

SPECIALIZED ARTISTIC EDUCATION IN MUSIC: WHAT IS THE INFLUENCE ON ACADEMIC ACHIEVEMENT, CONTROLLING FOR SOCIOECONOMIC STATUS AND INTELLIGENCE?

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ABSTRACT

The relationship between learning music and academic achievement has been discussed in numerous contexts. According to the literature, students involved in learning music obtain higher results in several school subjects. This study intends to examine the influence of musical training on the academic performance of pupils in schools providing specialized artistic education, controlling for socioeconomic status and intelligence. We analyzed the composite academic achievement score and the average marks in nine school subjects in the 7th grade. The sample is composed of 62 pupils who were enrolled in Specialized artistic education in music and 50 pupils following General basic education, in schools in Portugal. Results indicated higher academic achievement in students following Specialized artistic education in music regarding seven of nine school subjects: Portuguese, English, History, Natural Sciences, Physics and Chemistry, Geography, and Visual Arts, but not in Mathematics or Sports. Musical training predicts significantly academic achievement when socioeconomic status and intelligence remain constant. Our results were discussed as contributions to corroboration of the thesis that musical training is associated with higher academic proficiency. It is therefore hoped this study may draw attention to the evidence that participation in music can improve performance in various school subjects.

Keywords: Specialized artistic education in music, general basic education, academic achievement, school marks, socioeconomic status, intelligence

INTRODUCTION

Study of the benefits of learning music for academic performance is not recent. Students that participate in music have shown higher academic achievement both in their composite academic score [12], [14], [15] and in several school subjects [2], [3], [8], [11], [12], [13], [14], such as Mathematics [2], [3], [6], [7], [8], [11], [12], [13], [14], Reading [2], [8], [11], [12], [13], [14], Language Arts [2], [8], [12], Spelling [12], English [3], [7], German [14], French [3], Spanish [3], Science [3], [8], Physics [3], Chemistry [3], Biology [6], History [3], [14], Geography [14], Citizenship [8], Handicrafts [14], and Sports [3]. Some studies indicate a strong connection [2], [6], [7], namely in Reading and Mathematics [7]. Certain studies also highlight the association between the duration of music lessons and school performance, indicating that ongoing learning helps students to achieve higher school performance or keep it at a high level over time [8], [12], [14].

The cause of the relationship between involvement in music and academic performance is not straightforward, and several variables have been studied as being at the basis of, or competing towards that relationship. Among them, the most influential have been intelligence [2], [12], and socioeconomic level [2], [8], [12], [13], [14], [15], although recent research has studied the effect of personality factors (e.g., conscientiousness, openness-to-experience), on both academic performance and on students' likelihood to study music [4], [5].

Although these studies corroborate the effect of intelligence [2], [4], [12] and socioeconomic level [2], [8], [12], [13], [14], [15] on academic performance, some studies continue to show a positive association between participation in music and academic achievement even in the presence of both socioeconomic level [2], [12], [13], [14], [15] and intelligence [2], [4], [12]. On the other hand, Babo [2] observed that participation in music ceased to have an effect on academic performance in Reading and Mathematics when socioeconomic level and intelligence were controlled for.

Some studies analyzing the influence of learning music on academic performance support the idea that, among the various arts, music is the only one to be associated positively with academic performance [6], [11], [14]. In addition, it is also the only art activity that has been reported to be causally associated with academic achievement [11]. Young et al. [15] tried to understand the positive relationship between arts and academic performance, presuming this link would be formed mainly through learning to play a musical instrument. With a sample of 2339 children aged 11 and 12, the authors used as predictive variables two measures of arts (involvement with the arts in general and learning a musical instrument at home) and the mother's level of education, among others; as dependent variable, they used a composite measure of academic performance. Young et al. [15] found that, unlike the variable of "involvement with the arts in general", the measure of "learning a musical instrument at home" was a predictor of academic performance, and that the interaction between both variables was also significant. They concluded that involvement with the arts in general is a predictor of academic performance only when children play a musical instrument and that the effect of playing on that performance is independent of socioeconomic level.

Aims

Knowing that the influence of socioeconomic level and intelligence on school performance is an accepted fact and a determinant (e.g., [2], [4], [8], [12], [13], [14], [15]), in this study we analyze the role of both together with learning music in academic performance. So we intend to examine the influence of musical training on the academic performance of pupils in Portuguese schools offering specialized artistic education, controlling for pupils' socioeconomic status and intelligence.

MATERIALS AND METHODS

Sample

Twelve 3rd cycle schools that are part of the Portuguese basic education system were selected. Three of the schools offered General basic education and nine of the schools had a programme of Specialized artistic education in music. Specialized artistic

education in music refers to the type of education provided at both state and private vocational music schools. This programme begins in the 5th grade of basic education. The study plans of Specialized artistic education in music and General basic education are similar concerning the school subjects that comprise the various components of the curriculum, except for the art education component, which in Specialized artistic education in music incorporates three main subjects (ear training, learning an instrument, and orchestra participation).

The sample is composed of 112 children between 11 and 14 year old who were in the 7th grade ($M = 11.75$ years and $SD = 0.57$ years), 44 (39.3%) males and 68 (60.7%) females. Sixty two (17 males and 45 females) were pupils enrolled in Specialized artistic education in music and 50 (27 males and 23 females) were pupils of General basic education. Data were collected from schools in northern, central and southern Portugal.

Measures and variables

We collected the school marks at the end of the 7th grade for the following subjects: Portuguese, English, Mathematics, Natural Sciences, Physics and Chemistry, History, Geography, Sports and Visual Arts. A composite academic achievement score was calculated by averaging the marks in these school subjects (ranging from 1 to 5).

Pupils' socioeconomic status was assessed using parents' education across six dimensions: (a) both parents had basic education; (b) one parent had basic education and the other had secondary education; (c) one parent had basic education and the other had a degree or higher; (d) both had secondary education; (e) one had secondary education and the other had a degree or higher; and (f) both had a degree or higher.

Intelligence was measured using the general intelligence score (g) of the Reasoning Test Battery 7/9 [1], an instrument validated for the Portuguese population that evaluates the cognitive achievement of pupils from grades 7 to 9.

As an independent variable, we considered the absence versus the presence of musical training (no music vs. music). As dependent variables, we used the marks from the nine school subjects and the composite academic achievement score. We also adopted the control variables (covariates) of pupils' socioeconomic status and intelligence.

Procedures and data analysis

We obtained approval from schools and parents for pupils' participation in the study. Authorisation to administer the measuring instruments was granted by the Portuguese Ministry of Education and Science. The Reasoning Test Battery 7/9 was administered during class time at the start of the 7th grade. The procedures were aimed to guarantee the ethical assumptions of research and to ensure confidentiality during data collection and data analysis. The data were analyzed using SPSS 22.0.

RESULTS

Observing the composite academic achievement score, we found that music students ($M = 3.94$; $SD = 0.47$) perform better academically than non-music students ($M = 3.50$; $SD = 0.55$), $t(110) = 4.61$, $p < .001$. Examining average marks in the nine subjects, the MANOVA performed indicated higher academic achievement in pupils of Specialized artistic education in music in seven of the nine school marks: Portuguese, English, History, Natural Sciences, Physics and Chemistry, Geography, and Visual Arts, but not in Mathematics and Sports (see Table 1 and Figure 1).

Table 1. Average marks (M) and standard-deviations (SD) of academic achievement in the nine school subjects in the 7th grade for music students and non-music students: Univariate tests (F) and effect size (η^2)

Academic achievement	No music (<i>n</i> = 48)		Music (<i>n</i> = 62)		<i>F</i> (1, 110)	η^2
	M	SD	M	SD		
Mathematics	3.32	.84	3.53	0.76	1.95	.017
Portuguese	3.22	.65	3.45	0.53	4.31*	.038
English	3.40	.95	3.84	0.77	7.29**	.062
History	3.60	.73	4.10	0.65	14.61***	.117
Natural Sciences	3.44	.73	4.08	0.68	22.75***	.171
Physics and Chemistry	3.52	.81	4.11	0.68	17.64***	.138
Geography	3.54	.73	4.08	0.66	16.79***	.132
Visual Arts	3.60	.78	4.44	0.90	26.82***	.196
Sports	3.82	.69	3.82	0.64	0.00	.000

* $p < .05$ ** $p < .01$ *** $p < .001$

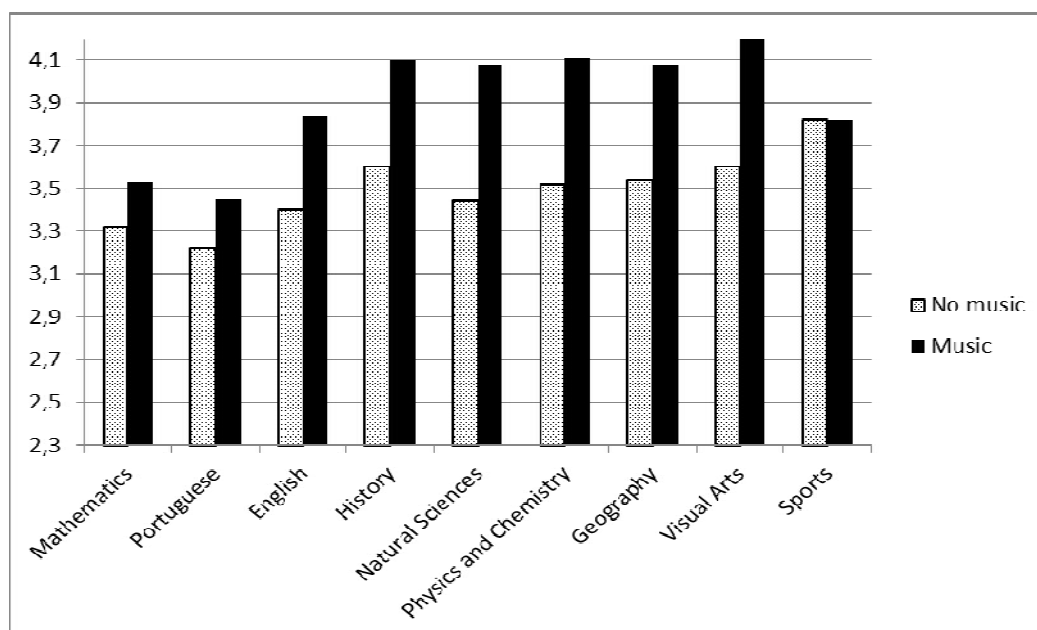


Figure 1. Average marks in the nine school subjects for music students and non-music students

Intelligence and socioeconomic status are shown in the literature to be positively correlated with academic achievement. The correlations between these variables and musical training are presented in Table 2. As we can see, musical training was determined to be positively correlated with all variables, and the correlations with academic achievement ($r = .402$) and intelligence ($r = .429$) have a high effect size.

Table 2. Intercorrelations (and R^2 in parentheses) of musical training, academic achievement, intelligence, socioeconomic status

	Musical training	Academic achievement	Intelligence	Socioeconomic status
Musical training (no music vs. music)	1	.402*** (16.2%)	.429*** (18.4%)	.340*** (11.6%)
Academic achievement		1	.539*** (29.1%)	.336*** (11.3%)
Intelligence			1	.385*** (14.8%)
Socioeconomic status				1

Note: Musical training is dummy-coded (no music = 0, music = 1) *** $p < .001$

According to our expectations, academic achievement, intelligence, and socioeconomic status are also correlated, which led us to calculate partial correlations of musical training in the prediction of academic achievement. We found a partial correlation of $r_{\text{partial}} = .197$, $p = .039$, $R^2_{\text{partial}} = 3.9\%$, which shows that musical training influences academic achievement positively, when intelligence and socioeconomic status remain constant. However, the effect size is low.

Table 3. Hierarchical multiple regression analyses examining the prediction of academic achievement by musical training (step 1), by musical training and socioeconomic status (step 2), and by musical training, socioeconomic status and intelligence (step 3)

Step	Predictors	B	SE	B	t
1	Musical training (no music vs. music) $R = .402$, $R^2 = .162$, $R^2_{\text{adj}} = .154$, $SE = .507$	.444	.096	.402	4.61***
2	Musical training (no music vs. music) Socioeconomic status $R = .455$, $R^2 = .207$, $R^2_{\text{adj}} = .192$, $SE = .495$	.359 .088	.100 .036	.325 .226	3.59*** 2.49*
3	Musical training (no music vs. music) Socioeconomic status Intelligence $R = .571$, $R^2 = .326$, $R^2_{\text{adj}} = .192$, $SE = .495$	.204 .044 .087	.098 .034 .019	.185 .113 .416	2.09* 1.31 4.60***
* $p < .05$ *** $p < .001$					

We performed a hierarchical multiple regression analysis in Table 3 to examine whether musical training predicts academic achievement beyond the influence of intelligence and socioeconomic status. Variables were entered into the hierarchical multiple regression analysis in three steps. In step 1 we found that musical training significantly predicts academic achievement in $R^2 = 16.2\%$. In step 2 socioeconomic status added 4.5% of the amount of total variance explained. However, musical training predicts academic achievement more significantly than socioeconomic status does. In step 3 we added the predictor of intelligence in the regression equation. We found that in the presence of intelligence, socioeconomic status lost statistical significance. As expected, intelligence showed a high prediction in academic achievement ($\beta = .416$). Despite the high prediction of intelligence, musical training continues to explain a significant amount of the variance ($\beta = .185$), and socioeconomic status lost its predictive value. We concluded that musical training significantly predicts academic achievement once socioeconomic status and intelligence remain constant.

DISCUSSION

This study aimed to analyze the influence of musical training on academic performance, taking the variables of socioeconomic status and intelligence into consideration. We found that music students perform better academically than non-music students in the composite academic achievement score, in line with Schellenberg [12], Wetter et al. [14], and Young et al. [15]. Agreeing with previous studies, analysis by school subject indicated higher academic achievement in music students in Portuguese [9], English [3], History [3], [9], [14], Natural Sciences [3], [9], Physics and Chemistry [3], [9], and Geography [9], [14]. Besides these subjects, we also found higher academic performance in Visual Arts in music students, but not in Mathematics or Sports. Our result for Sports corroborates that obtained by Wetter et al. [14]. Despite music students' average in Mathematics being higher than that of non-music students, the difference did not reach the significance level threshold. This result seems to contradict the literature on participation in music and academic success, which has revealed a positive association between music study and performance in mathematics [2], [3], [6], [7], [8], [11], [12], [13], [14]. A likely explanation relates to issues associated with school failure in this subject at a national level, as can be inferred from the data obtained from the Office of Educational Evaluation of the Portuguese Ministry of Education and Science, where results in Mathematics are below the average of OECD countries ($M_{\text{Mat,Portugal}}=487$; $M_{\text{Mat,OECD}}=494$; source: Pisa 2012 results – What students know and can do: Student performance in mathematics, reading and science, Volume I, OECD 2013).

Simple associations between academic achievement and the predictor variables revealed that music students tend to be better academic performers, to be more intelligent, and to come from families with higher socioeconomic status. The hierarchical multiple regression let us analyze to what extent musical training is a predictor of good academic performance when socioeconomic status and intelligence are entered in the equation as predictors of that performance. In the first step, we confirmed that musical training predicts 16.2% of academic achievement. In the second step, we added socioeconomic status to musical training as predictor variables, and although both were significant

(20.7% of total variance explained), musical training was shown to be a stronger predictor. In step 3, we added the intelligence predictor to the previous variables, which made the biggest contribution to the model, followed by musical training (three predictors significant explaining 32.6% of total variance). The link between socioeconomic status and academic achievement disappeared when musical training and intelligence were held constant. We concluded that musical training still managed to be a significant predictor of academic achievement, even in the presence of socioeconomic status and intelligence. Results consistent with ours after controlling for intelligence were obtained by Babo [2], Corrigall et al. [4], and Schellenberg [12], and after controlling for socioeconomic status by Babo [2], Schellenberg [12], Southgate and Roscigno [13], Wetter et al. [14], and Young et al. [15].

Our results corroborate the thesis that musical training is associated with higher academic proficiency and that the impact of learning music on improved academic performance has scientific support. In the latest reform of the curricular structure of Portuguese Basic education, made by the Ministry of Education and Science in 2012, and concerning only the 3rd cycle of General basic education, the subject of Music was allocated significantly less time than had been the case previously in the 7th and 8th grades. In the 9th grade of schooling, it was taken out the study plan completely. We hope this study will draw attention to the evidence that musical training can improve performance in various school subjects. In our opinion, it would be desirable to keep and enhance Music in the study plan of General basic education.

We conclude that musical training significantly predicts academic achievement after controlling for socioeconomic status and intelligence.

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