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Music Academic Performance: Effect of Intrinsic Motivation and Critical Thinking

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Abstract

The aim of the study was to analyze the relationship between intrinsic motivation, critical thinking and academic performance in music of secondary students. 494 students participated. Data were analyzed using structural equation mixture modeling. The results showed two groups or clusters of students, distinguished by their scores on intrinsic motivation, critical thinking and music grades, where a group was characterized by high and the other low scores on the three variables. Regarding the relationships between variables, we observed that the effect of intrinsic motivation on critical thinking was similar in both groups, but the regression of critical thinking on music grades was higher for students with lower scores. This study provides a better understanding of the different profiles and the effect of the variables in explaining music grades.

Keywords: Motivation, critical thinking, academic achievement, high school, music.

Resumen

El objetivo de este estudio fue analizar la relación entre la motivación intrínseca, el pensamiento crítico y el rendimiento académico en la asignatura de Música de estudiantes de Educación Secundaria Obligatoria. Participaron 494 estudiantes. Los datos se analizaron utilizando un modelo mixto de ecuaciones estructurales. Los resultados mostraron dos grupos o clústeres de estudiantes, diferenciados por sus puntuaciones en motivación intrínseca, pensamiento crítico y calificación en Música, donde un grupo se caracterizó por altas y el otro por bajas puntuaciones en las tres variables. Respecto a las relaciones entre las variables, se observó que el efecto de la motivación intrínseca sobre el pensamiento crítico era similar en ambos grupos, pero la regresión del pensamiento crítico sobre la calificación en Música fue mayor en el grupo de estudiantes con puntuaciones más bajas. Este estudio ofrece una mejor comprensión de los diferentes perfiles y del efecto de las variables para explicar las calificaciones en Música.

Palabras clave: Motivación, pensamiento crítico, rendimiento académico, educación secundaria, música.

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Introduction

The view of musical education as learning an artistic language with high educational value for human development, which favors the integral growth of the individual, has promoted an evolution from more traditional approaches focused on the domain of teaching content towards proposals emphasizing the process of construction of knowledge and the student's active role (Madariaga & Arriaga, 2011). This same message has been reflected in numerous organic educational laws (e.g., LOCE, 2002; LOGSE, 1990) that have been advocated, on the one hand, that music plays a very important role in students' development, as they develop highly globalizing skills —attention, concentration, memory, tolerance, self-control or sensitivity— both in the cognitive process and the communicative and human dimensions. On the other hand, music promotes the learning of languages, mathematics, history, and aesthetic and social values, as well as contributing to the person's intellectual, emotional, interpersonal, physical, psychomotor, and neurological development.

In order to understand the performance of secondary school students in the area of music, research focusing on social, personal or socio-personal factors (MacIntyre, Potter, & Burns, 2012), such as motivational (Reeve, 2005) or self-regulating variables (Phan, 2010; Zimmerman, 2013), are essential. Although there are numerous investigations on the process of learning music and musical performance in relation to psychological variables (e.g., Hedden, 2014; Holgado, Navas, & Marco, 2013; McPherson & McCormick, 2000; Nielsen, 2004; StGeorge, Holbrook, & Cantwell, 2012), literature to date on the explanation of academic performance in music through variables such as intrinsic motivation to learn new content and critical thinking on the subject is inadequate.

Intrinsic motivation

The main goal of schools is to prepare students to successfully master the challenges of the future (Spinath & Spinath, 2005), a process in which the student motivation toward learning takes on a key role in the acquisition and development of new concepts and skills. Spinath and Spinath (2005) conceived motivation as a central concept that emphasizes learning and goal-oriented behavior, among which they underline the choice of tasks or the ability to pay attention, effort, and persistence. In the same line, Martin, (2007) defines motivation as people's energy and drive to learn, work effectively, and reach the maximum of their potential.

Educators may be interested in adolescents' intensity when facing their studies and in the reasons

for studying, as students not only differ from one another in levels of motivation, but also in the kind of motivation that is dominant in each one (e.g., Habgood & Ainsworth, 2011; Lepper, Corpus, & Iyengar, 2005). Thus, intrinsic motivation refers to behaviors performed for their own sake and enjoyment, because they are pleasant or interesting and do not require external reinforcements, whereas extrinsic motivation refers to behaviors linked to external contingencies, are carried out for instrumental reasons (Ryan & Deci, 2000b). Unlike extrinsically motivated students, those intrinsically motivated tend to be more creative and to acquire knowledge better, because they voluntarily devote more time and energy to their studies (Niemiec & Ryan, 2009).

Critical thinking

Students use different strategies to learn and process the information presented in the classroom. These learning strategies range from memorization without reasoning to the transformation of contents, analyzing and thinking critically about them, trying to compare them with previous knowledge and knowledge of other subjects (Cano, García, Justicia, & García-Berben, 2014; Duncan & McKeachie, 2005; Pintrich, Smith, García, & McKeachie, 1993).

Encouraging students' critical thinking is a priority for education in the 21st century (Kong, 2014). As Weinstein and Palmer (2002) explained by making sense of new information that is received in the classroom by using prior knowledge, experiences, attitudes, beliefs and reasoning is essential for success in school and at work. These authors determined that the difference between someone with and without experience is not only the amount of knowledge that they possess, but also, and perhaps even more important, how this new knowledge is acquired and organized. In fact, the fact that students think and critically analyze what they are learning has been associated with academic performance (Phan, 2010). For example, Kettler (2014) a group of students with excellent academic performance was compared with another group of students with average performance, finding that the former group displayed higher levels of critical thinking. On the other hand, Lee (2013) assessed, in a sample of university students, whether when studying they attempted to understand and think about what they were learning or whether, in contrast, they learned it by heart. Through cluster analysis, three groups were observed, in which the cluster with the highest score in critical thinking obtained higher academic performance.

Regarding the relationship between motivation and critical thinking, Yang and Chang (2013) conducted a study in which they ob-

served that, after increasing motivation towards the subject of biology through an intervention based on a video game design, students between 13 and 14 years managed to think and analyze the contents of the subject more critically. Similarly, Semerci (2011) found a positive and significant correlation between achievement motivation and critical thinking in a sample of 772 university students. In the same vein, Kusurkar, Ten Cate, Vos, Westers, and Croiset (2013) noted that medical students studying to learn tried to understand and relate the contents with prior knowledge.

The present study

As indicated previously, there are several investigations that have analyzed the relationship between motivational variables such as intrinsic motivation and critical thinking. However, we are not aware of studies that have focused on the explanation or prediction of academic performance in the subject of music through the target variables of this study.

To explore the relationship between variables, in accordance with Wang, Liu, Chatzisarantis and Lim (2010), two data analysis strategies are generally considered: on the one hand, the so-called variable-oriented techniques and, on the other, person-centered techniques. Regarding the former, the most common strategies are regressions, which analyze how much the dependent variable increases when the independent variable increases for example, how much students' grades increase when critical thinking increases by one point. In people-centered techniques, the goal is to find groups of subjects with similar features and determine whether they differ in the dependent variable, for example, a group with high motivation and high critical thinking may differ from another group of subjects with lower values in these variables, for example, in their grades in music. As a result of the development of mixed structural equation models (McLachlan & Peel, 2000; Vermunt & Magidson, 2003), it is possible to combine both techniques and explore whether there are groups of students or clusters with similar characteristics, as well as to verify whether they differ in the relationship between variables, that is, to analyze whether the increase in music performance differs in the diverse clusters when critical thinking increases.

Thus, this work proposes the following goals: to identify groups of students or clusters with similar values in intrinsic motivation, critical thinking and performance in music, and to analyze whether the relation between intrinsic motivation and critical thinking and between critical thinking and music performance is different in the identified clusters.

Method

Participants

Participants in this study were 494 students (227 male, 237 female, and 29 with missing data) from Second (300), Third (105), and Fourth (88) grades of Compulsory Secondary Education (CSE) with an average age of 14.63 years (*SD* = 1.23 years). The participants came from four public schools in districts with an average socioeconomic level for the island of Gran Canaria.

Measures

To analyze scales reliability, we used as indicators, the average variance extracted (AVE) and McDonald's ordinal omega (McDonald, 1999). The former indicator provides the common variance among the items (Ping, 2014), values above .50 are a sign of reliability (Forner & Larcker, 1981). McDonald's omega, instead of Cronbach's alpha was used because its better accuracy (Revelle & Zinbarg, 2009; Zinbarg, Revelle, Yovel, & Li, 2005). In addition, taking into account that participants's responses were rated on Likert-type scales, that is, with categorical variables (Flora & Curran, 2004), following the recommendations of Elosua and Zumbo (2008), we estimated the AVE and the omega from the factorial analysis using the polychoric correlation matrix. Values are interpreted similarly to Cronbac's alpha, where the value of 1 indicates high reliability and 0, low reliability. Similarly, confirmatory factor analysis (CFA) was performed to explore factorial validity. Although it is common to use the RMSEA and its confidence intervals (90%) as an indicator of fit in AFC, Kenny, Kaniskan, and McCoach (2014) has recently noted that this index is not reliable with simple models with few degrees of freedom, so in this work, we used CFI and TLI as fit indicators. The calculations were performed with the statistical package Mplus version 7.11 (Muthén & Muthén, 2014).

Intrinsic motivation. We used the Intrinsic Motivation toward Knowledge subscale of the *Academic Motivational Scale* (AMS; Vallerand, Blais, Brierè, & Pelletier, 1989). This subscale refers to performing an activity for the pleasure experienced while learning new content. The items are presented with the stem "why do you attend the institute?" (For example, "Because for me, it is a pleasure to learn new things"). The responses were rated on a Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) points. With respect to the reliability of the scale, McDonald's omega obtained a value of .84, and the AVE of .57, regarding the value of χ^2 and the fit indices of the AFC: $\chi^2(2, 492) = 54.65$, $p < .01$), CFI = .99 and TLI = .98.

Critical thinking. To assess students' critical thinking, participants rated four items of the Critical Thinking subscale of the *Motivated Strategies for Learning Questionnaire* (MSLQ; Pintrich et al., 1993) on a scale Likert type ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Sample items include "I translate what I am studying into my own words". With respect to the reliability of the scale, McDonald's omega obtained a value of .85, and the AVE of .58, in terms of the fit indices of the AFC: $\chi^2(2, 492) = 9.66$, $p < .01$), CFI = .99 y TLI = .99.

Music grades. Music grades were obtained at end of course from the headmasters of the schools.

Procedure

This study is part of a research conducted in several high schools on the island of Gran Canaria. Initially, the headmasters of the centers were contacted to explain the goals of the research and request their authorization. After obtaining the relevant authorization from the centers, at the time of the assessment, we presented the goals to the students, and, to diminish the possible effect of social desirability, they were informed of the voluntary nature of their participation and the confidentiality of their data. We also requested their cooperation and they were encouraged to complete the questionnaires as honestly as possible. A researcher was present for the 15 or 20 minutes required for the administration of the instruments and provided any necessary help and support to complete the items. Music grades were obtained in June, at the end of the academic year.

Data analysis

Preliminary analyses

First, the means, standard deviations and correlations among the variables, using Pearson's coefficient, were calculated. Then the factor scores were calculated as an indicator of the factors. Finally, we used the full information maximum likelihood method (FIML; Enders, 2010) to estimate the missing values. The "psych" 1.4.2.3 library (Revelle, 2014) of the R program version 3.0.3 (R Core Team, 2014) was used to calculate descriptive statistics and correlations.

Structural equation mixture modeling

We used a structural equation mixture modeling (SEMM) to analyze the relationship between intrinsic motivation, critical thinking, and music grades, using an approach centered both on variables and on person. The first step consisted of deciding the number of groups or clusters. For this purpose, the logical and theoretical meaning, other research, the nature of the groups

and statistical criteria such as entropy, Lo-Mendell-Rubin likelihood (LRT), bootstrap likelihood ratio test (BLRT), Akaike information criteria (AIC) and the Bayesian information criterion (BIC), were taken into account. The next step was to examine the profiles in both groups and, finally, to analyze whether the effect of intrinsic motivation on critical thinking and of critical thinking on music performance is different in the identified clusters. The calculations were performed with the statistical package Mplus version 7.11 (Muthén & Muthén, 2014).

Results

Preliminary analyses

Variables average scores ranged from 4.78 for critical thinking, to 5.98 for music grades, while standard deviations varied from 1.40 for motivation towards knowledge, to 2.14 for music grades.

Number of groups

We compared the AIC and BIC of the solutions of 1 to 3 groups (see Table 2). The option of a single group obtained higher values

Table 1

Means, Standard Deviations, and Pearson Correlations

	M	*DT*	Intrinsic motivation	Critical thinking
Intrinsic motivation	4.88	1.4	—	—
Critical thinking	4.78	1.41	.42	—
Music grades	5.98	2.14	.24	.21

Table 2

Fit Indices for Solutions 1 to 3 Latent Classes

Groups	Parameters	Entropy	LMRLMR	BLRTBLRT	AICAIC	BICBIC
1	28	—	—	—	16065.41	16183.02
2	34	.71	.00	.00	16014.44	16157.26
3	40	.66	.09	.67	16003.82	16171.84

in AIC and BIC, whereas between the options of 2 and 3 groups or latent classes, we found mixed results. However, entropy and the classification table based on the probability of belonging to a class for each group showed better values for the option of two latent classes, and both LMR and BLRT showed that the three-class solution was not significantly better than the two-group option. Similarly, the three-group option had negative effects among the variables, which is at odds with the theory and with previous research. Taking into account these aspects, we chose the option of two groups or clusters.

Cluster profiles

As shown in Table 3, the first cluster or latent class (Group 1) has very low intrinsic motivation, critical thinking and music grades, whereas the other group (Group 2) obtained higher scores, with higher means in music and higher levels of intrinsic motivation and critical thinking.

Relationship between variables

The effect of intrinsic motivation on critical thinking in Group 1 was β = .634 [.494, .774], whereas in Group 2, it was β = .693 [.558, .827]. As there is overlapping in the confidence intervals (α=.05) of Group 1 and Group 2, we cannot establish that the relationship between the two variables is higher in Group 1 than in Group 2. With regard to the effect of critical thinking on music grades was, for Group 1, β = .314 [.166, .462] and, for Group 2, β = .131 [.019, .243]. As there was no overlapping in the confidence intervals (α = .05), we assumed that the effect is greater in Group 1.

Discussion

The goal of this work was to analyze the relationships between different determinants of academic performance in the subject of music in compulsory secondary education. To achieve this goal we used,

Table 3

Mean and Standard Deviation by Group

	Group 1		Group 2	
	M	*DT*	*M*	*DT*
Intrinsic motivation	3.38	.82	5.77	.77
Critical thinking	4.39	1.34	5.01	1.4
Music grades	5.31	2.23	6.37	1.98

through a quantitative approach, a technique of data analysis that combines two approaches, one variable-oriented and one person-centered.

Clear differences can be observed in both clusters. In this sense, Group 2 showed higher mean scores than Group 1 in the three studied variables (i.e., intrinsic motivation, critical thinking and music performance). These results are consistent with other researches such as that performed by Lee (2013), who observed that the cluster with the highest score in deep thinking, that is, in trying to understand and the new contents in depth, was the cluster with better academic performance.

Regarding the relationship between intrinsic motivation and critical thinking, we observed a positive and significant effect in both groups; that is, the higher a student's score in intrinsic motivation, the higher the score in critical thinking, regardless of the cluster. This is to say that, the greater students' interest in acquiring new knowledge, the greater their willingness to relate it to prior knowledge and to think about it critically, according to the issues posed by Niemiec and Ryan (2009), because students with higher intrinsic motivation towards studies devote more time and energy to academic tasks, so they better acquire and process the new information received in class.

Regarding the relationship between critical thinking and academic performance in music, a general positive effect was observed, similar to the results of other works such as that by Kettler (2014), who observed a relationship between critical thinking and students' performance. However, it can be seen that the effect of critical thinking on music grades is higher in Group 1; that is, in comparison with students who have better academic performance, students who obtain worse results benefit more from thinking about and analyzing the contents taught in the classroom. This unexpected result may be explained as follows: the more the students process and critically analyze the class contents, the less they will concentrate on studying what the teacher might ask them, so they are already acquiring knowledge and, as they devote more time to thinking about the class material, their learning is deeper (Dinsmore & Alexander, 2012). However, these students do not benefit in their grades, because the teacher may assess differently from the way of the students study (Boyle, Duffy, & Dunleavy, 2003).

Some practical implications can be derived from these results. As noted by Ryan and Deci (2000a), students will be intrinsically more motivated to the extent that the teachers propose activities that are more interesting, novel or challenging. Similarly, teachers should encourage meaningful learning, connecting new knowledge with students' prior cognitive background (knowledge, experiences) so as to facilitate understanding and not so much memorization. Finally,

schools should promote a learning-oriented assessment, where the assessment tasks promote experiences of deep learning, oriented towards the expected learning outcomes.

Regarding the limitations of this work, we note that, although mixed structural equation models help to explain or detect influences in variables such as academic performance (Berlin, Williams, & Parra, 2014; Lau-Barraco, Milletich, & Linden, 2014), the categorization or establishment of groups or clusters of continuous variables can lead to a loss of information, although it allows understanding more clearly the influence of a variable, as observed in this study. In this sense, this technique of data analysis shows that, in subjects who critically analyze less class contents and who have worse academic performance, the relationship between these variables is greater. Another drawback to using mixed models of equations is similar to what happens when using exploratory factor analysis. Researchers need to determine or choose the number of factors that best correspond to the theory and data, so there is some room for subjectivity, with its consequent margin of error (Marsh, Lüdtke, Trautwein, & Morin, 2009). Future studies could use this data analysis technique, mixed structural equation models (McLachlan & Peel, 2000; Vermunt & Magidson, 2003), in other samples of high school students, in music conservatories in all three levels (elementary, professional or higher) or in university students to analyze the relationship between the variables studied in this work or other motivational variables, such as causal attributions or goal orientations, or self-regulated variable, such as regulation of effort or time management, in order to determine in which subjects the relationship between such variables and performance is higher.

In conclusion, this work represents a first and innovative approach to the analysis of the relationship between intrinsic motivation, critical thinking, and academic performance in music. In addition, it has allowed us to gain a better understanding of the different profiles of high school students and the relationship between these variables to explain the music grades. This could help to design and better analyze the effectiveness of interventions to increase academic music performance by improving high school students' intrinsic motivation and critical thinking.

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