



*International Journal of
Research in Education
and Science*

www.ijres.net

Participation in Extracurricular Activities and High School Academic Performance: Does Breadth and Type of Activity Matter?

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Article Info

Abstract

Article History

Received:
4 August 2025

Revised:
2 December 2025

Accepted:
10 January 2026

Published:
1 March 2026

The study examines relationships between participation in extra-curricular activities (ECAs) and educational outcomes among high school students in Chile. Our approach involves exploring the relationship of ECA participation, by type and breadth, to language and math test scores and school attendance. The data source is a unique linkage of an original student survey with student-level administrative data. In student-level multivariate analyses, we find that that ECA participation is associated with gains in student attendance, an essential pathway to academic success. We also find significant positive association with language scores, as well as some positive but less consistent association with math scores. We note larger gains in language and attendance among participants in arts as compared with sports, and that greater breadth of participation was associated with better attendance, but did not influence test scores. Our findings inform educators' efforts to maximize returns of extracurricular programs for student success.

Keywords

Extracurricular activities
Academic performance
School attendance
High school students
Chile

Citation: Sandoval, A., Muschkin, C. G., & Arrau-Garcia, M. (2026). Participation in extracurricular activities and high school academic performance: Does breadth and type of activity matter? *International Journal of Research in Education and Science (IJRES)*, 12 (2), 455-478. <https://doi.org/10.46328/ijres.5412>



ISSN: 2148-9955 / © International Journal of Research in Education and Science (IJRES).

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Introduction

Educators across time and place share the ultimate goal of helping students to achieve their highest academic potential. Strategies for improving thresholds and reducing gaps in achievement include increased opportunities for students to engage in school-based extra-curricular activities (ECAs). There is substantial research evidence that participation in activities, including sports and arts, is associated with numerous positive developmental outcomes. These outcomes include measures of academic achievement, with positive associations across diverse segments of the population (Eccles & Gootman, 2002). Some studies have found that the least advantaged students may obtain the largest gains in a variety of academic outcomes (Berger et al., 2020; Crosnoe et al., 2015; Dearing et al., 2024; Hynes & Sanders, 2011). The current study aims to contribute to the knowledge base regarding the influence that participation in ECAs may have on academic outcomes, with a focus on three important dimensions of this relationship. First, we evaluate potential variation in these relationships across students with different backgrounds and demographic characteristics. Second, we explore the extent to which the types of ECA participation (sports and arts) may be differently related to academic success. Finally, we examine variation in the influence of ECAs by breadth of participation (number of activities in which each student is involved).

Our approach involves exploring the relationship of ECA participation, by type and breadth, to test scores and school attendance. We employ a unique data source that the research team has compiled from an original student survey linked to student-level administrative data from the schools. Making full use of this rich data source in student-level multivariate analyses, we seek to better understand the “how and for whom” of positive contributions of ECAs to students’ academic success. The goal of this study is to provide information that educators may find useful in optimizing the returns of extracurricular programs for improved academic outcomes.

Background

In studies focusing on ECA participation among high school students in the United States, many researchers find that participation in these activities allows students to gain important skills as well as confidence in their own abilities, which may contribute to educational success (Mahoney et al., 2006; Stanton-Salazar, 2011). Additionally, research suggests that ECAs may provide additional intellectual growth and problem-solving opportunities that are complementary to those of the regular school curriculum (Covay & Carbonaro, 2010). Educational outcomes that are positively associated with ECA participation include those occurring within the high school period, such as test grades and school attendance, as well as long-term benefits such as higher education aspirations and attendance (Crosnoe et al., 2015; Morris, 2016; Videon, 2002).

In addition to evidence of ECA benefits among high school students in the United States, the value of high school ECAs has been explored internationally, among tenth graders in Spain (Merino et al., 2022); secondary school students in Azerbaijan (Abizada et al., 2020); year 9 students across England (Robinson, 2024); high school students in St. Petersburg, Russia (Kravchenko & Nygård, 2023); and in Quebec, Canada (Phillipe et al., 2023). These studies found that extracurricular participation among high school students was associated with learning

outcomes such as higher test scores and grades, positive peer interactions, and improved school attendance, school engagement, and levels of university aspirations. A recent study among high school students in Chile notes that participation in an arts workshop may contribute to improved grades in math and language, and to higher aspirations to pursue higher education (Egaña del Sol et al., 2019; Egaña del Sol, 2023).

Why is ECA Participation Supportive of Academic Achievement?

Over decades, researchers have examined the role of extra-curricular activity participation in shaping educational outcomes, employing a variety of perspectives to conceptually frame these relationships. Developmental theories have guided some research among high school students in the United States, finding that participation allows students to practice important cognitive and noncognitive skills, gain confidence in their academic abilities, nurture educational aspirations, and develop meaningful relationships with adults (Mahoney et al., 2006; Stanton-Salazar, 2011). Recent studies build upon the research evidence of benefits related to ECAs, by exploring specific mechanisms that link students' ECA participation experiences to a wider range of educational outcomes (Crosnoe et al., 2015; Farb & Matjasko, 2012; Morris, 2016). The current study contributes to advances in these newer areas of research on the relationship of ECAs to academic outcomes, with focus on three pathways of influence: resource compensation, school attachment, and the differential experiences associated with type of and breadth of ECA participation.

Resource Compensation

One hypothesis guiding research on ECAs posits that students whose family backgrounds are less advantaged have more to gain from school activities, even if they are less likely than their peers from more advantaged backgrounds to be involved in such activities (Broh, 2002; Farb & Matjasko, 2010; Vandell et al., 2005). While some of the ECA benefits may be attributed to selection of more advantaged youth into activities, less advantaged youth may have more to gain from them (Covay & Carbonaro, 2010). The research evidence suggests that the relationship between ECAs and academics may vary with aspects of a student's family background. Activity participation can mitigate inequalities by allowing students to marshal additional resources that contribute to educational success (Crosnoe et al., 2015; Morris, 2015, 2016). In the current study, we examine variation in the relationship of ECA participation to academic outcomes by student characteristics that may be indicative of disadvantage, including family poverty, immigrant status, and poor health.

Attachment to School

A second perspective advanced by researchers suggests that relationships between ECA participation and academics may be due in part to effects on a student's feelings of attachment to school (Morris, 2016). ECAs can influence school attachment by allowing high school students to develop a school-oriented identity, develop better interpersonal skills, and spend time with peers and adults with positive values and work orientation (Covay and Carbonaro 2010; Fredericks & Eccles, 2005; Knifsend & Graham, 2012; Osterman, 2000). These positive experiences are linked to improved academic achievement (Morris, 2016; Berger et al., 2020). In the current

study, we consider an outcome that is closely related to school attachment, by exploring the relationship of ECAs to consistent school attendance. This outcome has received less attention in the research on the benefits of ECA participation; however, there is consistent research evidence that school attachment promotes attendance, and that a high attendance rate is critical for multiple measures of academic achievement (Gottfried, 2015; London et al., 2016; Rory, 2004).

Dimensions of ECA Participation: Breadth and Type of Activity

Analyses of ECA participation have recently evolved to include measures of type and breadth of activities, as they relate to academic outcomes (Farb & Motjasko 2012). Many studies explore how types of ECA activity may differentially benefit students. Some studies use detailed measures of participation in specific activities (Broh, 2002; Covey & Carbonaro, 2010; Eccles & Barber, 1999; Knifsed & Graham, 2012), finding limited variation across individual extracurricular classes, clubs, and sports teams. Overall, the findings suggest that groups or categories of activities may be a more useful way evaluating outcomes related to this dimension of ECA participation (Egaña del Sol, 2023; Merino et al, 2022). Thus, in the current study we analyze the relationship of academic outcomes to two categories of ECA activities: sports-related (including all team and individual sports) and arts-related (including music, theater, dance, visual arts).

Another important dimension of ECA participation that influences the relationship with academic outcomes is its breadth (the number of activities in which a student is involved). The participation experience for a youth who is involved in several activities may influence educational outcomes differently from involvement in a single activity (Farb & Motjasko 2012). Some research evidence suggests that involvement in a moderate number of activities can improve engagement in academic pursuits, grades, and school attachment (Abizada et al., 2020; Fredricks & Eccles, 2010; Knifsed & Graham, 2012; Morris, 2012). In our study, we consider the full range of activity participation, measuring breadth as the total number of both sports and arts activities in which a student has engaged during their high school years.

The overview presented in this section provides the conceptual framework for our student-level analyses of the relationship between ECA participation and student grades and school attendance, for student from different family backgrounds. We position our study within the literature that examines multidimensional aspects of this relationship, according to type and breadth of ECAs. We aim to contribute to a deeper understanding of the potential gains that students may accrue from different school experiences outside of the regular curricula.

The Study Context

While we situate our study in the context of the extant international body of research on ECA participation benefits for students, our conceptual framework and analyses strategies are designed to specifically address these relationships among high school students in Santiago, Chile. The study is based on the student-level survey that we conducted in three large high schools located in low-income neighborhoods of the city. School attendance in Santiago is segregated by poverty levels, reflecting the strong element of school choice in the Chilean school

system. Since implementation of a national school voucher system in the 1980s, many schools contain either a large majority or a small minority of lower income students. Continued high levels of educational segregation are attributed to the uneven distribution of schools across neighborhoods, self-selection into schools, and differences in access to public transportation (Honey & Carrasco, 2023; Ortiz, 2018; Valenzuela et al., 2014). These factors can directly influence school attendance and access to extra-curricular activities and may indirectly affect academic achievement.

The schools included in our study are comprised primarily of students from low-income families. In Chile, the national agency that establishes a student's poverty status is the Junta Nacional de Auxilio Escolar y Becas (JUNAEB). This agency measures the family's socioeconomic status through an exhaustive set of criteria, which is then indexed in the Household Social Registry. Each student's poverty status is thus established from the family's income and related socioeconomic factors, including home conditions, type of national medical insurance eligibility, and parental education (Ministerio de Educación, 2024). The poverty status designation is issued to the student's school record, with two possible outcomes: "prioritario" or "preferente." The prioritario level corresponds to students who are in the lowest 33% of the income distribution according to the Household Social Registry. The preferente level corresponds to students between 33% and 80% of the distribution in the Household Social Registry. Recent estimates indicate that nationally, secondary schools contained an average of 54 percent students who were "prioritario" (Ministerio de Educación, 2024). The schools in our sample, located in the Southern metropolitan region of Santiago, reflect a more pronounced urban segregation with 64 percent of enrolled students considered "prioritario" or poor. In our sample, 21 percent of students were considered "preferente" or low income but less poor, such that over 85 percent of these students were identified as socioeconomically disadvantaged.

Research Questions

The current study builds upon the extant literature that examines multiple dimensions of the relationship between ECA participation and a range of measures of academic success in high school. We draw upon a rich student-level database—a targeted student survey linked with administrative data provided by the schools—to address the following questions regarding ECA benefits for students in urban high schools in Chile:

Question 1. Does ECA participation influence school attendance, language test scores, and math test scores?

Do these relationships vary by student characteristics--some of which may indicate educational disadvantage--including sex, nativity, age, poverty status, and health status?

Question 2. Does the relationship of ECA participation to educational outcomes differ by type of activity, specifically arts-related vs. sports-related?

Question 3. Does the relationship of ECA participation to educational outcomes vary by breadth of participation (number of activities in which each student participated)?

Methods

The current study employs a quantitative analytical approach drawing upon a primary data source—an original

student survey—that the research team aligned with student-level administrative data from the schools. The data sources, outcome and predictor measures, and analytic strategy are described below.

Data Sources

Questionnaire and Sample Description

Student-level information on the sample of students included in the research project was drawn from a survey administered in Santiago, Chile in May 2023. Data were collected in three schools located in three southern districts of Santiago. All students in years one through four who attended classes during the data collection period were asked to participate in the research project. One or two members of the research team were present at each data collection session to brief students about the purpose and scope of the research, and to confirm consent with each participant. Enrollment across the three schools in May of 2023 was estimated at 1732 students, with 1455 students present at data collection time. The total number of completed interviews (N=1359), corresponds to 93% of the total population of students attending school during the study collection period. The remaining 7% include students who declined to participate and as those who were in school but not available to attend the data collection sessions. The surveys were administered in computer labs in each school, with each participating student completing a questionnaire at an individual computer station. The survey had a mean duration of 14 minutes.

The questionnaire used for this survey was designed by the research team and pilot tested in September 2022. Both the pilot and final questionnaires were administered using the Qualtrics software, and include information on demographics, health status, and extracurricular activities. Students were asked to identify the school-based ECAs they participated in during the past and current school years. A list of available ECAs was provided by each of the schools. Not all ECAs were offered in all three schools. The questionnaire, as part of the research protocol, was reviewed and approved by the Institutional Review Board at the Author's university.

Linked Administrative Data

To enhance the student-level information obtained from the survey, the research team requested access to administrative student data on demographic characteristics, school absences, and end of semester test scores in reading and math. This information was linked to the student records from the survey, using an encrypted unique identifier to provide a one-to-one merge. As per the university-approved research protocol, a single member of the research team received the administrative records and was responsible for completing the data linkage. Chile uses an identifier named RUT (Roll Unico Tributario) to track students, which we used as the unique identifier to merge data from the survey and the administrative information provided by the schools. Once the merge was completed, the RUT was removed from the analysis file to protect data confidentiality. A total of 1359 survey participant records were linked to their corresponding administrative records (100% match rate).

Measures and Analysis Strategy

We explore relationships between ECA participation and student academic success indicators, through

multivariate regression models that incorporate student information both from survey responses and the linked administrative data. Separate models are specified to address each of the three research questions, each using a cross-sectional study design, with descriptive rather than causal interpretation of the findings.

Educational Outcome Variables

Language and Mathematics Scores: the schools in the study use grade-level standardized tests both in Spanish language and Mathematics, administered two weeks prior to the end of each semester in mid-June and end of November. These standardized tests are not administered nationally; rather, they are unique to the schools included in this study. The tests and administration schedules are the same across these schools. The test scores used as dependent variables in this paper correspond to the percentage of total items to which the student replied correctly on each test. The scores used in the current study correspond to the tests administered in June of 2023.

Attendance: this measure refers to the percentage of days that a student was present in school, according to administrative attendance records for the first semester ending in June 2023.

ECA Predictors of Educational Outcomes

In our analyses of educational outcomes, the main predictor of interest is a student's reported participation in extra-curricular activities at any time during the school year corresponding to the study period. **Any participation** is defined as a dichotomous measure, equal to 1 if a student participated in an ECA of any kind and equal to zero otherwise. In separate models we examine the relationship of the outcomes to *ECA participation in sports activities* to *participation in arts activities*. These dichotomous indicators, defined in the same way as the "any participation" variable, summarize participation through two categories: participation in any of seven different sports activities, and participation in any of seven different arts activities. These categories of participation are not mutually exclusive; students may engage in either or both types of activities.

The third set of models estimates the relationship of each of the educational outcomes to the student's breadth of ECA participation. Students who participated in ECA activities were asked for the total number of ECA activities in which they participated, up to the date of the survey. This measure was defined as a counter variable ranging from 1 to 17. The variable has a negative skewness because most students only participated in 1 to 3 activities. The natural log transformation of the number of activities was used to improve the fitness of the models for estimating academic outcomes. Because the value 0 (no ECA participation) has an undefined value in a log transformation, the value 1 was added to the counter variable. Accordingly, the log of the counter has a value 0 for those students who did not participate in ECAs. The rest of the values correspond to the number of activities reported.

Covariates

The research literature on ECA involvement among high school students has a strong focus on the benefits of participation for the individuals involved in these activities, and the ways in which they can address the particular

needs of less advantaged students. While overall the empirical evidence for educational outcomes is positive, there also is considerable evidence of heterogeneity of benefits of ECA participation across groups of students. Thus, we have included a set of factors that have been shown to influence educational outcomes, and that may potentially influence the relationship of ECA participation to test scores and school attendance (Videon, 2002). We note that in our sample there is evidence of selection into ECA activities by student characteristics, with more vulnerable students less likely to participate overall. However, our recent study indicates that there are some interesting exceptions, with students who are poor, foreign born, or in poor health, being more likely to participate in some activities, particularly in the arts (Sandoval & Bowers, 2025). In the current study we do not attempt to account for selectivity when estimating the relationship of ECAs to test scores and attendance, since the participation and covariate variables are measured concurrently. However, by including these student characteristics in the estimation models, we seek to take their covariation into account for parsing the association of the participation variables with each outcome (Shulruf et al., 2008).

Sex

Research suggests a complex relationship of sex to educational factors, with variation across individual outcomes, grade levels, and other student characteristics. ECA participation also varies significantly by sex, both in the likelihood of participating as well as in the type of activity engagement. Thus, we include sex as a covariate in all of the models and test for sex variability in the impact of participating in each type of activity. **Sex** is coded dichotomously, with 1=Female and 0=Male. This variable is self-reported. A small number of responses were non-binary, but too few to include as a separate gender category.

Nativity

Immigrant students are subject to significant transitions in their educational trajectories. Among adolescents, these transitions may be reflected in difficulties with school engagement, attendance, and academic performance (Merino et al., 2022). As noted earlier, vulnerable students are in many cases more likely to benefit, in terms of engagement and academic success, from participating school-based extracurricular activities (Mahoney et al., 2005; Morris, 2015; Robinson, 2024). Our study provides an unusual opportunity to explore the extent to which foreign-born students, an under-studied group of vulnerable adolescents, may experience academic gains from participation in ECAs. It is particularly important to address the experiences of this group of students in Chile, where significant immigration is relatively recent and foreign-born high school students may be at risk for academic difficulties (Honey & Carrasco, 2023). The foreign-born population in Chile increased significantly between 1992 to 2022, from 1% to 9% of the total population (Doña-Reveco, 2022). In the Santiago metropolitan region, 11 percent of enrolled students were foreign-born in 2024 (Ministerio de Educación, 2025). In our study, we define nativity as: *Born Abroad*, equal to 1 if the student was born outside of Chile, and 0 if Chilean-born.

Health

Among adolescents, physical self-concept is a strong influence on psychological well-being, which has important

effects on mental status and behavior (Fernandez-Bustos et al., 2019). Physical health also has important consequences for school attendance and its academic success correlates (Allison et al., 2015). Researchers note that students' health status is an important factor for school-based program development (Gottfried & Hutt, 2019). We explore this factor as a covariate for estimating educational outcomes, with a focus on potential co-variation with the ECA predictor variables. *Poor Health* is coded 1 if a student reports poor health and coded 0 if they report good or excellent health status.

Age

Age refers to age in years and is measured as a continuous variable. This variable is highly correlated with grade level but as a predictor is more useful because it provides a wider range of values.

Poverty Status

Poor is coded as a binary variable, equal to 1 if administrative records indicate that the student is "prioritario" (poor); if the student is "preferente" (low income) or is non-poor, the variable is equal to 0.

All the outcome, predictor, and outcome variables are listed and their distributions summarized in Table 1.

Model Estimation

We address each of the research questions guiding the analyses through a series of multivariate linear regression models, appropriate for estimating the relationship of dichotomous and continuous predictors to continuously measured outcome variables. The first set of models addresses Research Question 1, regarding the extent to which any form of ECA participation is related to math and language test scores and to school attendance. Models are estimated separately for the three outcomes, with participation as the main predictor variable, and include all the covariates that may also influence educational outcomes. In this model (Tables 2A,B,C), the coefficients represent the relationship of each variable to the outcomes, net of the influence of each of the other predictors. This model, as well as all subsequent ones, are subject to tests for variability in the relationship of ECA participation by each of the included covariates. We test for variation by testing for participation x covariate interaction effects; only the significant interaction terms are presented in the tables.

In addition to the measures that we include as predictor and covariate variables, we employ fixed effects estimation methods. Since we are not able to measure and account for variations in school characteristics that may influence student outcomes, we included school fixed effects in each model to account for these unmeasured covariates. Such unobserved factors may include: the characteristics of school leadership and teachers, range of activities and academic support provided by the school, school size, and student access to public transportation. These and other school-level characteristics may be related to students' academic performance and may limit ECA participation. Inclusion of school fixed effects in the models accounts for variations due to these and other unmeasured school-level covariates that may correlate with academic outcomes.

Research Question 2 probes potential variation in the relationship of ECA participation to test scores and attendance, by separately estimating two sets of models with main predictors defined as participating in sports activities (Table 2B) and participation in arts activities (Table 2C). Students who participate in both types of activities are included in both sets of models. These models are specified in the same way as those described for RQ1, with tests for interaction and inclusion of school fixed effects.

In the models estimating the relationship of ECA breadth to test scores and attendance (RQ3), we replace the binary participation predictor variable with a continuous measure of the number of activities in which the student reports participating during their high school years. We use the natural logarithmic transformation of this number, in order to account for the right-skewness of this variable's distribution as is evident in Table 1. These models are summarized in Table 3.

Results

Variable Distributions

In Table 1 we summarize descriptive information for each of the dependent, predictor, and control variables used in our analyses. Math and Language test scores are defined as the percentage of test items that each student answered correctly, with an average of 68 percent in Language and 49 percent in Math. Regarding attendance, on average, students were present for 90 percent of total school days. We note the missing values on each of the outcome variables (9% on language scores, 15% on math scores, and 5% on attendance). Missing test scores reflect student absences on test administration dates. We did not substitute those students' scores on the alternative tests that were administered to them, as those tests were not standardized. Some attendance reports were missing from the administrative records, but these missing values were not related to the test scores. Tests of association revealed no systematic variation between the predictor variables and students having missing values on any of the outcome variables.

Among all students, over half participated in some ECA, with 37 percent participating in sports and 21 percent in arts. Given that almost half of students did not participate in an ECA, the mean number of all activities per student is less than 1. Economic and educational risk factors are evident in our sample. Almost two-thirds of the study sample is identified as poor, and 18 percent are immigrant students. We note also that a third of the students report being in poor health.

Table 1. Variable Descriptives

Variable	Mean	SD	Min	Max	n
Language Scores	68.37	14.06	7	97	1,226
Math Scores	49.04	20.97	3	97	1,146
Attendance	89.71	9.28	29	100	1,284
Participation Total	.53	.50	0	1	1,359
Arts	.37	.48	0	1	1,359

Variable	Mean	SD	Min	Max	n
Sports	.21	.40	0	1	1,359
Sex (Female)	.47	.49	0	1	1,333
Socioeconomic Status (Poor)	.64	.48	0	1	1,359
Nativity (Born Abroad)	.18	.38	0	1	1,359
Age	15.64	1.32	13	19	1,359
Health (Poor)	.32	.47	0	1	1,359
Number of Sports ECAs	.66	1.09	0	7	1,359
Number of Arts ECAs	.42	1.12	0	9	1,359

Multivariate Model

We employ a regression framework to further explore the relationships between ECA participation, in its various dimensions, to test scores and attendance. We use the terms “influence” and “predictive” to refer to these associations but do not claim that the relationships are causal. While the predictor variables precede the outcomes in time (the test scores and attendance are reported at the end of the school year), we do not claim to establish causality because we are unable to control for prior academic achievement and attendance in our models. With this longitudinal information, we would be able to more precisely specify the effects of ECAs on these outcomes. Instead, we consider the patterns revealed by the models to be indicative of a relationship between the ECA measures and each outcome, net of their association with the other student characteristics included in the models as covariates, as well as unmeasured school factors controlled through school fixed effects.

Models estimating the influence of any ECA participation are summarized in Table 2A. Positive and statistically significant regression coefficients for the variable “participates” in Models 1, 2, and 3 indicate that net of the influence of sex, poverty status, nativity, age, and health status, participation in ECAs is associated with higher language and math test scores, as well as higher attendance. The largest magnitudes of association are found in the language scores and attendance models. As compared with students who do not participate in any ECAs, students who participate score 2.9 percent higher in language, 2 percent higher in math, and higher attendance by 2.1 percentage points.

In accordance with Research Question 1, we also tested for variation in the influence of ECAs across the student characteristics represented by the covariates in the models. Only one significant interaction emerged, whereby the association of ECA to language scores varies by sex (Female*Participates). The negative interaction term indicates that the gain from ECA participation is highest among males—a boost of 2.9 percent for participant males and of only .8 percent for participant females. In other words, the overall female advantage in language scores is almost eliminated among the subset of students who participate in ECAs.

Tables 2B and 2C summarize the models that separately estimate the influence of participation in sports-related activities and arts-related activities, as per specified in Research Question 2. Models 1, 2, and 3 in these two tables are specified in the same way as the models in Table 2A. The patterns of association between participation and

academic outcomes are similar across types of ECAs. Participation in both sports and arts activities is positively and significantly related to language test scores and to attendance. Of note is the larger impact of arts participation, as compared with sports participation, on both test scores and attendance. Students who participate in arts activities have on average an 89% higher ECA-related gain in language scores, as compared with students participating in sports (percentage difference of 2.184 and 1.154 in Tables 2B and 2C). Students who participate in arts have a 33% larger gain in attendance, as compared with sports participants, though the gains are significant for both types of activities. As is the case for the models in Table 2A, the association of ECA participation with math test scores is positive but nonsignificant. For both types of ECA, we tested for heterogeneity of association between participation and each outcome, by assessing interactions between participation and each of the covariates. None of the interaction terms were significant, and the models were not improved by their inclusion; thus, they are not included in these summary tables. The full regression models summarized in these and subsequent tables are presented in the Appendix.

Table 2A. OLS Regression of Any Participation on Test Scores and Attendance

Variables	Model 1	Model 2	Model 3
	Language Scores	Mathematics Scores	Attendance
Any Participation	2.895 *** (1.052)	2.044 * (1.077)	2.084 **** (0.152)
Sex	2.839 ** (1.101)	-1.002 (1.206)	0.769 (0.531)
Sex * Participation	-3.696 ** (1.506)		
SES (Poor)	-0.741 (0.881)	-1.796 (1.372)	-0.520 (0.601)
Born Abroad	-2.642 ** (1.071)	-2.161 (1.679)	1.389 ** (0.722)
Age	-2.687 **** (0.288)	1.107 ** (0.440)	-0.894 **** (0.917)
Poor Health	0.792 (0.824)	-1.213 (1.284)	-1.893 *** (0.563)
R Square	0.16	0.15	0.06
Sample Size	1,202	1,122	1,256

Note: OLS coefficients with standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.000$

Table 2B. OLS Regression of Sports Participation on Test Scores and Attendance

Variables	Model 1	Model 2	Model 3
	Language Scores	Mathematics Scores	Attendance
Sports Participation	1.154 * (0.786)	1.587 (1.226)	1.819 *** (0.152)
Sex	0.993 (0.785)	-0.971 (1.213)	0.839 (0.536)
SES (Poor)	-0.863 (0.880)	-1.748 (1.373)	-0.479 (0.602)
Born Abroad	-2.638 ** (1.076)	-2.164 (1.6784)	1.342 * (0.726)
Age	-2.703 **** (0.288)	1.121 ** (0.440)	-0.884 **** (0.197)
Poor Health	0.749 (0.825)	-1.242 (1.284)	-1.907 *** (0.565)
R Square	0.16	0.15	0.06
Sample Size	1,202	1,122	1,256

Note: OLS coefficients with standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.000$

Table 2C. OLS Regression of Arts Participation on Test Scores and Attendance

Variables	Model 1	Model 2	Model 3
	Language Scores	Mathematics Scores	Attendance
Participates	2.184 ** (0.934)	2.173 (1.463)	2.419 *** (0.634)
Sex	0.825 (0.777)	-1.119 (1.201)	0.667 (0.530)
SES (Poor)	-0.811 (0.879)	-1.690 (1.373)	-0.413 (0.601)
Born Abroad	-2.605 ** (1.071)	-2.082 (1.678)	1.466 * (0.722)
Age	-2.694 **** (0.288)	1.139 ** (0.440)	-0.870 **** (0.197)
Poor Health	0.548 (0.828)	-1.444 (1.286)	-2.149 **** (0.566)
R Square	0.16	0.15	0.06
Sample Size	1,202	1,122	1,256

Note: OLS coefficients with standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.000$

The final set of regression models, presented in Table 3, estimates the relationship between the number of activities in which each student engaged (breadth of participation) and their test scores and attendance. The number of

activities is represented by the natural logarithm of the actual number of ECAs, with the addition of a constant to remove the zero value which has no logarithmic value. This transformation corrects for the skewed distribution of this variable, on which almost half of students score zero. Comparing across the models in Table 3, we note that the breadth of ECA participation is significantly associated only with attendance. Students who participate in larger numbers of ECAs have, on average, significant gains in attendance (each additional activity is associated with a 1.8 percent gain in days attended), but no consistent gains in language and test scores. This pattern of coefficients holds across categories of the student characteristic covariates, indicating homogeneity in the relationship between breadth of participation and each of the academic outcomes.

Table 3A. OLS Regression of Breadth of Sports Participation on Test Scores and Attendance

Predictor	Model 1	Model 2	Model 3
	Language Scores	Mathematics Scores	Attendance
Number of Sports Activities (Natural Log)	.057 (0.752)	1.193 (1.184)	1.788 **** (0.634)
Sex	0.847 (0.789)	-0.983 (1.219)	0.894 * (0.530)
SES (Poor)	-0.835 (0.882)	-1.761 (1.374)	-0.519 (0.602)
Born Abroad	-2.249 ** (1.075)	-2.087 (1.682)	1.396 * (0.725)
Age	-2.704 **** (0.288)	1.125 ** (0.440)	-0.870 **** (0.197)
Poor Health	0.701 (0.826)	-1.284 (1.284)	-1.938 *** (0.564)
R Square	0.16	0.15	0.06
Sample Size	1,202	1,122	1,256

Note: OLS coefficients with standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.000$

Table 3B. OLS Regression of Breadth of Arts Participation on Test Scores and Attendance

Predictor	Model 1	Model 2	Model 3
	Language Scores	Mathematics Scores	Attendance
Number of Arts Activities (Natural Log)	1.239 (0.840)	1.726 (1.328)	2.221 **** (0.576)
Sex	0.847 (0.778)	-0.983 (1.219)	0.593 (0.530)
SES (Poor)	-0.803 (0.881)	-1.762 (1.373)	-0.392 (0.601)

Born Abroad	-2.570 ** (1.073)	-2.075 (1.679)	1.443 ** (0.601)
Age	-2.698 **** (0.288)	1.138 ** (0.440)	-0.868 **** (0.197)
Poor Health	0.600 (0.828)	-1.431 (1.287)	-2.157 **** (0.566)
R Square	0.16	0.15	0.06
Sample Size	1,202	1,122	1,256

Note: OLS coefficients with standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.000$

Discussion and Conclusion

In summary of the regression models presented in Tables 2 and 3, our findings suggest that ECA participation is associated with important gains in student attendance which, as noted earlier, is an essential pathway to academic success. There were significant positive impacts on language test scores, as well as some positive association with math scores, though these were less consistent. This pattern of effects is similar across types of ECAs, with somewhat larger gains in language and attendance among arts participants as compared with sports participants. Larger breadth of participation enhanced the positive impact of participation on attendance, but did not influence language or math scores. We note that we find almost no heterogeneity in the association of each dimension of ECA participation with test scores and attendance.

In addition to summarizing the patterns of coefficients, we note that the R- square values for each of the models in Tables 2 and 3 is quite low, indicating that the models explain between 6 and 19 percent of the total variance in these academic outcomes. This is not unusual, as the body of educational research on student performance outcomes demonstrates the relevance of a wide range of variables measured at different levels of analysis (Farb & Matjasko, 2012). Our findings thus must be interpreted as modestly suggestive of a predictive relationship, with the direction and significance of the coefficients providing supportive evidence that ECA participation is a positive factor in formulae for student success.

In addition to exploring the relationships of ECA participation with test scores and school attendance, by type and breadth of activities, the conceptual framework for our study outlines the mechanisms through which ECA participation may influence a student's academic outcomes. We explore the possibility of a resource compensation mechanism by examining heterogeneity in the association of participation with test scores and school attendance, and find limited evidence of variation across groups of students. Although the covariates included in our models are indicative of vulnerability (poverty, poor health, foreign born), we found that students with these characteristics benefitted equally from their ECA experiences, as compared with their less vulnerable peers. We note, however, that most of the students in our study sample are from poor and low-income families; therefore, our findings suggest that the potential benefits of ECAs are important to these vulnerable populations. Our findings indicate that school attachment may be an important mechanism for ECA participation to generate academic benefits for high school students. The consistent positive relationship of participation to school

attendance, regardless of type of activity, suggest the need to give priority to this pathway to academic success.

Strengths and Limitations

One strength of our study is the rich student-level database that allows us to combine survey information on each student's ECA participation and self-reported health, with administrative records of demographic characteristics, test scores, and school attendance. Access to these administrative data provides us with a high-quality database for high school students from low-income neighborhoods, with sufficient power to conduct detailed multivariate analyses of the association of each academic outcome with multiple dimensions of ECA participation. Another important attribute of the current study is its focus on a low-income population of students whose participation in ECAs generated academic gains consistent with prior research findings that ECAs may particularly benefit at-risk students. Our study also contributes some foundational evidence that the relationships between ECAs and academic outcomes that have been abundantly studied in the United States and Europe also are important to consider for adolescents in Chile.

We acknowledge an important limitation, impeding causal interpretations, in that we lack longitudinal information on students' ECA experiences and academic trajectories. The study also is limited in that we do not have insight into the decision-making processes regarding school-based activities. In future studies, we hope to further contribute to the knowledge base on the benefits of ECAs for adolescents in Chile, through a follow-up study with a second wave survey that would allow us to capture variation over time. Also in this future research, we plan to systematically collect feedback from students regarding both their preferences and perceived obstacles to participating in specific activities, using qualitative data collection and analysis methods.

Recommendations

Our study seeks to extend our empirical understanding of ECA participation patterns and their implications, through our focus on lower income high school students in Santiago, Chile. Our findings provide modest but compelling supporting evidence of a positive association between ECA participation and academic performance. Administrators at the study schools note that the demand for ECA activities exceeds each school's capacity to provide them. The ubiquity of their student wait lists for ECAs reinforces the view that these programs can be an even stronger positive force for engaging students in the high school experience. Our findings suggest the importance of promoting higher ECA participation rates among high school students, and particularly among students such as those in our study, who are from lower income families. These students, who may be academically vulnerable and may have weaker engagement in school, benefit from ECA participation as much as their more advantaged peers, in terms of academic performance. Our findings indicate positive and consistent gains in student attendance among ECA participants; not only does participating in an ECA encourage school attendance, but this gain further increases with participation in multiple activities. Increasing the range and number of opportunities for ECA participation thus may be an important pathway for educators to improve educational outcomes for vulnerable adolescents. We venture to suggest that fostering participation among the large percentage of students who do not engage in ECAs would generate significant benefits, both for

participation high school students and for their schools. We frame these recommendations as instrumental support for educators in their mission to provide all students with optimal opportunities for positive development and educational success.

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Appendix. OLS Regression Models Summarized in Tables 2 and 3

Table 2A. OLS Regression of Any Participation on Test Scores and Attendance

Variable	b	SE	95% CI		p
			LL	UL	
Language Scores					
Participation	2.97	1.05	.823	4.961	.006
Sex	2.84	1.10	.678	5.001	.010
Participation*Sex	-3.70	1.51	-6.653	-.740	.014
SES (poor)	-.74	.88	-2.470	.987	.40
Born Abroad	-2.64	1.07	-4.745	-.540	.014
Age	-2.68	.29	-3.253	-2.123	.000
Poor Health	.79	.83	-.825	2.410	.337
Variable	b	SE	95% CI		p
			LL	UL	
Math Scores					
Participation	2.04	1.18	-.267	4.400	.083
Sex	-1.00	1.21	-3.369	1.364	.406
SES (poor)	-1.80	1.37	-4.490	.897	.191
Born Abroad	-2.16	1.68	-5.546	1.135	.199
Age	1.11	.44	.244	1.972	.012
Poor Health	-1.21	1.28	-3.734	1.306	.345
Variable	b	SE	95% CI		p
			LL	UL	
Attendance					
Participation	2.08	.51	1.077	3.090	.000
Sex	.77	.53	-.273	1.813	.148
SES (Poor)	-.52	.60	-1.700	.658	.386
Born Abroad	1.39	.72	-.028	2.807	.055
Age	-8.94	.20	-1.281	-.507	.000
Poor Health	-1.89	.56	-2.999	-.787	.001

Table 2B. OLS Regression of Sports Participation on Test Scores and Attendance

Variable	b	SE	95% CI		p
			LL	UL	
Language Scores					
					.142
Sports Partic	1.16	.79	-.388	2.698	.206
Sex	.99	.78	-.548	2.534	.327
SES (poor)	-.86	.88	-2.592	.865	.014
Born Abroad	-2.64	1.08	-4.750	-.527	.000
Age	-2.70	.29	-3.269	-2.137	.364
Poor Health	.75	.83	-.871	2.370	.000
Variable	b	SE	95% CI		p
			LL	UL	
Math Scores					
Sports Partic	1.59	1.23	-.819	3.995	.196
Sex	-.97	1.21	03.353	1.410	.424
SES (poor)	-1.75	1.37	-4.442	.947	.204
Born Abroad	-2.16	1.68	-5.470	1.142	.199
Age	1.12	.44	.258	1.990	.011
Poor Health	-1.24	1.28	-3.764	1.279	.334
Variable	b	SE	95% CI		p
			LL	UL	
Attendance					
Sports Partic	1.82	.54	.768	2.871	.001
Sex	.84	.54	-.213	1.891	.118
SES (poor)	-.48	.60	-1.660	.703	.427
Born Abroad	1.34	.73	-.082	2.770	.065
Age	-.88	.20	-1.272	-.497	.000
Poor Health	-1.91	.57	-3.016	-.780	.001

Table 2C. OLS Regression of Arts Participation on Test Scores and Attendance

Variable	b	SE	95% CI		p
			LL	UL	
Language Scores					
Arts Partic	2.18	.93	.351	4.018	.020
Sex	.83	.78	-.700	2.350	.289
SES (poor)	-.81	.88	-2.537	.914	.356
Born Abroad	-2.61	1.10	-4.707	-.504	.015
Age	-2.69	.29	-3.260	-2.129	.000
Poor Health	.55	.83	-1.074	2.170	.507
Variable	b	SE	95% CI		p
			LL	UL	
Math Scores					
Arts Partic	2.17	1.46	-.698	5.045	.138
Sex	-1.19	1.20	-3.551	1.164	.321
SES (poor)	-1.69	1.37	-4.384	1.003	.219
Born Abroad	-2.08	1.68	-5.375	1.210	.215
Age	1.14	.44	.276	2.004	.010
Poor Health	-1.44	1.29	-3.969	1.080	.262
Variable	b	SE	95% CI		p
			LL	UL	
Attendance					
Arts Partic	2.42	.63	1.175	3.664	.000
Sex	.57	.53	-.473	1.607	.285
SES (poor)	-.41	.60	-1.593	.766	.492
Born Abroad	1.47	.72	.050	2.884	.042
Age	-.87	.20	-1.257	-.483	.000
Poor Health	-2.15	.57	-3.259	-1.038	.000

Note. All models include school fixed effects.

Table 3A. OLS Regression of Breadth of Sports Participation on Test Scores and Attendance

95% CI					
Variable	b	SE	LL	UL	p
Language Scores					
Number of sports*	.057	.75	-1.418	1.532	.940
Sex	.85	.79	-.701	2.396	.283
SES (poor)	-.84	.88	-2.566	.896	.344
Born Abroad	2.49	1.06	.383	4.604	.021
Age	-2.70	.29	-3.271	-2.139	.000
Poor Health	.70	.83	-.919	2.323	.396
95% CI					
Variable	b	SE	LL	UL	p
Math Scores					
Number of sports*	1.19	1.18	-1.130	3.517	.314
Sex	-.98	1.22	-3.377	1.410	.420
SES (poor)	-1.76	1.37	-4.458	.935	.200
Born Abroad	2.09	1.68	-1.215	5.390	.215
Age	1.13	.44	.261	1.990	.011
Poor Health	-1.28	1.28	-3.805	1.236	.318
95% CI					
Variable	b	SE	LL	UL	p
Attendance					
Number of sports*	1.79	.51	.789	2.788	.000
Sex	.89	.54	-.161	1.950	.097
SES (poor)	-.52	.60	-1.701	.662	.388
Born Abroad	-1.36	.73	-2.779	.066	.062
Age	-.88	.20	-1.270	-.495	.000
Poor Health	-1.94	.56	-3.045	-.830	.001

Table 3B. OLS Regression of Breadth of Arts Participation on Test Scores and Attendance

Variable	b	SE	95% CI		p
			LL	UL	
Language Scores					
Number of arts*	1.24	.84	-.409	2.888	.141
Sex	.85	.78	-.679	2.375	.276
SES (poor)	-.80	.88	-2.532	.924	.362
Born Abroad	2.57	1.07	.465	4.675	.017
Age	-2.70	.29	-3.264	-2.132	.000
Poor Health	.60	.83	-1.025	2.225	.469
Variable	b	SE	95% CI		p
			LL	UL	
Math Scores					
Number of arts*	1.73	1.33	-.882	4.333	.194
Sex	-1.17	1.20	-3.531	1.187	.330
SES (poor)	-1.67	1.37	-4.366	1.023	.224
Born Abroad	2.08	1.68	-1.219	5.369	.217
Age	1.14	.44	.274	2.002	.010
Poor Health	-1.43	1.29	-3.957	1.094	.266
Variable	b	SE	95% CI		p
			LL	UL	
Attendance					
Number of arts*	2.22	.58	1.091	3.352	.000
Sex	.59	.53	-.446	1.634	.263
SES (poor)	-.39	.60	-1.572	.787	.514
Born Abroad	-1.44	.72	-2.860	-.025	.046
Age	-.87	.20	-1.256	-.482	.000
Poor Health	-2.16	.57	-3.268	-1.047	.000

* *Natural logarithm of the number of sports and arts activities in which a student participated.*

Note. All models include school fixed effects.