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Activity in a Music Program and the Development of Cognitive Processing Skills

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Abstract

Activity can be linked to observable behaviour and to cognitive skill development. This paper is based on a study which identifies the role of activity in a music program. During a 30-week intervention period, young students experiencing learning difficulties participated daily in a music program. Test data indicate that over this time the students developed cognitive processing skills of listening comprehension. The test results show a significant effect of the music program from the pretest to the posttest and the postposttest period. Observational data supplemented with data from teacher-diaries, lesson-ratings and teacher-interviews appear to qualify the test findings. It is concluded that participation in a music program of appropriate musical activities can develop cognitive processing skills in students with learning difficulties.

Introduction

A key element in a music program is that of activity. The concept of activity in most music programs in schools is identified with the physical action, response, or observable behaviour of an individual or a group of students participating in a musical activity. While activity can be related to observable behaviour, it also can be linked to the cognitive activity required for the acquiring, organising and using of knowledge (Neisser, 1976) and to the intellectual "working-out" of observable behaviour (Leont'ev, 1981). Many music programs in schools are organised around singing, listening, playing musical instruments, movement and creative activities. The external behaviour of students engaged in these activities can be readily observed. However, the role of activity in the development of cognitive processing skills, such as listening, is not as easy to assess or to define in a music program.

Listening has been defined by Wolvin and Coakley (1985), "as the process of receiving, attending to and assigning meaning to aural stimuli" (p. 74). It is a recognised component of cognition (Flavell, 1977). According to Anderson and Lynch (1988), listening must be an active process for the purpose of information acquisition. It has been argued that skills, for instance attention, associated with active listening, are necessary for components of cognition to occur such as comprehension and memory (Robinson, 1989). As the first step in the process of understanding, listening thus requires effort on the part of the listener to attend, comprehend and apply knowledge to a message received. While many previous studies have discussed language and comprehension (Brown, Bransford, Ferrara & Campione, 1983; Flavell, Speer, Green & August, 1981), to this author's knowledge no publications have appeared about the role of music in the development of listening comprehension skills particularly in students with learning difficulties (Bygrave, 1991a).

In studies related to music listening the role of successive and simultaneous cognitive processes have been discussed (Fiske, 1984), as have the use of cognitive strategies (Fiske, 1985). It has been suggested that cognitive processing takes place when the listener identifies what is and what is not music (Serafine, 1988). Cognitive aspects of listening to music have been speculated upon (Minsky, 1982), as well as cognitive responses (Hedden, 1973). The responses of people listening to music also have been discussed (Sloboda, 1985).

Various models of music cognition have been proposed. They include a model for testing the listener component of the music communication process (Heller & Campbell, 1982), a memory model for explaining music information processing (Williams, 1982), a model of the music decision-making process (Fiske, 1987), and a connectionist model of musical learning (Fiske, 1995/96). A model also has been constructed illustrating how music as an activity can develop memory and other cognitive processes in children (Bygrave, 1991b).

A previous study addressed aspects of the development of listening skills through specific listening programs. Bygrave (1991a) investigated whether the listening skills of students with learning difficulties could develop through their participation in two listening programs, a music program and a story-telling program. Results indicated that while the listening skills of the students did improve, the composition of the programs pointed to divergent aspects of the programs. Bygrave (1994) concluded that "an examination of different components of programs, such as those of a music program ... (could) provide more information concerning the listening process" (p. 58). The purpose of this paper therefore, is to present findings from the effect of a music program in particular, the effect of musical activities on the development of the cognitive processing skills of listening comprehension in students with learning difficulties. The components of a music program that could influence the development of these skills will be discussed. Research relating students in special education settings to music has been examined previously (Bygrave, 1985; Bygrave, 1991a).

Procedures

A detailed report on the background and procedures of the study has been presented elsewhere (Bygrave, 1994). Details concerning a specific aspect of the study also have been reported (Bygrave, 1995/96). In brief, the subjects of the study were students with learning difficulties enrolled in four special education settings. A total of 29 students (19 male and 10 female) were involved, with an average age of 7.7 years and an average IQ of 80. All the students were of European descent and from similar backgrounds. The two listening programs, a music program (Leask & Thomas, 1986) and a story-telling program (Field & Walsh, 1989), were randomly assigned to the special education settings, with one group participating in the music program, a second in the story-telling program, a third in both programs, and a fourth acting as a control group. The special education teachers implemented the programs over an intervention period of 30 weeks and all four teachers were interviewed weekly by the researcher. The music program centred around singing, listening, playing musical instruments, creative and movement activities. The story-telling program focussed on developing language skills such as comprehension, through listening to a story read by the teacher.

This paper will present two sets of data. One set concerns the results of a test on listening comprehension administered to all students participating in the listening programs. The students were tested prior to the intervention period (pretest), post intervention period (posttest), and again 7 weeks later (postposttest). The other set of data was obtained through observations of the students in the music program. The observational data were used in association with the diaries of the two teachers of the students in the music program. Additional information obtained from teacher-interviews and weekly lesson-ratings supplemented these data.

The Token Test (DeRenzie & Vigolo, 1962; Mackie & Dermody, 1981) was used to assess the student's listening comprehension skills. This test is used in Australia as a measure of auditory receptive language abilities (Dermody, Kehoe & Bochner, 1989). The Token Test consists of 20 tokens of 2 different shapes and sizes and of 5 different colours. There are a total of 61 spoken commands which are grouped into 5 parts; these become progressively more complex. The test was administered by two independent testers to individual students in a quiet setting and the results were withheld from the teachers.

The observational protocol and the teacher-diaries were constructed using similar categories to allow for adequate comparison. The observational protocol was designed to collect information over a 15-minute period on the organisation, location, activities and use of resources by teachers and students during a music lesson. Six observations of music lessons in each class were undertaken over the intervention period (a total of 12 observations); two of these were recorded on video at the third and sixth observations (a total of 4). In the diaries the teachers recorded daily information about the music lesson organisation, lesson activities, aspects of the activities, use of resources, and their personal assessment of the student-response to the lesson. Music lessons were rated weekly on a 7-point scale by the teachers during teacher-interviews.

Results

Twenty nine students participated in a pretest, posttest and postposttest of the Token Test. An analysis of the pretest scores for the four groups showed no significant difference between the groups. A two-way factorial treatment (music yes or story no) was used to analyse data collected from the tests. This analysis was designed to measure whether participation in a music program, a story-telling program, or in both programs, would effect the listening comprehension skills of the students. A comparison was made of the Yes-Music Group versus No-Music Group (includes Story Groups) means, the Yes-Story Group versus No-Story Group means and the interactive effect between the Music and Story Groups; that is the effect of music in the presence of Yes-Story compared to No-Story Groups. The analysis indicated that music had a significant effect ($p<.05$) on the listening comprehension skills of the students for the postposttest-pretest period (see Figure 1). The mean gains on the Token Test (Postpost-Pretest) for the groups were Control: 6.17 ($\underline{n}$=6); Music A: 17.12 ($\underline{n}$=8); Music B (included Story-telling): 12.56 ($\underline{n}$=9); Story-telling: 10.67 ($\underline{n}$=6).

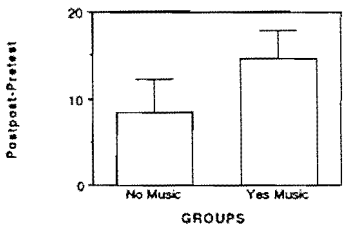

Figure 1. Mean of Postpost-Pretest for Token Test scores and 95% Confidence Interval for Yes Music and No Music (includes Story Groups) Groups.

Data obtained from the observations and from the teacher-diaries provide some indication of the composition of the music lessons. The proportion of time observed and recorded over the intervention period on student-participation, lesson-organisation, resources, extension and revision of an activity, and of student-interest is expressed as a percentage. An analysis of the distribution of activities showed participation by the students in listening, movement, singing, playing musical instruments and creative

activities (76%). The music lessons were organised within the classroom with the whole class (100%). The students used resources (94%), and responded to a tape recorder or musical instrument through movement, singing or playing musical instruments (78%). Aspects of the lessons included time spent on extending and revising a musical activity (84%). The teachers recorded student-interest in the music lessons (89%) and scored a weekly lesson-rating of "above average" (Mean score=5). Inter-observer reliability data were obtained from observation-videos (3rd obs. M=98%; 6th obs. M=96%). In general the observational data were found to parallel that of the teacher-diaries (94% return).

Discussion

As stated in the introduction, there is no known information concerning the role of music in the development of listening comprehension skills in students with learning difficulties. This paper addresses this issue. In particular it presents findings from the effect of a music program on the development of the cognitive processing skills of listening comprehension in students with learning difficulties; and discusses components of a music program that could lead to the development of these skills.

The data from the Token Test indicate a positive effect of the music program on the student's listening comprehension skills. These skills developed throughout the period from the pretest to the postposttest. It is apparent from the data that while students in all groups showed some improvement over this period, those in the music groups clearly achieved the higher results. The data from the observational protocol and teacher-diaries indicated that the students constantly utilised resources during classroom music lessons. Although a high proportion of lesson time appeared to have been spent on revising and extending a musical activity, this apparently did not detract from the student's interest in the music lessons. It would seem that for a relatively large proportion of the lesson time, the students participated in musical activities. In a study of special education settings, disruptions to lessons regularly occur due to variable behaviour, integration, and support services. It was observed that the teachers spent a significant amount of time during a music lesson on non-task speech (average of 5 minutes).

Several possibilities, related to components of the music program, could explain why the listening comprehension skills of the students in the music program improved. One possibility concerns the means used by the students in the musical activities to think through conceptual problems such as those associated with beat and pitch. The use of a learning tool has been seen as a necessary part of cognitive activity (Vygotsky, 1981), and it has been proposed that learning tools can be used during music activities to develop cognitive skills (Bygrave, 1991b). A prominent feature of the music lessons was the use of resources, such as percussion instruments, as indicated by the observational data. While these instruments were used by the students to apply music concepts in different musical activities, the instruments also were used frequently in revision and extension activities during the music lessons.

Another possibility relates to the fact that there were a variety of musical activities in the music program to which the students could actively apply their listening skills. As mentioned previously, listening must be an active process for acquiring knowledge. Apart from listening to music, the students listened in conjunction with singing, creative, playing percussion instruments, and movement activities. Earlier studies have found that a music program involving various listening, instrument playing, singing and dancing activities, provided more cognitively-challenging activities than other programs such as story-routines (Sylva, Roy & Painter, 1980).

A music activity in its entirety must be considered as a possibility. An example of one musical activity, "Musical Sandwiches" (Leask & Thomas, 1986), presented various learning tasks. The students had opportunities to apply memory skills to drawing pictures of percussion instruments, problem-solving skills to arranging these pictures as a "sandwich", listening and comprehension skills to understanding

the sounds associated with the pictures and the instruments, and attention and listening skills for responding to individual musical "sandwiches" played on instruments by peers. The positive response of the students to such a musical activity was frequently commented upon during teacher-interviews.

It is of interest that movement as another activity of the music program, aside from listening, featured as an integral part of the music lessons. A further analysis of the distribution of activities of the music program indicated that movement was recorded in one music group as the most distributed lesson activity (21%; listening 19%). In the other group, movement was the second most distributed lesson activity after listening (20%; listening 23%). It is suggested that the teachers in many instances perceived movement in the music lessons as an observable response to listening.

While the study involved only a small sample of students, the results nonetheless would suggest that activity plays a vital role in a music program. Questions then may be asked as to what kind of activity is effective in a music program. Is it the observable behavioural activity or is it the activity associated with cognitive processing skills such as listening comprehension? Alternatively, is it the combination of both kinds of activity in a music program that is the most effective? The answer clearly lies in the latter. On the basis of the observational data obtained, it can be argued that the physical activity observed in the performance of a musical task is the response to the cognitive activity generated through an active listening process where a message is received, understood and applied. Data from the Token Test would corroborate such cognitive activity.

An important finding of this research is that the cognitive processing skills of listening comprehension of students with learning difficulties, were shown to develop through a music program. Given the continuous educational debate about the relevance of music in education, such a finding is significant. The results of this study suggest that serious consideration be given to implementing appropriate musical activities in classrooms in schools for all students, particularly considering the large and rising number of young students experiencing learning difficulties in Australian schools. While this paper provides information about the development of cognitive skills in group settings the findings from case studies in this research to be presented in the future, will provide further evidence for the significant effect of musical activities on student's learning and development.

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