

Critical Review:

Do classroom-based music activities influence literacy skills in Elementary school children with poor reading skills?

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This critical review examines the evidence regarding the effect of classroom music lessons on literacy skills of school age children with reading disabilities. Study designs include: mixed (between and within subjects) randomized clinical trial, mixed nonrandomized clinical trial, case-control study, crossover study, and single group pre-posttest. Overall, the literature reviewed indicates that music programs in a classroom setting may be beneficial in supporting the development of literacy skills. Recommendations for further research and clinical implications are provided.

Introduction

Researchers have found numerous significant correlations between musical ability and literacy skills. For instance, in children with typical reading ability, associations have been established between phonological awareness and pitch awareness (Loui et al., 2011; Lamb & Gregory, 1993); and between phoneme segmentation and tonal and rhythm discrimination (Lucas & Gromko, 2007). Conversely, Douglas and Willatts (1994) found rhythm discrimination, but not pitch discrimination, to be related to reading ability. The relation between reading and musical skills also holds true for children with reading disabilities. Both Overy (2000, 2003) and Forgeard (2008) found children with dyslexia had deficits in rhythm skills compared to normal readers. Moreover, Overy (2000, 2003) suggests that reading and rhythm deficits in children with dyslexia are due to underlying temporal processing deficits.

The relation between music and reading, as found in the literature, has led researchers to suggest that music programs may be beneficial for reading intervention. Degé and Schwarzer (2011) and Bolduc (2009), among others, have found music programs to be effective in improving phonological skills in preschoolers and kindergarteners, respectively. The subsequent step is to examine the effectiveness of musical intervention on literacy skills of children with reading disabilities.

A positive outcome from experimental studies investigating the efficacy of classroom-based music programs on reading ability would suggest that the school music educator may be an important collaborator for the speech-language pathologist with respect to class-wide language and literacy support. While the intent is not to replace the work of the S-LP, a music program carefully designed to promote the development of literacy skills could provide extra support to the

entire class, including those students whose difficulties may be too mild to qualify for S-LP services.

Objectives

The primary objective of this paper is to critically evaluate existing literature on the effects of classroom-based music programs on literacy skills of children with poor reading ability. The secondary objective is to offer evidence-based recommendations regarding the use of classroom music activities to complement reading instruction and speech-language services. Suggestions for further research will also be discussed.

Methods

Search Strategy

Computerized databases including CINAHL, JSTOR, PsychInfo, and Web of Knowledge were searched. The following key terms were targeted: (music) AND (children) AND (intervention OR program) AND (reading OR dyslexia OR literacy OR (phonological awareness)). The search was limited to articles written in English. Examination of reference lists from retrieved articles revealed further studies for review.

Selection Criteria

Studies selected for review were required to investigate the effects of a school music program on literacy skills of children who have been identified as or are at risk of having weak reading skills. No limits were placed on the method of measuring reading skill, the type of musical intervention, or outcome measures.

Data Collection

Results of the literature search yielded seven articles that met the selection criteria described above. These included the following study designs: mixed (between and within) randomized clinical trial (2), mixed

(between and within subjects) nonrandomized clinical trial (2), case-control study (1), crossover study (1), and single-group pre-post test study (1).

Results

Overy (2000) conducted a mixed (between and within subjects) nonrandomized clinical trial to explore the effects of classroom music programming on language and literacy skills of 28 children (mean age 6:8) over the course of one school year. In this study the classroom teacher was trained by The Voices Foundation to incorporate music in the classroom. Phonological scores were obtained using the phonological segmentation test of the *Dyslexia Screening Test*; spelling and reading skills were tested using the *Weschler Objective Reading Dimensions* (WORD), which included standard scores, allowing for comparison to national norms. Results of repeated measures ANOVAs on pre- and posttest scores showed that the six children classified as having a “strong risk” of dyslexia made greater gains in phonological and spelling scores than did peers with “no risk” or “mild risk”; however, none of the three groups demonstrated improvement in reading scores.

Strengths of Overy’s study include the reliable and valid measures used and appropriate statistical analysis of the data. Nonetheless, this study also has a number of limitations. Due to the absence of a non-treatment control group matched for reading level, the reader cannot safely conclude that the increase in scores was caused by the music program alone, particularly considering the treatment lasted an entire school year. Additionally, the baseline scores on all measures for the “mild risk” and “no risk” groups were higher than those of the “strong risk” group, contributing to a possible ceiling effect that may have curbed score increases, thereby inflating the perception of improvement in the “strong risk” group. Overy did not report whether the participants’ reading skills were tested using the Basic Reading Scale or Reading Comprehension Scale of the WORD. Since these tests examine decoding and comprehension respectively, it is unclear which skill was tested. A final limitation of this study is the dearth of information offered about the music program, such as duration, frequency and nature of the activities. This lack of treatment details restricts the possibility of replicating the study. Overall, the results of this study provide a suggestive level of evidence.

Overy (2003) published a single group pre-posttest study investigating the impact of classroom music lessons on literacy skills. Participants were nine boys (mean age 8:8) with dyslexia. After a 15 week control period, they participated in 15 weeks of music lessons. Lessons were specifically designed for children with

dyslexia in that they were based on existing approaches to classroom music education, and emphasized rhythm and timing. Music lessons totaled 1 hour each week, divided into three sessions of 20 minutes. Participants were tested before and after the treatment block using spelling and single word reading tests from the WORD, tests from the *Dyslexia Early Screening Test* (DEST) and the *Phonological Abilities Test* (PAT), and a series of musical tests designed for this study. Significant increases in scores were noted in rapid auditory processing, phonological ability, and spelling ability. Similar to her previous study, Overy did not see improvements in reading scores.

Measures used in Overy’s (2003) study are somewhat problematic because the DEST and PAT (ages 4:5 to 6:5 and 5 to 7, respectively) are intended for children younger than those in the study. Such an age discrepancy raises some concern about the validity of the measurements. Further, no information is given regarding the selection of the participants, such as criteria required for the diagnosis of dyslexia. Lastly, details of data analysis are not included. Only p-values for the tested areas showing improvement are given; no description of scores from the control period or pre- and post-treatment are offered. Overall, the results of this study offer an equivocal level of evidence due to the limited information reported.

Douglas and Willatts (1994) conducted a pilot study using a case-control design to explore the influence of a 6-month music program on reading skills. Participants were twelve students (ages 8:1-10:8, mean age 8:9, 6 boys, 6 girls) recommended by the learning support teacher who thought they would benefit from extra reading support. The six children in the treatment group participated in musical games involving pitch and rhythm activities. The non-musical attentional control group, which was matched for reading ability, participated in activities designed to promote discussion skills. The *Schonell Reading Test* was used to obtain reading scores before and after treatment. Analysis of variance was used to examine the scores, and showed a significant increase in reading scores of the treatment group only. No change was seen in the control group.

A limitation of this study is the selection process used to determine participant eligibility. The absence of inclusion criteria and baseline reading ability inhibits application of these treatment methods to other appropriate populations. Also, the measure used only tests single word decoding, which is not necessarily a complete representation of a child’s reading ability. The researchers used appropriate methods of data analysis. Despite the limitations outlined above, this study offers a suggestive level of evidence.

Using a mixed (between and within subjects) randomized clinical trial, Roskam (1979) examined the effectiveness of a 3-month period of music activities on auditory awareness, spelling, and reading abilities of 36 children (ages 6 to 9) with a learning disability. The researcher randomly assigned participants to three groups: music treatment, regular treatment, and combination of music and regular treatment. Music treatment focused on auditory training, including matching, sorting, discriminating, and reproducing pitches, rhythms, phrases, and songs. Regular treatment consisted of routine language activities for children with learning disabilities, including spelling, story writing, and vocabulary building. All groups received two one-hour sessions each week. Pretest and posttest assessments consisted of: *Peabody Individual Achievement Test* (spelling, reading comprehension, and reading recognition), *Buktenica Test of Nonverbal Auditory Discrimination*, and *Wepman Test for Verbal Auditory Discrimination*. Differences of scores were examined using analysis of variance. Results of data analysis showed no significant improvement on any measure for any group. However, Roskam highlighted that in four of five measures (nonverbal auditory discrimination, verbal auditory discrimination, reading recognition, spelling), the music group showed greatest improvement, with the combination group second and regular group third.

Despite statistically insignificant results, this study has a number of strengths: randomization of participants, controls of similar ability, thorough description of the treatment conditions, and adequate sample size. Conversely, there are also a number of weaknesses. One limitation identified by the researcher is the difference in mean ages of treatment groups. Participants in the music group (mean age 7:3) were younger than the combined group (mean age 8:5) and regular treatment group (mean age 8:8), which could compromise the validity of the results. An additional shortcoming is variable attendance in all groups, which may have hindered progress. The data, though analyzed appropriately, is presented as means of pre-post difference, with no baseline scores included. This lack of descriptive data about the participants' reading ability limits clinical application of this study. Overall, Roskam's study offers an equivocal level of evidence.

Draper (2007) conducted a mixed group randomized clinical trial comparing the effects of singing, gestures, and singing with gestures on sight-word recognition and reading comprehension in six students with dyslexia. Participants (ages 10:1 to 14:10, mean age 12:0, 4 boys, 2 girls) were randomly assigned to two groups, which participated in the following four conditions: no contact control, music, gesture, and music with gesture. In the

music condition, participants were taught a short melody to accompany each word. In the gesture condition, participants were taught the corresponding American Sign Language gesture. Both were taught in the combined condition. Three 10-minute sessions were administered each week. Reading ability was measured according to sight-word recognition in isolation and in passages, and reading comprehension. Participants were tested before and after each condition. Results revealed significant improvements on sight-word recognition in isolation and reading passages for all conditions. No improvements were found on reading comprehension. The researcher used paired t-tests to determine significance of improvements in scores for each measure and repeated measures ANOVA to discern relative effectiveness of the conditions. This statistical analysis was appropriate for this study.

No participant selection criteria was outlined, and little information was offered regarding the baseline reading abilities of participants, limiting comparison to other studies. Further, because the control condition was no contact, it is risky to conclude that the increases in scores are due to music or gestures rather than simply greater exposure to the target vocabulary. Although the duration of the intervention was not mentioned, the treatment was described in sufficient detail to allow for replication. The criterion-referenced measures used were appropriate for the nature of the study. Despite the lack of information on statistical power or effect size, the mean posttest score in word recognition for music only conditions improved by greater than 2 SD of mean pretest scores, giving weight to the clinical significance of this study. Overall, Draper's study offers a suggestive level of evidence due to the statistically and clinically significant gains made with the music condition, and the quality of measures used. However, further research should be conducted to determine the relative effectiveness of this program compared to standard intervention programs before applying this approach clinically.

Register, Darrow, Standley and Swedberg (2007) employed a mixed (between and within subjects) nonrandomized clinical trial to examine the influence of combined music and reading lessons on reading comprehension and vocabulary. Participants were two classrooms of grade two students, which were randomly assigned to the treatment condition (n=17) and control condition (n=16); and eight students with reading disabilities, who participated in the treatment condition only. The control condition consisted of the regular reading program. The combined program focused on skills such as grapheme-phoneme recognition, decoding, and story sequencing, and incorporated story songs, puppets, and instruments. Music was used to

facilitate activities, help tell stories, and evoke imagery connected to the stories. Twelve treatment sessions were administered over four weeks. Word decoding, word knowledge, and reading comprehension subtests from the *Gates-MacGinitie Reading Test* were used before and after treatment to measure reading skill. Register et al. found the children with reading disabilities showed significant improvement on all three scores. Both parametric and nonparametric tests were conducted on the data, which is appropriate considering the small sample size.

Similar to other studies reviewed, limited criteria for participant eligibility were specified, such as criteria required to indicate presence or severity of reading disability. An additional limitation is the use of the *Gates-MacGinitie* to reassess after only four weeks of intervention because the test manual lacks validity or reliability measures. Examples of treatment activities were given, but the program appears to be too elaborate to replicate from only the information outlined in the study. It is important to note when comparing this study to others reviewed that this treatment program included significantly more language-based activities and explicit teaching of reading strategies. Finally, this study does not have controls matched for reading ability, limiting the conclusions that can be made regarding the effectiveness of the program. Despite finding statistically significant increases in reading measures, this study offers an equivocal level of evidence due to its methodological weaknesses and lack of information about the participants.

Colwell and Murlless (2002) conducted a crossover study to investigate the effects of singing versus chanting on reading accuracy of five students with learning disabilities (ages 6-8, grades 1-3). Conditions included two control periods of the usual pull-out reading program, a music condition and a chanting condition. Music and chanting conditions were carried out 4 times each week for 25-30 minutes with the class. The researcher used songs/chants containing individualized target vocabulary for each participant, and taught corresponding signs for them. Participants were tested by reading a list of target words at the start and end of each condition, using a new word list each week. Participants were again tested on all target vocabulary two weeks following the final week of treatment. Researchers concluded that there were no apparent differences in outcome of treatment conditions compared to the existing pull-out reading program.

Strengths of this study include a control period of existing programming, clearly described methods, and reasonable criterion-referenced measures; however, the small sample size and limited duration of this study

moderate its significance. No statistical analysis was carried out, likely due to the small sample size. Instead, researchers offered qualitative comments about the changes in raw scores, which restricts the conclusions that can be made regarding the comparative effectiveness of conditions. Moreover, treatment conditions were conducted in a class setting, whereas the control condition was conducted either individually or in small groups. This additional variable of group size may have influenced the outcome. Despite methodological shortcomings, it is noteworthy that in treatment conditions, participants were trained on items from each other's word list in addition to their own, and still demonstrated improvement comparable to controls. Overall, this study offers an equivocal level of evidence. It does, however, offer suggestive clinical importance due to the ease with which the program could be administered by a classroom teacher.

Discussion

Before drawing conclusions from the research reviewed in this paper, it is necessary to consider the methodological limitations of the studies. One limiting factor is the use of small sample sizes in many of the studies. Colwell and Murlless (2002), Register et al. (2007), Draper (2007), and Overy (2000; 2003) all used fewer than 10 participants. A related concern is the incomplete information provided regarding participant descriptions or selection criteria. Small sample sizes and few details about the participants, such as severity of reading disability or measures used to identify the impairment, limit the likelihood that the participants involved were representative of the larger population of children with reading disabilities. Poor representation in turn restricts generalization of the findings, and reduces the external validity of the evidence.

The variation in interventions offered raises additional concern when summarizing results. Duration of treatment ranged from four weeks (Colwell & Murlless, 2002; Register et al., 1994) to an entire school year (Overy 2000) and frequency ranged from two (Roskam, 1979) to four times each week (Colwell & Murlless, 2002). The nature of the activities employed in the interventions also differed significantly between studies. Roskam (1979), for example, focused heavily on auditory training through the use of music, while Register et al. (2007) integrated music with the teaching of literacy skills such as letter-sound knowledge, decoding, and story sequencing. Draper (2007) and Colwell and Murlless (2002) concentrated on teaching sight-word vocabulary through song or short melodies and sign. Similar to Roskam (1979), Overy (2003) and Douglas and Willatts (1994) used treatments made up of musical activities involving pitch and rhythm. The only

information offered about the treatment condition in Overy's (2000) study was that the teacher was trained to incorporate music into the classroom. Such diversity among the treatment conditions calls into question the elements required in an effective musical intervention.

Another methodological limitation is the range in focus and quality of outcome measures used in the studies. Assessments included tests of achievement (Roskam, 1979), phonological awareness (Overy, 2000, 2003), single-word reading (e.g., Douglas & Willatts, 1994), and reading comprehension (e.g., Register et al., 2007). Both standardized and criterion-referenced tests were administered. The variety in the measures used limits comparisons between studies and generalizations that can be made from the research as a whole. Also, a number of the measures used tested only a single aspect of reading, such as sight-word recognition. This approach to reading assessment is problematic because it does not fully assess each of the skills required in reading, offering instead an incomplete picture of each participant's reading ability.

Finally, it is important to note that, with the exception of Douglas and Willatts (1994), all authors of the studies reviewed are music therapists or music educators. While these professionals play an integral role in the development of suitable musical interventions, research with such an interdisciplinary focus would benefit from collaboration with researchers with expertise in the development of language and reading.

Conclusion

The studies reviewed collectively offer an equivocal level of evidence supporting the use of classroom music activities in reading intervention. More research is needed to determine the type of music program that most effectively supports the development of literacy skills. Further testing would also be beneficial in determining which literacy skills are best supported by classroom music programming.

Recommendations

Based on the limitations of the studies reviewed, it is recommended that further research be conducted, and that it include the following:

- Larger sample sizes, and stronger experimental designs, including controls, in order to increase the strength of the research.
- Clearly outlined participant selection criteria to allow for replication and generalization.
- Use of valid and reliable outcome measures that accurately assess all aspects of reading,

such as phonemic decoding, sight-word recognition, reading fluency, and reading comprehension.

- Collaboration between music therapists, teachers, and speech-language pathologists in order to promote the use of interprofessionally accepted intervention approaches in research.

Clinical Implications

Due to the limited strength of evidence provided by the reviewed studies, it is recommended that clinicians proceed with caution when including musical activities in literacy intervention. However, the S-LP should recognize the potential value in collaborating with music educators in order to integrate the development of literacy skills into regular classroom activities. The lack of S-LP involvement in the present research also indicates a need for discussion between music educators and S-LPs. Through discussion and collaboration, clinicians can contribute to the direction of future interdisciplinary research and treatment methods.

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