even assuming that these findings represent a gross overestimation on my part and that of my colleagues, then surely to find even one child in so small a group whose fascination for music amounted almost to obsession, or just two or three for whom music was of great importance, would be exceptional.

I must stress that in assessing the children's attitudes, no account was taken either of their musical ability or achievement. In fact, one of the greatest challenges I face at Linden Lodge is trying to devise teaching strategies for multi-handicapped youngsters to whom music clearly means a great deal, but who can achieve, by most people's standards, very little. I could give several examples of pupils who fall into this category, perhaps one of the most extraordinary being a boy who attends Rushton Hall School near Kettering (which specifically caters for junior age children who are blind with additional handicaps), whose sole form of verbal communication is to hum the opening of nursery rhymes. He then expects you to finish them, which can be rather nerve-racking in view of the fact that he sometimes provides only two or three notes for you to go on, and is inclined to become distressed if the outcome he anticipated is not immediately forthcoming!

Of equal interest, in my view, is a boy aged 7 called Omur (who, by the way, is number 10 on your list). When he arrived at Linden Lodge some three years ago, we wondered whether, as well as being totally blind and severely mentally handicapped, he was deaf too, since showed no reaction to sounds. However, since he has been with us, Omur has learnt to make effective use of his hearing - in fact, one of the great interests he has developed is playing

the piano. This he will do for substantial periods of time; I have to admit that I'm the one who usually calls a halt after half an hour or so! He enjoys playing on his own, although he will interact in a limited way with a sympathetic co-performer. Whilst on occasions he roams up and down the keyboard trying individual notes in an exploratory fashion, he frequently gets a fixation for 'g' around one and half octaves below 'middle c', repeating it obsessively until he is stopped. To give you an idea of the general effect, here is a brief excerpt from a session I had with Omur a few weeks ago. You will hear him playing entirely on his own, largely with the left hand, although at one point that right hand joins in - interestingly enough - with the 'g' an octave higher.

[Audio excerpt 2 - Omur]

To me, Omur's playing raises a number of questions. For instance, what significance, if any, can we attribute to the fact that he always returns to the same note and then reiterates it so single-mindedly? Then, can this special attention to a particular pitch, and of course his wider interest in playing the piano, be developed any further, and if so, how? - one has to bear in mind the degree of Omur's mental impairment, which means, among other things, that he has no speech at all.

* * *

So much for the attitudes to music adopted by the children. We now consider some of the implications of being unable to see for their music education. Being blind naturally makes life that much more difficult for instrumentalists: consider, for example, how much of our technical expertise is usually acquired visually, by watching others and seeking to emulate what

they do. Then, how often do most pianists, for instance, look at their hands and at the keyboard while they are practising and during performance? Blind people must learn to gauge the distance of leaps, large and small, purely kinaesthetically. In music for ensemble, there are additional problems:

consider the extent to which the members of a string quartet, for example, normally use visual cueing to help synchronise an initial attack, to ensure a sustained chord is terminated simultaneously, or to assist in changes of tempo. And for those who wish to join a band, orchestra or choir, there is, as I mentioned earlier, the obstacle of not being able to see the conductor.

Serious though these difficulties may appear, they can all be surmounted one way or another, with a little extra thought or effort. However, people who are blind and musical have other problems to face which can be much harder to overcome. The most formidable of these, in my view, is the matter of literacy. Currently, there is only one way in which the severely visually impaired can read music, and that is through braille.

Now, if you look at your sheets, you will see that I have indicated by placing a tick in column 6 which children are, or seem likely to become, competent readers of braille music. There are only six of them in total, a number which seems ridiculously small, bearing in mind the high level of musical interest and achievement in the group, and even taking into account that I have included those who have moderate or severe learning difficulties. (Perhaps I should add that this figure, to the best of my knowledge, appears to be a fair reflection of the position found in comparable schools up and down the country.) This leaves us with the question: "Why?". The answer, which is widely acknowledged by those who work in this field, is quite simply because braille music is so difficult to learn and to use. Let me give you

an idea of the intricacies involved by explaining something of how the system works. You will need to refer to the back page of your handouts.

All braille comprises individual 'cells' of six potential dots, arranged in two adjacent columns of three, which are numbered for convenience as shown. If we include the 'blank' cell, in which none of the dots actually appear, this yields 2^6 , or 64 possible combinations through which information can be conveyed. However, since there are many more than 64 different items of musical data that need to be notated at various times, the same configuration of dots often has to stand for more than one thing, and its meaning can be ascertained only through context. Perhaps the simplest examples of formations that serve a dual function are those that indicate duration: the lengths of notes that are commonly found in music each have to share a sign. As you can see from your sheets, the semibreve and semiquaver, for instance, are both indicated by dots 3 and 6 together, while the minim and demisemiquaver are each shown by a dot 3 on its own. To me, such ambiguity represents one of the major obstacles that hinders the ready acceptance of braille music, yet one that is, unfortunately, an inescapable consequence of having only six dots through which to describe a universe of sound.

Despite unavoidable difficulties of this nature, the system of braille music that we use is, I believe, still a good deal more complicated than it needs to be. For example, could you imagine anything more bizarre than writing down the scale of C major ascending (that is, 'c, d, e, f, g, a, b') as 'd, e, f, g, h, i, j'? Yet that is exactly what happens in braille music: the letter 'd' as used in ordinary reading and writing means 'c' in music; 'e' stands for 'd', and so on: hardly a method that recommends itself educationally. And as one works further through the code, it becomes ever more apparent that ease of

learning was far from the sophisticated mind of its author. If anyone would care to know more, I have here the 'Revised International Manual of Braille Music Notation 1956', Part I (which deals with Western Music).

A third problem, and one that inevitably bedevils any attempt to transmit information in tactile form is posed by the perceptual limitations which characterise our sense of touch: the most discerning fingertips in the world are ultimately a poor substitute for the retina. Essentially, they can scrutinise data only in serial fashion, which in terms of braille means examining each item successively from a single file of cells, inevitably a much slower process than the rapid and directionally free scanning that is possible visually. Yet most music is essentially 'two dimensional': it has both a 'vertical' element, in that sounds can be arranged simultaneously, and a 'horizontal' component too, since notes occur successively. One way that braille copes with these two perspectives is to reduce them, as far as possible, to a solitary line of cells. Hence chords become flattened out, as it were, into a series of intervals that have to be restacked in the performer's mind. As you can imagine, transcribing counterpoint is a nightmarish exercise. On your sheets I have given an example from page 40 of the 'Revised International Manual' - a comparatively simple two-part passage. In braille, beats one and two of the upper voice are written first, followed by the crotchets and quavers that fit beneath it, then the last beat of the top part appears, followed by its accompanying semiquavers, and so the process is repeated for the remaining bar. Piecing these fragments together demands levels of aural and mental agility, well in excess, I would say, of those required to read and hear the print version.

A final complication of braille to which I should like to draw to your attention is the fact that reading it occupies at least one hand, which is

not therefore free to do anything else. Although this does not affect singers, sightreading is impossible for most instrumentalists, who can learn a new piece from a given text only by internalising short portions of it before trying them out. These may well have to be ratified against the text before practising from memory can ensue - altogether a painstaking process. For pianists and other keyboard players the situation is a little easier since, if they so desire, they can at least read with one hand while playing with the other. To show you how this works, I have a video of Fiona (number 5 on your lists), making her third ever attempt to read braille music. You will see her playing first with her right hand as she reads with her left, and then the roles are reversed.

[Video ~~ex~~cerpt 1 - Fiona]

The many difficulties associated with braille music have profound educational consequences. To make effective use of it demands not only a good deal of musical ability, but a high degree of intelligence too - a combination that relatively few people possess. In crude terms, this means that visually impaired children who, as far as one can judge, would almost certainly have had the wherewithal to deal with print music were they able to see it, are condemned instead to musical illiteracy. The absence of notation naturally affects one's teaching approach - most obviously in that everything must be taught and learnt by rote. This method at least develops the memory, and keeps it in trim to an age when most of us have settled for the safety of visual cues. Certainly, as you can see from your sheets, it is my impression that many of the children at Linden Lodge do indeed seem to learn new pieces quickly and retain them well, and this is one area, it seems to me, in which it would be fascinating to perform a comparative study with their sighted peers. Sadly, though, the apparent gain in the children's capacity for

remembering things is more than offset by their undoubted loss of musical independence. It is perhaps unfortunate for them that we live in a society whose tradition of classical music is so strongly rooted in literacy; over the centuries, composers have come to rely on notation to support the complexity of the pieces that they write: even the best pair of ears in the world would be pushed to hear and remember every instrumental and vocal line in Wagner's 'Ring', for example. Hence, the only way that someone like Anthony, whom I mentioned at the beginning of this talk, could even begin to enter such a world (for the problem of sightreading would remain unresolved), would be by having constant access to a musical companion to tell him precisely what was written in his part.

Such a situation is fraught with impracticalities, and it seems inevitable that my gifted, though musically illiterate, pupils who are keen to perform at a high amateur or even professional level should choose to work in styles of music which are, for the most part, aurally based, including, in our own culture, 'pop' and jazz. Looking down the list I have given you, it is not hard to pick out the children who find themselves in this position.

Consider, for example, number 26, Hayley. Musically, she is interesting in a number of ways. Around the age of seven or so she developed an astonishing maturity of vocal production, complete with vibrato, no doubt in imitation of singers she admired. On stage, one senses that she is a 'natural' performer, possessed with that same urge to communicate in sound that grips Anthony. Although I am delighted with the success of her initial forays into the realm of 'pop' music, I cannot help feeling some regret that realistically she has little choice but to confine herself to this genre, since the convolutions of braille music would, I feel, prove too tortuous for her to follow. To give you a taste of Hayley's style, here is an excerpt from the single she released last year.

* * *

We now move on to consider the implications of congenital blindness for music psychology. Specifically, we will examine whether being severely visually impaired from birth (or shortly afterwards) is likely to affect a child's musical development, and if so, how? Although there are several points that I feel should be made in this connection, today I will concentrate on the one that seems to merit most attention; that is, the issue of absolute pitch or 'AP'. Apropos comments I made earlier, it appears to me that this is one area in particular where a detailed study of the tiny minority of children to which we are currently referring could inform our understanding of the able-bodied majority.

The incidence of AP among the children I teach and have taught at Linden Lodge strikes me as being so remarkably high, that I devoted a column to it - the fifth from the left - on your sheets. Although I have chosen to make a bimodal distinction between the possessors and the non-possessors, so-called, I am aware that this is an oversimplification, and that no such division can actually be made. In fact, I would argue that we all have AP, it is just that the five or so categories (according to Pollack, 1952) to which we can typically assign pitches are too broad to be of any great musical benefit. To gain a tick on the list, though, children must, in round terms, be able to recognise or produce a pitch consistently within a four octave range centred on middle c, and with rather less than a semitone's deviation. Note that this is a minimum qualification, and many of the youngsters can achieve far better. Looking at the results of the survey, you may wonder how one can ascertain whether or not a pupil has AP if he or she

is unable to label pitches verbally. In such circumstances, evidence may be gleaned in a number of ways, including, for example, the fact that a child consistently sings songs (with no introduction) at the 'correct' pitch. It would be interesting to equate the performance of children such as these with Siegel's (1974) research, which shows that the verbal encoding of stimuli apparently plays an important part in the way AP functions.

The figures I have come up with show that nineteen out of the fifty children (that is, 38%) have AP, according to the criteria given above. Clearly, this percentage needs verifying, preferably on a larger population, but even if we assume that it is, in fact, hopelessly exaggerated, then I suggest that even half that number would still be more than sufficient to warrant further investigation.

It would be easy, though not entirely satisfactory, to account for the high proportion of youngsters who have AP by an early preoccupation with sound fostered by the denial of vision, an explanation that certainly accords with my knowledge of the children. To take an example, consider pupil number 1 on your list, Nicholas, with whom I first became acquainted when he was just a year old. Even then he showed an extraordinary fascination for music: I recall he came into the room where Anthony was improvising on the organ, and was instantly riveted by what he heard; he continued to listen, transfixed, for twenty minutes or so. I can remember wondering then, how many other 1-year-olds would concentrate on a single source of sound for so long? Some six months later, Nicholas was already beginning to pick out the tunes of nursery rhymes on the piano by himself, though at his point they all started on 'c'. By the age of two, it was quite clear that he had developed AP: I hummed 'Twinkle, twinkle, little star' to him in 'A', and he promptly played in the right key, complete, I could add, with a primitive

tonic-dominant harmonic sketch in the left hand! How informative it would surely be to undertake a detailed case study of the development of pre-school pitch perception in a child such as Nicholas. It has also been my pleasure to witness the acuity of AP heighten as children move up through the infant and junior school. I well remember the day, for example, when pupil number 28, Philip, who showed a precocious pianistic technique from an early age first discerned, at the age of 7 or so, that the piano in the gym was tuned very slightly sharper than the one in his classroom. He came for his regular post-breakfast piano lesson, not having played before that day, and after a couple of chords remarked on the apparent discrepancy that previously had gone unnoticed. Sure enough, when we checked, he was right.

Another factor in the AP equation which may be significant, although I cannot account for its effect, is the fact that a disproportionate number of the 19 children rated as possessors - actually just under 80% - have one of two medical conditions, 'retinopathy of prematurity', which I referred to in my introduction, or 'lebers congenital amaurosis', an inherited disorder, about which relatively little seems to be known. The presence of either of these conditions is shown in column 4 of your hand-out by the initials 'ROP' or 'LCA' respectively. If we examine the statistics for each separately, we find that 5 out of the 9 youngsters with lebers amaurosis, that is to say, 56%, have AP, while 10 of the 21 retinopathy children, or 48%, are similarly endowed. Why this should be, I don't know. Both disorders, as well as causing blindness, can have other complications too, although this is not necessarily the case. Would it be ridiculous to assert that the part of the brain responsible for processing pitch could possibly be affected? - a far-fetched hypothesis, perhaps, and one to which it would be dangerous to subscribe without appropriate medical or psychological evidence, which is currently lacking. An alternative explanation would be that these conditions

somehow predispose children to be particularly interested, often obsessively so, in organised sound, and abilities such as perfect pitch follow as a result of sustained early attention to music. We should always remember, of course, that neither ROP nor lebers amaurosis guarantees absolute pitch, they merely seem to increase the likelihood of its occurrence; and while it would undoubtedly be valuable to study pupils gifted in this area such as Nicholas and Philip, a complete picture could be gained only if we look too at those youngsters who don't have their facility. Consider, for example, pupil number 46, Lisa, who seemed to have all the qualifications for developing AP, being born totally blind through LCA into a musical family who gave her every encouragement at home, and yet her long-term memory for pitch was wholly unremarkable.

I would like to conclude this discussion of AP with two brief observations. First, before I came to Linden Lodge, I had always regarded the possession of AP as the hallmark of a fine musician, yet I soon discovered that this simply wasn't the case: to be 'musical' one needs a set of cognitive, physical and even emotional qualities, of which absolute pitch is a useful though entirely dispensable member. Indeed, several of the children I teach, while being able to name the notes of tunes with no difficulty, find it extremely difficult to realise the aural structures they discern so effortlessly in instrumental terms; or, as I put it on your sheets, they seem to lack hand-ear coordination (see pupils 13, 16, 20, 21 and 25, for example). The second point I would like to make is in a way the converse of the first, namely: the youngsters who have so far fared best musically, at least in the eyes of the public, are those such as Hayley, Terry and Nichola (numbers 26, 29 and 30), who, by the standards we are using, don't have AP at all!

* * *

In addition to absolute pitch, I believe there is a tendency for other areas of musical ability to be affected by early blindness too. There isn't the time today to go into great detail, but I will at least raise one or two points, with the hope of hearing your views later.

I have already mentioned memory in connection with braille music. Even if we discount Anthony, whose extraordinary capacity for assimilating new material is without doubt worthy of investigation, I am often struck not only by the rapid rate at which many of my other pupils learn new material but how well they remember it over extended periods, and I would love to know whether the children are, generally speaking, measurably better than average in this respect, or whether this is purely a subjective reaction on my part.

I feel that the children's rhythmic abilities could usefully be investigated too; consider, for example, that, as well as a number who have been competent, we have had three outstanding drummers at the school in recent years, Terry, Anthony and Peter (pupils 29, 35 and 45), who have between them performed many times to public acclaim. Moreover, several of the children have had extended interactive experiences with Indian and African percussionists, and have given a good account of themselves, both in accurately reproducing the rhythms given, and in the improvisation of new patterns. I wonder at times how well someone like Anthony would have fared, had he been born into an aural culture, since his particular gifts seem so ideally suited to music-making of this type.

Something else that may warrant examination is the fact that almost all the youngsters listed were able to sing in tune from an early age - not just those with absolute pitch. In fact, the only children that were not able to do so, as far as I am aware, either have a severe hearing loss, or are speech

impaired or mentally handicapped (pupils 2, 4, 6, 10, 11 and 27). Again, it would be interesting to find out whether or not the congenitally blind do tend to develop a sense of 'relative pitch' earlier, or more effectively, than their sighted counterparts.

Still in the realm of pitch, you will recall that one of the qualities I observed in Anthony was his ability to name all the notes in a two-handed cluster of only short duration. Several of the other children with AP have this facility too, and I would like to know if anyone considers it an attribute worth quantifying. It is certainly a quality worth having: on more than one occasion, Anthony was a great help to me in transcribing tapes and records.

Lastly, I would like to mention the transpositional capability demonstrated by a number of those children who play instruments. Among the best are pupils 1, 5, 28, 35 and 45, although one child in particular (number 8) has developed this facility to a simply astonishing degree, as I hope to show you at the end of this talk. Another boy, Philip (whom I referred to earlier), experimented a good deal with his multispeed tape-recorder, and in his quest to reproduce what he heard, not only transposed pieces to all keys, but also altered the tempo according to pitch. Hence, he would play something an octave higher twice as fast, and so on. To show you how early the ability to transpose can manifest itself, I will refer again to Nicholas (pupil number 1 on your sheets), who is still only 4 years old. It is especially valuable to use him as an example, because in him are embodied many of the educational challenges I have to face. For instance, he has very few verbal labels for what he is able to do musically, so teaching occurs largely on an imitative basis. Furthermore, he has no concept of a conventional pupil-teacher relationship, and like many children, I suppose, he thoroughly enjoys

doing if not the opposite of what you ask him, then at least a deliberately distorted version of it. His favourite form of musical misbehaviour is immediately to change key as soon as anyone attempts to join in with him, singing or playing. He doesn't just limit himself to the five related keys, either: before you know it, you can be an augmented fourth away, then up a major third, down a minor sixth, and so on. For the last few months, I have been trying to structure what he does by playing a song, for example, and going up a semitone each verse. In the video I will now show you, you can see this principle in action. It is the end of a session, and Nicholas is playing and singing the 'goodbye' song to me, as he is accustomed to doing. I am guiding his efforts as gently as possible with an electric piano. I had planned that we should start in E^b and progress up the chromatic scale to A^b. However, it soon becomes apparent that Nicholas has other ideas, and at one point he continues to play in 'E' after I have moved up to 'F', before finally playing with me at the required pitch. Needless to say, I find him a great joy to teach!

[Video excerpt 2 - Nicholas]

* * *

We now move on to the penultimate section of this talk, in which I will examine a few of the ways that having a handicap in addition to blindness can affect a child's music education.

For example, it can be extremely difficult for some physically impaired children who would like to play an instrument to realise their ambition, and the greater their musicality, the more acute the problem can become. Consider, for instance, the position of Ushma (pupil number 3 on your lists)

who, despite being totally blind and confined to a wheelchair with brittle bones, has a great love of music, and is determined to play the pieces on the keyboard that she enjoys singing. Although she has tackled the piano enthusiastically over the last six months or so, there is obviously a limit as to what she can manage because of the restricted forces her arms, wrists and fingers will sustain. She currently plays the electric organ too, which goes some way to alleviating the affects of her handicap, since the volume of sound it produces is not related to the pressure that has to be exerted on the keys. I feel the ultimate solution to Ushma's difficulty in this area, however, lies in the acquisition of a really good synthesiser, through which an almost unlimited range of sounds will be available to her at the touch of a fingertip.

The new technology has already come to the rescue of Andrew (pupil number 22). Despite being hooked on the sounds of the drum kit, his arms and legs simply lack the movement necessary for him to play it as well as his excellent ear would demand. However, he does have sufficient fine motor control to play the drum synthesiser, which enables him, after all, to realise some of the sounds he can hear within. Here he is, getting acquainted with our latest model. The pleasure this gives him is, I believe, quite evident.

[Video ex@rpt 3 - Andrew]

There is, I need hardly tell you, a great deal that could be said about mental handicap and music, and I can raise only one or two issues here. I mentioned at the beginning the particular difficulties faced by those whose great musical talent is not matched by comparable cognitive development in other areas. Aside from this, I think I can safely say that participation in musical activities, whether passive or active, brings an enormous amount of

pleasure to many of the less able children at Linden Lodge - surely, a worthy end in itself. It is well known, of course, that music also has a practical value in promoting advancement in other areas, such as speech and language, physical coordination, self-discipline, and, not least, socialisation. A glance at your lists will show the number of children to whom music is beneficial in one or more of these ways. To conclude, though, I would like point out something much more unusual. Several of the children have what would seem to us to be a very high threshold of boredom for performing repetitive tasks. That is, they never apparently tire of doing the same activity over and over again. If you couple this to a strong desire to play a musical instrument, then potentially you have the ideal scenario for practise. A piece can be broken down into portions small enough for the child to grasp in one lesson, who will then quite contentedly repeat what has been learnt until asked to stop. Over a period of time, through such means, children in this position come to perform works which initially seemed well beyond them. As an example, here are the concluding moments from Calvin's rendition of 'Supertrouper', which had been rolling for ten minutes or so when I started to record. He is pupil 33 on your lists.

[Audio excerpt 4 - Calvin]

* * *

In conclusion, I would like to mention the three main courses of action that suggest themselves to me on the basis of the material that I have presented today.

First, the assertions I have made with regard to the attitudes and abilities of the children at Linden Lodge and similar schools need to be verified by a

suitable programme of research. As I stated earlier, even if the validity of my observations only half stands up to scientific scrutiny, then that would still mean that the musical development of many congenitally blind children differed substantially from that typically displayed by their sighted peers. If this is indeed the case, then we need to know why. Could we, for example, point exclusively to an early preoccupation with sound, that children who can see rarely exhibit to the same degree, or are other factors at work too?

Second, we need ask whether we find desirable any of the musical attributes that blind youngsters seem to develop so readily, such as perfect pitch. If so, and we can isolate the means through which they occur, then surely we should consider applying this information to the music education of sighted children?

Third, I would like to see a great expansion in the body of expertise that currently surrounds those with great musical ability but whose cognitive development in other areas is weak, with the ultimate aim of producing educational programmes to help such people use their strengths to ameliorate their weaknesses.

And now, to round off what I have been saying, I would like to introduce you to Derek, since he seems to embody so many of the points I have tried to make.

He is just nine years old, and I have been teaching him the piano for four years now, although he actually taught himself to play quite effectively from the age of two. Derek is a classic case of someone who finds many areas of schoolwork problematic, but who excels in music. As I have written in his notes (pupil number 8, by the way), he is still learning the verbal labels

for much of what he understands intuitively in purely sonic terms, and so, even now, learning occurs largely through imitation.

Watching Derek play, you can see he is a natural pianist, although some of his fingering is somewhat eccentric - hardly surprising, though, when you think that he laid the foundations of his technique entirely unaided, without even having the benefit of a visual model to guide him. Suffice to say his fingers are always led by his truly remarkable ear. Derek enjoys playing pieces in all styles, though he shows a natural inclination to jazz; he is a great improviser. In fact, one of his major strengths and weaknesses is that he never plays back precisely what he hears, for while this shows a genuinely creative talent it is also indicative of a lack of self-discipline. Hopefully both these areas will develop in the future. But for the moment, Beethoven is quite likely to come out sounding something like hotted up Scott Joplin.

Derek can harmonise melodies with the full range of chromatic chords, and he has a wonderful facility for transposition: as soon as he has grasped a piece in one key, it is instantly available to him in all eleven others (major or minor).

Above all, like Anthony, Hayley, and many of the other children I have talked about today, he shows an irresistible urge and ability to communicate in sound, which, in the final analysis, must surely be the greatest gift of all.

Anyway, without further ado, may I present Derek.

[Live performance - Derek]

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Musical Attitudes and Abilities of the 50 Children to Enter Linden Lodge School Most Recently, who
Have Been Blind Since Birth or Shortly After, as at October, 1988.

Num	M F	Age	LCA ROP	AP? ROP	Brl Mus?	Att.	Comments
1.	M	4	LCA	✓	?	5	Playing the piano is chief interest and achievement. Chromatic melodies and diatonic harmonies played by ear; can transpose to any key, including major/minor switch. Improvisation, both free and around known pieces. As yet, cannot verbalise his musical understanding, so teaching is on a purely imitative basis. Shows great potential.
2.	F	8	LCA	x	x	4	Despite severe learning difficulties and speech impairment, singing songs, listening to tapes and moving to music are three main forms of enjoyment. Accurate vocal imitation of rhythms and approximation to pitch contour. Music vital to development of speech.
3.	F	8	-	x	?	4	Singing and playing the tunes she sings on the piano/organ are two of her great interests. Quick to learn; excellent retention of material. High intelligence; confined to wheelchair; music an important area of achievement and means of expression.
4.	M	9	-	x	x	3	Motor and speech impaired; enjoys music - especially fond of playing the drums, which helps train coordination and rhythm of speech.
5.	F	7	LCA	✓	✓	4+	Playing the piano and singing main hobbies. High intelligence; starting braille music. Latest piece - 1st prelude from the '48' (learnt by ear). Composes pieces, mainly based on ostinati. Certain transpositional ability.
6.	M	7	-	x	x	2-	Severe hearing impairment - shows little interest in music.
7.	M	7	LCA	x	✓	3	Enjoys singing; vocal melodic improvisation around given harmonies. Plays simple diatonic tunes on the keyboard by ear (in C).
8.	M	9	ROP	✓	x	5+	By a considerable margin, playing the piano main interest and achievement. Exceptional technical accomplishment. Learns pieces in all styles entirely by ear - natural inclination to jazz - brilliant improviser and can transpose the most complex pieces to any key (major or minor). Still learning verbal labels for what he understands intuitively in purely sonic terms; hence learning is to a large extent through imitation.
9.	M	7	ROP	x	x	3	Enjoys singing, listening to and imitating sounds, especially of the electronically synthesised variety.
10.	M	7	ROP	x	x	4+	Severe learning difficulties; no speech at all, and does not sing. Yet enjoys playing the piano for substantial periods. Often fixates upon particular notes; has developed method of rapid repetition by flicking the thumb.
11.	M	11	ROP	x	x	4	Severe learning difficulties, including emotional and behavioural disturbance and limited verbal communication. Listening to tapes important for reassurance (frequently asks for them himself), and singing assists in speech development and socialisation.
12.	F	12	-	x	x	2-	Shows little interest in music.
13.	M	12	ROP	✓	x	3+	Can play diatonic tunes with bass line by ear on the keyboard. Despite A.P. and ready assimilation of new material, finds it hard to coordinate what he hears with physical movements necessary for playing an instrument.
14.	F	16	ROP	x	x	5-	Would like to take up music professionally, but lacks the ability. Has learnt the flute and piano up to ASB grade IV by ear. Also enjoys singing.
15.	M	9	LCA	x	✓	4-	Of high intelligence, and would himself like to know why he hasn't got A.P.! Especially enjoys composing his own songs (for which I provide the harmonies), and performs them using a multitrack tape-recorder, playing the keyboard (single line), drums and singing.

16.	F	10	ROP	✓	×	4	Moderate learning difficulties. Thoroughly enjoys listening to music of all styles and singing. Despite A.P., has only recently developed the coordination and spatial awareness to begin to play what she hears on the piano.
17.	M	9	-	×	×	3+	Loves producing electronically synthesised sounds, but currently lacks the application to make anything of them.
18.	M	10	-	?	?	?	? - started to learn the violin using the Suzuki method.
19.	M	10	-	×	×	4	Very keen to play the keyboard; tunes and simple bass lines by ear. Also a good singer and accurate rhythmic sense on the drums.
20.	M	17	LCA	✓	×	4+	Moderate learning difficulties. Sings the bass in part-songs. Good drummer and plays the recorder by ear in the simpler keys. Despite A.P., finds coordination on the piano difficult; can play Grade I pieces.
21.	M	13	-	✓	×	4	Moderate learning difficulties. Enjoys listening to music of all styles, and has a vast repertoire of songs. Has recently developed sufficient hand/ear coordination to start the recorder and piano.
22.	M	14	-	✓	×	4+	Adores listening to the drum kit, and would love to play it, but greatly hindered by physical disability. Drum synthesiser is possible, however, and is much enjoyed.
23.	F	21	ROP	?	?	?	?
24.	F	12	ROP	?	?	?	?
25.	F	12	ROP	✓	×	3	Despite A.P., excellent rhythmic sense and memory, lack of ear/hand coordination makes applying her musical abilities instrumentally a problem. A very good singer, however.
26.	F	12	-	×	×	4+	An amazingly mature voice from an early age, complete with expressive devices including a rich vibrato. Has performed in numerous public concerts around London and on T.V., and has made a record. Very quick to learn songs. No transfer of musical ability to instruments. Braille music too difficult, so all learning by ear.
27.	M	14	-	×	×	4	Despite severe hearing loss, very enthusiastic about 'rock' - likes the rhythm especially, and loves to play the drum kit.
28.	M	13	ROP	✓	×	4+	Exceptional pianistic technique from an early age (learnt to play the 'Italian Concerto' by ear at the age of 8, for example). Despite high intelligence, eccentric behaviour makes learning difficult. A passion for the music of Bach, but can improvise in popular styles too. Enjoys playing the pieces he learns in all keys. Also keen on the recorder and singing.
29.	M	15	-	×	×	4+	Enjoys 'pop' music, and has played in local groups. Quick to learn by ear, and highly competent guitarist, drummer, keyboard player and singer.
30.	F	12	-	×	×	4+	Similar to pupil no. 26 above - very mature singing from an early age, with numerous successful public concerts behind her. Quick to assimilate new material, and vast repertoire of songs at her disposal. Again, difficulty realising her musicality in instrumental terms.
31.	M	12	ROP	×	×	4+	Desperately keen to play the piano, but poor ear/hand coordination makes this difficult. Through sheer determination, has learnt to play diatonic tunes with bass lines in the simpler keys. Enjoys singing and playing the drums; good sense of rhythm.
32.	M	19	ROP	✓	×	3	Despite moderate to severe learning difficulties, enjoys playing tunes by ear on the recorder in the simpler keys, and singing.

33.	M	16	-	x	x	4+	Never seems to get bored playing the piano; will repeat a single phrase hundreds of times. Hence, has learnt to play a number of simple tunes with bass lines, an outstanding achievement in view of his learning difficulties.
34.	M	15	-	/	/	4	Sings, plays the piano, and the E ^b horn. Of high intelligence; braille music user. Working through the ASB examinations; GCSE music. Composed from a early age in a traditional tonal idiom. Now writing sonata movements.
35.	M	20	LCA	/	x	5+	Despite severe learning difficulties, displays enormous musical talent. Acutely accurate senses of pitch and rhythm; phenomenal memory. Has played percussion (classical and 'pop') in youth concerts across London, and is also a competent pianist, recorder player and saxophonist. Yet as a young adult, despite his overriding desire to continue his musical education and keep performing, is finding it very hard to win the necessary acceptance.
36.	M	15	ROP	x	x	3	Enjoys singing; despite moderate learning difficulties, memorises new material quickly and retains it well.
37.	F	15	-	x	x	4+	Like pupil no. 33, never seems to get bored playing the piano. Despite moderate to severe learning difficulties, has learnt to play pieces by ear in three or four parts (such as hymn tunes); often in the right key. Also plays the recorder by ear. With both instruments shows irretrievably eccentric fingering. Enjoys singing too.
38.	M	16	ROP	/	?	?	? - plays tunes by ear on the piano and sings bass.
39.	M	18	ROP	/	/	5-	A virtual obsession with 'pop' music of the last 30 years (father played in a band in the '60's and now produces records). Will listen to tapes of such music for hours on end, and knows many hundreds of songs from this era. Despite learning difficulties in certain areas, is studying braille music, and has passed Grade V ASB on the piano.
40.	F	18	ROP	x	x	2-	Little interest in music.
41.	F	19	-	x	x	2-	Can play a few tunes on the piano by ear, but shows little interest in music.
42.	M	17	-	x	x	4-	Shows great interest in certain styles of 'pop' music, especially 'raps', of which he has composed and performed a number very successfully in local concerts.
43.	F	19	-	x	/	4-	Shows a great sensitivity to music. Grade V on the piano. Can also play the recorder by ear and a good drummer. Braille music a possibility, though difficult.
44.	F	19	ROP	/	x	4+	Fanatical about certain styles of 'pop' music, enjoys singing; unusually low voice. Plays simple tunes by ear on the keyboard.
45.	M	18	ROP	/	x	5	Despite emotional and behavioural difficulties, performs in family's reggae band semi-professionally. Excellent drummer, keyboard player. Good technical facility. Also sings. Has composed many songs in reggae style, and using his own system of braille music (having rejected the conventional one). Superb memory.
46.	F	18	LCA	x	x	3	Shows an intermittent interest in music despite great encouragement at home. Plays by ear on the recorder, clarinet and piano. Made a start on the 'cello.
47.	M	20	-	/	x	3+	Despite tendency to eccentric behaviour, plays tunes and bass lines competently by ear on the keyboard. Sings bass.
48.	F	20	ROP	x	x	4+	Thoroughly enjoys singing the soprano line in madrigals and other part songs.
49.	F	20	ROP	x	x	3	Shows a certain facility to play tunes and simple accompaniments on the keyboard by ear.
50.	M	20	LCA	/	x	3	Despite severe learning difficulties can play ostinati and simple tunes on the piano. Enjoys singing 'pop' songs.

LCA = Leber's Congenital Amaurosis. ROP = Retinopathy of Prematurity.

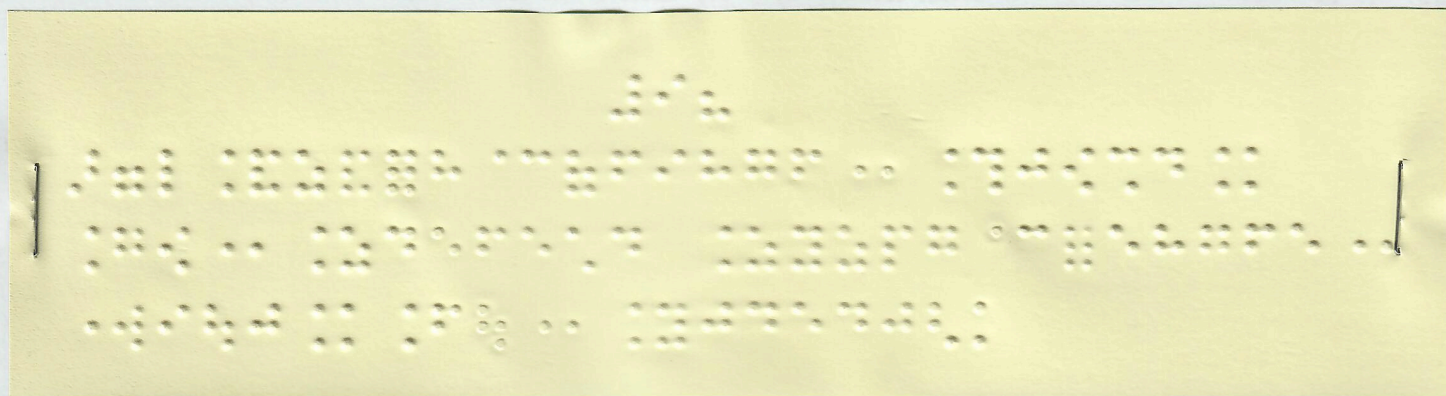
AP = Absolute Pitch. Brl Mus = Braille Music. Att. = Attitude (5 high; 1 low).

Duration Signs.

- Semibreves and 16ths
- Minims and 32nds
- Crotchets and 64ths
- Quavers and 128ths

d e f g h i j

Example of Braille Music from 'Revised International Manual of Braille Music Notation 1956'. (p. 40)



Line 2: treble clef; 5th octave 'e' semiquaver, 'd' semiquaver, 'e' semiquaver, 'f' semiquaver, 'g' quaver tied onto 'g' semiquaver, followed by e, a, g, f, e (by context all semiquavers within the same octave); to be played at the same time as 4th octave 'c' crotchet, 'b' quaver (by implication in the fourth octave), 'a' crotchet, sharpened 'c' quaver; return to top part: ...

Line 3: 5th octave 'f' quaver, 'a' crotchet; played at the same time as 5th octave 'd' semiquaver, 'c' sharp, 'd', 'e', 'd', 'c' natural (by context all semiquavers), new bar ... etc.

