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Dagma Venturini Marques Abramides<sup>2</sup> Effect of music education on the promotion  
of school performance in children*Efeito da educação musical na promoção do  
desempenho escolar em crianças*

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## Descritores

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## ABSTRACT

**Purpose:** This study investigated the effect of music education on the repertoire of school skills in children submitted and not to music education. **Methods:** The study sample was composed of 80 children aged 8-12 years, of both genders, divided into two groups: 40 students submitted to music education (experimental) and 40 students not submitted to music education (control). Data were collected using the Social Skills Rating System (SSRS-BR) and the School Performance Test (SPT) questionnaire. The results were submitted to statistical analysis (paired sample *t*-test and repeated measures ANOVA) at a 5% significance level. **Results:** Results showed statistically significant difference between the groups, evidencing improvement in school performance and academic competence in the children submitted to music education. **Conclusion:** The benefit brought by musical learning associated with different areas of education and health is of great relevance, representing an effective strategy in inclusive practice and promotion of physical and mental health in children.

## RESUMO

**Objetivo:** Este estudo investigou o efeito da educação musical no repertório de habilidades escolares em crianças expostas e não expostas à educação musical. **Método:** Foram avaliadas 80 crianças, entre oito a doze anos, ambos os sexos, divididos em dois grupos: 40 alunos com educação musical (experimental) e 40 alunos sem educação musical (controle). Para coleta dos dados, foram utilizados o questionário do Sistema de Avaliação de Habilidades Sociais (SSRS-M) e o Teste de Desempenho Escolar (TDE). **Resultados:** Indicaram diferença estatisticamente significativa nas crianças expostas à educação musical, evidenciando que houve melhoria no desempenho escolar e na competência acadêmica. **Conclusão:** Portanto, é de grande relevância o benefício da aprendizagem musical aliada a diferentes áreas da educação e da saúde, uma vez que pode representar uma estratégia eficaz na prática inclusiva e na promoção da saúde física e mental das crianças.

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## INTRODUCTION

The social and educational inclusion of children and adolescents is a current theme in view of the World Health Organization (WHO) guidelines<sup>(1)</sup>, which advocate the development of life skills as a protective factor at these stages of the life cycle. In practice, several artistic activities are proposed, including music education.

Analysis of the literature points to the use of musical activities in the promotion of life skills, encompassing social and school skills that should be used as protective factors for satisfactory development in childhood because, considering that social skills are essential factors for the full development of schoolchildren, music education can contribute to both the assessment and promotion of these skills.

Human beings are musical in essence, whether in body rhythm (walking, chewing, speaking) or physiological rhythm (breathing and heartbeat), and music has been proved important for the neurodevelopment of children and their cognitive functions. Music education interferes with brain plasticity, favors connection between the neurons in the frontal area, which is associated with the processes of memorization and attention, and stimulates communication between both sides of the brain, which may explain its relationship with reasoning and mathematics<sup>(2)</sup>.

Music activates various brain areas, even those involved with other types of cognition, thus being a complex study, but allowing knowledge of its functioning, from the learning of a motor skill, language, to the origin of emotions<sup>(3)</sup>.

Musical practice makes the brain work “in a network”: when individuals read a musical score, they need to transfer this (visual) information to the brain, which in turn transmits the necessary movement to the hands (touch) and, finally, the ears identify whether the movement made is correct or not (hearing). Although music perception is primarily located in the right hemisphere of the brain, recent studies have shown that musical learning depends on both hemispheres, because it is interdependent on other brain functions such as memory, verbal language, resolution of problems and analysis, among others<sup>(4-5)</sup>.

Music education is among the main modalities of musical intervention, and is a process of knowledge construction that aims to arouse and develop a taste for music, favoring the development of sensitivity, creativity, sense of rhythm, pleasure of listening to music, imagination, memory, concentration, attention, self-discipline, respect for others, socialization and affection, also contributing to effective body awareness and movement<sup>(6)</sup>.

It has been emphasized how music assists with understanding and learning various school subjects<sup>(7)</sup>. If the most obvious role of school is to prepare young people for the future, adulthood, and their responsibilities, in this context, music can contribute to making the school environment more learning-friendly, stimulating the ability of each student<sup>(8)</sup> and improving concentration and individual performance<sup>(9)</sup>.

## Social and school skills

The field of social skills (SS) has been widely explored in an interdisciplinary manner, considering that these skills are social behaviors necessary for building healthy and productive interpersonal relationships<sup>(10)</sup> in different environments and with different people<sup>(11)</sup>, according to parameters typical of each context and culture<sup>(12)</sup>.

According to Murta<sup>(13)</sup>, the concepts of SS and social competence qualify a special type of social performance (emission of a behavior or sequence of behaviors in any social situation). The term SS applies to the notion that there are different classes of social behaviors in the repertoire of individuals, and that these social behaviors are valued by culture and required to cope with the demands of interpersonal situations. Social competence (SC) is the ability of individuals to organize thoughts, feelings and actions (coherent with each other), according to their goals and values, to meet the immediate and mediate demands of the environment. The term SC has an evaluative meaning that refers to the effects of skill performance on situations experienced by individuals. In summary, studies have indicated that socially competent performance depends on a set of requirements, which are summarized as follows: (a) diversity of social skills, (b) development of values of living together, (c) knowledge about the coexistence norms of the social environment, (d) self-knowledge, and (e) self-monitoring, defined as the general ability to observe, describe, interpret and regulate thoughts, feelings and behaviors in social situations.

Del Prette and Del Prette<sup>(14)</sup> organized SS into classes and subclasses of broader or smaller scope, which include the following skills: (a) communication, (b) civility (say please, thank, introduce oneself, and greet people), (c) assertions of confrontation or defense of rights and citizenship (express opinion, disagree, make and refuse requests, interact with authorities, cope with criticism, express displeasure, deal with anger from others, ask for a change in behavior, etc.), (d) empathy and expression of positive feelings, (e) professional or work-related (group coordination, speaking in public, (f) educational, towards parents, teachers, and other agents involved in education or training.

Because they are considered protective factors for learning and behavioral problems, SS contribute to health promotion in childhood and adolescence<sup>(15)</sup>, whereas music is clearly associated with interpersonal relationships in everyday life, thus playing an important role in treatment alternatives, mainly when used as an intervention technique in behavioral processes and emotional states<sup>(16-20)</sup>.

Studies have shown the relationship between academic competence and social skills by comparing children with and without learning disabilities, and reported that the latter present greater deficits in social interactions. They suggested that the promotion of social competence in children can drastically favor their academic performance<sup>(21,22)</sup>.

The role of music in everyday life is clearly associated with interpersonal relationships, and the increasing number of studies addressing musical learning in the health and education field has demonstrated its importance in treatment alternatives,

especially when used as an intervention technique in behavioral and learning processes and emotional states.

Considering the aspects of social interaction, social skills are fundamentally important factors for the full development of schoolchildren. Music educators, together with other professionals such as speech-language pathologists and psychologists, can contribute to the evaluation and promotion of these skills, developing methodologies and techniques that optimize the social repertoire economically and effectively. The innovative character of the present study lies in this fact, as Music as a Human Science combines the areas of Speech-language Pathology and Psychology to establish a multidisciplinary approach.

In the analyzed literature, there are few studies addressing the impact of music on SS defined in more specific categories, such as school performance. In this context, the general objective of this study is to investigate the effect of music education on the repertoire of school skills in children submitted and not to music education. The specific objectives are (a) to compare the children's repertoire of school skills in the experimental group before and after the music education intervention; (b) to compare the repertoire of school skills of children submitted and not to music education.

## METHODS

This survey was approved by the Research Ethics Committee of the aforementioned Institution (process no. 162.293/2012), and all participants signed an Informed Consent Form (ICF) prior to study commencement.

The study was conducted at the Bauru Center of *Projeto Guri - Associação Amigos do Projeto Guri* (AAPG), linked to the *Secretaria da Cultura do Estado de São Paulo*, which offers a music education program. The main objective of this Project is to foster the development and social inclusion of children and adolescents through music.

Children enrolled in the *Projeto Guri* were selected after authorization from the coordination of the AAPG. The study

sample was composed of students aged 8-12 years, because in this age range there is acquisition and development of school skills, as well as consolidation of the repertoire of social skills (SS).

Participants were divided into two groups: experimental (EG) and control (CG). The eligibility criteria for the EG were as follows: aged 8-12 years; both genders; presence or absence of physical, mental and/or behavioral disabilities; no previous musical learning; regularly enrolled in the school system; enrolled in the *Projeto Guri* and expected to begin music education immediately. The eligibility criteria for the CG were the same as those for the EG, except for the last item mentioned, that is, they were in the waiting list to start music education.

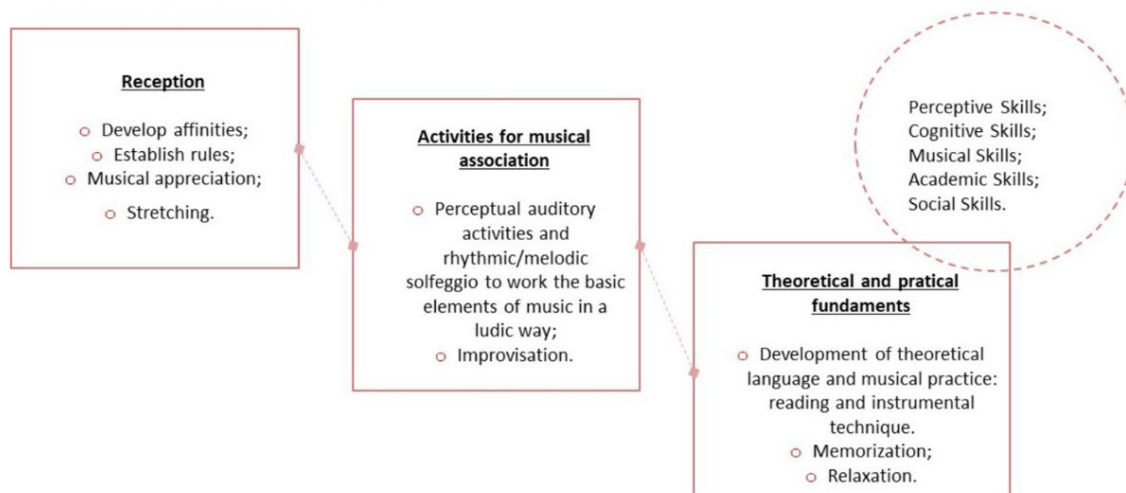
After application of the established inclusion criteria, 80 students were selected to participate in the study: 40 children submitted to music education (GE) and 40 children not submitted to music education (CG). Eighty mothers and 80 teachers, who did not know to each group the students belong, also participated in this survey.

A quasi-experimental design was adopted because the study involved a control condition, enabling evaluation comparisons between the indicators considered important in social interactions (dependent variables), which were obtained pre- and post-intervention (music education - independent variable). Both groups were assessed using two instruments: School Performance Test (SPT) and Social Skills Rating System (SSRS).

The study focused on the first stage of the six-month music education program. This stage was conducted collectively with the 40 children of EG in the learning of musical instruments in general. The music initiation consisted of two 60-min weekly classes, divided by instruments. All participants were evaluated at the beginning of the activities and six months later.

In the first stage, the children were playfully introduced to the concepts and theories of the musical universe. At this stage, the children learned to develop their musical skills through activities that work on the basic elements of sound and music. They began to develop musical theoretical language and practice by learning the chosen musical instrument (Figure 1).

## Class Structure Model



**Figure 1.** Class structure model used to promote school skills

The following instruments were used to assess the children in both groups:

- With the children: the School Performance Test (SPT) is a psychometric instrument developed by Stein<sup>(23)</sup> that aims to objectively provide an assessment of the abilities for school performance of 1<sup>st</sup> to 6<sup>th</sup> grade students, specifically writing, arithmetic and reading.
- With the parents and teachers: the Social Skills Rating System (SSRS-BR) is a scale originally produced in the USA<sup>(24)</sup> and validated for the Brazilian context by Bandeira et al.<sup>(22)</sup>, with previously proven psychometric qualities regarding internal consistency and temporal stability for Elementary School children. The versions for teachers (T) and mothers (M) were used in this study; they evaluate the frequency and importance of SS, the frequency of problem behaviors, and the academic competence of schoolchildren.

Both instruments were applied pre- and post-intervention in the EG. In the CG - children not submitted to music education - the same instruments were applied at the first moment (1<sup>st</sup> test) and reapplied six months later (2<sup>nd</sup> test), while the EG was undergoing the intervention procedure at the Bauru Center of the *Projeto Guri*.

The data obtained were tabulated and analyzed by a qualified statistician using the PASW 18 - SPSS Statistics 22.0 (Softonic International S.L.) and Statistica for Windows 10.0 (StatSoft Inc) software. Calculation of the mean and percentage values was performed to characterize the groups, and the following tests were applied for the control variables: Chi-squared test (gender and type of school), Student's *t*-test (age), and Mann-Whitney test (socioeconomic level).

For comparison between the results of the 1<sup>st</sup> and 2<sup>nd</sup> tests, both in the EG and the CG, the Paired sample *t*-test was performed. Repeated measures analysis of variance (ANOVA) was used for comparison between the groups (experimental and control). The Tukey test was applied to confirm the repeated measures ANOVA results. A significance level of 5% ( $p < 0.05$ ) was adopted for all statistical analyses.

## RESULTS

Table 1 shows the characterization of the study sample according to gender, age, family socioeconomic level, and type of school attended. No statistically significant difference was observed between the groups, and the initial equivalence was maintained.

Tables 2 and 3 show, respectively, the values in mean, standard deviation and statistical significance of the total, writing, arithmetic and reading scores obtained in the School Performance Test (SPT) for the experimental (EG) and control (CG) groups. Statistically significant difference was verified in the comparison between the results of the 1<sup>st</sup> and 2<sup>nd</sup> evaluations of the students' performance in the SPT intra-group (EG and CG).

Tables 4 and 5 show, respectively, the values in mean, standard deviation, and statistical significance of the academic competence of the EG and CG, according to the students' responses in the Social Skills Rating System (SSRS-BR). Statistically significant difference was found in the comparison between the results of the 1<sup>st</sup> and 2<sup>nd</sup> assessments of the students' performance in the SSRS-BR (Teacher report form) intra-group (EG and CG).

**Table 1.** Characterization of the study sample

PARTICIPANT	EXPERIMENTAL (n=40)	CONTROL (n=40)	VARIABLE CONTROL ( <i>p</i> )
	n (%)	n (%)	
<b>GENDER</b>			
Female	19 (47.5)	16 (40)	0.652
Male	21 (52.5)	24 (60)	
<b>AGE (years)</b>			
8	06 (15)	05 (12.5)	0.660
9	04 (10)	07 (17.5)	
10	11 (27.5)	07 (17.5)	
11	09 (22.5)	11 (27.5)	
12	10 (25)	10 (25)	
<b>SOCIOECONOMIC LEVEL</b>			
A1	02 (5)	02 (5)	0.450
A2	07 (17.5)	07 (17.5)	
B1	06 (15)	08 (20)	
B2	10 (25)	15 (37.5)	
C	13 (32.5)	08 (20)	
D	02 (5)	00 (0)	
<b>TYPE OF SCHOOL</b>			
Public	26 (65)	19 (47.5)	0.176
Private	14 (35)	21 (52.5)	



**Table 2.** Comparison between the results of the first and second evaluations of the experimental group in the school performance test (SPT)

SPT (students submitted to music education)	Mean		Standard deviation (SD)		<i>p</i>
	1st	2nd	1st	2nd	
Total	105.20	110.73	23.90	23.73	<b>0.000*</b>
Reading	25.53	26.85	6.53	6.37	<b>0.000*</b>
Writing	25.05	27.28	7.52	7.45	<b>0.000*</b>
Arithmetic	54.58	56.60	10.83	10.76	<b>0.000*</b>

\*Paired sample *t*-test**Table 3.** Comparison between the results of the first and second evaluations of the control group in the school performance test (SPT)

SPT (students not submitted to music education)	Mean		Standard deviation (SD)		<i>p</i>
	1st	2nd	1st	2nd	
Total	103.25	105.60	25.21	25.91	<b>0.000*</b>
Reading	24.40	25.20	7.82	8.01	<b>0.000*</b>
Writing	23.83	24.28	8.52	8.61	<b>0.000*</b>
Arithmetic	54.98	56.95	10.13	10.10	<b>0.001*</b>

\*Paired sample *t*-test**Table 4.** Comparison between the results of the 1<sup>st</sup> and 2<sup>nd</sup> evaluations of academic competence of the experimental group in the Social Skills Rating System (SSRS-BR) in the Teacher report form

SSRS-BR (Teacher) (teachers/students undergoing music education)	Mean		Standard deviation (SD)		<i>p</i>
	1st	2nd	1st	2nd	
Global score	26.90	29.08	10.06	9.27	<b>0.000*</b>

\*Paired sample *t*-test**Table 5.** Comparison between the results of the 1<sup>st</sup> and 2<sup>nd</sup> evaluations of academic competence of the control group in the Social Skills Rating System (SSRS-BR) in the Teacher report form

SSRS-BR (Teacher) (teachers/students not undergoing music education)	Mean		Standard deviation (SD)		<i>p</i>
	1st	2nd	1st	2nd	
Global score	27.78	27.53	8.75	8.81	0.777*

\*Paired sample *t*-test

## DISCUSSION

The age range chosen for this study (Table 1) was based on research that indicates that this is the best phase of life for the neurodevelopment of children and their cognitive functions<sup>(2,25)</sup>. With this premise, it is possible to associate child development directly with social and academic skills, considering that studies in the analyzed literature<sup>(26-27)</sup> indicate that these skills begin to be acquired and are better developed in childhood through different learning processes, such as close people, social modeling, and reinforcement schemes.

The choice of music education as an intervention procedure was due to the fact that musical learning works on emotional, sensitive, cognitive, perceptual, motor, social and language factors.

Regarding the analysis of the School Performance Test (SPT) evaluations (Tables 2 and 3), statistically significant differences were observed in both the experimental (EG) (Table 2) and control (CG) (Table 3) groups in the reading, writing and arithmetic scores.

Children in the GC did not undergo the intervention procedure, but they were attending regular school education; therefore, adequate development regarding school skills and learning was expected in both analyzed groups.

However, the results indicate that EG had a better performance in arithmetic compared with the CG. Such favorable change in the EG can be analyzed in light of studies that point out that music practice combined with rapid and accurate performance involves complex physical movements and emotional experiences, integrating motor, mental and social skills from various neural structures.

The capacity to adapt to changes in stimuli is also implicit in these abilities; this capacity is a feature of brain plasticity, which requires the interdependence of functions of the two brain hemispheres, triggering neural interactions that result in human reactions to the musical stimulus, showing how the brain integrates complex perceptual and behavioral tasks<sup>(4)</sup>. According to Cardoso et al.<sup>(28)</sup>, music can be an important stimulus for the development of a child's brain. Ilari<sup>(20)</sup> states that, between birth and ten years of age, a child's brain is in full development and presents increasing conditions for learning.

Comparison of the evaluation of academic competence (Tables 4 and 5) between the groups (EG and CG) showed statistically significant difference in the EG. When we think of learning, we think of a long-term activity, thus time has a direct influence on human learning.

According to Ilari<sup>(20)</sup>, although many educators question how to stimulate a child's brain and musical intelligence, no

magic is needed to develop them, only music, because studies have indicated that learning music assists with the systems that compose the human mind (attention, motor, memory, superior and spatial order controls). Villa-Lobos<sup>(29)</sup> points out that when music education is performed collectively, it has great power of socialization and predisposes individuals to put aside their selfishness and individualism at the necessary moment, integrating them in society.

It is worth highlighting that only the first stage of music education was performed in the present study, a factor that may have influenced the results because, as previously mentioned, time of exposure to music education directly influences the academic performance of children. Thus, it would be important to observe how the completion of subsequent stages would influence school performance, considering that musical learning has been used to increase performance of children in classroom tasks<sup>(30)</sup> and improve learning in various school subjects, concentration, and individual performance<sup>(8,9,10)</sup>.

Considering the results of the effect of music education on the promotion of school performance, the investigation associating the two themes was promising in this study, because the class structure used, the physical and interactive environment, the quality of the stimuli, the established contingencies, and the interdisciplinarity between the areas of Speech-language Pathology, Psychology and Music are the factors that show the positive effects generated by music education.

It should be mentioned that the present study presents some limitations: the quasi-experimental design prevented generalization about the effect of the intervention and not all the stages of music education were performed for evaluation - aspects that should be investigated in further studies.

## CONCLUSION

Children submitted to music education showed significant improvement in academic competence and in the repertoire of school skills regarding reading, writing and especially arithmetic, which positively interfered with their school performance, compared with those of children not submitted to music education. We have also concluded that the factor 'time of exposure' to music education is fundamental for the development of their academic competence.

No statistically significant improvement in academic competence was observed in the Control Group (students not submitted to music education), but there was improvement in school skills, as they were also attending regular school; therefore, their academic development was also expected.

No negative correlations between music education and school performance were verified in either group.

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#### **Author contributions**

*PMS participated in the study design, collection, analysis and interpretation of data, and writing of the manuscript; DVMA was the study advisor, participated in the study design, analysis and interpretation of data, and writing of the manuscript.*