

Extracurricular Activity on Music and Visual Art Associates with Children' Academic Achievement by Transferring Each Subject Score

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Abstract

The present longitudinal study examined whether extracurricular activities in the arts have a positive association with general academic performance, which is mediated by improved art scores. Data was collected from 700 seventh-grade children (379 boys and 321 girls) for over three years. Information regarding their participation in extracurricular activities in music and visual arts, grade points in general academic performance (i.e., Japanese, Social Studies, Mathematics, Science, and English), music, and arts were obtained, at the end of the seventh and ninth grades. Structural equation modeling revealed that both participation in extracurriculars in music and visual arts was positively associated with improvements in general academic performance from seventh to ninth grade, and these associations were mediated by improvements in music and visual arts scores. This finding suggests that arts education can contribute to improving general academic performance.

Introduction

Arts education is believed to cultivate creativity and innovative skills, in addition to knowledge and skills that are specific to the arts. Children have the option to participate in music and visual arts as extracurricular activities, which are organized, structured, involved, and supervised by adults outside school (Mahoney et al., 2005), besides the art classes that are a part of formal education.

In Japan, extracurricular activities are provided after school, which are supervised by teachers. In a recent national survey, almost all schools provide extracurricular activities. Of these, music (such as chorus and brass bands) and visual arts are the two most popular activities. Approximately 65% of junior high students participated in music (46%) or visual arts (19%) activities. About 78% of junior high students participated in these activities for more than 4 days a week (Japan Sports Agency, 2018). These varied types of arts education have been studied to understand their impact on academic performance.

Music education is one of the most studied fields in art education. Several studies have suggested the impact of music lessons on general academic achievement (Linch, 1994; Schellenberg, 2004, 2006; Wetter et al., 2009). Recently, Wetter et al. (2009) showed a significant positive association between music lessons as extracurricular activities and academic outcomes by surveying 120 children. Further, Southgate and Roscigno (2009) revealed that music involvement both inside and outside school was associated with children's and adolescents' academic achievements (mathematics and reading), even if socioeconomic status and family background were controlled on a nationally representative data source in the US. Such results are replicated in a more recent survey on 11–12-year-olds in the US (Young et al., 2014). Although, a few studies indicate no significant relationship between music education and academic achievement (for a review Winner et al., 2013).

The relationship between visual arts education and academic performance remains controversial. Vaughn and Winner (2000) reported that students who selected visual art courses as their secondary subject in high school showed higher verbal and math test scores. Other studies investigated the popular visual art class—Visual Thinking Strategies (VTS)—and reported that VTS participants showed higher scores and performance in standard academic tests and critical thinking, respectively (Housen, 2000; Curva et al., 2005; Adams et al., 2007). Although these studies demonstrated that students who were involved in visual art courses achieved higher grades, they have been criticized for not controlling socioeconomic status (Winner et al., 2013).

Winner et al. (2013) proposed several hypotheses on why there is a transfer effect of arts education on general academic performance. First, art instruction could directly lead to the improvement of general academic performance. Second, it could lead to the improvement of artistic skills that also improve general academic performance. Previous

research has examined the first hypothesis, and the results remain inconsistent. Thus, the current study aims to examine the two hypotheses, that is: 1) whether music and visual art education are associated with general academic performance; 2) whether the effect of music and visual art education has an indirect association with general academic performance mediated by music and visual art scores.

To test these hypotheses, a 3-year longitudinal survey was conducted, which focused on art involvement as extracurricular activities in junior high school students. Given that all the children in Japan take music and visual art classes in junior high school as secondary subjects and can also increase involvement in them as extracurricular activities, data collection was possible. Additionally, the present survey measured art-related scores and general academic performance of Japanese junior high school students twice (in 7th and 9th grade), which made it possible to examine the association between improvement of arts subject scores and academic performance over 2 years (Figure 1). In Japan, junior high school students typically start their extracurricular activities at the end of April in 1st grade. Children's academic attainment is integrated at the end of each grade. These can be analyzed as one-time survey data by specifying the cross-sectional association between art involvement, art score, and academic performance at the baseline level (7th grade). Further, by measuring art subject scores and general academic performance in the third year, researchers can examine the longitudinal association between arts involvement, art scores, and academic performance. Finally, it is possible to specify the association between arts involvement and children's growth in art scores and academic performance for 2 years by considering the autoregressive effect of the first year. This analysis procedure enables researchers to specify the transferring effect of arts education on academic performance.

Several variables were controlled, considering previous research on other extracurricular activities (e.g., Ishihara et al., 2020; Lubans et al., 2018), such as involvement in other extracurricular activities (e.g., sports and cultural activities), sex, music, and visual art score in 7th grade, socioeconomic variables (i.e., household income and maternal education), and learning habits.

Methods

Participants

Figure 2 shows a flow diagram of participant recruitment and the follow-up process. We requested 20 public junior high schools in Sapporo, which is the prefectural capital of Hokkaido in northern Japan, and cities near Sapporo for permission to recruit 7th-grade students (i.e., 12–13-year-olds). Eleven schools declined to participate, and three schools declined to send letters to their parents. A total of 946 first-year junior high school students were recruited from six public schools. Students in one school did not participate in the follow-up measurement (N=164), and 82 participants were excluded due to missing data (grade points =73, questionnaire of extracurricular activities = 9). Complete data on academic performance, grade points in music and visual arts, and extracurricular activities questionnaire were available for 700 children (male, n =379; female, n =321). All the participants and their parents or legal guardians were informed consent for the current study participation. The study was approved by the institutional review board of the Hokkaido University of Education and the principals of participating schools, and it was conducted in accordance with the approved guidelines. Table 1 shows the characteristics of the participating children.

Procedure and Measures

The academic year runs from April to March. We collected data on the participants' academic performance at the end of the 7th and 9th grades (i.e., 2 years apart). The participants' SES was assessed in October when they were in the 7th grade.

Grade point of each art-related subject and general academic performance (AP)

Teachers evaluate students' achievements as a grade point (GP) in each subject at the end of each school year. The GPs of music and visual arts in the national standard curriculum were also obtained from schools. Each score ranged from 1 to 5 points, with high GPs indicating high performance in each subject. We analyzed an individual's GPs of music and visual art at the end of the 7th and 9th grades. As a general AP, the GPs of five academic subjects (Japanese, mathematics, social studies, science, and English) in the national standard curriculum were obtained from schools. The current study focused on the five core subjects, as they are considered academic achievements in high school entrance exams.

Socioeconomic status

SES was assessed only as a baseline using a five-point questionnaire administered to participants' parents and guardians, which questioned their household income (from 2 million yen to 8 million yen), and maternal educational attainment (ranging from completing junior high school to earning a bachelor's degree). We obtained SES data consisting of household income and maternal educational attainment from 492 participants due to non-respondents.

Learning habits

Learning habits were assessed using the duration of learning after school on weekdays and weekends. The participants answered the question of learning duration on weekdays ("How much time do you study on weekdays after school?") using five categories ((1) more than 3 hours; (2) more than 2 hours and less than 3 hours; (3) more than an hour and less than 2 hours; (4) more than 30 minutes and less than an hour; and (5) less than 30 minutes). In addition, they were also asked, "How much time do you study in a day on weekends?" using the five categories described above.

Extracurricular activity

The participants completed a questionnaire regarding their participation in sports and cultural activities during October while in the 7th and 9th grades. They were asked a single question ("What extracurricular activity do you belong to?"), and their responses were coded as follows: 1) I belong to sports activity; 2) I belong to cultural activity; and 3) I do not belong to any activity. When participants checked (1), the ECA sports were coded as 1 and the others 0, and the same coding was applied when they checked option (2).

Participants in the Blass band and Chorus (N=76; male = 10, female = 66) were coded as participants in the music extracurricular activity, with ECA music as 1. In addition, the participants in the visual arts (N = 31; male = 7, female =24) were coded as participants in the visual art extracurricular activity, with ECA visual arts as 1.

This study was not preregistered. The data and study materials of this study are available from the authors.

Statistical analysis

Structural equation modeling with full-information maximum likelihood estimation was conducted to predict the total GP in general AP at the 9th-grade after controlling for household income, maternal education, sex, total GP in general AP at 7th, GPs in music and visual art, learning habits, and extracurricular activity in sports, culture, music, and visual art. The variables in the hypothesis and controlled variables were included as explanatory variables for GP in general AP. The GP of general AP in 7th and 9th-grades were modeled as latent variables, which were defined by GPs of five subjects (i.e., Japanese, Social Studies, Math, Science, and English) at each time point. Additionally, learning habits in 7th and 9th-grades were modeled as latent variables, which were defined by learning times on weekdays and weekends. The GP in general AP and GPs in music and visual arts in 9th-grade were modeled as being explained by each variable in the 7th-

grade. The variables in the hypothesis and all the control variables were first included as explanatory variables of objective variables such as GP in general AP and GPs in music and visual arts. Then, the model was refined by excluding insignificant paths from control variables (other than the main paths related to ECA music and visual arts and SES) and adding covariate relationships between the five main subjects and other control variables when the modification indices (the change of χ^2 value with one degree of freedom when a particular path was added) were more than 3.84. This indicates that the p value for the added parameter would be less than .05. As the current survey has a large sample size (N = more than 200), we adapted *the* $\chi^2 / \text{d.f.}$ ratio as an indicator of model fit, as suggested by Kline (1998), to evaluate the model fit by the value of χ^2 . All statistical analyses were conducted using R Studio software, version 1.3.1093.

Results

Table 1 shows the demographic characteristics of the participating children and the descriptive statistics of total GP of general AP and GPs.

Four children quit their participation in music or visual arts extracurricular activities (Music: $N=2$ [one male and one female], visual arts: $N=2$ [one male and one female]). Their participation in extracurricular activities did not last in the follow-up measurement (less than a year). Thus, subsequent analyses excluded these data.

Structural equation modelling

Structural equation modeling (SEM) was used to test the hypothetical model (Figure 1). The structural equation model showed an adequate fit (Figure 3: $\chi^2 (189) = 608.59, p < .001, (\chi^2 / \text{d.f. ratio} = 3.2), \text{CFI} = .96, \text{GFI} = .99, \text{AGFI} = .99, \text{RMSEA} = .06, 90\% \text{ CI} = .05-.06, p = .02$). Table 2 presents the direct, indirect, and total association of variables on GP in general AP in 9th-grade. With respect to music, although the indirect association via GP of Music in the 9th-grade was positive ($b^* = .04, p < .001$), the direct association of ECA music was negative (direct association: $b^* = -.05, p = .01$), and the total effect was not significant ($b^* = .03, p = .22$). Regarding visual arts, the indirect associations via GP of Visual Arts at 7th and 9th-grade were positive (indirect effect via GP of Visual Arts at 7th-grade: $b^* = .03, p = .005$; indirect effect via GP of Visual Arts at 9th-grade: $b^* = .01, p = .01$); however, there was no significant direct association of ECA visual arts ($b^* = .00, p = .85$), which resulted in a significant total effect ($b^* = .08, p = .006$). The results of this analysis are summarized in Table S1.

Discussion

The current survey investigated the direct and indirect effects of extracurricular activities in music and visual arts on each art subject score and general academic performance. Although the total and direct effects were different between music and visual arts, both extracurricular activities of music and visual arts were positively associated with improvements in academic performance when they were mediated by each subject's score improvement, which supported the second hypothesis of Winner et al. (2013). That is, children participating in music or visual arts clubs saw improvements in their general academic performance, and the improvement was mediated by the increase in their music and visual arts scores. Additionally, this relationship was not diminished even after controlling for the influence of socioeconomic status.

This study is the first to illustrate the specific way in which arts involvement enhances academic performance. Considerable attention has been paid to extracurricular sports activities (e.g., swimming, hockey, soccer, martial arts, etc.), and there has been a positive association between cognitive and social development and mental health (Agans et al., 2014; Ishihara et al., 2018, 2020; Oberle et al., 2019; Darling et al., 2005; Broh, 2002; Shephard, 1996). Similarly,

involvement in arts (e.g., music and visual arts) had a positive association with general academic performance. Considering that many countries have reduced the instruction time for music and visual arts subjects in the past decade (Winner et al., 2013), this finding is significant for arts education. It is necessary to review and acknowledge the benefits of arts education.

The Impact of Music Club Activities

Previous research has indicated a positive correlation between music involvement and academic performance (e.g., Winner & Cooper, 2000; Schellenberg, 2004, 2006; Wetter et al., 2009). However, the current study indicated that the direct effect of music involvement on academic performance was significantly negative when controlling for the SES and GP of music. Considering that there was a significant indirect effect via GP of music at the 9th-grade, perhaps, the direct effect decreased because of the transferring effect. The size of the negative direct effect ($b^* = -.05, p = .01$) competes with that of the indirect positive effect via GP of music ($b^* = .04, p < .001$), which results in no significant yet positive total effect. These results support that the positive association of music involvement with general academic performance in previous studies was explained not by the involvement, but by the outcome of music learning.

The transferring effect of music involvement and education on general academic performance is a novel finding in music education research. Although the size of the transferring effect is quite small, it is surprising that the improvement of general academic performance from 7th to 9th grade was explained by the improvement of the GP of music and extracurricular activities involved in it. Interestingly, the indirect effect was not significant in the 7th grade but was in the 9th grade. This result implies that participation in music activities itself is not associated with the GP of music; that is, music club children did not achieve higher scores in their first year of junior high school. However, they could improve their academic performance, and this improvement was mediated by the enhancement of their music skills and knowledge. The current findings suggest that music learning for more than a year enables the transferring effect on academic performance. Overall, these results support the claim that the impact of music lessons is small but long-lasting (Schellenberg, 2006; Dege, 2020).

The Impact of Visual Arts Club Activities

This is the first study that showed a positive association between visual arts involvement and academic performance even after controlling for socioeconomic status. Past research on visual arts education has been criticized for using a correlational study on a one-time survey without controlling for related variables such as socioeconomic status (e.g., Winner & Cooper, 2000; Catterall et al., 1999). Contrary to the results of music extracurricular activities, visual arts extracurriculars themselves did not have a direct association with general academic performance but had an indirect association with baseline GP of visual arts. These results imply that the participants in the visual arts club were likely to achieve higher visual arts and academic scores. However, like music activities, the activity improved the visual arts score, resulting in higher general academic performance. The indirect effects mediated by the improvement of GP of visual arts were significant in the 9th grade, which contributed to the total effect of visual art involvement and general academic performance. This implies that visual art learning demonstrates its transferring power to academic performance in 2 years.

While the effect size was quite small, like music activities, it suggests that the second hypothesis by Winner et al. (2013) could apply to visual arts. Visual arts education was divided into "Education of Art" and "Education through Art." The former refers to the instruction of knowledge and skills in visual arts, and the latter means that individuals develop their general abilities, personality, and identity through artistic activities (e.g., art viewing and creation). Read (1953), a philosopher in arts and arts education, demonstrated that when individuals are provided "education of art," it results in "education through art." While this process includes various skills, knowledge, and social and psychological

development, the current finding presumably supports the assumption that development takes place through visual arts education, as suggested by philosophers.

Limitations and Future Studies

There are several limitations in this study. First, the current longitudinal survey could not specify what kind of activities in each type of extracurricular activity improve the arts and academic performance. Many experiments have been conducted on the impact of arts education that specify the pathway of cognitive and social developments focusing on detailed instructions in arts education (Schellenberg, 2004; Loui et al., 2011; Spelke, 2008; Dolev et al., 2001). Future experiments can contribute to determine the source and results of transfer and estimate the causal relationship of arts education and general academic performance with higher accuracy.

Second, it should be noted that the impact of extracurricular activity in the arts can differ between ages and cultures. The size of the effect or its mechanism may differ because of the different developmental features in childhood and early adolescence. Additionally, cultural background is an important factor in understanding the impact of extracurricular activity in the arts. Some countries provide extracurricular activities in schools, while others do not. Further, the contents, procedure, and amount of time spent in arts education can be different. Future studies should analyze these differences using meta-surveys.

Declarations

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Tables

Table 1. Characteristics of the participating children

Variables	7th grade		9th grade	
N♂Boys/Girls)	700 (379/321)			
Household income	3.26	(1.04)		
Maternal education	2.73	(1.00)		
General academic performance	17.60	(4.16)	17.35	(4.78)
GP of Music	3.59	(0.75)	3.78	(0.93)
Visual arts score	3.61	(0.86)	3.62	(0.86)

Note: Data are presented as the mean ± SD. Household income and maternal education were calculated for the complete data (N=492).

Table 2. Standardized direct, indirect, and total effects for all variables in the model

	AP (Time2)							
	Estimate	SE	Z	p	Lower	Upper	Std.all	
ECA Music								
direct	-0.12	*	0.05	-2.532	0.01	-0.21	-0.03	-0.05
indirect1 (via GP of Music at 7 th -grade)	0.02		0.02	0.988	0.32	-0.02	0.06	0.01
indirect2 (via GP of Music at 9 th -grade)	0.09	***	0.02	4.820	0.00	0.05	0.12	0.04
total	0.12		0.10	1.239	0.22	-0.07	0.32	0.03
ECA Visual Art								
direct	0.01		0.07	0.185	0.85	-0.12	0.14	0.00
indirect1 (via GP of Visual Arts at 7 th -grade)	0.09	**	0.03	2.812	0.01	0.03	0.16	0.03
indirect2 (via GP of Visual Arts at 9 th -grade)	0.05	*	0.02	2.499	0.01	0.01	0.09	0.01
total	0.29	**	0.11	2.742	0.01	0.08	0.51	0.08

Note: indirect1 means the indirect effect mediated by art-related score (7th grade) and indirect2 means the indirect effect mediated by art-related score (9th grade).

Figures

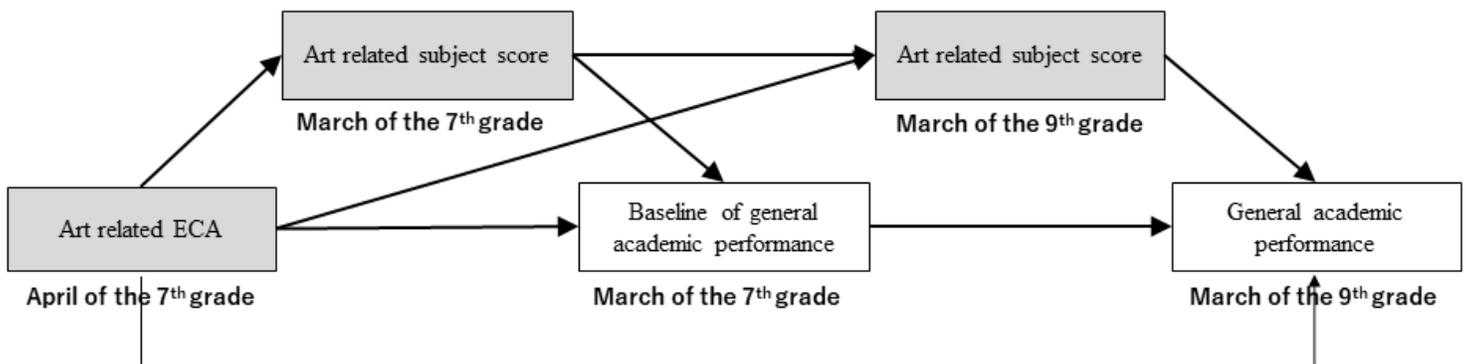


Figure 1

The hypothesis model in the current study

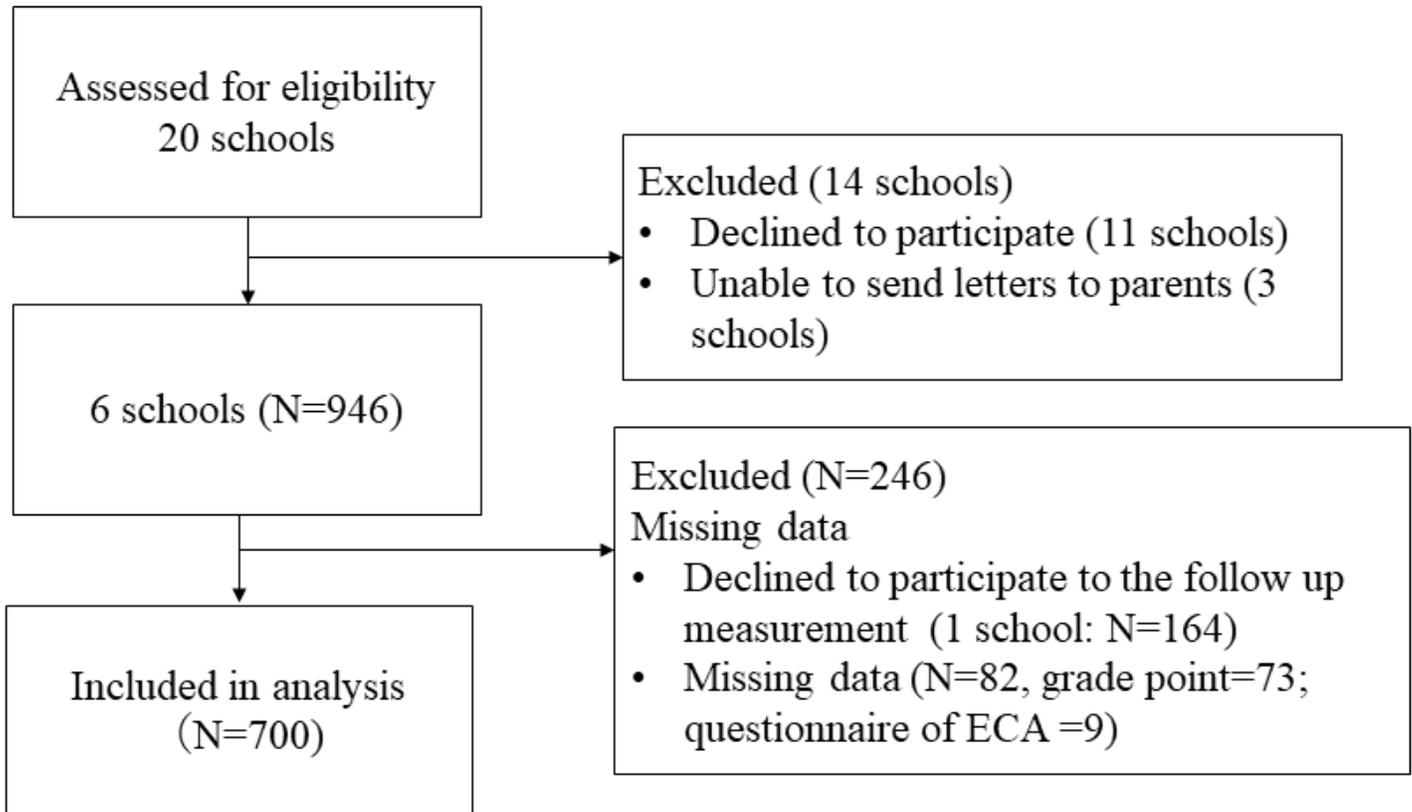


Figure 2

Flow diagram of the recruitment of children and missing data

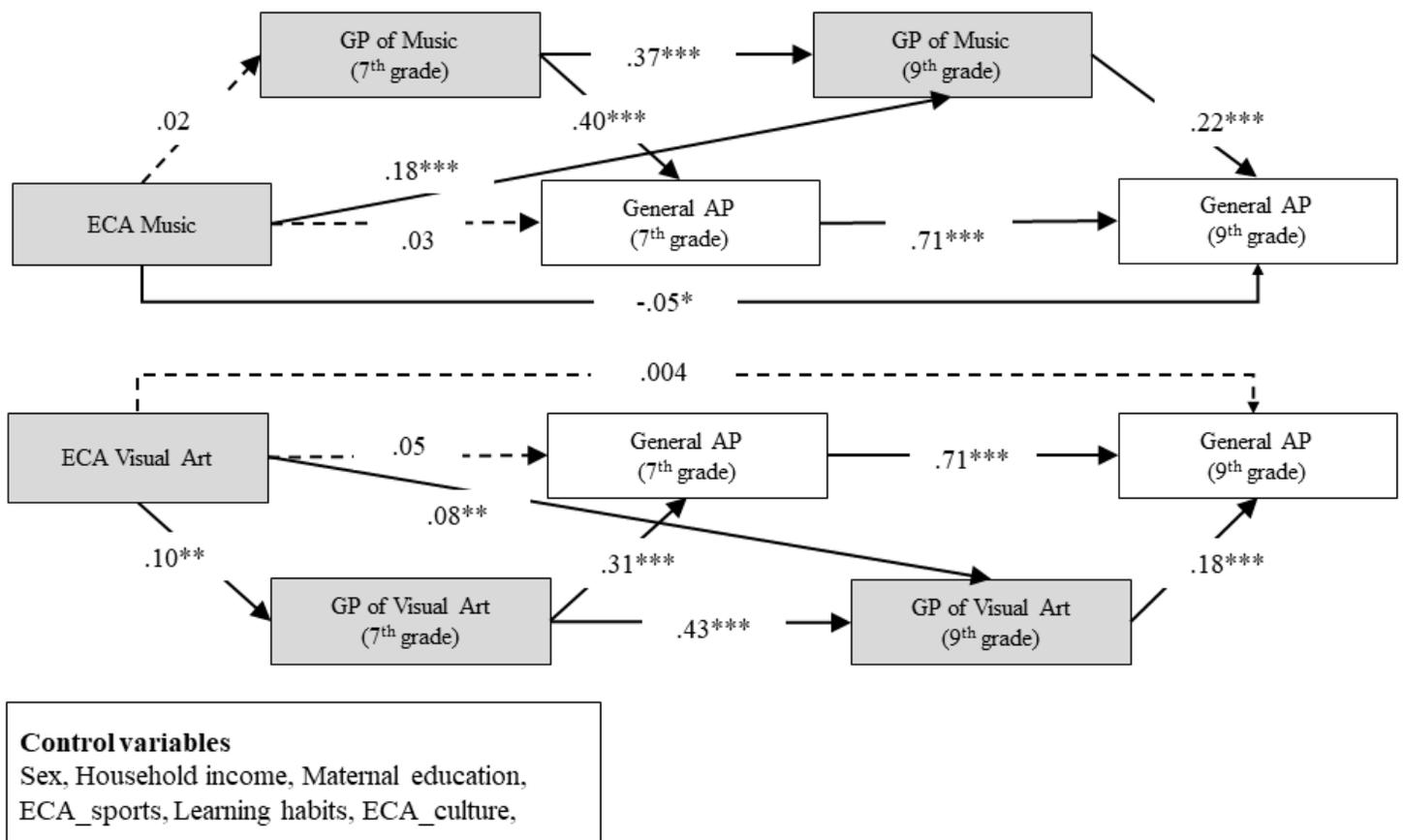


Figure 3

Direct and indirect pathways from extracurricular activity in music and visual arts to academic performance, mediated by music and visual arts scores (without SES control). Note: Structural equation modeling N=696, χ^2 (df = 189) = 608.59 ($p < .001$), CFI=0.96, GFI=0.99, AGFI=0.99, RMSEA=0.06; dotted paths denote non-significant effects, while solid-line paths denote significant effects. Values are presented as standardized β (b^*), after controlling for sex, ECA_sports = participation in sports extracurricular activities, ECA_culture = participation in cultural extracurricular activities.

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