

DOCUMENT RESUME

ED 425 918

SE 061 915

AUTHOR Cheek, Joyce M.; Smith, Lyle R.
TITLE Music Training and Mathematics Achievement of Ninth Graders.
PUB DATE 1998-10-13
NOTE 5p.
PUB TYPE Reports - Research (143)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Grade 9; *Mathematics Achievement; *Mathematics Education;
*Music Education; Secondary Education

ABSTRACT

Iowa Test of Basic Skills (ITBS) mathematics scores of ninth graders (N=113) who had received music lessons were compared according to whether the students were given private lessons. Comparisons were also made between students whose lessons were on the keyboard and students whose lessons involved something other than the keyboard. Students who had private lessons for two or more years performed significantly higher on the composite mathematics portion of the ITBS than those students who did not have private lessons. Students whose lessons involved the keyboard had significantly higher ITBS mathematics scores than those students whose lessons did not involve the keyboard. These results are discussed in relation to previous research on music training and mathematics achievement. (Author)

* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *

Music Training and Mathematics Achievement of Ninth Graders

Joyce M. Cheek: Columbia County, Georgia, Public School System
and

Lyle R. Smith, Augusta State University

ED 425 918

ABSTRACT

ITBS mathematics scores of ninth graders ($n = 113$) who had received music lessons were compared according to whether the students were given private lessons. Comparisons also were made between students whose lessons were on the keyboard and students whose lessons involved something other than the keyboard. Students who had private lessons for two or more years performed significantly higher on the composite mathematics portion of the Iowa Tests of Basic Skills (ITBS) than did students who did not have private lessons. Students whose lessons involved the keyboard had significantly higher ITBS mathematics scores than did students whose lessons did not involve the keyboard. These results are discussed in relation to previous research on music training and mathematics achievement.

PERMISSION TO REPRODUCE AND
DISSEMINATE THIS MATERIAL HAS
BEEN GRANTED BY

L. Smith

TO THE EDUCATIONAL RESOURCES
INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

This document has been reproduced as
received from the person or organization
originating it.

Minor changes have been made to
improve reproduction quality.

Points of view or opinions stated in this
document do not necessarily represent
official OERI position or policy.

BEST COPY AVAILABLE

5/19/15
ERIC
Full Text Provided by ERIC

Music Training and Mathematics Achievement of Ninth Graders

Numerous studies have focused on the relationship between the degree of training a youngster has in music and the achievement level of that youngster. For example, Nisbet (1991) claimed that there is a close relationship between the musical symbolism used in setting the time signature and mathematical symbolism used to represent fraction concepts. Wenger and Wenger (1990) reported evidence that some neuroscientists suspect that, when children exercise cortical neurons by being actively involved in music, they are also making the circuits used for mathematics stronger, and that they are improving their spatial reasoning skills and are better able to handle complex reasoning tasks. Other studies (e.g., Rayl, 1995; Martin, 1995) reported similar findings in that adolescents with formal training in music tend to achieve higher in mathematics than adolescents with no formal training in music. Other research (e.g., Shaw, Rauscher, Levine, Wright, Dennis, & Newcomb, 1997; Fisher & O'Malley, 1997) indicates that students whose music training involves the keyboard tend to achieve higher in mathematics than do students whose music training does not involve the keyboard.

The purpose of the present study was to examine the types of training adolescents receive in music and to determine if significant relationships exist between the types of training and the students' mathematics achievement levels. A total of 113 ninth graders were involved in the study. All 113 of the students received music lessons at school, 36 of them also had private music lessons, and 77 of them did not have private music lessons. All 113 of the students had taken the ITBS near the end of their eighth grade year. They were surveyed about the status of their music training early in the ninth grade year. The survey asked for the type of instrument(s) for which students received lessons (voice lessons were included as a type of training), whether private lessons were received, the number of years students had music lessons at school, the number of years students had private lessons, and demographics such as the gender of the respondents.

Results

A total of 45 males and 68 females were included in the analysis. No significant difference was found between the ITBS mathematics scores of males and the ITBS mathematics scores of females. Of the 45 males, 13 had received private music lessons. Of these 13 males, 3 had keyboard lessons and 10 had music lessons on instruments other than the keyboard. Of the 68 females, 23 received private lessons. Of these 23 females, 17 had keyboard lessons and 6 had lessons other than the keyboard.

The ITBS mathematics scores of the 36 students who received private lessons were compared to the ITBS mathematics scores of the 77 students who did not receive private lessons. No significant difference was found between the two sets of scores. However, 20 of the 36 students who received private lessons had these lessons for 2 or more years, and a comparison of the scores of these 20 students to the scores of the 77 students who had no private lessons yielded a significant difference in favor of the 20 students ($t = 5.72, p < .001$).

Of the 77 students whose music lessons were all at school, 25 had school lessons for fewer than 2 years and 52 had school lessons for more than two years. No significant difference was found between the ITBS mathematics scores of the 25 students with fewer than 2 years of lessons and the ITBS mathematics scores of the 52 students with more than 2 years of lessons.

Analyses of the types of instruments for which students received lessons resulted in one significant finding. For the 36 students who received private lessons, 20 received keyboard lessons and 16 had lessons other than the keyboard. The 20 students who received keyboard lessons had significantly higher ITBS mathematics scores than did the 16 students who had lessons other than the keyboard ($t = 3.60, p < .01$).

In summary, this study supports the hypothesis that mathematics achievement is enhanced by music training, provided the training is for an extended length of time (two or more years) and provided the music lessons are private. The reasons why the private lessons and the school lessons yielded significantly higher achievement than did school lessons only can only be conjectured. It may be that the combination of private lessons and school lessons provides a degree of exposure that reaches a threshold at which maximum benefit is attained. It may be that affluence plays a role in this phenomenon, such that more affluent families were more willing to

pay for private lessons, although a cursory examination of the students involved did not seem to indicate that this was the case.

The study also indicates that keyboard instruction tends to be related to mathematics achievement more so than music instruction of other types. This supports the works of Fisher and O'Malley (1997) and of Shaw et al. (1997).

Due to the small sample of the present study, replications with larger samples should be conducted. If possible, groups of students who receive private music lessons (but no music lessons at school) should be examined also. This could answer the question of whether private music lessons (without any school music lessons) tend to optimally enhance mathematics achievement or whether the combined experience of private lessons and school lessons are most beneficial.

References

- Fisher, A., & O'Malley, C. (1997, June 1). The wrong keyboard. *Popular Science*, 97, 41.
- Martin, M. (1995). S.A.T.'s and music. *American Music Teacher*, 44, 16-17.
- Nisbet, S. (1991). Mathematics and music. *The Australian Mathematics Teacher*, 47, 4-8.
- Rayl, A. J. S. (1995). Striking a neural chord: Musical links for scientists and mathematicians of tomorrow. *Omni*, 17, 14.
- Shaw, G., Rauscher, F., Levine, L., Wright, E., Dennis, W., & Newcomb, R. (1997). Music training causes long-term enhancement of preschool childrens' spatial-temporal reasoning. *Neurological Research*, 19, 2-8.
- Wenger, W., & Wenger, S. H. (1990). Training music sight-reading and perfect pitch in young children, as a way to enhance their intelligence. *Journal of the Society for Accelerative Learning and Teaching*, 15, 77-89.



U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement (OERI)
Educational Resources Information Center (ERIC)



REPRODUCTION RELEASE
(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: <i>Music Training and Mathematics Achievement of Ninth Graders</i>	
Author(s): <i>Joyce Cheek and Lyle R Smith</i>	
Corporate Source: <i>Augusta State University</i>	Publication Date: <i>10/13/98</i>

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, *Resources in Education* (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic/optical media, and sold through the ERIC Document Reproduction Service (EDRS) or other ERIC vendors. Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce the identified document, please CHECK ONE of the following options and sign the release below.

← Sample sticker to be affixed to document

Sample sticker to be affixed to document →

Check here
Permitting microfiche (4" x 6" film), paper copy, electronic, and optical media reproduction.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY _____ *Sample* _____ TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

Level 1

"PERMISSION TO REPRODUCE THIS MATERIAL IN OTHER THAN PAPER COPY HAS BEEN GRANTED BY _____ *Sample* _____ TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)"

Level 2

or here
Permitting reproduction in other than paper copy.

Sign Here, Please

Documents will be processed as indicated provided reproduction quality permits. If permission to reproduce is granted, but neither box is checked, documents will be processed at Level 1.

"I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce this document as indicated above. Reproduction from the ERIC microfiche or electronic/optical media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries."

Signature: <i>Lyle R Smith</i>	Position: <i>Professor</i>
Printed Name: <i>LYLE R SMITH</i>	Organization: <i>Augusta State Univ</i>
Address: <i>College of Education Augusta State Univ. Augusta, GA 30904-2200</i>	Telephone Number: <i>(706) 667-4509</i>
	Date: <i>10/13/98</i>

Share Your Ideas With Colleagues Around the World

Submit your conference papers or other documents to the world's largest education-related database, and let ERIC work for you.

The Educational Resources Information Center (ERIC) is an international resource funded by the U.S. Department of Education. The ERIC database contains over 820,000 records of conference papers, journal articles, books, reports, and non-print materials of interest to educators at all levels. Your manuscripts can be among those indexed and described in the database.

Why submit materials to ERIC?

- **Visibility.** Items included in the ERIC database are announced to educators around the world through over 2,000 organizations receiving the abstract journal, *Resources in Education (RIE)*; through access to ERIC on CD-ROM at most academic libraries and many local libraries; and through online searches of the database via the Internet or through commercial vendors.
- **Dissemination.** If a reproduction release is provided to the ERIC system, documents included in the database are reproduced on microfiche and distributed to over 900 information centers worldwide. This allows users to preview materials on microfiche readers before purchasing paper copies or originals.
- **Retrievability.** This is probably the most important service ERIC can provide to authors in education. The bibliographic descriptions developed by the ERIC system are retrievable by electronic searching of the database. Thousands of users worldwide regularly search the ERIC database to find materials specifically suitable to a particular research agenda, topic, grade level, curriculum, or educational setting. Users who find materials by searching the ERIC database have particular needs and will likely consider obtaining and using items described in the output obtained from a structured search of the database.
- **Always "In Print."** ERIC maintains a master microfiche from which copies can be made on an "on-demand" basis. This means that documents archived by the ERIC system are constantly available and never go "out of print." Persons requesting material from the original source can always be referred to ERIC, relieving the original producer of an ongoing distribution burden when the stocks of printed copies are exhausted.

So, how do I submit materials?

- Complete and submit the *Reproduction Release* form printed on the reverse side of this page. You have two options when completing this form: If you wish to allow ERIC to make microfiche and paper copies of print materials, check the box on the left side of the page and provide the signature and contact information requested. If you want ERIC to provide only microfiche copies of print materials, check the box on the right side of the page and provide the requested signature and contact information. If you are submitting non-print items or wish ERIC to only describe and announce your materials, without providing reproductions of any type, please contact ERIC/CSMEE as indicated below and request the complete reproduction release form.
- Submit the completed release form along with two copies of the conference paper or other document being submitted. There must be a separate release form for each item submitted. Mail all materials to the attention of Niqui Beckrum at the address indicated.

For further information, contact...

RECEIVED

Niqui Beckrum
Acquisitions Coordinator
ERIC/CSMEE
1929 Kenny Road
Columbus, OH 43210-1080

1-800-276-0462
(614) 292-6717
(614) 292-0263 (Fax)
ericse@osu.edu (e-mail)

JAN 25 1996

AUGUSTA COLLEGE
Office of the Vice President
For Academic Affairs