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Music as a Tool in Learning: Improvements in Basic Competences in Children Studying an Integrated Music Programme[1]

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Abstract. Son Serra (Son Serra State Primary School), in Mallorca, is the first state-run school in the Balearic Islands to offer integrated music and non-integrated pathways to students in the same class. This study aims to compare the results of students from the fourth year of primary education from both pathways in a maths, Spanish, Catalan and English language level tests. Socioeconomic information on the children's families was also gathered. The results showed students from the integrated music group always outperforming their peers from the non-integrated group in the four assessed competences. Having established that the families' socioeconomic status does not condition these results, the benefits of receiving more music practice were discussed.
Keywords: primary education; music training; integrated centres; tests of basic competences; skills transfer.

[es] La letra con música entra: mejoras en las competencias básicas en el alumnado de un programa integrado de música

Resumen. El CEIP Son Serra, en Mallorca, es el primer colegio público de las Islas Baleares que combina alumnos de itinerario integrado y no integrado en las mismas aulas. Este estudio pretende comparar los resultados de los alumnos de cuarto de primaria de ambas vías en una prueba de nivel de matemáticas, castellano, catalán e inglés. También se recogió información socioeconómica de las familias de los niños. Los resultados de las pruebas de nivel muestran diferencias entre ambos itinerarios, destacando siempre los del itinerario integrado de música por encima del resto en las cuatro competencias evaluadas. Una vez comprobado que el índice socioeconómico y cultural de las familias no es un elemento que condicione dichos resultados, se discuten los beneficios de una mayor práctica musical.
Palabras clave: educación primaria; formación musical; centros integrados; pruebas de competencias básicas; transferencia de habilidades.

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1. Introduction

Numerous studies have examined the interdisciplinary cross-cutting value of music, over and above purely aesthetic considerations or specific musical ones (Chen et al., 2021; Ferrer, 2009; Fucci-Amato, 2007; Pérez-Aldeguer, 2014; although see Sala & Gobet, 2021). In the field of education, research has also been conducted into music's influence on the acquisition of basic competences in primary education. Literature on the subject generally coincides in agreeing that music plays a facilitating, enhancing role in the acquisition of competences and skills that are not specifically musical, from early childhood differential development to aspects as apparently distant from music as socio-emotional adjustment. In this regard, some studies indicate that when appropriate pedagogical techniques are

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used in early childhood, active music lessons for infants and parents can accelerate infants' acquisition of culture-specific musical knowledge and can positively influence parent-child communication and social interaction. Despite the focus in the literature on older children, the present findings suggest that the infant brain may be particularly plastic regarding musical experience (Gerry et al., 2012). Another review explores evidence linked to the development of language, numeracy, intelligence and other attitudinal aspects, conditioning positive effects on pleasant and rewarding experiences (Hallam, 2010). Furthermore, music training can contribute to the transmission of cultural information, and it can boost effective communication with interlocutors, both in terms of linguistic knowledge and the specificities of different cultures (Bernabé, 2012). From a cooperative perspective, musical activities–whether they involve composition, improvisation or playing instruments–seem to contribute to socio-affective development (Bermell et al., 2016) and to an understanding of other cultures (the social, historical and cultural backgrounds of different ethnic races), while also nurturing tolerance of students' social skills (Kim & Yoon, 2015). Hille and Schuppa (2014) go one step further, concluding that studying and playing a musical instrument is associated with good academic results, particularly in students of a lower socioeconomic status.

As for cognitive skills, including language, numerous studies analyse the potential of music at this level. More specifically, Miendlarzewska and Trost (2014) show evidence of the positive influence of music training on the brain's development. Their neuroimaging results revealed plastic changes in the brains of adult musicians, although it is not specified whether this is due to intensive music practice or to other factors. In this line, the study by Hyde et al (2009) demonstrates structural brain changes after 15 months of music training in early childhood, which correlate with improvements in musically relevant motor and auditory skills. Moreover, the study by Kraus and Chandrasekaran (2010) also stands out, concluding that music training encourages changes in the auditory system that prepare musicians for auditory challenges beyond specifically musical ones. These findings shed light on brain plasticity and suggest that structural brain differences in adults are likely to be due to training-induced plasticity. Other studies have shown that music practice improves executive function, supporting the theory that music training boosts overall cognitive mechanisms (Chen et al., 2021; Jaschke et al., 2018; Schellenberg & Peretz, 2007).

In the field of language skills, broad empirical evidence has come to show that music training can improve reading and phonological skills. In this sense, music perception skills and production are related to a greater phonological awareness and early reading ability in children aged between four and five (Anvari et al., 2002; Linnavalli et al., 2018). This correlation between auditory and cognitive mechanisms is supported by previous studies, like that of Atterbury (1985), where children with low reading skills showed clear difficulties in tonal discrimination; that of Lamb and Gregory (1993), where the level of tonal discrimination was related to phonetic awareness; or the study by Douglas and Willats (1994), which concludes that rhythmic discrimination influences reading skills. Other works have also linked music practice to improved verbal memory, reading capacity and executive functions among children (Miendlarzewska & Trost, 2014; Rickard et al., 2010; Roden et al., 2012). In this line, the results of another study showed that a group of children who underwent musical training for one year showed a significant improvement in verbal memory. Students who interrupted the training showed no improvement. Contrary to the differences in verbal memory between groups, their changes in visual memory were not significantly different (Ho et al., 2003).

When it comes to mathematical competence, numerous authors have used music in mathematics with promising results (An et al., 2008; Giráldez, 2007; Johnson & Edelson, 2003). In one study that stands out particularly by An and colleagues (2013), an analysis was made of the effects of using music activities in a maths class, exploring how these activities might influence the students' mathematical skills. The study was conducted with 46 children from the first and third year of elementary education. Starting out from the premise that, in recent years, conventional ways of teaching maths have failed to achieve expected overall outcomes, the study explored teaching maths through integrated music activities. The teachers who took part designed and gave their own sessions. Five weeks after different music activities had been incorporated, tailored to the part of the maths syllabus that was being taught, the students showed statistically significant improvements in almost all the evaluations in relation to previous ones. Another study using a non-instrumental music programme for underachieving primary school students in mathematics revealed improvements in numerical cognition and appears to be a useful tool for the rehabilitation of underachieving children in mathematics (Silva et al., 2017).

The explanations of the relevant literature tend to be tied in with music training and its influence on the transfer of general skills to cognitive domains, similar to the way in which cognitive mechanisms allow for the transfer of general and language skills between music training and bilingualism (Bialystok & Depape, 2009; Schroeder et al., 2016). In this context, it seems that music training generates a certain neural sensitivity to statistical regularities in auditory perception to the benefit of language-related processes (Patel, 2011) in both normal populations and impaired ones (François & Schön, 2014). This transfer effect of auditory benefits in language-related or general processes seems to be mediated by the amount of music practice through neural plasticity processes. That is, greater amounts of music practice also seem to improve memory in response to verbal or non-verbal acoustic stimuli (Talamini et al., 2017). Furthermore, these changes in the brain's organization and its associated cognitive abilities can be demonstrated through better academic results (Sachs et al., 2017) and better memory capacity in both the long and the short term (Talamini et al., 2017).

Alternatively, there are recent studies that are less optimistic about the improvement of non-music-specific skills through the influence of frequent musical practice. Schellenberg (2011) concludes that the evidence for such an

influence is limited and that it is likely to be due mainly to genetic and demographic factors. This author suggests that the lack of evidence for distant cognitive transfer effects means that causality seems unjustified. Likewise, the results of the meta-analysis proposed by Sala and Gobet (2017, 2020) also do not seem to support the hypothesis that musical ability transfers to general cognitive skills in children and young adolescents (although see a recent study challenging some of these results: Bigand & Tillman, 2022). Even when music training appears to foster some of the participants' cognitive skills (i.e., intelligence and memory), they question the reliability of the results. These same authors mention, in a later study, that some correlational studies challenge the conclusion that frequent music practice is associated with general cognitive mastery skills or academic performance. They consider, however, that music may be beneficial for some non-cognitive constructs of children, such as prosocial behaviour and self-esteem (Sala & Gobet, 2020).

In spite of all this, the classroom hours dedicated to music in Spanish schools are reduced to part of the art education curriculum. In this study, we explore the value of learning music in primary education. More specifically, we analyse the level of acquisition of language-related and mathematical competences among primary school students at a school that provides an integrated music pathway. Integrated centres combine the general teaching curriculum with music training during the same school hours and in the same place. This avoids the drawbacks of reconciling compulsory and musical studies at different centres. In addition to using the same teaching centre and incorporating a large part of the curriculum, the students are taught by one set of staff, with teachers of subjects from the general curriculum coordinating with music teachers (Andreu & Godall, 2012).

CEIP Son Serra (Son Serra State Primary School), located in the Son Serra-La Vileta district of Palma (Mallorca), is the only state-run school that offers integrated music in the Balearic Islands. There are two classes at CEIP Son Serra for each year of primary education, with students who take the integrated music pathway forming part of both. These students combine classes from the general curriculum (from the third to the sixth year of primary education) with four years of elementary music. During infant education and the first stage of primary education, preparations are made for future students of the integrated music pathway. Two hours a week of infant education are spent raising the students' awareness of music through music workshops and creative movement. This specialization continues during the first two years of primary school, with three hours a week dedicated to workshops with instruments, theory of music and a choir. From the third year, a total of six hours is devoted to music by students who take the integrated music pathway, with individual classes playing an instrument, group classes, music theory and choir practice. This amounts to three more hours a week than the other students. To cover these hours, the school opens in the afternoon for individual instrument classes and joint theory-of-music classes.

Hence, unlike other existing integrated music schools, CEIP Son Serra's classes contain students following both the integrated music and non-integrated pathways. Because this is the only state school in Spain that combines both pathways, our study was able to analyse the results of language and maths level tests taken by the students of both groups. Our aim was to analyse the influence of music on the level of acquisition of mathematical and language-related competences in students enrolled on the integrated music pathway, when compared with students from the non-integrated pathway. Literature in this field suggests that students who have regular well-planned music classes in their everyday lives will improve in subjects and skills that are not specifically musical.

2. Materials and Methods

2.1. Sample

CEIP Son Serra is a state-run Balearic education centre that offers an integrated music pathway and non-integrated pathway in the same school within the same hours. It is a centre with two classes for each year of the curriculum (A and B). In each class, half the students follow the integrated-music pathway and the other half do not. A total of 40 students in the 4th year of primary education from both pathways were given the tests. In the case of the integrated music students (MSI), the sample was comprised of 21 students (M_{age} = 10.13 years old; 11 girls), while the non-integrated sample was made up of 19 students (MNI; M_{age} = 10.06 years old; 13 girls). To carry out this study we have had the permission of the school for its public mention and the consent of the parents of the participating students.

2.2. Instruments

Diagnostic assessment tests for the 4th year of primary education were used. These tests were developed by the Institut d'Avaluació i Qualitat del Sistema Educatiu (IAQSE), a body attached to the Balearic Regional Ministry for Education & University Affairs. This body is in charge of drawing up exams for students on completion of the 4th year of primary education and the 2nd year of the first stage of secondary education. Likewise, it organizes their application, the gathering of the results and the answers to questionnaires, and the use and dissemination of the data.

The competences that are assessed in the aforementioned diagnostic tests are language communication (Catalan, Spanish and English) and mathematics. The purpose is to gather information in order to improve teaching and learning processes in these basic competences. Their main use is to help schools reflect on and analyse the results with a

view to improving their functioning, teaching and learning methods, and the achievement levels in basic curricular competences. The theory used in the design of the diagnostic tests was agreed upon in conjunction with Spain's other self-governing regions, following the guidelines of conceptual frameworks for international assessments, in particular PISA and the guidelines of the Instituto Nacional de Evaluación Educativa (INEE), attached to the Spanish Ministry for Education, Culture & Sport.

2.2.1. Basic competence tests

Each of the tests assessing the basic competences of students in the 4th year of primary education was based on a different model, made up of closed-ended questions or items (on a scale from one to seven) and open-ended questions. Each test comprised approximately 70% closed-ended questions and 30% open-ended ones.

Three different competence tests were used to assess language communication in Catalan, Spanish and English, with one part common to all of them (a minimum of fourteen items or questions repeated in all three models) and a specific part (the remaining items which differed for each test). These competence tests assessed different skills (oral and written comprehension and written expression), as well as the cognitive processes involved in written expression (spelling and grammar structures) and in oral and written comprehension (obtaining and interpreting information and reflecting on/assessing it). The competence tests were designed and presented in different formats, as appropriate. They included audio recordings to assess oral comprehension and written tests to evaluate reading comprehension and written expression.

There were four different models of mathematical competence tests, with twelve items common to each of them and others specific to each one (twelve items per test). With this design, the whole curriculum could be covered without all the students having to answer all the questions. From the common part and type of analysis, the obtained scores could be compared. Different areas of the maths syllabus were evaluated (numbers and operations, measurement, geometry, and processing information), in addition to different cognitive processes (reproduction, connection and reflection).

2.2.2. Family questionnaires

The parents of the participants in the study were asked to complete a socioeconomic questionnaire drawn up by IAQSE. From information about the students' social, cultural and economic backgrounds, a socioeconomic and cultural index (ISEC) was calculated, taking into account factors like the mothers' and fathers' level of education, their professions, the number of books at home, the students' expectations in terms of future studies, and the physical resources available to help them in their studies. The questionnaire was based on ones used in former diagnostic assessments; in principle, from models habitually used in other state evaluations (General Diagnostic Evaluation of the Spanish Institute for Educational Evaluations–INEE) or international ones (PISA, PIRLS-TIMSS, etc.).

2.3. Relevant information about the centre

As mentioned above, CEIP Son Serra is an integrated music centre that offers both an integrated music pathway and a non-integrated pathway. To this end, integration also entails an adaptation of the curriculum and greater coordination on the part of the teaching staff, made up of general education teachers and specialist music teachers. The centre currently has a total of 23 music and performing arts teachers out of a staff of 57. The high level of preparation of the music teachers, both in terms of theoretical subjects and instrumental specialities, is noteworthy since all of them are graduate education professionals and music practitioners.

The centre's timetable is adapted to the continuous inclusion of both general studies subjects and those specific to the fundamental teaching of music. Therefore, it comprises a 5-hour timetable, from 8.30 to 13.30, for all the students of the centre, with an afternoon extension for the students of the integrated pathway. Given that these students must take the compulsory subjects of elementary music studies (2 hours a week of musical language, 1 hour of choral singing, 1 hour of collective class, 1.5 hours of instrumental ensemble and 1 hour of principal instrument), the centre has adapted a specific afternoon timetable for those not taken during the morning timetable. Ultimately, students on the integrated pathway attend the school for three hours more per week than non-integrated students, thus completing the compulsory subjects of both curricula.

On the other hand, 11 instrument specialities are taught: clarinet, flute, trombone, horn, saxophone, violin, viola, cello, double bass, piano, and percussion. Each pupil on the integrated pathway chooses an instrumental speciality before beginning elementary studies in the third year of Primary Education and is always advised by the team of music teachers. The pedagogical approach to musical training for the integrated itinerary is in line with the specific training given in conservatories, aimed at elementary mastery of the chosen instrument. All of this is carried out within a framework of educational innovation and personal accompaniment that promotes skills and values such as coeducation, diversity, pluralism, freedom, and democracy, and where music is a transversal element of learning.

2.4. Procedure

The competence tests were conducted in accordance with general and specific instructions drawn up for each test by IAQSE. They were given during the first week of June 2014, with the students having 60 minutes to answer each of the four tests. The members of the research team gave out the tests and explained how they worked to the students. The students' teachers left the room whilst the test supervisors remained. In the case of the ISEC questionnaire, the school sent it to the parents some days before the tests were conducted. Once the questionnaires had been completed, the school management team passed the results to the research team.

The competence tests were corrected by the research team. To make sure that the open-ended questions were uniformly and objectively marked, each test was accompanied by a guide on how to correct it, with guidelines and an explanation of the scores by IAQSE. Once the tests had been corrected, the results were sent to IAQSE. The data was analysed by the latter, based on the Item Response Theory, which takes into account the difficulty of each question. To draw up the performance scales, the school's mean score for each competence was taken as a reference in relation to the mean score for students in that self-governing region. In this way, the students' performance could be obtained on a scale with a mean of 500 and standard deviation of 100. The students' scores on this scale showed their competence levels. The higher the score, the higher the level of achievement. On completion of this process, IAQSE returned the standardized scores for the four competence tests, together with the ISEC score. The scale with the scores of the socioeconomic index has a normal distribution, in this case with a mean value of zero and a standard deviation of one.

2.5. Data analysis

The data from the different competence tests was analysed according to the participants' pathway (integrated music or non-integrated) and the socioeconomic and cultural index. To find out whether the participants' scores differed in the various competence tests (Spanish, Catalan and English language and maths) depending on their chosen pathway (MSI or MNI), *t*-tests for independent samples were used. Two participants from each group (MSI and MNI) had to be removed from the sample due to incomplete data. The same procedure was used to test whether there were differences in the socioeconomic status of the children taking part in the study, measured through the ISEC questionnaire given to the parents. A logistic regression analysis was also used to test whether the parents' socioeconomic status influenced the students' choice of pathway. A check was also made of possible associations between the scores of the different competence tests and the ISEC by computing possible correlations. For this analysis, the data for the original full sample was used, without excluding the participants with incomplete information whenever possible. If this relationship was demonstrated to be significant, a linear regression analysis was conducted to find out the amount of variance explained by the ISEC on the mean score for that subject.

SPSS v22 was used for all statistical analyses. A significance level of $p < .05$ was used for all the tests.

3. Results

Table 1 shows the descriptive values for the different dependent variables that were compared between the groups (integrated and non-integrated music pathways) in the study.

Table 1. Descriptive statistics for the two groups and the results of the normality tests (Shapiro-Wilk) for the four subjects and the parents' socioeconomic index.

		Descriptive statistics			Normality	
	Group	**N**	**Mean**	**SD**	**W**	**p**
Spanish	MSI	19	609.853	102.082	.921	.116
	MNI	17	498.388	70.152	.948	.429
Catalan	MSI	19	605.916	78.479	.949	.382
	MNI	17	520.135	81.309	.941	.329
English	MSI	19	610.332	58.105	.968	.730
	MNI	17	555.300	87.292	.958	.586
Maths	MSI	19	552.347	78.231	.948	.361
	MNI	17	491.494	78.197	.971	.833
ISEC	MSI	19	0.342	0.931	.944	.315
	MNI	17	–0.152	0.460	.927	.193

Note. MSI: integrated music; MNI: non-integrated; N: no. of participants; SD: standard deviation; W: Shapiro-Wilk statistic.

The scores of the participants from the integrated music pathway (MSI) were significantly higher than those of their peers from the non-integrated group (MNI) for all the subjects. More specifically (See Figure 1), the MSI group obtained higher mean scores than the MNI group in the Spanish language test, $t(34) = 3.78$, $p < .001$, $d = 1.259$, Catalan language test, $t(34) = 3.22$, $p = .003$, $d = 1.075$, English language test, $t(34) = 2.25$, $p = .031$, $d = 0.751$, and maths test, $t(34) = 2.33$, $p = .026$, $d = 0.778$. The socioeconomic status of the parents of participants from the MSI and MNI groups (assessed using the ISEC) turned out to be similar, $t(34) = 1.98$, $p = .056$, $d = 0.661$. Although differences were not found in the ISEC scores, a logistic regression analysis was conducted to check whether the parents' socioeconomic status influenced the choice of one pathway or another. The model showed a non-statistically significant trend, classifying 63% of the cases correctly, χ^2 (35) = 3.68, $p = .055$, R^2 Nagelkerke =.126. That is, parents with a higher socioeconomic status seem to show a certain tendency to register their children for the MSI pathway, although this is not conclusive.

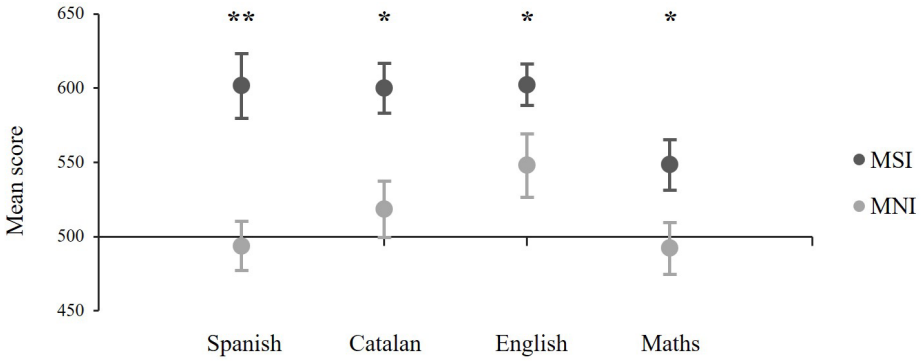

Figure 1. Graph of the mean scores obtained by the integrated music and non-integrated groups in the different subjects. The horizontal axis crosses the vertical one at 500 because this is the standard mean score (standard deviation 100) of all the competence tests. The error bars show the standard error of the mean. MSI: integrated music pathway; MNI: non-integrated music pathway. * $p < .05$; ** $p < .001$.

Correlations were also computed to explore associations between the distributions of the participants' scores in the four subjects and the parents' socioeconomic status. The results can be seen in Table 2. The scores of the different subjects were positively and significantly correlated with one another (*p*s <.001). However, only the distribution of the English language scores showed a moderately significant relationship with the ISEC. Thus, the parents of the participants who achieved the highest scores in this subject were shown to have a higher socioeconomic status, $r(36) = .33$; $p = .049$. The results of the simple regression analysis showed that the ISEC score significantly predicts the score for English language, $b = 32.85$; $\beta = .33$, $t(35) = 2.04$, $p = .049$, with the parents' socioeconomic status explaining 10.9% of the variance in the participants' English language scores, $R^2 = .109$; $F(1.35) = 4.15$; $p = .049$.

Table 2. Matrix of correlations between the ISEC and the scores for the four subjects.

	N	ISEC	Spanish	Catalan	English	Maths
ISEC	38	1				
Spanish	37	.309	1			
Catalan	37	.216	.834**	1		
English	36	.330*	.659**	.708**	1	
Maths	38	.186	.659**	.638**	.655**	1

Note. The asterisks indicate bilateral significance: * $p < .05$; ** $p < .001$.

4. Discussion

This study compared the results of language tests (Catalan, Spanish and English) and a maths test taken by students from the same class, studying the same 4th year primary education curriculum, except for having chosen between the integrated or non-integrated music pathways.

The competence test results showed that the students from the integrated music pathway (MSI) obtained better scores in all the assessed basic competences than their peers from the non-integrated pathway (MNI). Along the same lines, numerous previous studies report improvements in the academic results of individuals who take regular music classes, revealing the potential positive effects of music training and playing an instrument on language-related and cognitive performance. More specifically, better results have been found on reading and writing (Banai & Ahissar,

2013; Cardarelli, 2003; Register, 2001), verbal memory, reading capacity and executive functions (Miendlarzewska & Trost, 2014), reading comprehension and phonetic production in a second language (Patel & Iversen, 2007), and comprehension, oral production and reading skills in a foreign language (Fonseca & Toscano-Fuentes, 2012). As for mathematical competence, several authors have found positive outcomes when composition and musical creation are used in association with teaching mathematics in school-age children (An et al., 2008; An et al., 2013; Giráldez, 2007; Schlaug et al., 2005).

CEIP Son Serra is the only integrated music school in Spain where students from the integrated music and non-integrated pathways form part of the same class. Hence, we had a sample at our disposal where the only subject not common to all the children was music, unlike other centres of this kind which solely offer the integrated music pathway, often with an aptitude test prior to admission. For instance, Andreu and Godall (2012) analysed the level of acquisition of basic competences in students from Oriol Martorell Primary & Secondary Integrated Art School (CEPSA Oriol Martorell) in Barcelona. The difference in relation to our sample was the fact that all the students at CEPSA Oriol Martorell were following an integrated study programme, either for music or dance, and they also had to take an aptitude test before being admitted to the school. In contrast, CEIP Son Serra's students in Palma do not take a prior aptitude test and children from both pathways are in the same class. In their preliminary study, Andreu and Godall (2012) showed that, as a general rule, students specializing in music achieve marks in basic competence tests that are better or on a par with the average mark in Catalonia for centres attended by children of a similar socioeconomic status. Students of CEPSA Oriol Martorell stood out particularly in mathematics, although they also achieved good results in language tests (including Spanish, Catalan and English language). In our case, as well as demonstrating that students from the MSI group achieved better results than the MNI group in all the above competences, the results could also be compared with those of the self-governing region where the school is located. In this sense, students from the MSI pathway were found to achieve better results than the average scores for the Balearic Islands in all the considered competences.

Although certain variables like motivation, reward or the social context for music training seem to modulate the beneficial effects of this training in the long term (Miendlarzewska & Trost, 2014), the higher linguistic proficiency of students who study music might be due to the fact that music training helps them to process pitch and language, bringing about positive transfer effects between both cognitive domains (Magne et al., 2006). Hence, music training seems to modulate the cortical synchronization of the neuronal networks involved in verbal memory formation (Cheung et al., 2017; Rickard et al., 2010; Roden et al., 2012). Along the same lines, according to the OPERA hypothesis (overlap, precision, emotion, repetition, attention), neuronal plasticity drives the said networks to work with higher precision than is needed for normal oral communication (Patel, 2011). Consequently, since speech shares these networks with music, there are benefits in speech processing. The OPERA hypothesis is used to account for the observed superior subcortical encoding of speech in musically trained individuals, and to suggest mechanisms by which music training might improve linguistic reading abilities. Hence, music training seems to reorganize how the brain works (Moreno & Bidelman, 2014) by means of the transfer of general skills to other cognitive abilities (Talamini et al., 2017).

Regarding the participants' socioeconomic status, the individual results of the competence tests are relatively independent of the students' socioeconomic and cultural level. In this study, the ISEC only explains a small amount of the variance in the English competence test (about 10%), unlike other studies based on similar measures or various reports from state educational indexes (Gil Flores, 2013; MECD, 2014; MECD, 2017). Furthermore, whilst a trend was observed for parents with a higher sociocultural status to prefer to enrol their children on the MSI pathway, the participants' choice of one pathway or the other was also found to be independent of the parents' socioeconomic status. In the opposite direction to our tendency, some studies have found that it is students from lower socio-economic backgrounds who seem to express a greater desire to learn to play a musical instrument (McPherson et al. 2015). However, it appears that music training is accompanied by benefits in academic performance regardless of socioeconomic status (Guhn et al., 2020). We therefore believe that there might be a certain pre-existing willingness to opt for this choice. However, this preference does not seem to make a definitive impact on the students' final decision and the positive outcomes of music practice seem to emerge without dependence on who made the decision. Accordingly, the results of a longitudinal experiment demonstrating that music education provided through the Démos (*Sistema de educación musical y orquestal con vocación social*) programme can counteract the negative influence of living in low socio-economic environments by improving several basic cognitive functions: general intelligence, processing speed, concentration ability and reading accuracy (Barbaroux et al., 2019).

Despite the abovementioned, there are important recent studies that are less positive about the influence of music practice on the development of non-music specific skills. As already mentioned in the introduction to this article, Hallam (2010) circumscribes the beneficial effects of music practice to non-specific musical skills only in the case of pleasant and enjoyable experiences. A further contribution is that much of the previous studies concerning instrumental music that associate greater musical training and extra-musical outcomes are mainly correlational (Hogan et al, 2018). However, their results at the end of the early childhood stage revealed no differences between groups. That is, these results do not show an association between increased time spent on general music learning and positive outcomes beyond these specific skills. Furthermore, a review analysed the beneficial impact of music interventions from 46 studies addressing five developmental domains (Dumont et al., 2017): motor, social, cognitive, linguistic,

and academic. The study suggests a positive influence on specific motor skills, empathy and spontaneous cooperative and helpful behaviour, the level of cognitive functioning, and reading skills (however, not on phonological skills). Regarding the cognitive domain, however, seven reviewed studies provided insufficient information on whether music can have a positive effect on intelligence, but due to the quasi-experimental design of these studies and the limited sample of participants no clear conclusions can be drawn. Also, the results of another study provide support to the hypothesis that children who receive instrumental music lessons are ahead of those who do not on a number of cognitive skills. However, the correlational design of this study does not allow to determine whether music causally improved verbal and non-verbal reasoning skills, or whether other variables were responsible for the effects found (Forgeard et al., 2008).

In this regard, one of the present study's limitations was our inability to establish the cause of the identified differences, given that this is a cross-sectional study and participants were not randomly assigned to the two groups compared in this work. In this sense, it is important to note that more intelligent people appear to be more predisposed to take part in music activities, regardless of their socioeconomic status (Swaminathan et al., 2017). Thus, the results of this study could be accounted for by the fact that more intelligent students might choose to register for the MSI pathway, leading to differences between the MSI and MNI groups. Another limitation relates to the sample, which was relatively small and local. In future studies, it is advisable for a longitudinal methodology to be followed, in addition to taking into account other cognitive processes and not just competence measures. A similar study should also be conducted with students who are bilingual to try and observe the influence of this factor.

To conclude, the results of this study show that music practice might have a beneficial influence on the acquisition and development of language-related and mathematical competences. The seemingly positive impact of music training on the degree to which these competences are acquired does not seem to be tied in with the students' socioeconomic status. We are therefore optimistic about the potential benefits of more music practice, although we must be prudent in claiming that there is a causal relationship between integrated music programmes and improvements in language-related and mathematical competences.

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