

Research report

Music and academic performance



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HIGHLIGHTS

- Students who select music courses have better grades than the others in all subjects.
- Cognitive mechanisms related to overcoming cognitive dissonances are discussed.
- Enjoyment of music might cause academic improvement.

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ABSTRACT

In a previous study we demonstrated that listening to a pleasant music while performing an academic test helped students to overcome stress, to devote more time to more stressful and more complicated task and the grades were higher. Yet, there remained ambiguities as for the causes of the higher test performance of these students: do they perform better because they hear music during their examinations, or would they perform better anyway because they are more gifted/motivated? This motivated the current study as a preliminary step toward that general question: Do students who like/perform music have better grades than the others? Our results confirmed this hypothesis: students studying music have better grades in all subjects.

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1. Introduction – 'Mozart effect', music, and academic performance

The 'Mozart effect' is a short-term improvement on "spatial-temporal reasoning" [1–5]. In our previous publication we demonstrated that listening to a pleasant music while performing an academic test helped students to overcome stress due to cognitive dissonance, to devote more time to more stressful and more complicated task and the grades were higher [6]. It is known that the experience of pleasure tends to optimize behavior [7,8]. Our results have suggested that the 'Mozart effect' is caused by overcoming cognitive dissonance during academic tests. This short-time effect could be a small part of the musical cognitive function.

A fundamental cognitive function of music could be its facilitation of accumulating knowledge. Overcoming stress due to cognitive dissonance is necessary for accumulating knowledge and therefore is fundamental for the entire human evolution [9]. These previous results therefore might be significant for understanding the cognitive function of music, its origin, and evolution – the issues remaining mysterious for 2500 years [10–20]. Here we continue this line of inquiry by addressing a question if long term study of music systematically improves academic performance.

There are quite a few studies that show significant differences in individuals that are musically trained compared to individuals that do not have that musical training. Groussard et al. [21] found that musical expertise resulted in additional activations in the areas of the hippocampus, medial frontal gyrus and superior temporal areas in both hemispheres which suggest that there is a constant interaction between episodic and semantic memory. George and Coch [22] found that long-term music training in non-professional musicians is associated with improvements in working memory. Musically trained individuals outperformed not musically trained on standardized subtest of visual, phonological, and executive memory.

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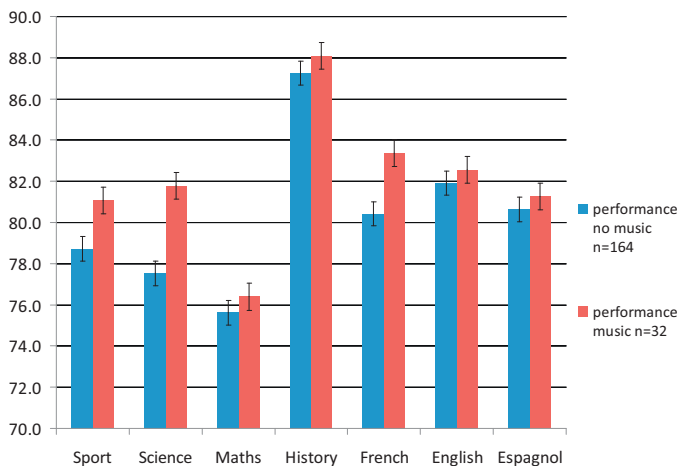


Fig. 1. The mean grades for different courses for the students (14–15 yrs) from the third school-year of secondary school, during the year 2011–12.

However, these studies compared “musicians” with “non-musicians”. Whether music itself has an effect on memory and cognitive functions in general is still under debate. This question also was addressed by a number of previous studies [23–25]. However the results again have been inconclusive, these references suggest that more research needs to be done to see if long-term music participation improves academic achievements. This question is addressed here.

2. Methods

The population studied consisted of students from a secondary school of the province of Québec Canada. The students belonged to the *International Baccalaureat* program for which they were selected on their first year of secondary school based on their high grades in previous years. They formed a homogenous group in terms of their grades. During the first 2 yrs of their secondary school curriculum (levels 1 and 2), music was compulsory with two courses taking nine days per period. Over the third, fourth, and fifth years (years 3, 4, and 5), music courses were optional and students had to choose one option between plastic art (painting and sculpture), dramatic art, and music. During the first two years the student academic performance was similar in this highly selective and performing population. Over the following three years all students were still of similar academic standard, but any student who disliked music was free to choose another optional course, and all the students who liked music could continue to take it at the school. A new experienced teacher, very skilled and much liked by students, had been teaching over the last three years of the music course. Several of his students were eventually able to enter the *Conservatoire de music* after these three years.

The mean grades for the academic year 2011–2012 were recorded for three different school years, corresponding to the third year ($n=196$ students), the fourth ($n=184$ students) and the fifth (which is the senior class of the secondary school; $n=180$ students). Students were of both sexes, aged 14–15, 15–16, and 16–17 years old (for the corresponding school year). It is important to keep in mind that all the students were among the top grade level of their school, whether they selected music courses or not.

The three different school years were analyzed as three separate groups. From all the test results available we selected only courses with quantifiable performance including: sport, science, mathematic, French, English, history, chemistry, physics, Spanish, ethics, present-day world.

3. Results

Figs. 1–3 illustrate striking results. Each year, the mean grades of the students that had chosen a music course in their curriculum were higher than those of the students that had not chosen music as an optional course. This tendency is true regardless of the topic of the course.¹

¹ There are two exceptions to this statement. Of the 25 courses rated over 3 years (Figs. 1–3) there are only 2 cases when non-musical student scores are higher than

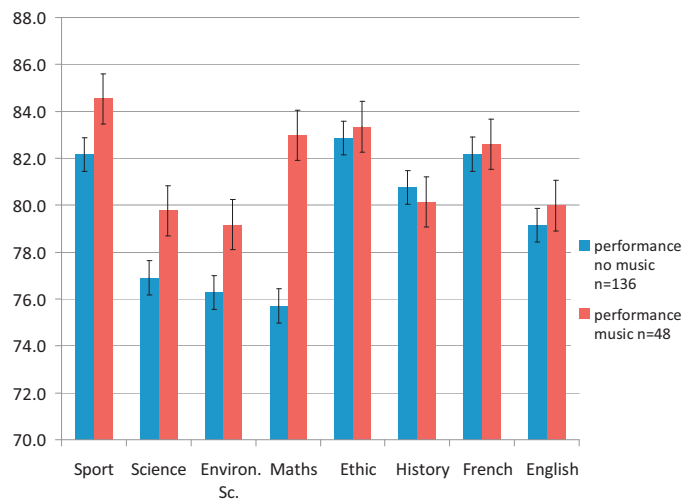


Fig. 2. The mean grades for different courses for the students (15–16 yrs) from the fourth school-year of secondary school, during the year 2011–12.

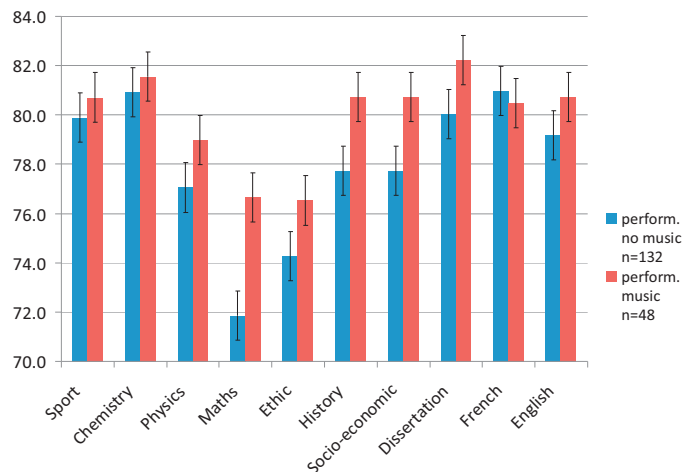


Fig. 3. The mean grades for different courses for the students (16–17 yrs) from the fifth school-year of secondary school, during the year 2011–12.

Table 1

Statistical significance of the results in Fig. 1: T -test probabilities of the null hypotheses, H_0 , are low for Science and French (H_0 : music has no positive influence on academic performance as measured by the mean grade for each course for the students (14–15 yrs) from the third school-year of secondary school, during the year 2011–12).

subject	Sport	Science	Math	History	French	English	Spanish
$p <$	0.11	0.00	0.43	0.32	0.06	0.31	0.34

Statistical significance of these results is very high. The probability of null hypothesis (H_0 : music does not positively affect academic performance), according to T -test over all data is very low, $p < 0.001$. For individual subjects over years statistical significance varies, with many cases reaching high statistical significance, as shown in the following Tables 1–3 (corresponding to Figs. 1–3).

These results confirm that music has a link to cognition. They do not indicate causality: whether the students have better grades because they practice music from time to time or whether they chose music because they are better at school. However these data

musical student scores (History year 2, French year 3); in both cases the differences are of low statistical significance.

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