Predictors of Taking Elective Music Courses in Middle School

among Low-SES, Ethnically Diverse Students in Miami

Abstract

Researchers attempting to show that music has positive effects on children need to understand and control for pre-existing differences between those who do and do not select into musical participation in the first place. Within a large-scale, community-wide, prospective, longitudinal study of predominantly low-income, ethnically diverse students ($n = 31,332$), we examined characteristics of students who did and did not enroll in music elective courses (band, choir, orchestra, guitar, other) in public middle schools (6th, 7th, and 8th grade) in Miami. Predictor variables included gender, ethnicity, poverty, special education, ELL status, 5th grade English proficiency, prior academic performance (5th grade GPA, standardized math and reading test scores) and initial school readiness skills (social, behavioral, cognitive, language, and motor skills) at age four. Only 23% of middle-school students enrolled in a music class in 6th, 7th or 8th grade, with band having the highest enrollment, followed by choir, orchestra, and guitar. Being male, and having greater cognitive skills at age four, higher 5th grade GPA and reading skills were related to later music participation. Black students, students in special education, and those not proficient in English were less likely to participate in middle school music classes. Results varied somewhat by type of music.

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Researchers have investigated the developmental value of music in children and found

positive effects of music on cognition, behavioral, emotional, and social development (Brown &

Sax, 2013; Moreno et al., 2011; Schellenberg, 2006; Williams, Barrett, Welch, Abad, &

Broughton, 2014; Winsler, Ducenne, & Koury, 2011). In addition to these benefits, music has the

potential to help children build confidence and drive for success through commitment,

persistence, and motivation (Rosevear, 2010). Music is the most consistently available arts

elective in the United States, but even music classes are not equally available to all students

(Parsad, Spiegelman & Coopersmith, 2012). In the 2008-2009 academic year, schools where the

majority of the students were eligible for free or reduced lunch (FRL) less consistently offered a

music class (81%) compared to schools where only a small proportion of students were eligible

for FRL (96%). Additionally, schools with the lowest poverty concentration more consistently

offered 5 or more music classes (62%) compared to schools with a high poverty concentration

(35%) (Parsad, Spiegelman & Coopersmith, 2012). Students in poverty have limited access to

music courses and less music course options.

The implementation of the No Child Left Behind Act led to a decline in budgets for

music programs in the United States. Between 1999-2000 and 2003-2004, California schools

experienced a 50% decrease in student enrollment in music classes and a 26.7% decrease in

music teachers (Abril & Gault, 2006). This is especially unfortunate for low-income children of

color as several scholars argue that music and the arts can be especially helpful for children in

poverty and have the potential to help reduce the achievement gap (Brown & Sax, 2013; Foran,

2009). The Turnaround Arts Initiative, for example, implemented high-quality arts-education to

low-income and underperforming school districts (Stoelinga, Joye, & Silk, 2013). Students in

Turnaround Arts schools increased more in reading and/or math proficiency compared to students in schools that received similar school improvement grants but allocated funding to other non-art related areas (Stoelinga et al., 2013).

Arts programs in schools support student academic growth differently than academic classes (Catterall, 1998). Catterall's study compared children in poverty who did and did not have arts experiences. Students who were highly involved with the arts outperformed students who had little art-involvement in English classes and on standardized tests, and this difference in academic performance became more pronounced between 8th and 10th grade. Students highly involved with the arts were less likely to be bored in school and less likely to drop out of school compared to students with little arts engagement (Catterall, 1998). Increased interest, persistence, and performance in school demonstrates the value of encouraging high arts involvement among all students, and especially for students in poverty. Middle school is a critical time to examine student elective arts course enrollment because 6th-8th grade is the first time students have the opportunity to choose full elective courses. Early participation is particularly important for music enrollment because, unlike high school, students may enter music classes in middle school with limited skills. High school music participation becomes more of a closed system because students are often expected to be equipped with certain musical skills in order to participate (i.e., auditions, ability to read music, basic technique) (McNeal, 1998).

Methodological Issues

Research on the effects of music on children's cognitive, social, and academic development is plentiful but limited because most of the research is correlational which does not allow for causal inference. For example, there is correlational evidence that well-trained musicians show a variety of advanced cognitive skills such as working memory, attention, executive functioning, and reaction time compared to non-musicians, presumably from years of

practice and training (Bialystok & DePape, 2009; Pallesen et al., 2010; Zuk, Benjamin, Kenyon, & Gaab, 2014). However, it can't be concluded that the musical training *caused* the enhanced cognitive function since the students who went into music in the first place could have been different (e.g., higher initial IQ or greater initial executive functioning skills) before the musical training took place, or a third variable such as socioeconomic status, parental education, or parental investment could have led to both the cognitive enhancements and the pursuit of music.

Experimental research allowing causal inference through random assignment of students to either a musical training/experience group or a control group is rare but has provided causal evidence of ancillary benefits of musical training. Schellenberg (2006) randomly assigned 144 six year old children to four conditions. Two of the groups received music lessons, either piano or voice for 36-weeks, and the other two groups received either drama lessons or no lessons for 36-weeks. Child IQ was assessed before they began lessons and after 36 weeks. They found that children in the music conditions had a greater increase over time in IQ than the two control conditions (Schellenberg, 2006). Other experimental research also shows positive effects of musical training on cognition, executive functioning, and/or academic performance (Gardiner, Fox, Knowles, & Jefrey, 1996; Holochwost et al., 2017; Moreno et al., 2011).

Because randomly assigning students to musical experience groups is difficult, and often impossible (when examining in-school elective music courses, for example), quasi-experimental designs are critical in research on the effects of music on children. Quasi-experimental designs typically compare naturally existing groups of individuals who either are or are not exposed to musical experiences on cognitive or academic outcomes, with careful attention to measuring, and statistically controlling for, pre-existing "selection factors" – the many ways that the children who do and do not get music exposure are initially different in terms of family demographics (ethnicity, SES, parental education) and/or child prior competence (earlier academic or cognitive

skills). Numerous studies controlling for at least family demographics and in some cases many more covariates find that children involved in music perform better either in school or on various cognitive assessments compared to those without musical experience (Corrigall, Schellenberg, & Misura, 2013; Gerry, Unrau, & Trainor, 2012; Miksza, 2010; Dos Santos-Luiz, Monico, Almeida & Coimbra, 2016; Schellenberg, 2006; Southgate & Roscigno, 2009; Williams et al. 2014; Winsler, Ducenne, & Koury, 2011).

Not all quasi-experimental studies, however, show significant "effects" of music and the pattern appears to be that the more selection factors controlled for, and the stronger the statistical procedure used, the less likely significant effects of music are found. A recent study using data from the Panel Study of Income Dynamics Child Development Supplement (Foster & Jenkins, 2017) included many family and child covariates and found no evidence for a causal effect of musical experiences on child outcomes (math skill, verbal skill, and working memory, parent reports of social skills and behavior, and child-reports of self-concept) after selection variables were included. Children who received musical experiences outside of school had parents with higher IQ, greater years of education, and more money and time to spend on their children which explained the advanced academic achievement (Foster & Jenkins, 2017). These researchers, however, examined parent report of student out-of-school musical training rather than middle school music enrollment. Students who take music in school are also different than students who do not (Elpus, 2013; Kinney, 2010). Elpus (2013) found music students had significantly greater SAT scores than non-music students. However, after controlling for factors such as SES, race, family composition, and academic achievement, the difference in SAT performance between music students and non-music students disappeared. It may be that students who enroll in music classes are those who are already well situated and advantaged and likely to excel in school regardless of their musical experience (Elpus, 2013). Additionally, music student performance on

the SAT varied by the type of music elective. Not controlling for background differences, instrumental students (band and orchestra) scored higher than non-music students on the SAT while choir students scored lower than non-music students (Elpus 2013). These studies highlight both the importance of understanding the selection effects at play in research on the potential benefits of musical experiences and the need to examine specific types of music exposure.

The Current Study

Using data from a large-scale, community-wide, prospective, longitudinal study of predominantly low-income, ethnically diverse students in Miami ($n = 31,332$), we examined characteristics of students who did and did not enroll in music elective courses (band, choir, orchestra, guitar, other) in public middle schools (6th, 7th, and 8th grade). Predictor variables included gender, ethnicity, poverty, special education, ELL status, 5th grade English proficiency, prior academic performance (5th grade GPA, standardized math and reading test scores) and initial school readiness skills (social, behavioral, cognitive, language, and motor skills) at age four. Prior research typically does not have a long-term prospective longitudinal design and is limited by small and relatively homogenous and advantaged samples. We followed a large group of ethnically diverse (mostly Latino and Black) students largely in poverty for 10 years from prekindergarten through 8th grade of middle school. We use official school transcript data to determine exposure to in-school music electives rather than rely on student or parent retrospective reports of more general types of in- and out-of-school musical experiences. In addition to examining common selection factors such as SES, gender, and ethnicity, we examine a host of additional variables likely associated with middle school musical exposure, such as special education status, ELL status, English proficiency, initial school readiness in preschool (cognitive, social, behavioral, and motor skills), and prior elementary school academic performance.

We ask the following research questions: 1) What proportion of students in grades 6-8 enroll in music classes, and what type of music classes are they taking (i.e., band, chorus, guitar, orchestra, other)? 2) What are the pre-existing demographic and child-level differences (gender, ethnicity, poverty, special education, ELL status, English proficiency, prior academic performance, school readiness at age four) between students who do and do not select into music electives in middle school? 3) To what extent are selection factors different for different types of music courses (i.e., band, choir, guitar, orchestra)?

Method

Participants

Participants of this study are children from the Miami School Readiness Project (MSRP; Winsler & Wallace, 2002; Winsler, et al., 2008), a large-scale, prospective longitudinal study that followed five cohorts of children who attended either community-based childcare with subsidies or public-school pre-K programs at age 4 between the 2002-2007 in Miami Florida. Not all cohorts in the sample reached 7th and 8th grade by the 2013-2014 academic year when data collection stopped. Cohort-based attrition existed by design - there are 6th grade data for 5 cohorts, 7th grade data for 4 cohorts, and 8th grade data for 3 cohorts. Thus, 30,413 students had 6th grade data, 23,788 students had 7th grade data, and 16,392 students had 8th grade data. Appendix - Online Supplementary Table 1 shows the background characteristics, school readiness, and 5th grade academic performance of the entire sample. Students were 51% male, and racial/ethnic diversity was 61% Hispanic, 32% Black, 6.4% White, and 0.1% Asian. A large majority of the sample was in poverty (81% received free/reduced lunch in 6th grade). About 15% of the students received special education services in 6th grade. In kindergarten, 57% were categorized as English language learners, but by 5th grade, 95% of students were English

proficient according to district criteria for no longer receiving ESOL services. The sample included children who repeated a grade in elementary or middle school (14.6%).

Procedure

School readiness was measured directly during the students' pre-K year by well-trained outside assessors or by the student's pre-K teacher, and parents and teachers reported on the child with the survey instruments described below (Crane, Mincic & Winsler, Ducenne, & Koury, 2011; Winsler et al., 2008; Winsler, Gara, Alegrado, Castro & Tavassolie, 2019; Winsler & Wallace, 2002)). School system student records were collected for each child from K through 8th grade. Administrative school records of student demographic information (e.g., student gender, ethnicity) were collected with consent, and with appropriate de-identification procedures as approved by the institutions' IRB procedures.

Measures

Child-Level Predictors

Gender. Females were coded as 0 and males were given a 1 using school record data.

Race/Ethnicity. Child race/ethnicity was collected by the school district, and coded into four categories: "Hispanic" (60%, $n = 17,734$) included individuals who identified as Hispanic/ Latino; "Black" (33%, $n = 9,635$) included individuals who identified as African American /Black/Caribbean, or Black and some other racial group; "White/Other" (6%, $n = 1,883$) included individuals who identified as White or a mixture of other racial groups, and "Asian/Pacific Islander" (0.7% $n = 199$)

Cognitive, language, and motor skills at age 4. The Learning Accomplishment Profile-Diagnostic (LAP-D, Nehring, Nehring, Bruni, & Randolph, 1992) is a norm-referenced, developmental assessment administered individually to children at the beginning and end of the pre-K year (T1: September-October; T2: April-May). Scores from T2 were used to most

accurately represent children's school readiness at school entry, and if T2 scores were not

available, T1 scores were used. Children who received subsidies to attend childcare were

administered the LAP-D by bilingual, trained assessors. Children who attended public school

pre-K programs were administered the LAP-D by their pre-K teachers, who completed the same

training by the publisher. The primary language (English; Spanish) used to administer the LAP-

D was chosen by the assessor after discussion with the teacher and interacting with the student in

both languages to determine the student's strongest language. There are four scales with two

subscales each: cognitive (counting and matching), language (comprehension and naming), fine

motor (writing and manipulation), and gross motor (body and object). Internal consistency

reliabilities ranged from .93 to .95 (Winsler et al., 2008).

Socio-emotional skills and behavior at age 4. Children's social skills and behavior were

measured at age four using the Devereux Early Childhood Assessment (DECA; Lebuffe &

Naglieri, 1999). Preschool teachers completed the DECA at the same two time points as above.

T2 scores were used when available and if not, T1 was used. The DECA is comprised of three

subscales (initiative, attachment, and self-control) that are combined to create an overall measure

of children's socio-emotional strengths (total protective factors TPF) and there is a separate

behavioral concerns subscale. A 5-point Likert scale indicates frequency of child behavior

(0=never to 4=very frequently). Bigger numbers on TPF indicate greater strengths, and bigger

numbers on behavioral concerns indicate more problems. Teachers could fill out the DECA in

Spanish or English and 34% filled out the Spanish form. Good internal consistency reliability

was found among the sample for TPF (.94) and behavioral concerns (.81), and this did not vary

by rater or language of form (Crane, Mincic & Winsler, 2011; Winsler et al., 2008).

ELL Status in Kindergarten. English language learner status was determined by the

schools from parent-reported home language used at kindergarten entry. Those who reported

predominantly speaking another language at home were considered ELLs in kindergarten by the school system.

English Proficiency at the End of Elementary School. ELL students were assessed by the district for English proficiency with the Miami-Dade County Oral Language Proficiency Scale-Revised (M-DCOLPS-R) assessment (Abella, Urrita, & Schneiderman, 2005). This test measures aural comprehension and oral production, and those students who were determined to be ELLs were provided with English for Speakers of Other Languages (ESOL) instruction. ESOL levels are marked 1-5, with levels 1 and 2 indicating beginning English learners who still have much difficulty, levels 3 and 4 being advanced stages of English learning, and level 5 is considered sufficiently proficient in English to exit the ESOL program (Abella, Urrita, & Schneiderman, 2005). Those at level 5 (and those who were never considered ELLs) were considered English proficient ("1") and those with a value less than 5 received a "0".

5th Grade Grade Point Average (GPA). GPA is the average of grades student received from all subjects they received grades for in 5th grade. Grades were based on a 5-point, A-F scale, where 5.0 = A, 4.0 = B, 3.0 = C, 2.0 = D, and 1.0 = F.

5th Grade Standardized Test Scores. The state's high-stakes standardized test (FCAT; Human Resources Research Organization and Harcourt Assessment, 2007) is a mandatory exam given to third through twelfth graders in Florida. The test consists of a math and reading portion, and questions are formatted using multiple choice, short answer, and detailed responses. The test is graded using a continuous score ranging from 100 to 500 with Cronbach's alpha reliability for reading and math tests at 0.91 and 0.88 (Morrissey, Hutchison & Winsler, 2014).

Special Education Status. Special education status in 6th grade was collected from administrative records in the form of the student's primary exceptionality code. Students who had a code in 6th grade received a '1' for special education, and others received a '0'. Disability

types included: intellectual disability, speech/language disorder, or visually impaired, deaf or

hard of hearing, specific learning disabled, dual-sensory impaired, autistic, emotionally

disturbed, traumatic brain injured, or other health impaired. Gifted students received a 0 and

were considered non-disabled.

      Poverty Status. Children's poverty status was based on student eligibility for free or

reduced lunch (FRL) in 6th grade. Eligibility is determined at the beginning the year by the

family meal application completed by the child's primary caregiver. Children 130% of the

federal poverty line qualify for free lunch, and those who are 185% of the poverty line qualify

for reduced-price lunch. This was coded '1' for free or reduced lunch and '0' for did not receive.

      Music Exposure in Middle School

      Administrative data collected each year on each student for all grade levels included all

course subjects taken on the end-of-year transcript (e.g., math, social studies, science, band

etc…). Music is an in-school arts elective that students had the option to take. Using whether a

child's transcript included a music class, we created the following variables denoting whether,

when, and which music courses students took in middle school. *Band.* If the course "Band"

appeared in a given grade (6th, 7th, or 8th), the student was flagged as having band experience in

that grade (i.e., 6th Grade Band = Yes "1" vs. No "0"). These were then aggregated across all

grades (6th, 7th, and 8th) to make a variable indicating YES ("1") or NO ("0") whether that child

EVER experienced band at least once in middle school. The same was done for the other forms

of music: *Chorus*, *Orchestra*, *Guitar*, and *Other* (music theory, keyboard, and general music).

We also created the same set of variables aggregated across all forms of music to indicate

whether the student elected to take ANY type of music course during middle school.

      It is important to note that practically all (94.4%) of the children attended schools that

offered music, although this varied somewhat by race/ethnicity (95.2% for White, 95.9% for

Latino/Hispanic, 91.4% for Black, and 97.1% for Asian students, with Black students being slightly more likely to attend a school that didn't offer music electives. Below, we report analyses including all students, but we note the rare cases where results changed slightly when analyses were re-run on just students who attended a school where music was offered. Also note that our data come from administrative records, and so we were not able to collect information on whether students had out-of-school musical experiences, either concurrently or earlier.

Results

RQ1: What proportion of students in grades 6-8 enroll in music classes, and what type of music classes are they taking (i.e., band, chorus, guitar, orchestra, other)?

Table 1 shows overall music enrollment rates for each type of music elective for 6th, 7th, 8th grade, and ever across all of middle school. Out of the 31,332 students in the sample, 22% ever enrolled in a middle school music class. Student participation was lowest in 8th grade at 12%, 6th grade had slightly more participation with 14% enrollment, and 7th grade had the greatest participation in music classes at 15%. Across all years, band had the highest enrollment, followed by choir, guitar, and orchestra. This pattern persisted except in 8th grade where more students enrolled in orchestra than guitar. Only 3% of students enrolled in more than one music class, and this was most common in 8th grade, followed by 7th then 6th grade. Only 4% of students enrolled in the rare courses of keyboard, general music, music theory, or jazz ensemble. Enrollment in these classes was highest for 7th grade, followed by 8th then 6th grade.

RQ2: What are the pre-existing demographic and child-level differences between students who do and do not select into music electives in middle school?

First, we examined variables individually using univariate analyses. Chi-square analyses were used for categorical variables and t-tests for continuous variables. We then performed a series of developmentally informative, hierarchical, multivariate logistic regression analyses

including all examined variables in blocks as predictors of participation in *any* type of music class in middle school. This process was then repeated separately for the four largest types of music class - band, choir, guitar, and orchestra.

Any Music

Table 2 shows how enrollment in any music class in middle school varied by each of our demographic and prior child competence variables. Males were slightly more likely to enroll in music during middle school compared to females, $\chi^2(1) = 5.309$, $p < 0.021$. There were notable ethnic differences in enrollment in music overall, $\chi^2(1) = 90.880$, $p < 0.001$. Asian/Pacific Islander students were most likely to take a music class, followed by White students and then Latino students, with Black students being the least likely to take music classes in middle school. Students who received FRL were less likely to enroll in music classes overall compared to students not in poverty, $\chi^2(1) = 15.281$, $p < 0.001$, and students with disabilities were half as likely to enroll in a music class than typically developing students, $\chi^2(1) = 269.891$, $p < 0.001$. ELL students were slightly more likely to enroll in a music class than non-ELL students, $\chi^2(1) = 21.229$, $p < 001$, and students not fully English proficient in 5th grade were less than half as likely to take music, $\chi^2(1) = 132.42$, $p < 0.001$. Finally, as seen in the bottom of Table 2, students who went on to select music elective courses in middle school performed better on every measure of prior academic performance in 5th grade (GPA, math, reading) and entered kindergarten 7 years earlier with stronger cognitive, language, motor, social, and behavioral skills than those who did not take music electives in middle school.

The above analyses were unadjusted bivariate associations. Here we report how the demographic, school readiness, and prior academic performance variables all combine to predict music course enrollment using logistic regression analyses that control for the inter-correlations between the predictor variables. Step 1 included the demographic variables (ethnicity, gender,

FRL, disability status, ELL status, English proficiency) and school readiness skills at age four. In

Step 2, prior academic achievement (5th grade GPA, 5th grade standardized test scores) was

included. Model 2 shows the relationship between music enrollment and 5th grade achievement

controlling for demographic and school readiness variables. Model 2 also shows whether the

demographic and school readiness variables at age four remain associated with music enrollment

in middle school after considering 5th grade achievement. Thus, if an association established in

Step 1 ceases to be significant in Step 2, the association is better explained by academic

competence than demographics. Note that we did not include math scores in Block 2 because

they were too highly correlated with reading (*r* = .88) to avoid multicollinearity.

Step 1. Table 3 shows the results of the logistic regression predicting selection into any

music classes in middle school. Odds ratios (*OR*) are provided which indicate the extent to which

the odds of taking a music elective course in middle school increase (greater than '1') or

decrease (less than '1') as a function of being one level of the variable (i.e., male) compared to

the other (female). For continuous predictors, the *OR* indicates how much the odds of music

selection increase/decrease with a 1-point increase in the predictor (i.e., moving from the 39th to

the 40th percentile in cognitive skills).

In Step 1, ethnicity, gender, poverty, disability, English Proficiency and cognitive skills

were unique predictors of music participation in middle school. Ethnicity, gender, disability,

English proficiency, and cognitive skills remained unique predictors after including academic

performance, but poverty ceased to be a unique predictor. Black students had 28% fewer odds

than White students and 20% fewer odds than Hispanic students of taking a music class in

middle school. Males had 20% greater odds of taking music than females. Students with a

disability had 37% fewer odds of enrolling in a music class than students without a disability.

Students who were proficient in English in 5th grade had almost 3 times greater odds of enrolling

in a music class than those who were not. Cognitive skills at age four were positively associated with later enrollment in a middle school music course. For every 1-point increase in cognitive skills at age four, the odds of music enrollment increased by .005%. Thus, a 50-point increase in cognitive skills at age four results in 25% (e.g., moving from the 25th to the 75th percentile - .005 x 50) greater odds that the child will enroll in music in middle school. Recall that these are adjusted effects after controlling for other variables in the model. Thus, for example, even controlling for poverty status and school readiness, Black students were still less likely to take a music class in middle school than other groups.

Step 2. Step 2 included students' prior academic competence variables (5th grade GPA and reading scores). Prior achievement was significantly positively associated with later middle school music electives (controlling for demographic and school readiness skills). For every 1-point increase in prior GPA (moving from a 'B' to an 'A'), the odds of music enrollment increased by 25%. For every 1-point increase in 5th grade reading, the odds of later enrolling in a music class increased by .004%. Thus, a 50-point increase in 5th grade reading results in 20% (.004 x 50) greater odds that the child would later enroll in music in middle school.

It is important to note that once children's 5th grade achievement is taken into account, the demographic and school readiness effects (reported in Step 1 above) remained significant predictors except for poverty and ELL status. Once prior child performance in school was entered, there were no differences in the odds of taking a music class as a function for FRL, suggesting that the reason why poverty was associated with music selection before is because poverty leads to poorer academic performance in school, and it is school performance that is a more important predictor of music selection than poverty (within this mostly low-income sample). Also notable is that Black students were *still* less likely to take music classes compared to Latino and White students even after poverty and school performance were factored in,

however effect sizes reduced somewhat in magnitude after school performance was added. This means that *part* of the reason why Black students are less likely to take music is that they are not doing as well in school as other students. But it also means that the disparity in access to music in middle school for Black students is still true even for non-poor students and students doing well in school.

The analyses above included all children in the sample, however, as mentioned in the Method section, a very small group (5%) of students attended a school that appeared to not offer music electives. To see whether that contributed to our findings, we re-ran the logistic regression limiting the sample to only those students who attended schools that clearly offered music options. Results were practically identical in almost all cases, with parameter estimates typically changing by only .02 points. However, when limiting the analyses to only children attending schools that offered music (and sample size reduced by 418 students), the formerly statistically significant effect of Black students being less likely to take music (compared to White and Hispanic students) reduced to marginal/non significance. Additional exploration revealed that this change was mostly due to the race/ethnicity difference found in specifically guitar enrollment (see below) disappeared when analyses were limited to students who had the option of talking music (no changes were observed for the other forms of music). This suggests that Black students are more likely to attend schools where music is not offered, and that some (but not all) of the race/ethnicity effects involving Black students having less music participation can be explained by Black students being more likely to attend a school that does not offer music.

RQ 3: To what extent are selection factors different for different types of music courses?

Univariate Analyses

Here we will describe the unadjusted bivariate associations found for each type of music elective. Appendix/Online Supplementary Tables 2, 4, 6, and 8 show how enrollment in band,

chorus, guitar, and orchestra in middle school varied across the demographic and child competence variables. Overall, 12% of the sample enrolled in band, 4% enrolled in chorus, 3% enrolled in guitar, and 2% enrolled in orchestra at least once in middle school.

Gender. Similar to overall music discussed above, males were more likely to enroll in band, $\chi^2(1) = 136.021$, $p < .001$ and nearly twice as likely to enroll in guitar, $\chi2(1) = 46.685$, $p < .001$ than females. Gender was oppositely related to chorus enrollment - females were three times as likely to enroll in choir than males, $\chi^2(1) = 371.692$, $p < .001$. There was no gender difference for orchestra, $\chi^2(1) = 3.689$, $p = .06$.

Ethnicity. There was no association between race/ethnicity and band, $\chi^2(3) = 1.782$, $p = .619$, or chorus enrollment, $\chi^2(3) = 4.966$, $p = .17$. However, we did find associations between ethnicity and guitar, $\chi2(3) = 101.567$, $p < .001$. and orchestra enrollment, $\chi^2(3) = 182.642$, $p < .001$. White/Other, Hispanic, and Asian/Pacific Islander students were more likely to take guitar than Black students. The same ethnic difference seen in guitar favoring White and Latino students over Black students was also found for orchestra. However, for orchestra, we saw that Asian/Pacific Islanders were much more likely to enroll than all other groups.

Poverty status. We found that the lower likelihood of music enrollment among students who receive FRL was driven mostly by guitar and orchestra. Students in poverty in 6th grade were less likely to take guitar than students who were not, $\chi2(1) = 15.527$, $p < .001$ and more than half as likely to take orchestra than students not in poverty, $\chi^2(1) = 157.385$, $p < .001$. There was no difference between students who received FRL and students who did not for chorus, $\chi^2(1) = .747$, $p = .387$. Students who received FRL were actually slightly *more* likely to enroll in band than students who did not, $\chi^2(1) = 9.873$, $p < .01$. This suggests that poverty is not as large a barrier for involvement in band as it is for orchestra and guitar.

Disability Status. As was the case for overall music enrollment, students who received special education services were half as likely to enroll in band, $\chi^2(1) = 111.714$, $p < .001$, chorus, $\chi^2(1) = 51.279$, $p < .001$, and guitar, $\chi2(1) = 52.256$, $p < .001$ compared to typically developing students. There was an even greater difference in enrollment related to disability status for orchestra. Students with a disability were nearly 3 times less likely to enroll in orchestra than students without a disability, $\chi^2(1) = 42.634$, $p < .001$.

ELL status. The greater likelihood of English language learners enrolling in music overall was largely driven by guitar, $\chi2(1) = 68.620$, $p < .001$, and orchestra, $\chi^2(1) = 14.452$, $p < .001$. Impressively, ELL students were nearly twice as likely to enroll in guitar than non-ELL students. Unlike guitar and orchestra, ELL students were slightly less likely to enroll in choir than non-ELL students, $\chi^2(1) = 12.462$, $p < .001$. We did not find a relationship between ELL status and band enrollment, $\chi^2(1) = .000$, $p = .995$.

English Proficiency. Students who were proficient in English by 5th grade were more likely to enroll in band, $\chi^2(1) = 54.042$, $p < .001$, chorus, $\chi^2(1) = 31.196$, $p < .001$, guitar, $\chi2(1) = 14.386$, $p < .001$, and orchestra, $\chi^2(1) = 16.059$, $p < .001$ compared to students not English proficient by 5th grade. Notably, students proficient in English were twice as likely to enroll in band and twice as likely to enroll in orchestra than students not proficient in English.

School Readiness at Age 4. Similar to overall music enrollment, students who later enrolled in band, $t(17,432.01) = -2.72$, $p < 0.01$ and guitar, $t(17,432.01) = -4.16$, $p < 0.001$ had higher *gross motor skills* at age 4 compared to students who did not choose to enroll in band or guitar in middle school. We did not find differences in gross motor skills between students who enrolled in chorus, $t(809.08) = -1.15$, $p = 0.25$ or orchestra, $t(431.02) = 1.62$, $p = 0.11$. Students enrolled in band, chorus, guitar, and orchestra on average had higher age-4 *fine motor skills* (band, $t(19,809.01) = -2.58$, $p < 0.01$, chorus, t(937.42) = -5.52, $p < 0.001$, guitar, $t(19,809.01) =$

-3.49, $p < 0.001$, orchestra, $t(19,809.01) = -5.51$, $p < 0.001$) compared to students who did not

enroll in middles school. The same was true for *cognitive skills* in pre-K (band, $t(3,583.01) = -$

4.95, $p < 0.001$, chorus, $t(934.18) = -6.00$, $p < 0.001$, guitar, $t(19,793.01) = -5.97$, $p < 0.001$,

orchestra, $t(491.15) = -7.04$, $p < 0.001$), and early *language skills* (band, $t(3,557.66) = -2.96$, $p <$

0.01, chorus, $t(19,705.01) = -6.23$, $p < 0.001$, guitar, $t(19,705.01) = -3.69$, $p < 0.001$, orchestra,

$t(491.29) = -6.46$, $p < 0.001$).

Similar to overall music enrollment, students enrolled in chorus, $t(25,984.00) = -5.44$, $p <$

0.001, guitar, $t(25,984) = 1.751$, $p < 0.05$, and orchestra, $t(622.35) = -4.03$, $p < 0.001$ had higher

early social skills compared to students not enrolled in chorus, guitar, or orchestra, respectively.

There was no relationship between social skills and band enrollment, $t(4,332.39) = -1.07$, $p =$

0.28. The finding that middle school (overall) music students had fewer behavioral concerns was

driven by chorus and orchestra. On average, students who enrolled in chorus, $t(25,984.00) =$

4.54, $p < 0.001$ and orchestra, $t(623.48) = 6.63$, $p < 0.001$ had fewer behavioral concerns at age

4 compared to students not enrolled, respectively. No relations were found between behavior

concerns at age 4 and middle school band, $t(25,984.01) = 0.56$, $p = 0.58$ or guitar, $t(25,984) =$

1.75, $p = .08$ enrollment.

5th grade academic competence. Students enrolled in band, chorus, guitar, and orchestra,

in all cases, had higher 5th grade academic performance regardless of the performance indicater.

Music students had higher 5th grade *GPA* (band, $t(28,952.01) = -4.07$, $p < 0.001$, chorus,

$t(28,952.00) = -8.31$, $p < 0.001$, guitar, $t(28,952.01) = -10.84$, $p < 0.001$, orchestra $t(28,952.01)$

$= -14.08$, $p < 0.001$), *math test scores* (band, $t(4,876.26) = -15.30$, $p < 0.001$, chorus, $t(1,317.85)$

$= -7.38$, $p < 0.001$, guitar, $t(28,571.01) = -17.17$, $p < 0.001$, orchestra, $t(702.97) = -12.84$, $p <$

0.001), and *reading test scores* (band, $t(4,871.73) = -15.59$, $p < 0.001$, chorus, $t(1,316.19) = -$

9.98, $p < 0.001$, guitar, $t(28,614.01) = -17.84$, $p < 0.001$, orchestra, $t(702.31) = -13.91$, $p <$ 0.001) compared to students not enrolled in those music types, respectively.

Multivariate Analyses

Above we described the unadjusted bivariate associations found for each type of music elective. We now describe the multivariate results for each type of music elective, and discuss how the findings relate to the pattern reported for overall music enrollment. Appendix/Online Supplementary Tables 3, 5, 7, and 9 show the results of the multivariate logistic regression models for band, chorus, guitar, and orchestra respectively. We only discuss the results of Step 2 (when all predictors were entered), but report the few cases where an effect of a demographic variable changed from Step 1 to Step 2 when elementary school competence was added.

Demographics

Race/Ethnicity. The decrease in odds for Black compared to White student enrollment found for overall music enrollment above appears to be driven specifically by guitar and orchestra. Black students had 37% fewer odds of enrolling in guitar, and 52% fewer odds of enrolling in orchestra compared to White students. Similarly, the decrease in Black student enrollment compared to Hispanic students found for overall music enrollment was also driven by guitar and orchestra. Black students have 40% fewer odds of enrolling in guitar and 40% fewer odds of enrolling in orchestra compared to Hispanic students. It is worth noting that Black student under-representation specifically in guitar classes reduced to marginal statistical significance when we re-ran the analyses limiting the sample to just those who were at schools known to offer music, which suggests that when given the opportunity Black students sign up for guitar just as much as other groups. Black student under-representation in orchestra, however, was always present regardless of alternative model specification. There were no significant race/ethnic differences found for band or chorus participation. A new and strong race/ethnicity

effect was found for orchestra – Asian students had almost 3 times the odds of enrolling in orchestra compared to White students.

Gender. The increased odds of enrollment in music classes overall found for males compared to females was largely driven by band and guitar. Males had 74% greater odds of band enrollment and 71% greater odds of guitar enrollment compared to females. However, the gender effect was reversed for choir enrollment. Males had 66% fewer odds of enrolling in choir compared to females. No significant gender difference was found for orchestra enrollment.

Poverty status. The effect of free/reduced lunch status changed markedly depending on the form of music examined, and in some cases whether 5th grade academic competence was controlled for or not. For *band*, receiving free/reduced lunch status was actually positively associated with enrollment – those in poverty had 74% greater odds of taking band than those not in poverty. For *chorus*, although students in poverty initially had 23% less odds of enrolling, when 5th grade academic performance was included, the poverty effect disappeared, meaning that school performance is more important than poverty status in predicting choir enrollment. A similar pattern was found for *guitar* – those in poverty were less likely to enroll in guitar but after prior elementary school performance was added to the model, the effect was no longer significant. The largest effect of income was found for *orchestra*. Controlling for all other variables, those receiving free/reduced lunch at school were almost half as likely to be in orchestra compared to those not technically in poverty.

Disability status. The decrease in odds of overall music enrollment for students in special education observed above was driven by guitar and band. Students with disabilities had 32% fewer odds of enrolling in band and 45% fewer odds of enrolling in guitar. No differences in enrollment in chorus or orchestra were observed for students with and without disabilities, after controlling for all other variables including academic performance.

ELL status and English proficiency. Although no relationship between *ELL status* and overall music enrollment was observed, ELL status was significant for both chorus and guitar enrollment. ELL students had 22% *fewer* odds of being in chorus but 31% *greater* odds of being in guitar, compared to native speakers of English. ELL status was unrelated to band or orchestra enrollment. Recall that *English proficiency* was related to greater odds of overall music enrollment as reported above. We find that this was driven mostly by band and chorus. English proficiency was related to double the odds of band enrollment, and 3.5 time greater odds of chorus enrollment. English proficiency was unrelated to both guitar and orchestra enrollment..

School Readiness. For *band*, the only school readiness indicator related to enrollment after all other variables were included was cognitive skills at age four – for each one percentile point increase in cognitive skills, the odds of being in band seven years later increased by .002. For *chorus*, none of the age-four readiness scores were significantly related to enrollment in the final model. For *guitar*, gross motor skills were related to enrollment – those with greater gross motor skills at age four were more likely to enroll in guitar.in middle school, controlling for other factors. Similarly cognitive skills at school entry were positively related to taking guitar in middle school. Interestingly, behavior problems at age 4 was associated with increased chances of being a guitar student later in middle school. For *orchestra*, gross motor skills and social skills were negatively related to later enrollment – so those with poorer social skills and weaker gross motor skills at school entry were actually more likely to sign up for orchestra later in middle school, all things considered. Finally, behavior problems at age four were negatively associated with taking orchestra later on.

Elementary school academic performance. As seen in the online supplementary Tables, math and reading test scores in 5th grade were consistently and strongly related to enrollment in all four types of music classes (band, chorus, guitar, and orchestra) in middle school. Those with

better GPAs in 5th grade were also more likely to sign up particularly for orchestra and guitar.
Teacher-assigned grades in 5th grade were unrelated to enrollment in chorus and band, however,
with all other predictor variables included.

Discussion

Previous research shows that musical experiences provide multiple benefits (Brown &
Sax, 2013; Moreno et al., 2011; Schellenberg, 2006; Williams et al. 2014; Winsler, Ducenne, &
Koury, 2011). Arts engagement is related to improved academic performance and socio-
emotional skills and appears especially helpful for children in poverty and English Language
Learners (ELLs) (Catterall et al., 2012; Eisner, 1998). Yet schools in low-income communities
are less likely to provide music electives than schools in richer communities (Parsad, Spiegelman
& Coopersmith, 2012). The research on the effects of music participation is seriously limited,
however, because it tends to be quasi-experimental and correlational in nature rather than
experimental, and often there is not sufficient control over selection effects – the ways that
students who do and do not go into music are initially different.

This study revealed many pre-existing differences or selection effects that are present
between students who are and are not involved in in-school middle school music elective courses
in an ethnically diverse, large ($n = 31,332$) sample of children largely in poverty in Miami.
Identifying pre-existing differences between music students and those who do not take music is
important in order to understand the effects music classes may have on students (Schellenberg,
2006). Quasi-experimental research comparing existing music exposure groups must carefully
control for selection effects when attempting to make causal inferences that music has positive
'effects' on children. The first step, however, is to identify the many selection effects present.
Previous research shows that children who receive musical experiences *outside* of school have
parents with higher IQ, more education, more money, and more time to spend with their children

(Foster & Jenkins, 2017). Here we examined many different selection effects associated with *in-school* music elective courses in public middle schools.

In our sample of ethnically and linguistically diverse students mostly in poverty, almost a quarter (22%) enrolled in music-related elective courses in 6th-8th grade in middle school. This is less music participation than average for the Southern United States region, which is 39% (Bell, 2014). This discrepancy is likely due to the low-income and urban nature of our sample, compared to the regional sample that includes students from all backgrounds. In order to provide students in poverty greater access to musical experiences, school systems need to focus resources on music programs and educators must develop methods that target low SES-children and encourage their participation in musical experiences. Perhaps students in poverty are not socially encouraged to take music electives because music may not be seen as a "lucrative" skill or activity. Similar to other communities in the United States, practically all of the Miami schools studied here offered music classes in 6th through 8th grade.

Importantly, we find that students who enroll in elective music classes in middle school are broadly and academically more competent than students who do not enroll in music classes as early as 7 years before they reach middle school. At age 4, students who later chose to take a music elective in middle school typically had greater motor, cognitive, language, social, and behavioral skills than students who did not take a music elective in middle school. Previous studies have shown that people who take band in middle school do better in school academically (Kinney, 2008), but we found that it is the students who are *already* doing better academically in elementary school who are later choosing to take music in middle school. Indeed, the strongest predictors of taking music classes in middle school in our study were the prior academic performance measures. It is possible that children with greater natural abilities self-select into music classes where they can be challenged and their potential fostered (Elpus, 2013; Foster &

Jenkins, 2017). Previous studies have sometimes reported that after controlling for systematic differences between music students and non-music students, there are no associations left between music participation and improved cognitive outcomes (Elpus, 2013). Clearly, researchers trying to conclude that musical experience in middle school promotes later school outcomes need to understand and control for these pre-existing selection differences between students who do and do not get exposure to middle school musical experiences. Another real possibility is that students with lower GPAs and/or those who score lower on standardized math and reading tests are made to take remedial classes and these may take the place of elective courses such as music.

It was notable that Black students in our sample had the lowest participation rate in music overall and across all music electives. After controlling for other variables including poverty status and prior academic performance, Black students were still less likely than White and Hispanic students to take music electives, both overall, and in the specific areas of guitar and orchestra. However, when our analyses were limited to the 95% of students who were known to attend a middle school that offered music electives, the finding of Black student under-representation in overall music and guitar reduced to marginal statistical significance. This suggests that some of the race/ethnicity effects involving Black students having less music participation can be partially explained by Black students being more likely to attend a school that does not offer music. However, even when available, Black students are less likely to enroll in orchestra compared to other racial/ethnic groups. Other research examining ethnic differences in middle school arts participation more broadly, including music, visual art, drama and dance similarly finds that Black students not only attend schools with fewer arts opportunities but that even when available, they are less likely to select into arts opportunities (Winsler, Gara, Alegrado, Castro & Tavassolie, 2019). Researchers need to investigate further why, even when

given the opportunity, Black students are not choosing to enroll in school music and the arts compared to other groups.

Another robust ethnicity effect was observed for orchestra. Asian students were considerably more likely to take orchestra compared to other groups. The greater likelihood of orchestra enrollment among Asian/Pacific Islander students could be due to cultural values of discipline and sustained work within a focused domain. Concentration and commitment required to master a musical instrument are strongly valued in East Asian cultures (Morris & Leung, 2010; Yang, 2007). Additionally, artistic disciplines are used to support character formation within many Asian cultures (Lowry & Wolf, 1988). These values appear to be influential for immigrant students whose parents may encourage music enrollment to support exposure to mainstream cultural experiences (Yang, 2007).

Gender differences were also found but they varied considerably by music type. Overall, males were slightly more likely to enroll in music electives. This was driven by band and guitar, however, where males were indeed more likely to be enrolled than females. Females, however, were more likely to enroll in chorus, while there was no gender difference for orchestra. With no bias for male or female enrollment, orchestra appears to be the most gender-neutral music elective. Unlike chorus, there is no social stigma against male participation in orchestra nor is there widely accepted social support for female participation (Bennetts, 2013; Warnock, 2009) Regardless of gender, students appear to find a sense of belonging in orchestra.

Poverty effects were still often present for access to music courses even though our sample was predominantly low-income with 81% qualifying for free or reduced lunch. The effect poverty status on music enrollment, however, differed by music type. Overall, students who qualified for FRL were less likely to take a music elective, specifically chorus, guitar, and orchestra, at least in bivariate relations. However, those in poverty were actually slightly more

likely to enroll in band compared to students above the poverty threshold. Those in poverty were always less likely to be in orchestra. Poverty thresholds do not appear to keep students from participating in band as they do for orchestra where buying and renting instruments is more expensive. Schools may also give band more financial support (i.e., subsidized rental rates for instruments) than other music classes which helps support student participation for low-income families (Albert, 2006; Kinney, 2008). Other research clearly shows that SES is positively related to childhood musical experiences (Elpus, 2013; Foster & Jenkins, 2017), but such research typically includes the full spectrum of SES including much more wealthy participants, and has examined other musical experiences that happen outside of school. With our mostly low-income sample attending high-poverty, urban public schools in Miami, the negative effects of crossing federal poverty thresholds on public school music participation are reduced.

We were the first to our knowledge to examine disability status as a predictor of music participation in school. Importantly, students with disabilities were consistently less likely to take a music elective than typically developing students overall and for each type of music class. After including covariates, differences in enrollment for students with and without disabilities did, however, go away for chorus and orchestra which suggests that these two forms of music participation do not show access issues for children with disabilities. Disability status was still related to lower enrollment in band and guitar, however. Students with disabilities can benefit greatly from taking music classes in school, especially those in poverty (Nagel & Silverman, 2017). Perhaps additional training and support for band and guitar educators on best practices for recruiting and maintaining musical engagement with students with disabilities is needed.

Finally, we found relationships for ELL status and English proficiency for music enrollment in middle school. Overall, kindergarten ELL status was positively related to music enrollment, with ELL students being more likely to participate (especially true for guitar),

compared to non-ELLs, but music participation was also strongly related to English proficiency in 5th grade. Those who were proficient in English (including native speakers and former ELLs) were more likely to take music in all of its forms. ELLs who were still working on their English proficiency were unlikely to be in music classes. A different pattern was observed for chorus, however - ELL students were less likely to select into the choral arts. Sufficient proficiency in English and having English as one's native language appears to be important for middle school student choices to participate in choirs, where singing (mostly in English) is key.

It is worth noting that our longitudinal design and data analysis strategy involving the introduction of various predictors at several steps allowed us to observe not only unadjusted selection factors in a univariate fashion which is common in other studies, but also whether such demographic differences disappeared and were better explained by other variables like school readiness or elementary school achievement when included in the model. Several selection effects changed when other variables were included in the models which highlights the importance of controlling numerous selection variables to explore what goes on beneath the bivariate correlational surface. For example, although higher performance on each of the school readiness measures was bivariately linked to overall music participation, when demographic variables such as gender and poverty were included, only cognitive and fine motor skills remained significantly related to later music enrollment. Similarly, after controlling for prior academic performance, poverty and ELL status (and for orchestra and choir, special education status) were no longer related to taking music overall, suggesting it is sometimes how well students are doing in school that is more important for predicting music course enrollment.

Conclusions / Implications

We carefully examined important pre-existing selection factors that differentiate those that do and do not take elective music classes in middle school in the unique ethnically diverse

community of Miami, Florida. We found many large differences between students that do and do not get exposure to music in middle school. Students who take music in 6th through 8th grade were more advantaged in terms of poverty and disability status, had stronger skills in a variety of different areas seven years earlier, and were already doing much better in school before they got to middle school and had a chance to sign up for music electives. Understanding such selection effects is critical for scholarship exploring whether music has ancillary positive effects on other domains of child development and academic performance with quasi-experimental designs.

Our work contributes to the literature in many ways. Our long-term, prospective, longitudinal design and very large sample is an improvement compared to much of the existing research. We used official school record data to determine exposure to in-school musical courses rather than relying on student or parent retrospective reports of musical participation in general. In addition to commonly observed background variables (SES, gender, and ethnicity), we identified many other selection factors importantly related to middle school music selection, including disability status, ELL status, English proficiency, initial school readiness at kindergarten entry, and prior academic performance in the form of GPA and math and reading test scores. Our large sample uniquely included students from diverse ethnic and linguistic backgrounds, including many Latino students, an understudied group. However, our unique context of Miami Florida, where Latino students are the majority and White students are a relatively small minority, and our predominantly economically disadvantaged sample raises challenges for generalizing to other communities. This should be kept in mind when interpreting and applying the results of the present study. Finally, rather than only examining a multi-music aggregate as is commonly done, we were able to identify selection factors that are specific to band, orchestra, choir, and guitar participation in middle school.

The present study has implications for educational practice and music education. We found that only a small portion of students choose to take a music elective in middle school, and students of color and students with disabilities and those not doing as well in school had less representation in music electives. These students are not getting that same exposure to music in public middle schools as other groups which unfairly denies them potential positive effects of art involvement (NEA, 2013). Efforts to increase music program funding and offerings in middle schools, and increase student participation, especially in the groups found to be under-represented here, are recommended. Given that unique background differences related to participation in different types of music classes (e.g., band vs. choir), music educators in this community and others can use this information in their student recruitment efforts. While poverty may prevent students from taking instrumental music classes like guitar and orchestra, it does not appear to keep students from participating in band or chorus. It is possible that band and chorus classes provide students with additional support that encourages participation among students in poverty and if so, such methods might be used for these other music forms as well.

In terms of implications for research, our results show that researchers interested in the 'effects' of music participation on children need to understand that there are large pre-existing selection factors, present years before the participation occurs, and appropriately control for this in their studies. Importantly, students who enroll in music classes in middle school are already performing better academically than their non-music classmates way before reaching middle school, so one can't conclude any causal effects of music in a correlational study that observes higher academic performance among music students. Armed with the new knowledge about these important selection effects and how they differ by specific types of music, the next step for researchers is to carefully control for these selection factors while examining later academic outcomes for students in middle school music classes.

References

Abella, J., Urrita, J., & Schneiderman, A. (2005). An examination of the validity of English

    language achievement test scores in an English language learner population. *Bilingual*

    Research Journal, 29, 127–144. doi: 10.1080/15235882.2005.10162827

Abril, C., & Gault, B. (2006), The state of music in the elementary school: The principal's

    perspective. *Journal of Research in Music Education*, 54, 6-20. doi:

    10.1177/002242940605400102

Albert, D. (2006). Socioeconomic status and instrumental music: What does the research say

    about the relationship and its implications? *Journal of Research in Music Education* , 25,

    39-45. doi: 10.1177/87551233060250010105

Bell, A. (May, 2014). *Arts education in the south phase I: Public school data and principals'*

    perspective. Summary Report. South Arts, Inc.: Atlanta, Georgia. Retrieved from:

    http://programs.ccsso.org/link/aep/SouthArtsReport2014ALFLGAKYLAMSNCSCTN.p

Bennetts, K. (2013). Boys' music? School context and middle-school boys' musical choices.

    Music Education Research, 15, 214-230. doi: 10.1080/14613808.2012.759550

Bialystok, E., & DePape, A.-M. (2009). Musical expertise, bilingualism, and executive

    functioning. *Journal of Experimental Psychology*, 35, 565-574. doi:10.1037/a0012735

Brown, E. D., & Sax, K. L. (2013). Arts enrichment and preschool emotions for low-income

    children at risk. *Early Childhood Research Quarterly*, *28*, 337–346.

Catterall, J.S. (1998). Involvement in the arts and success in secondary school. *Americans for the*

    Arts Monographs, 1(9), 1-10.

Catterall, J.S., Dumais, S.A., & Hampden-Thompson, G. (2012). *The arts and achievement in at-*

    risk youth: Findings from four longitudinal studies. National Endowment for the Arts.

    Washington, DC. Retrieved from: http://arts.gov/sites/default/files/Arts-At-Risk-Youth.pdf

Corrigall, K., Schellenberg, G., & Misura, N. (2013) Music training, cognition, and personality.

    Frontiers in Psychology, 4(222). doi:10.3389/fpsyg.2013.00222

Crane, J., Mincic, M., & Winsler, A. (2011). Parent-teacher agreement and reliability on the

    Devereux Early Childhood Assessment (DECA) in English and Spanish for ethnically

    diverse children in poverty. *Early Education and Development*, 22, 520-547. doi:

    10.1080/10409289.2011.565722

Dos Santos-Luiz, C., Monico, L., Almeida, L., & Coimbra, D. (2016). Exploring the long-term

    associations between adolescents' music training and academic achievement. Musicae

    Scientiae 20(4), 512-527. doi: 10.1177/1029864915623613

Eisner, E. W. (2002). The arts and the creation of mind. New Haven, CT: Yale University Press.

Elpus, K. (2013). Is it the music of is it selection bias? A nationwide analysis of music and non-

    music student's SAT scores. Journal of Research in Music Education 61(2), 175-194. doi:

    10.1177/0022429413485601

Foran, L. M., (2009). Listening to music: Helping children regulate their emotions and improve

    learning in the classroom. *Educational Horizons*, 88(1), 51–58.

Foster, M., & Jenkins, J. (2017). Does participation in music and performing arts influence child

    development? *American Educational Research Journal 54,* 399-443. doi:

    10.3102/0002831217701830

Gardiner, M. F., Fox, A., Knowles, F., & Jeffrey, D. (1996). Learning improved by arts training.

    Nature, 381, 284. doi: 10.1038/381284a0

Gerry, D., Unrau, A., & Trainor, L. (2012). Active music classes in infancy enhance musical,

    communicative and social development. *Developmental Science, 15*, 398-407.

Human Resources Research Organization, & Harcourt Assessment. (2007). *Technical report for

    2006 FCAT test administrations: Reading and mathematics*. San Antonio, TX: Harcourt

Kinney, D. W. (2010). Selected nonmusic predictors of urban students' decisions to enroll and

persist in middle school band programs. *Journal of Research in Music Education*, *57*, 334–

350. doi: 10.1177/0022429409350086

Kinney, D. (2008). Selected demographic variables, school music participation, & achievement

test scores of urban middle school students. *Journal of Research in Music Education,* 56,

145-161. doi: 10.1177/0022429408322530

Holochwost, S. J., Propper, C. B., Wolf, D. P., Willoughby, M. T., Fisher, K. R., Kolacz, J., &

Jaffee, S. R. (2017). Music education, academic achievement, and executive functions.

Psychology of Aesthetics, Creativity, and the Arts, 11, 147-166. doi: 10.1037/aca0000112

LeBuffe, P., & Naglieri, J. A. (1999). The Devereux Early Childhood Assessment. Lewisville, C:

Kaplan.

Lowry, K., & Wolf, C. (1988). Arts education in the People's Republic of China: Results of

interviews with Chinese musicians and visual artists. Journal of Aesthetic Education, 22(1),

89–98. https://doi.org/10.2307/3332967

McNeal, R.B. Jr. (1998). High school extracurricular activities: Closed structures and stratifying

patterns of participation. *The Journal of Education Research, 93*, 183-191. doi:

10.1080/00220679809597539

Miksza, P. (2010). Investigating relationships between participation in high school music

ensembles and extra-musical outcomes: An analysis of the education longitudinal study of

2002 using a bioecological development model. *Bulletin of the Council for Research in

Music Education, 186(FALL 2010),* 7-25.

Moreno, S., Bialystok, E., Barac, R., Schellenberg, E.G., Cepeda, N.J., & Chau, T. (2011). Short-

term music training enhances verbal intelligence and executive function. *Psychological

Science, 22*, 1425-1433. doi: 10.1177/0956797611416999

Morrissey, T., Hutchison, L., & Winsler, A. (2014). Family poverty, school attendance, and

academic achievement in early elementary school. *Developmental Psychology, 50*, 741-753.

doi:10.1037/a0033848

National Endowment for the Arts. (2013). How a nation engages with art: Highlights from the

2012 survey of public participation in the arts. Research Report #57. Washington, DC:

Author.

Nehring, A. D., Nehring, E. F., Bruni, J. R., & Randolph, P. L. (1992). Learning

Accomplishment Profile Diagnostic (LAPD). Lewisville, NC: Kaplan Press.

Pallesen, K. J. Brattico, E., Bailey, C. J., Korvenoja, A., Koivisto, J., Gjedde, A., & Carlson, S.

(2010). Cognitive control in auditory working memory is enhanced in musicians. *PLoS

ONE*, *5*(6), 1–12. doi: 10.1371/journal.pone.0011120

Parsad, B., Spiegelman, M., & Coopersmith, J. (2012). *Arts education in public elementary and

secondary schools: 1999-2000 and 2009-10* (NCES 2012-014). National Center for

Education Statistics, Institute of Education Sciences U.S. Department of Education.

Washington. D.C.

Rosevear, J. C. (2010). Attributions for success: Exploring the potential impact on music

learning in high school. *Australian Journal of Music Education*, *1*, 17–24.

Schellenberg, G. (2006). Long-term positive associations between music lessons and IQ. *Journal

of Educational Psychology*, 98, 457-468. doi: 10.1037/0022-0663.98.2.457.

Southgate, D., & Roscigno, V. (2009). The impact of music on childhood and adolescent

achievement. *Social Science Quarterly, 90*, 4-21. doi: 10.1111/j.1540-6237.2009.00598.

Stoelinga, S. R., Joyce, K., & Silk, Y. (2013). Turnaround Arts Initiave: Progress Report 2013.

President's Committee on the Arts and the Humanities. Retrieved from:

http://www.pcah.gov/sites/default/files/Turnaround%20Arts%20Interim%20Evaluation_November%202013_1.pdf.

Warnock, E. (2009). Gender and attraction: Predicting middle school performance ensemble participation. *Contributions to Music Education,* 36(2), 59-78.

Williams, K., Barrett, M., Welch, G., Abad, V., & Broughton, M. (2014). Associations between early shared musical activities in the home and later child outcomes: Findings from the longitudinal study of Australian children. *Early Childhood Research Quarterly,* 88, 113-124. doi: 10.1016/j.ecresq.2015.01.004

Winsler, A., Ducenne, L., & Koury, A. (2011). Singing one's way to self-regulation: The role of early music and movement curricula and private speech. *Early Education & Development*, *22*(2), 274–304. doi:10.1080/10409280903585739

Winsler, A., Gara, T., Alegrado, A., Castro, S., & Tavassolie, T. (2019). Selection into, and academic benefits from, arts- related courses in middle school among low-income, ethnically diverse youth. Psychology of Aesthetics, Creativity, and the Arts. doi: 10.1037/aca0000222

Winsler, A., Tran, H., Hartman, S. C., Madigan, A. L., Manfra, L., & Bleiker, C. (2008). School readiness gains made by ethnically diverse children in poverty attending center-based childcare and public school pre-kindergarten programs. *Early Childhood Research Quarterly*, 23, 314–329. doi: 10.1016/j.ecresq.2008.02.003

Winsler, A., & Wallace, G. (2002). Behavior problems and social skills in preschool children: Parent-teacher agreement and relations with classroom observations. Early Education & Development, 13, 41-58. doi: 10.1207/s15566935eed1301_3

Yang, M. (2007). East meets West in the concert hall: Asians and classical music in the century

    of imperialism, post-colonialism, and multiculturalism. *Asian Music*, 38(1) 1-30. doi:

    10.1353/amu.2007.0025

Zuk, J., Benhamin, C., Kenyon, A., & Gaab, N. (2014). Behavioral and neural correlates of

    executive functioning in musicians and non-musicians. *PLoS ONE, 9*(6), e99868.

    doi:10.1371/journal.pone.0099868

Table 1

Proportion of Middle School Students Enrolled in a Music Class by Year and Type of Class

Year	Grade 6		Grade 7		Grade 8		Ever in Middle School	
Total	30,413		23,788		16,392		31,332	
Type of Music Class	*N*	**Percent**	*N*	**Percent**	*N*	**Percent**	*N*	**Percent**
Any Music Class	4,379	14.4%	3,613	15.2%	1,992	12.2%	7,040	22.5%
Band	2,415	7.9%	1,855	7.8%	1,008	6.1%	3,861	12.3%
Choir	682	2.2%	620	2.6%	342	2.1%	1,253	4.0%
Guitar	497	1.6%	480	2.0%	237	1.4%	968	3.1%
Orchestra	468	1.5%	369	1.6%	272	1.7%	687	2.2%
Keyboard	266	0.9%	225	0.9%	160	1.0%	594	1.9%
General Music	94	0.3%	150	0.6%	84	0.5%	327	1.0%
Music Theory	118	0.4%	96	0.4%	43	0.3%	249	0.8%
Jazz Ensemble	0	0.0%	4	0.001%	1	0.001%	5	0.001%
More than 1 Class	159	0.5%	184	0.8%	148	0.9%	464	3.0%

Table 2. Bivariate Correlates of *Any* Music Class Enrollment in Middle School

Variable	Enrolled	
	n	*%*
Total	7,025	22.5%
Gender*		
Male	3,724	23.1%
Female	3,301	22.0%
Ethnicity***		
White/Other	499	25.3%
Hispanic	4,404	23.9%
Black	2,058	19.6%
Asian/Pacific Islander	62	30.2%
Poverty Status***		
No free/reduced lunch	1,726	24.7%
Free/reduced lunch	5,493	22.3%
Disability Status***		
Non-Disabled	6,249	24.5%
Disability	678	13.8%
English Language Learner***		
Non-ELL	2,831	21.2%
ELL	4,208	23.4%
English Proficiency***		
English Proficient	6,669	23.6%
Not English Proficient	157	10.6%

	Enrolled			Not Enrolled			
	n	*M*	*SD*	*n*	*M*	*SD*	*d*
School readiness at age four							
Gross motor skills**	4,268	69.10	28.43	13,166	67.84	29.03	0.04
Fine motor skills***	4,852	59.32	27.76	14,959	55.75	29.17	0.13
Cognitive skills***	4,841	56.46	29.94	14,954	50.97	30.31	0.18
Language skills***	4,838	47.62	30.78	14,869	43.55	30.60	0.13
Social skills***	6,024	61.24	27.34	19,962	58.84	28.12	0.09
Behavioral concerns***	6,024	44.31	28.86	19,962	46.96	29.68	0.09
5th grade academic performance							
GPA***	6,750	4.19	0.52	22,204	4.06	0.59	0.25
FCAT math***	6,751	303.73	67.50	21,822	279.13	68.01	0.36
FCAT reading***	6,760	286.71	61.02	21,856	262.81	60.28	0.39

Note. *p<.05, **p<.01, ***p<.001.

Table 3. Logistic Regression Predicting *Any Music* Enrollment in Middle School

	Step 1		Step 2	
	Odds Ratio	*SE(B)*	Odds Ratio	*SE(B)*
Demographics				
Hispanic/White	.901	.086	.952	.087
Black/White	.722***	.088	.825*	.089
Asian/White	.942	.245	.928	.247
Black/Hispanic	.801***	.057	.866**	0.057
Male	1.199***	.041	1.257***	.042
Received free/reduced lunch	.852**	.054	.957	.055
Special Education	.633***	.077	.761***	.078
English Language Learner	1.065	.053	1.017	.053
English Proficiency	2.728***	.148	2.097***	.149
School Readiness at age 4				
LAP-D				
Gross motor skills	1.000	.001	1.000	.001
Fine motor skills	.998	.001	.998	.001
Cognitive skills	1.005***	.001	1.004***	.001
Language skills	1.000	.001	.999	.001
DECA				
Social Skills	1.000	.001	.999	.001
Behavioral concerns	1.000	.001	1.001	.001
Elementary academic performance				
GPA in 5th grade			1.249***	.045
Reading 5th grade			1.004***	.000

Note. *p<.05, **p<.01, ***p<.001. To analyze the fourth ethnicity contrast (Black/Hispanic) we ran a another regression model flipping the reference group from White to Black students.