



Question: *Is student cardiovascular health related to student 2007–2008 mathematics, reading/ELA, science, social studies, and writing TAKS performance and attendance?*

Response:

The purpose of the present report is to extend earlier analyses that examined the association between student physical fitness and performance on Spring 2008 mathematics (math) and reading/English language arts (ELA) Texas Assessment of Knowledge and Skills (TAKS) exams (Ware Herrera, 2009). The current results support earlier findings.

Key Findings

- Across grade levels, students' cardiovascular health was strongly associated with their performance on the 2007–2008 math and reading/ELA TAKS. Students whose cardiovascular health was rated as being in the "healthy fitness zone" had higher scores on the math and reading/ELA TAKS than did students who were not rated as being in the healthy zone.
- Across grade levels, students' cardiovascular health was strongly associated with their attendance during the 2007–2008 school year. Students with a healthy cardiovascular status were absent fewer days than were students with an unhealthy cardiovascular status.

Method

The FITNESSGRAM® comprises six measures of physical fitness, including body composition (body mass index, or BMI); cardiovascular capacity; abdominal strength; upper body strength; endurance; and flexibility. Student performance on the FITNESSGRAM® subtests (e.g., minutes and seconds taken to run 1 mile) are used to determine whether students are in the *Healthy Fitness Zone* or if their fitness *Needs Improvement*. The Healthy Fitness Zones are research-based levels of fitness thought to offer protection against the diseases associated with sedentary living (Welk & Blair, 2008).

This report extends earlier reports (Ware Herrera, 2009; Williams, 2007) that examined the association between BMI, overall fitness, and student academic and attendance outcomes. For this report, cardiovascular health was examined separately from the other fitness variables. Students' cardiovascular health rating depended upon students' performance on the cardiovascular portion of the FITNESSGRAM® assessment. In the following tables, results are displayed for students whose cardiovascular fitness was rated as being in the healthy zone (FITNESSGRAM® Healthy Fitness Zone), in comparison with students whose fitness was not in the healthy zone (FITNESSGRAM® Needs Improvement).

Ordinary least squares regression analyses were conducted, clustering at the campus level, which corrects the standard errors for non-independence of observations. To account for the possibility that the associations between cardiovascular fitness and students' TAKS performance and attendance scores may have been due to other factors, regression analyses included the covariates of students' TAKS scores from 2006–2007, gender, special education

status, economic disadvantage (eligibility for free or reduced price lunch), age, and limited English proficiency (LEP) status.

Analyses were performed for all students grades 3 through 12 who had TAKS and fitness data in 2007–2008 ($n = 45,787$; see Table 1 for student demographic characteristics and Appendix A1 for the number of students who had FITNESSGRAM® cardiovascular assessment, TAKS, and school absences data). Regression analyses also were conducted at the school level (elementary, secondary, and high school) to determine whether the patterns of associations were the same or varied across levels. All statistically significant associations are presented in the following sections. Please note the tables and figures present the observed means, rather than regression-predicted scores.

Table 1. Demographic Characteristics of Students in 3rd to 12th Grade Who Were Assessed with the FITNESSGRAM® in 2007-2008

Demographic characteristics	Number	Percentage
Female	22,126	48%
Male	23,661	52%
Hispanic	24,974	55%
African American	5,620	12%
White	13,552	30%
Asian/Native American	1,640	3%
Special education	4,826	11%
LEP	8,925	23%
Economically disadvantaged	25,654	56%
Total	45,787	100%

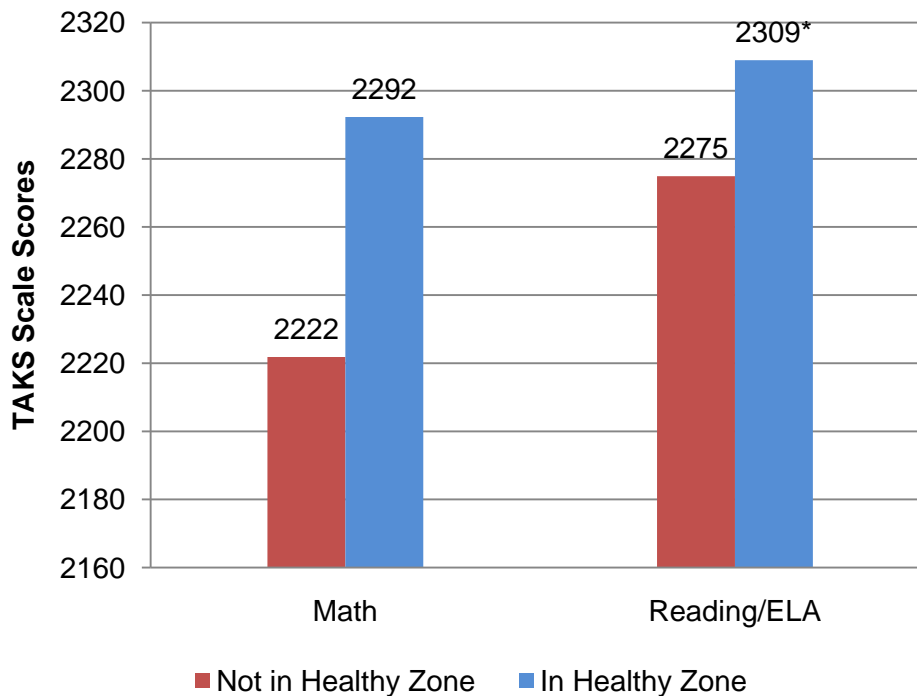
Source. AISD student records

Results

Cardiovascular Healthy Zone and TAKS Associations in Grades 3 Through 12

Significant overall associations were found between student cardiovascular health and TAKS performance (Figure 1). Across grades 3 through 12, students who were rated as having cardiovascular fitness in the healthy zone had significantly higher reading/ELA and math TAKS scale scores than did students with cardiovascular ratings not in the healthy zone. The associations between student cardiovascular health and science, social studies, and writing TAKS were not statistically significant. The number and percentage of students who scored in the healthy zone and not in the healthy zone are included in Appendix Table A2.

Figure 1. Student Cardiovascular Health and TAKS Performance, Grades 3–12



At the elementary level, student’s cardiovascular health was significantly related to performance on the math and reading TAKS (Figure 2). Elementary students whose cardiovascular health was in the healthy zone had significantly higher math TAKS scale scores than did their counterparts whose cardiovascular health was not in the healthy zone. Surprisingly, elementary students whose cardiovascular fitness was not in the healthy zone had significantly higher reading TAKS scale scores than did students whose cardiovascular fitness was in the healthy zone. The difference in the scale scores between the two groups was 6 points (elementary students not in the healthy zone had an average scale score of 2281 on the reading/ELA TAKS, compared with 2275 for students in the healthy zone).

Given the small magnitude of difference and the incongruence of this finding with findings that show student BMI and overall fitness to be positively associated with student TAKS performance (e.g., students in the healthy zone have significantly higher TAKS scale scores than do students not in the healthy zone; Ware Herrera, 2009), caution is required when interpreting the elementary level results. Further study is needed to understand why elementary students whose cardiovascular health was not in the healthy zone had higher reading/ELA TAKS scores than did students in the healthy zone group. The links between student cardiovascular fitness and other subject TAKS were not significant at the elementary level.

Figure 2. Student Cardiovascular Health and Performance on Reading and Math TAKS at the Elementary School Level

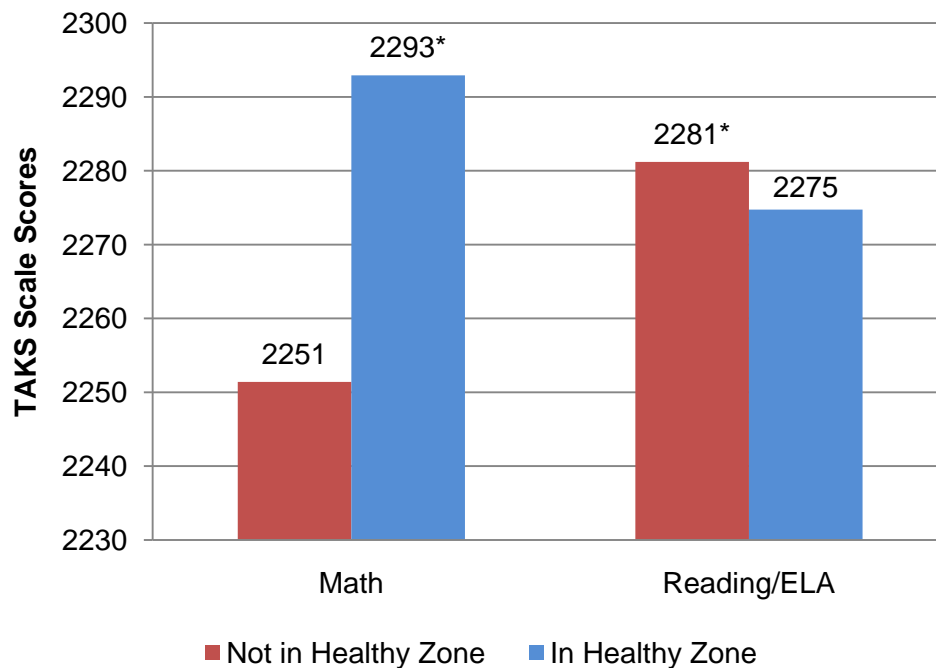
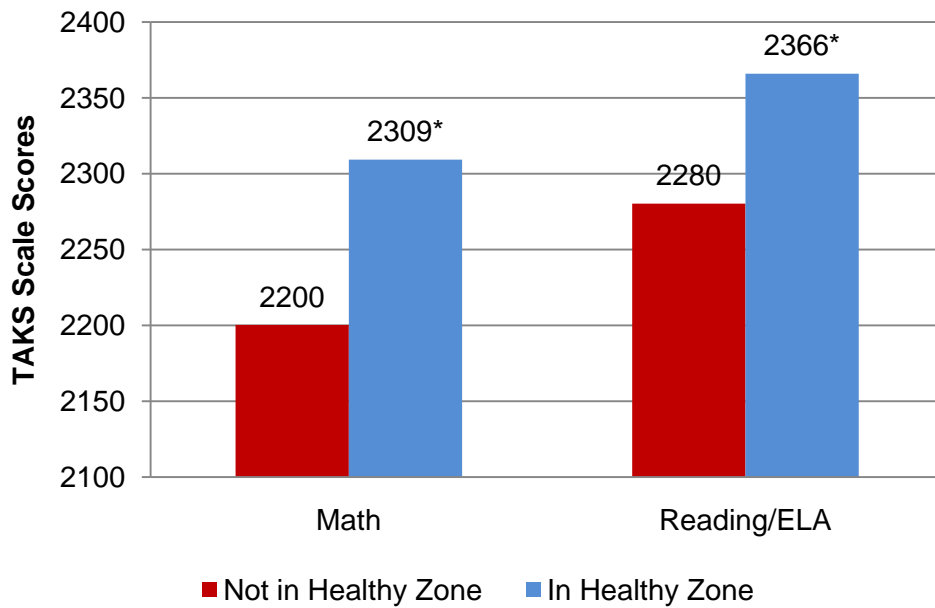
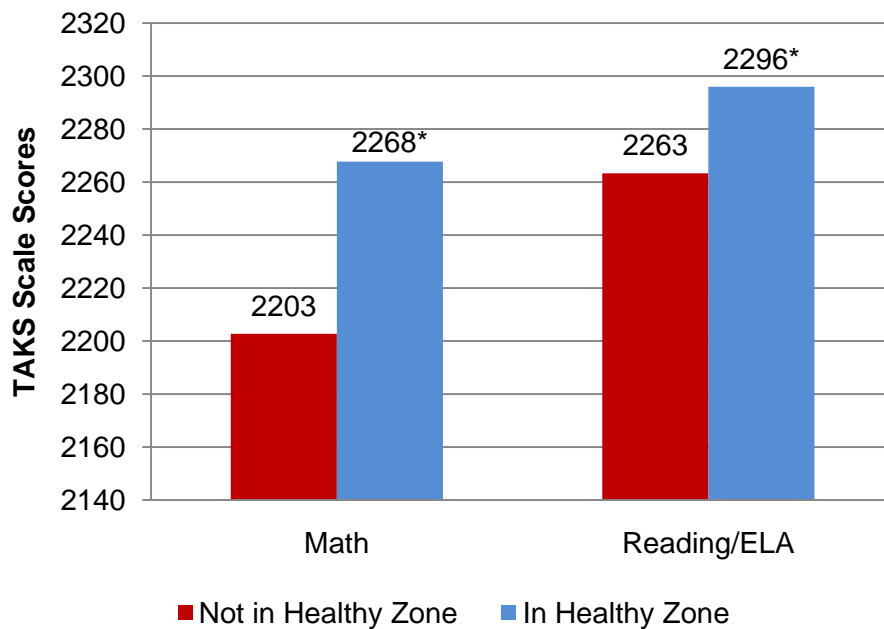


Figure 3. Student Cardiovascular Health and Performance on Reading and Math TAKS at the Middle School Level



At the middle and high school level, students whose cardiovascular health was in the healthy zone had significantly higher reading/ELA and math TAKS scale scores than did students whose cardiovascular health was not in the healthy zone (Figures 3 and 4).

Figure 4. Student Cardiovascular Health and Performance on Reading and Math TAKS at the High School Level



Student Cardiovascular Health and Attendance Associations in Grades 3 Through 12

Overall, students in grades 3 through 12 with a healthy zone cardiovascular fitness had significantly fewer days absent during the 2007–2008 school year than did students whose cardiovascular fitness was not in the healthy zone (Figure 5). This pattern remained statistically significant when examined separately by grade level (Figures 6, 7, and 8).

Figure 5. Student Cardiovascular Fitness and Absences, Grades 3–12

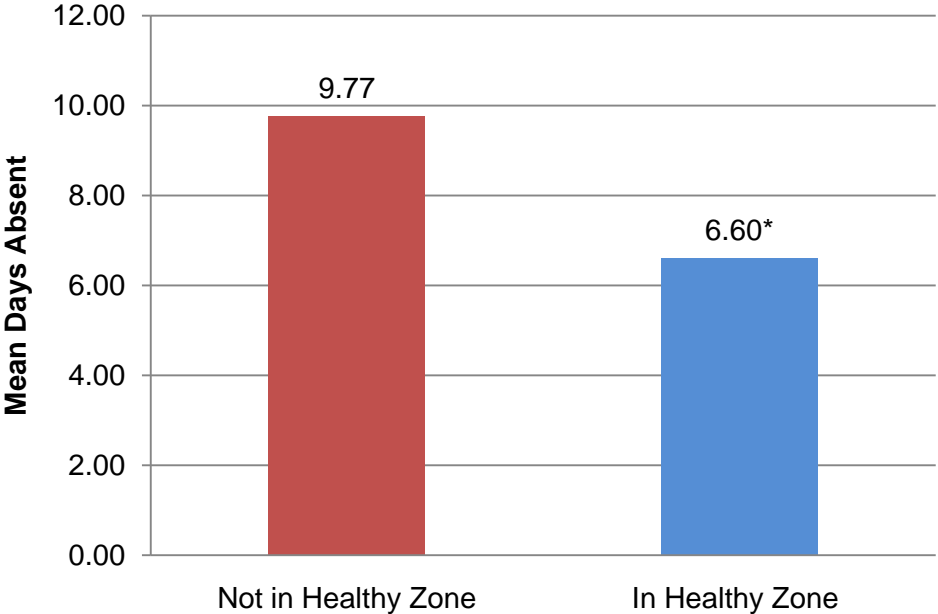


Figure 6. Student Cardiovascular Fitness and Absences at the Elementary Level

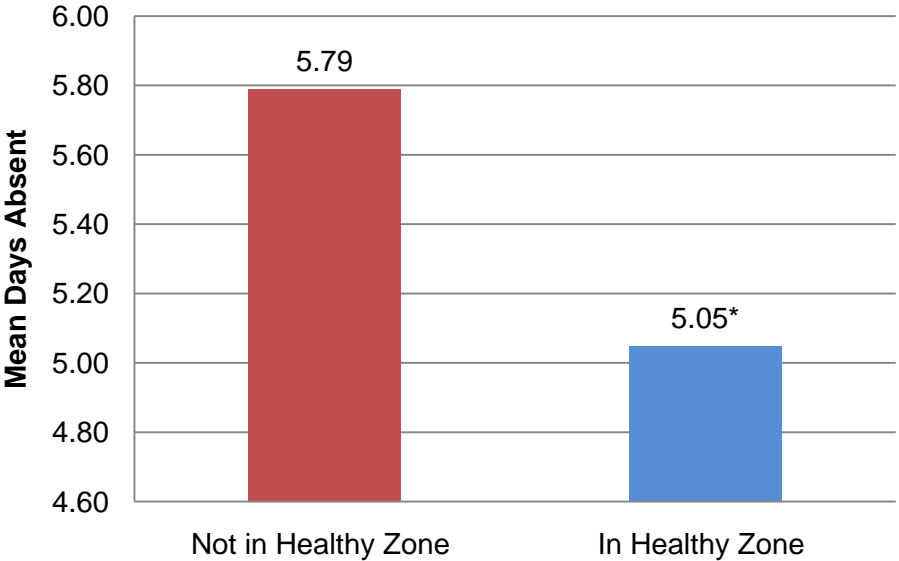


Figure 7. Student Cardiovascular Fitness and Absences at the Middle School Level

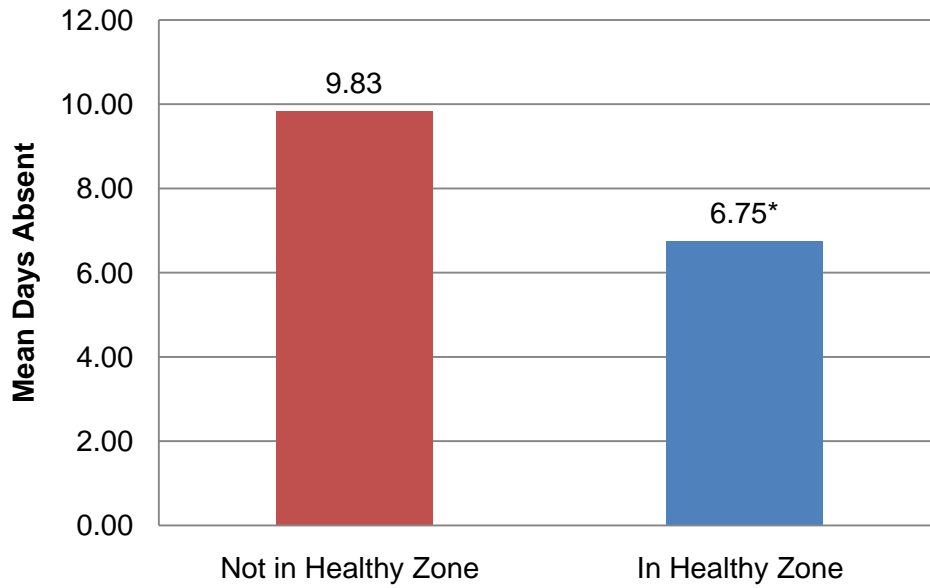
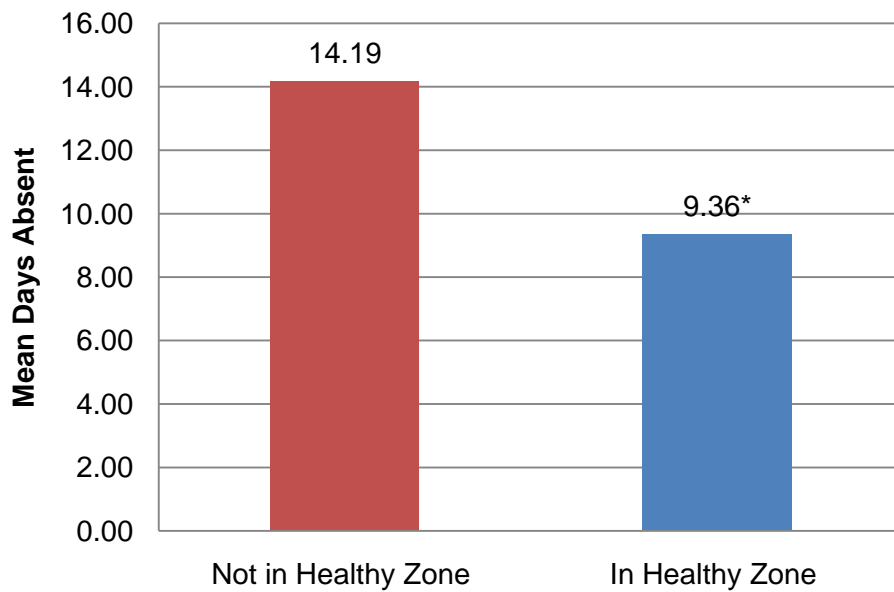


Figure 8. Student Cardiovascular Fitness and Absences at the High School Level



References

- Ware Herrera, A. (2009). *E-Team report: Is physical fitness related to students' 2007–2008 mathematics, reading/ELA, science, social studies, and writing TAKS performance and attendance?* (DPE publication number 07.93). Retrieved October 29, 2009, from http://www.austinisd.org/inside/docs/ope_07-93_Physical_Fitness_TAKS_and_Attendance.pdf
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- Williams, H. C. (2007). *Is physical fitness related to academic achievement?* (DPE publication number 06.07). Retrieved June 9, 2009, from, http://www.austinisd.org/inside/docs/ope_Fitness_and_Achievement_3-9.pdf

Appendix

Table A1. Total Number of Students with FITNESSGRAM® Cardiovascular Fitness Data, TAKS Mathematics and Reading/ELA Data, and Absences Data by School Level

TAKS Subject	Level		
	Elementary	Middle School	High School
Mathematics	15,864	10,728	10,683
Reading/ELA	15,906	10,791	10,708
Absences	17,172	12,261	12,094

Source. AISD FITNESSGRAM® student data, TAKS records, and attendance records.

Table A2. Number and Percentage of Students in the Healthy Fitness Zone and Not in the Healthy Fitness Zone by School Level

TAKS Subject	Level		
	Elementary	Middle School	High School
In the Healthy Zone	16,414 (52%)	11,783 (55%)	8,529 (40%)
Not in the Healthy Zone	15,356 (48%)	9,736 (45%)	12,862 (60%)
Total	31,770 (100%)	21,519 (100%)	21,391 (100%)

Source. AISD FITNESSGRAM® student data.