DOCUMENT RESUME

ED 258 412 EC 172 932

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TITLE Math Computation and Spelling Achievement of Deaf Children with Deaf Parents and Deaf Children with Hearing Parents.
PUB DATE [83]
NOTE 15p.
PUB TYPE Reports Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Academic Achievement; Adolescents; *Deafness; *Mathematics Achievement; *Parenting Skills; *Parent Role; Secondary Education; *Spelling

ABSTRACT

This study compared the test performance of deaf students with deaf parents (DS/DP) and deaf students with hearing parents (DS/HP) in math computation and spelling, two areas which appear to be least related to the development of abstract language. The Math Computation and Spelling subtests of the Stanford Achievement Test were administered to 10 DS/DP and 10 DS/HP (ages 15 to 17) enrolled at the Florida School for the Deaf, all of whom had hearing losses of 70 db or greater in the better ear. Standard scores for both subtests were compared using a dependent t-test. Results indicated that DS/DP performed significantly better on the Spelling subtest ($p<.05$) than did DS/HP. The difference in performance on the math computation subtest was not statistically significant. These and similar research findings are discussed in light of the suggestion that parenting practices of deaf parents may contribute to the higher achievement levels of their children. Practices cited include acceptance of the child's deafness, time devoted to parenting, provision of a role model leading to higher self-esteem for the child, and amount of communication between parent and child. (JW)

Math Computation and Spelling Achievement of Deaf Children With Deaf Parents and Deaf Children With Hearing Parents

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Running head: MATH AND SPELLING ACHIEVEMENT

Abstract

The question under investigation in this study was whether deaf students with deaf parents do better on tests of academic achievement than do deaf students with hearing parents. The tests used were the Math Computation and Spelling Subtests of the Stanford Achievement Test. Deaf students with deaf parents did do significantly better on the Spelling Subtest. Reasons for these results and implications of these results are explained.

Math Computation and Spelling Achievement of Deaf Children With Deaf Parents and Deaf Children With Hearing Parents

A body of literature has been built up over the past several years in which the linguistic development, academic achievement and cognitive skills of the deaf students who have deaf parents (ds/dp) have been compared to the linguistic development, academic achievement and cognitive skills of deaf students who have hearing parents (ds/hp). In most of these studies ds/dp did significantly better than did ds/hp (Corson, 1973; Meadow, 1966; Sisco & Anderson, 1980; Vernon & Koh, 1970, 1971). In two studies; however, this was not the case (Conrad & Weiskrantz, 1981; Messerly & Aram, 1980). In one of these studies ds/dp did equally as well as ds/hp on a test of general cognitive ability (Conrad & Weiskrantz, 1981). In the other study ds/hp did significantly better than did ds/dp when compared on measures of general academic achievement (Messerly & Aram, 1980).

In those studies where ds/dp did significantly better than did ds/hp various reasons are offered to explain these results. Some authors have credited the results to the fact that ds/dp tend to be exposed to sign language at an earlier age (Vernon & Koh, 1970). This early introduction

to sign is seen as benefiting the child by giving him or her a linguistic code early on with which to operate. Others point out that sign language itself may not be the key variable but rather that the presence of any early communicative system, be it oral or sign, is the key variable (Corson, 1973). Other authors have suggested that the data can be explained by comparing the parenting practices of deaf parents with deaf children against those of hearing parents with deaf children (Sisco & Anderson, 1980). These authors feel that deaf parents are better able to accept the hearing loss of their child than are hearing parents. Some of these authors suggest that deaf parents may also provide better nurturing and care of deaf children.

In those studies where ds/hp did better or equally as well as ds/dp the authors suggest that sampling procedures may account for differences in their results. Messerly and Aram (1980) suggest that they took their sample from a population which is not comparable to the general population of deaf children by virtue of this population's overall higher achievement level. They believe the skewed nature of their population affected the results. Conrad and Weiskrantz (1981) call into question sampling biases

which may have occurred in the studies where ds/dp were found to perform better than ds/hp on measures of cognitive ability to explain the difference in the results they found. They feel that there is no reason to assume better general cognitive performance on the part of ds/dp.

The present study attempts to add further information to this area of study. Reported here is a comparison of arithmetic computation and spelling achievement levels of a sample of ds/dp and matched sample of ds/hp. Arithmetic computation and spelling were used because they are the two academic areas where deaf students attain their highest levels of achievement (Trybus, 1973). They are also areas which appear to have the least relationship to measures of achievement in language areas such as reading achievement (Trybus & Buchanan, 1973). In this study, unlike in most of the others reported, the instrumentation used was standardized on deaf students. Additionally, standard scores and not grade equivalent scores were used in these analyses unlike in most of the earlier studies.

Procedures

Subjects

There were twenty students used in this study. All of the students were enrolled at the Florida School for

the Deaf in St. Augustine, Florida. Ten of the students came from homes where both parents were deaf (ds/dp). The other ten students came from homes where both parents were hearing (ds/hp). The students were matched for age, sex, and I.Q. I.Q. scores ranged from 84 to 108 with a mean of 98. The students all had hearing losses of 70 db or greater in the better ear. There were fourteen females and six males included in the study. They ranged in age from 15.1 years old to 17.3 years old.

Measure

The Arithmetic Computation and the Spelling sections of the Stanford Achievement Test: Special Edition for Hearing Impaired Students were used to assess the students. Administration of the test followed the procedures recommended by the Office of Demographic Studies. Both sections of the test were administered during the Spring when the entire battery is normally given to the students at the Florida School for the Deaf.

Standard scores were used for the statistical analysis to allow for more accurate comparison of scores derived when different levels of the test are used. The standard scores for both subtests were compared for the ds/dp and their matched counterparts of ds/hp using a dependent t-test. (Edwards, 1958).

Results

The results of the t-test analysis used in the study are given in Table 1. In these results ds/dp did significantly better on the Spelling section than did ds/dp. On the Math Computation section of the test ds/dp attained a higher mean than did ds/hp but statistical significance was not reached.

Discussion

The results of this study add some support to those of previous studies in which ds/dp attained higher achievement levels than did ds/hp (Corson, 1973; Meadow, 1966; Vernon & Koh, 1970, 1971). Two of the differences between this study and these previous studies, however were the use of an achievement test battery standardized on deaf students and the use of standard or scaled scores in the statistical analyses.

In the Messerly and Aram (1980) study both of the above described procedures were also followed but the results of the study differed from the results of this study. In the Messerly and Aram study no significant

Table 1

Math and Spelling Achievement Levels for Deaf Students With Deaf Parents Compared to Deaf Students With Hearing Parents

Subtest	Mean Grade Equivalent Scores		Mean Standard Scores		Standard Deviation of Standard Scores		t-values
	ds/dp	ds/hp	ds/dp	ds/hp	ds/hp	ds/hp	
Math Computation	6.1	4.8	166.6	153.2	23.33	13.97	1.5*
Spelling	6.8	6.2	170	166	22.11	22.234	3.64*

*$p < .10$

**$p < .05$

difference between the two groups of students were found for the Math Computation or the Spelling subtests on the Stanford Achievement Test. The differences between the results of these two studies may be explained in part by the populations from which the two samples were drawn. Messerly and Aram state that their sample did not appear to be representative of the total population of deaf students based on achievement levels. In this study it appears that the sample used is representative of the total population of deaf students as based on achievement levels (Di Francesca, 1972). This may account for some of differences in the results found in the two studies.

The focus of this study has not been on overall academic achievement but rather on achievement in two areas in which deaf students typically do their best and which appear to be the least related to the development of abstract language. Achievement levels on the Math Computation and Spelling subtests of the Stanford Achievement test are consistently the highest levels attained by deaf students for all of the test battery except for the Primary I level (Di Francesca, 1972). It is assumed that this occurs because these subtests require less semantic and syntactic mediation on the part of the student than do

the other subtests included in the test battery. The Math Computation subtest requires the student to use numeric combinations while the Spelling subtest requires the student to use rote memory for a grapheme/phoneme task. The relatively low relationship these two subtests have to abstract language development can also be seen in the intercorrelations among the subtests on the Stanford Achievement test. Math Computation and Spelling show lower correlations with tests of reading and language than do any of the other subtests in the test battery (Trybus, 1973). They are of course still significantly related to reading and language, but less so than the other subtests in the battery; Spelling showing lower correlations with reading and language than does Math Computation.

The fact that ds/dp did better than did ds/hp on a subtest with relatively low semantic and syntactic content gives some support to the general theory proposed by Sisco and Anderson (1980) in explaining similar findings. They suggested that the better performance demonstrated by ds/dp on nonverbal tasks could not be completely explained by these children receiving exposure to a linguistic system such as sign language. Rather, Sisco and Anderson felt that the parenting practices of deaf parents accounted

for these results. This explanation differs from the explanation offered by Vernon and Koh (1970, 1971). Vernon and Koh suggested that early exposure to sign language was the reason their sample of ds/dp performed better than their sample of ds/hp.

The differences between these two explanations as to why ds/dp do better than do ds/hp is certainly not resolved by this study, but some additional information is added. The low semantic and syntactic nature of the subtests used in this study gives some indication that it may not be the sign language used at an early age by ds/dp that gives them the advantage over ds/hp. Rather, it may be other variables which give them this advantage. Arguements, of course, can be raised that the development of an early language system in these children helps them to better mediate all instruction including instruction in areas with low abstract language content. However, these authors believe that generally the evidence is beginning to point to the explanations offered by Sisco and Anderson (1980).

If this theory is correct, a question which needs to be answered is which parenting practices give ds/dp the advantage over ds/hp in the area of academic achievement. Some authors have suggested that the deaf parents early

acceptance of their child's deafness may account for this advantage (Corson, 1973); others have suggested that the time spent by the deaf parent in parenting their child may account for the advantage (Sisco & Anderson, 1980). Another possibility is that the role model presented by a deaf parent may be helpful in raising the deaf student's self estoem and this higher self esteem inturn is the variable which leads to better academic achievement on the part of the ds/dp. It may also be that the amount of communication between deaf parent and deaf student that gives the ds/dp the advantage over the ds/hp. Finally, it may be a combination of some or all of these factors which accounts for the results found in this and most other studies.

To answer this question more research would be needed. This research might follow the course of comparing parenting practices of hearing parents with deaf students who are matched for I.Q. but who show a wide variance in academic achievement levels. This may yield some information as to what parenting practices correlate to a deaf student's academic achievement levels. This information would be of great value in developing better educational programs for parents of deaf infants.

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