***Question:* Is physical fitness related to students 2007–2008 mathematics, reading/ELA, science, social studies, and writing TAKS performance and attendance?**

***Response*:**

The purpose of the present report is to replicate earlier analyses that examined the association between student physical fitness and performance on Spring 2006 mathematics and reading/English language arts (ELA) Texas Assessment of Knowledge and Skills (TAKS) exams (Williams, 2007). The current results support and extend earlier findings. Students' physical fitness, as measured by the FITNESSGRAM®, was significantly associated with their performance on TAKS tests taken during the spring of 2008 and with the number of absences from school during the 2007–2008 school year.

***Method*:**

This report extends the earlier report (Williams, 2007) by examining not only the association between fitness and all subject areas of the TAKS, but also the association between fitness and student attendance. The FITNESSGRAM® comprises six measures of physical fitness, including body composition (BMI), aerobic/cardiovascular capacity, abdominal strength, upper body strength, endurance, and flexibility. For this report, BMI is examined separately from and in combination with the other fitness variables. Similar to the methods described in the earlier report, a composite variable was created that summed across the six fitness measures and was based on the number of times the student's performance was rated as being in the "healthy zone" for each individual fitness assessment. The composite variable represents a student's total fitness score.

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 fitness and student TAKS performance and attendance may be due to other factors, regression analyses included the covariates of students' TAKS scores from 2005–2006, 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). Regression analyses also were conducted at the school level (elementary, secondary, and high school) to determine whether the pattern of associations were the same or varied across levels. All statistically significant associations are presented in tables in the following section. Please note that each of the tables includes the *observed* means, rather than regression-predicted scores.

Results:

Table 1. Student Demographics

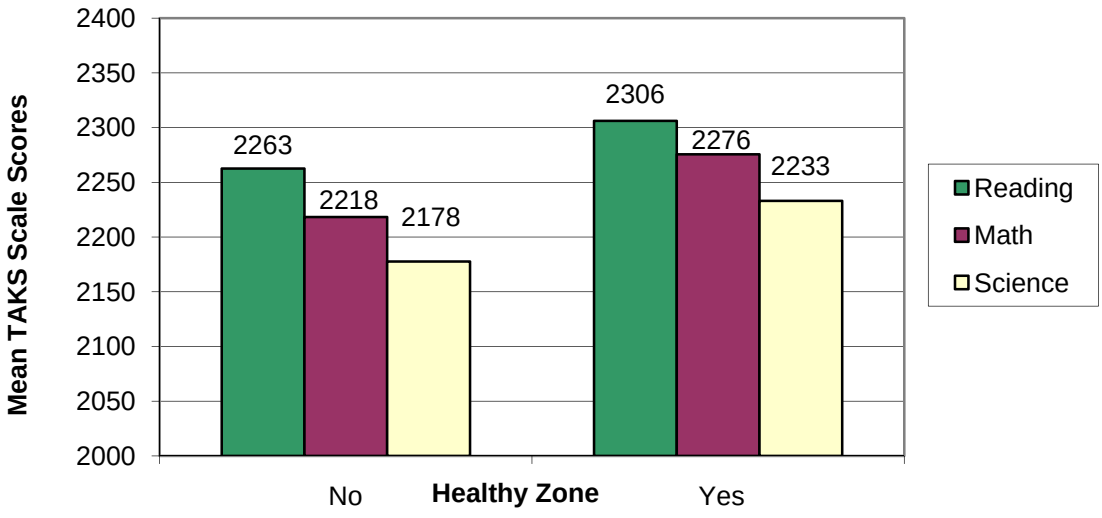
Demographic characteristics	Number	Percentage
Female	22,126	48%
Male	23,661	52%
Hispanic	24,974	55%
African American	5,620	12%
White	13,552	30%
Asian/Native American	1,640	3%
Special education	4,826	11%
LEP	8,925	23%
Economically disadvantaged	25,654	56%
TOTAL	45,787	100%

Source. AISD student records.

BMI Healthy Zone and TAKS Associations in Grades 3 Through 12

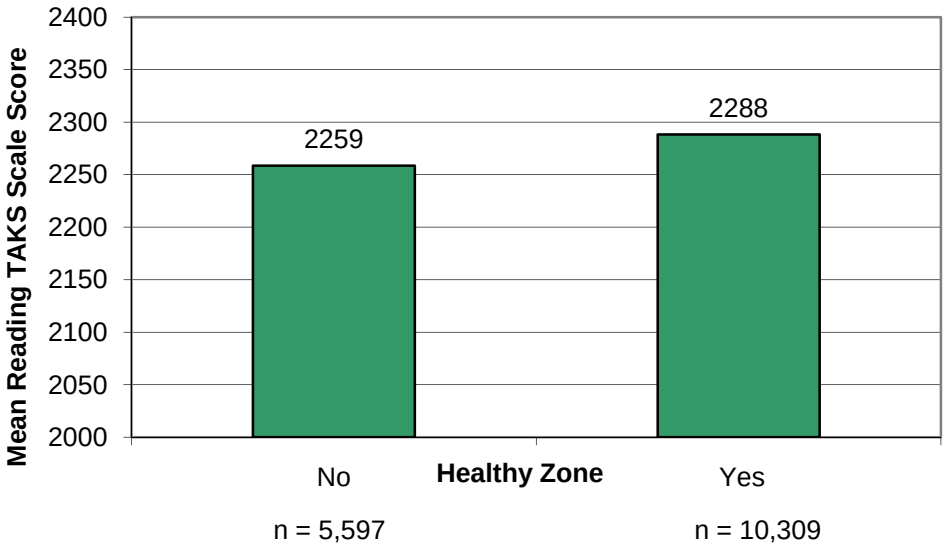
Significant overall associations were found between student BMI and TAKS (Figure 1). Across grades 3 through 12, students who were rated as having a BMI in the healthy zone had significantly higher reading/ELA and math (n = 24,928) and science (n = 10,443) TAKS scores than did students with BMI ratings in the unhealthy zone (reading/ELA and math, n = 12,413; science, n = 4,586). The associations between student BMI and social studies and writing TAKS were not significant.

Figure 1. BMI and TAKS Performance, Grades 3–12



At the elementary level, student BMI was significantly related to TAKS performance on the reading test (Figure 2). Elementary students whose BMI was in the healthy zone had significantly higher reading TAKS scores than did their counterparts whose BMI was not in the healthy zone. The links between BMI and other subject TAKS were not significant at the elementary level.

Figure 2. BMI and TAKS Performance at the Elementary School Level



At the middle school level, students whose BMI was in the healthy zone had significantly higher reading/ELA and math TAKS scores than did students whose BMI was not in the healthy zone (Figure 3). At the high school level, students whose BMI was in the healthy zone had significantly higher reading/ELA, math, and science TAKS scores than did students who did not have a BMI in the healthy zone (Figure 4).

Figure 3. BMI and TAKS Performance at the Middle School Level

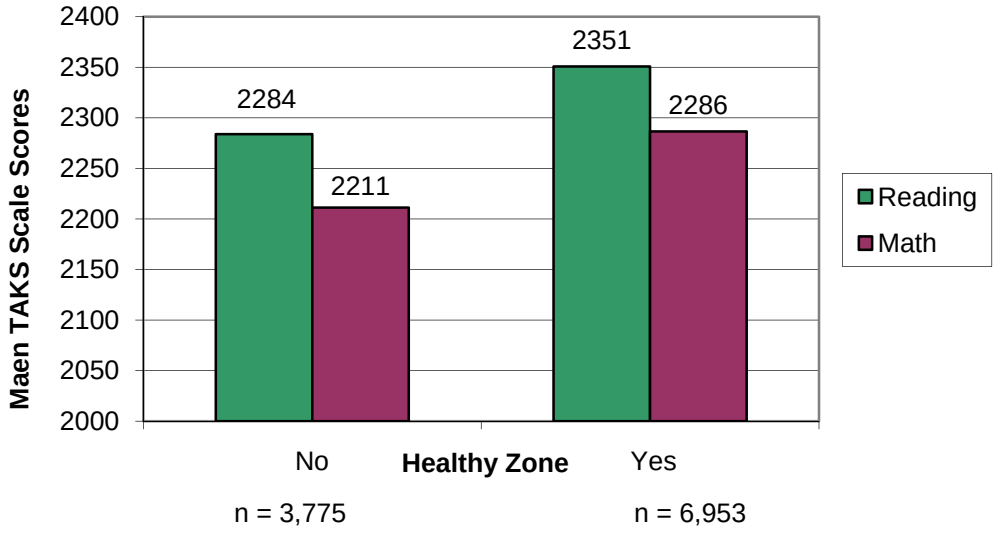
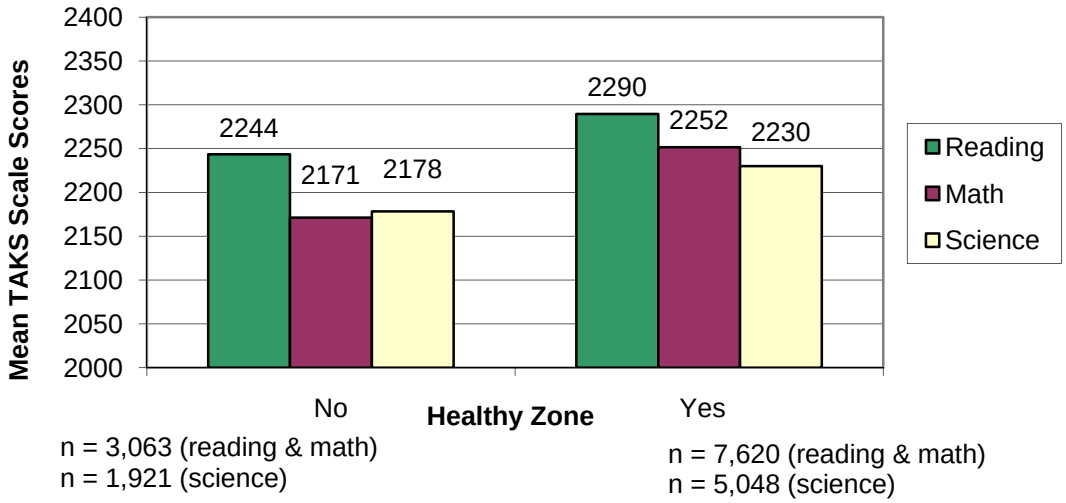


Figure 4. BMI and TAKS Performance at the High School Level



BMI Healthy Zone and Attendance Associations in Grades 3 Through 12

Overall, students in grades 3 through 12 with healthy BMI scores had fewer days absent during the 2007–2008 school year than did students whose BMI scores were 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. BMI and Absences, Grades 3–12

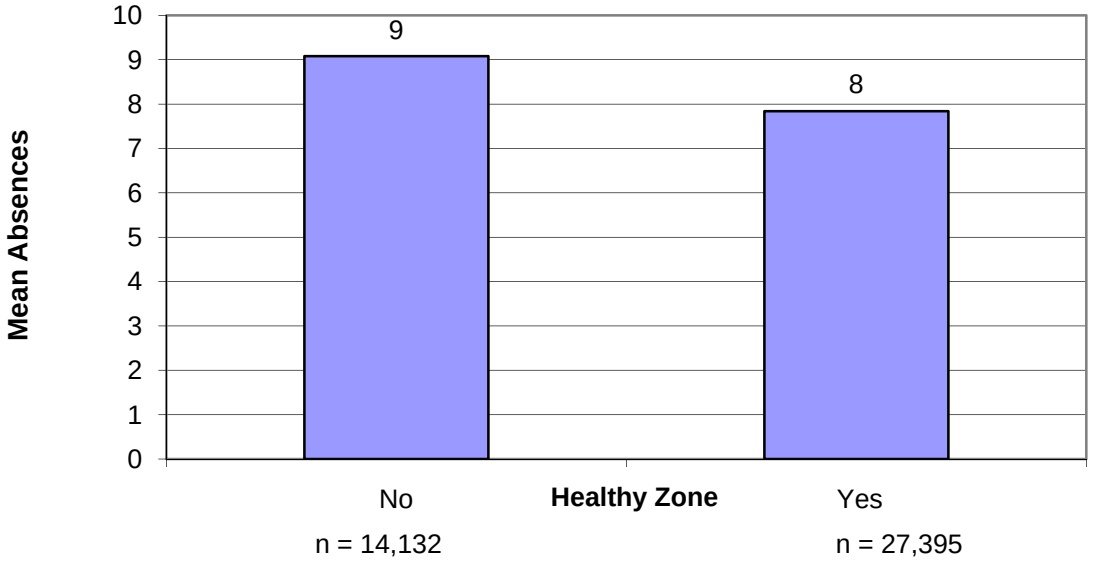


Figure 6. BMI and Absences at the Elementary Level

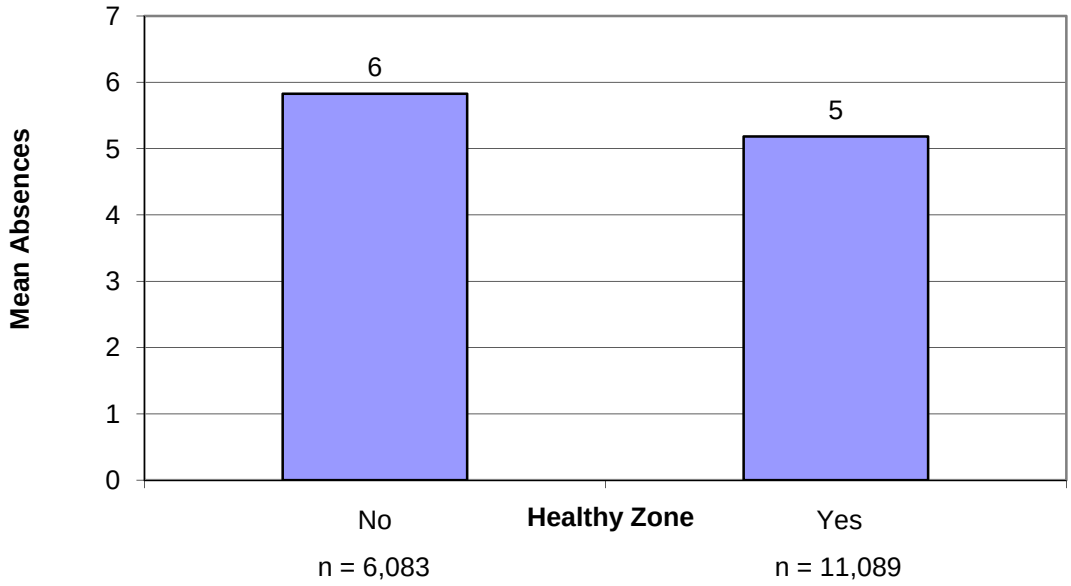


Figure 7. BMI and Absences at the Middle School Level

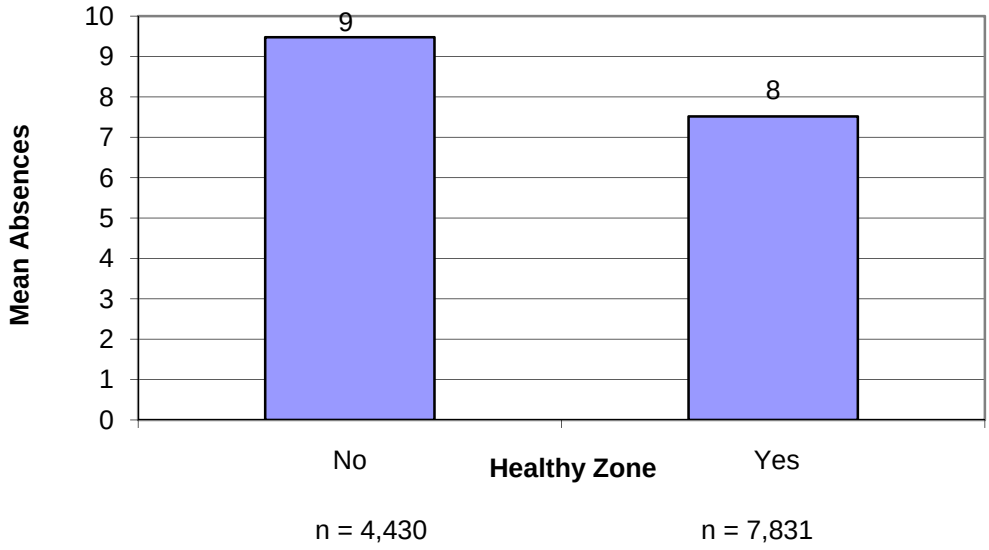
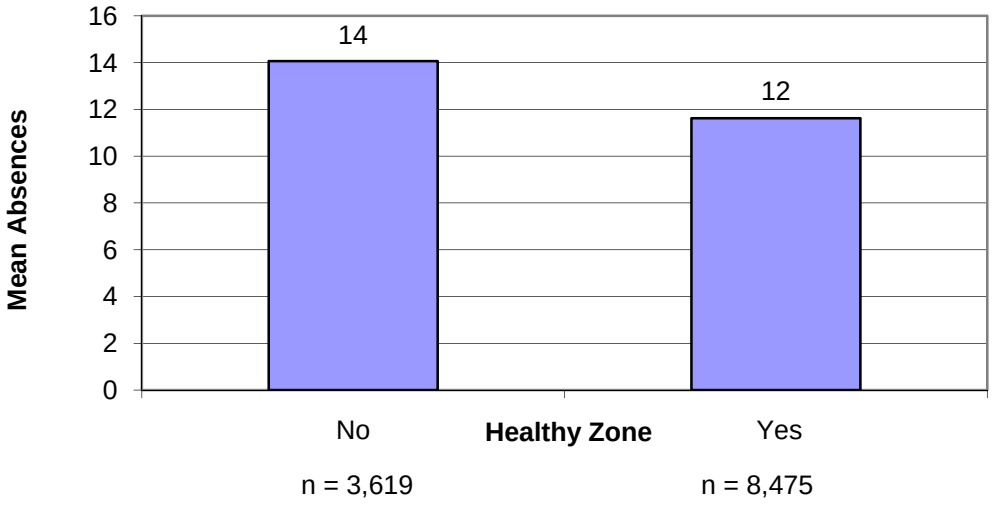


Figure 8. BMI and Absences at the High School Level



Total Fitness Scores and TAKS Performance

The FITNESSGRAM® comprises six separate indicators of student fitness: (a) BMI, (b) aerobic/cardiovascular capacity, (c) abdominal strength, (d) upper body strength, (e) endurance, and (f) flexibility. As shown in Figure 9, a significant, linear association was found between the number of indicators on which students scored in the healthy zone and student performance on the Spring 2008 math and reading/ELA TAKS across grades 3 through 12. That is, the higher students' total fitness, the higher their average TAKS scores. This pattern remained statistically significant when examined separately by grade level (Figures 10, 11, and 12). The associations between students' total fitness and other TAKS subjects were not significant. The number of students in the data set with each total fitness score is listed in Table 2.

Table 2. Students with TAKS Scores, by Total Fitness Score

Total FITNESSGRAM ® score	Number of students with math TAKS scores	Number of students with reading/ELA TAKS scores
0	644	652
1	2,290	2,298
2	4,756	4,802
3	8,067	8,102
4	9,991	10,003
5	8,660	8,663
6	2,867	2,885

Figure 9. Total Fitness Score and TAKS Performance, Grades 3–12

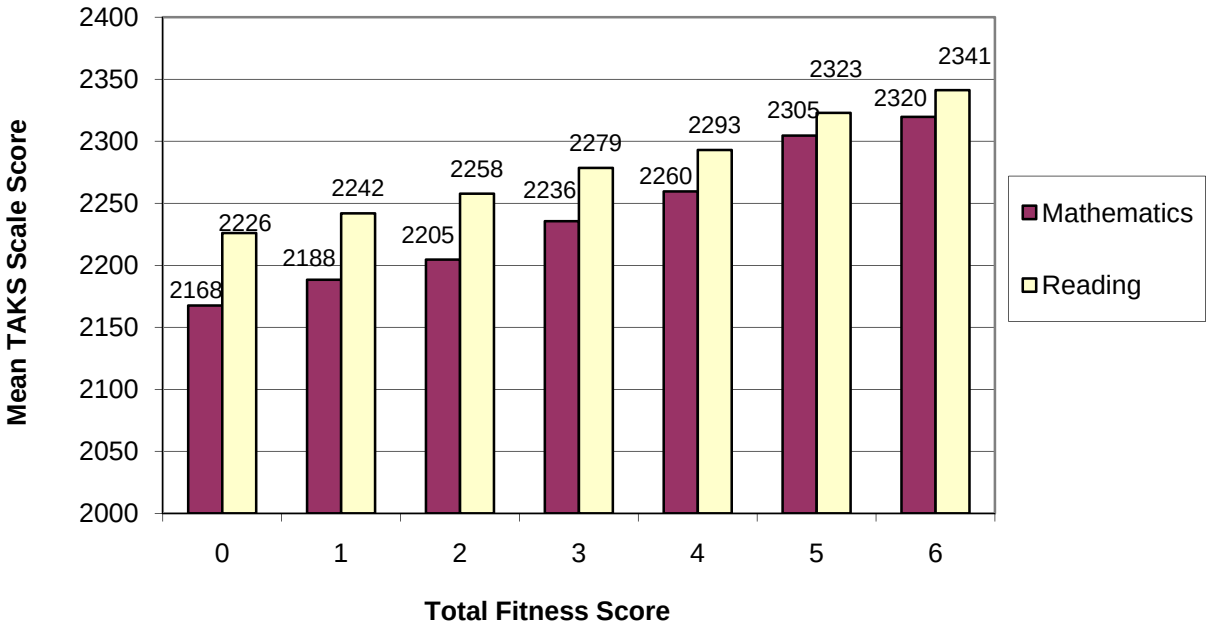


Figure 10. Total Fitness Score and TAKS Performance at the Elementary Level

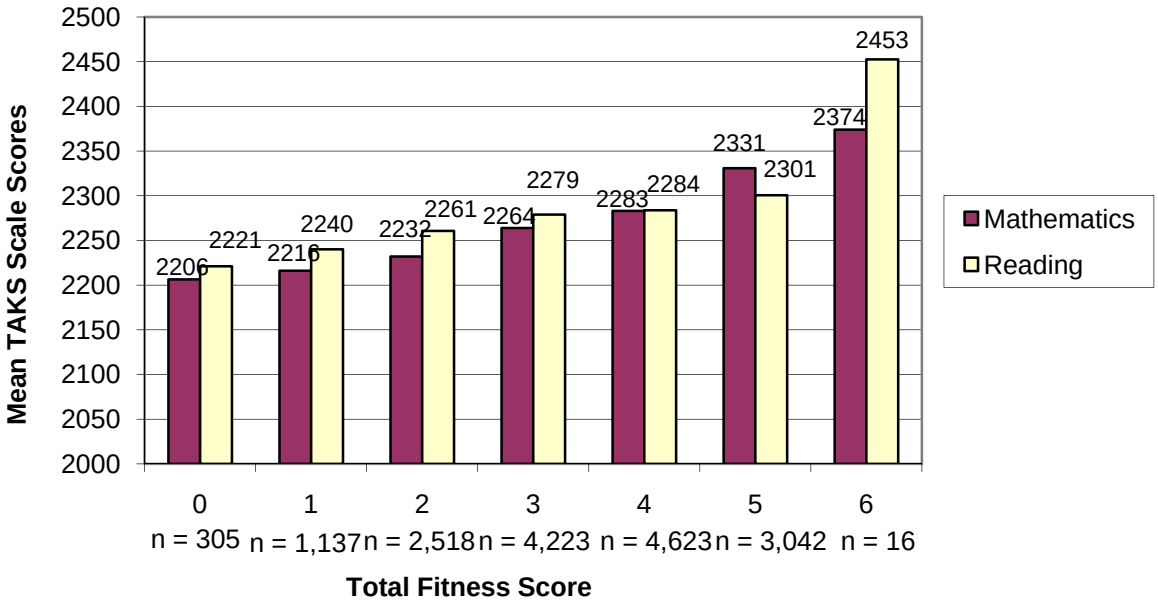


Figure 11. Total Fitness Score and TAKS Performance at the Middle School Level

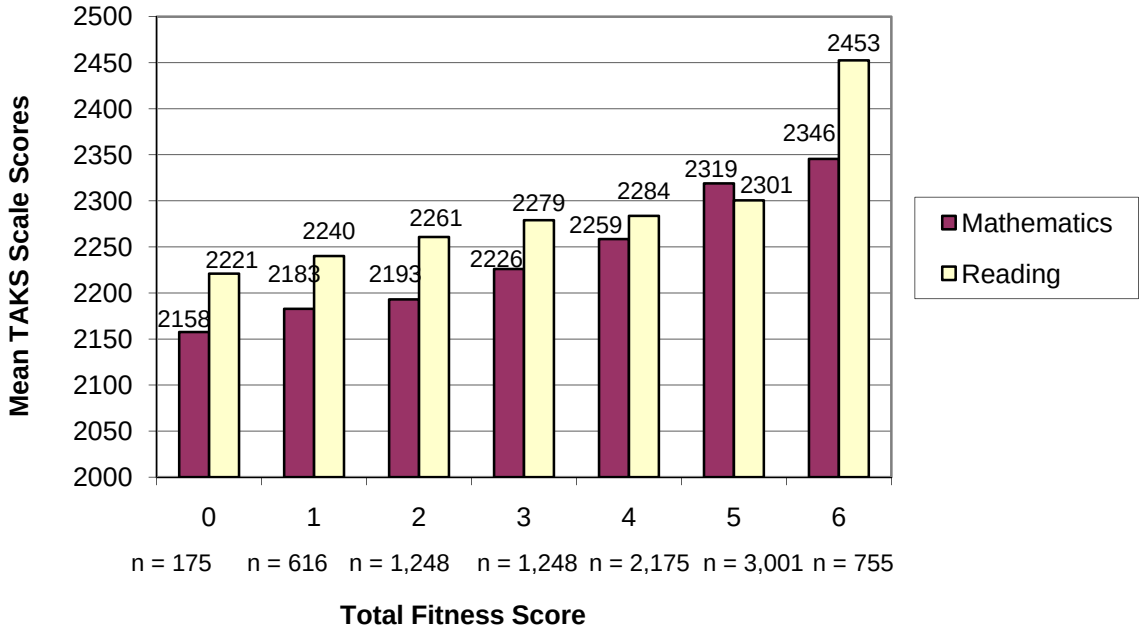
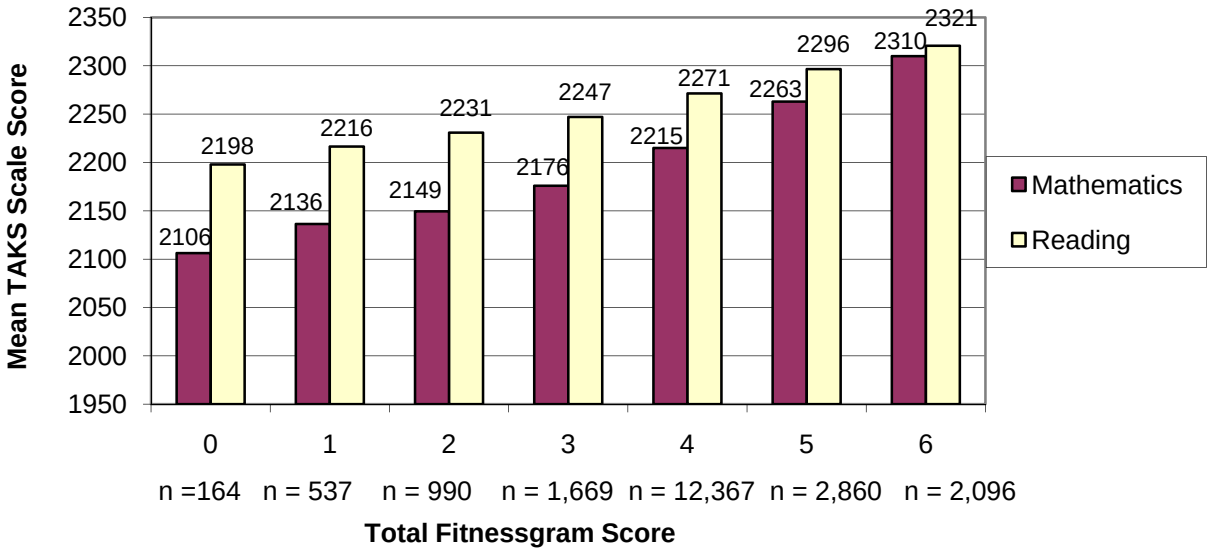


Figure 12. Student Overall Fitness and TAKS Performance at the High School Level



Total Fitness Scores and Attendance

Across grades 3 through 12, a significant linear relationship was found between students' total fitness scores and attendance. Students who had higher total fitness scores were absent fewer days than were students who had lower fitness scores (Figure 13).This significant association persisted across school level; at all grade levels, as fitness level increased, absences decreased (Figures 14, 15, and 16).

Figure 13. Total Fitness and Absences, Grades 3–12

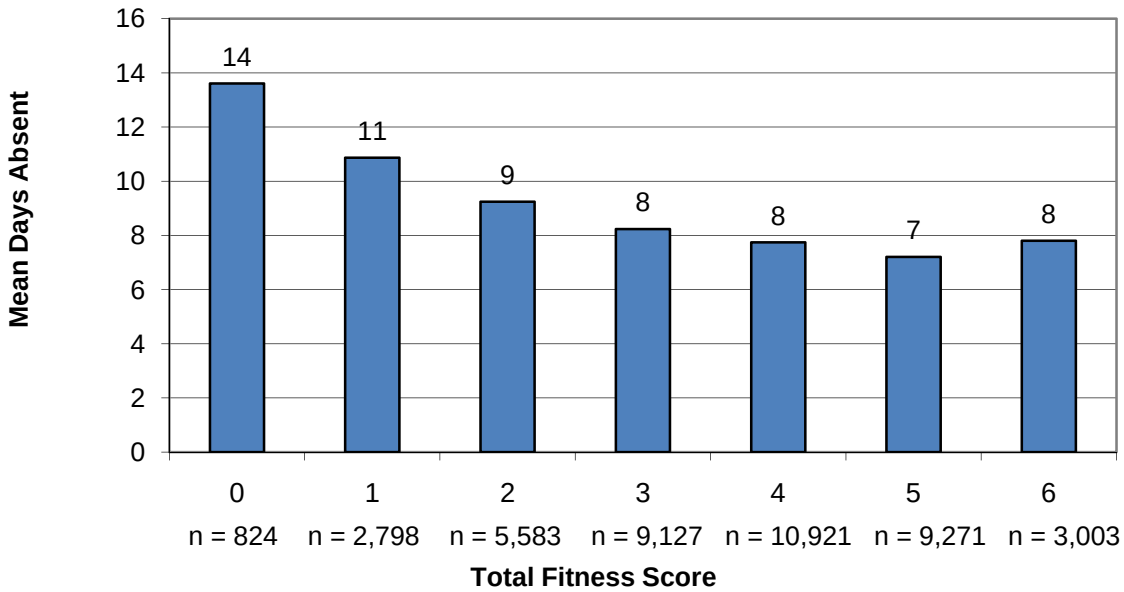


Figure 14. Total Fitness and Absences at the Elementary Level

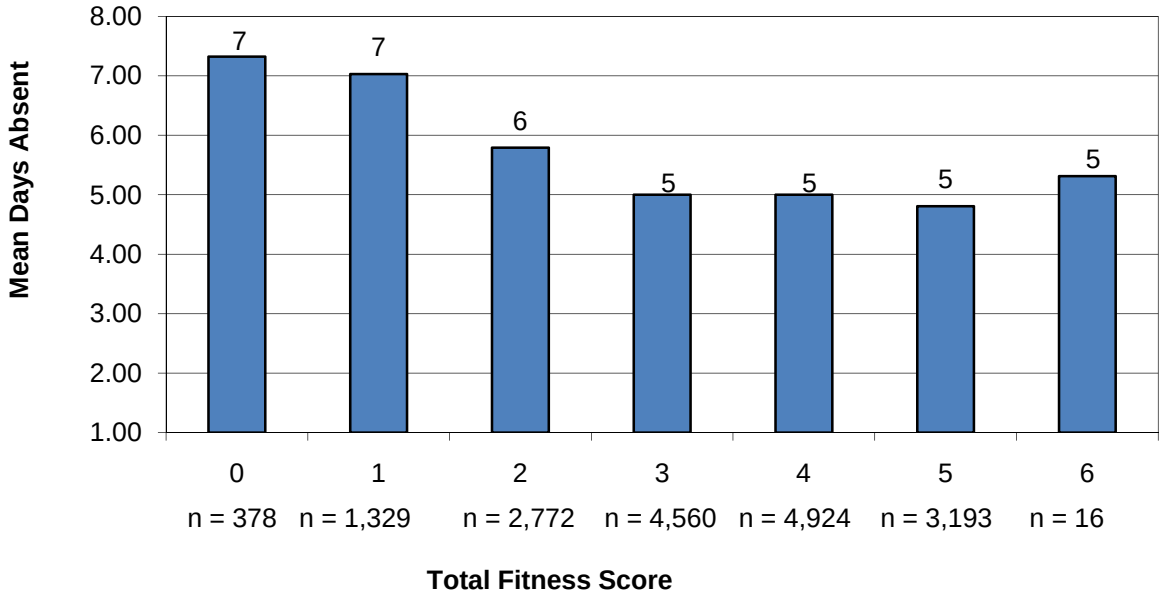


Figure 15. Total Fitness and Absences at the Middle School Level

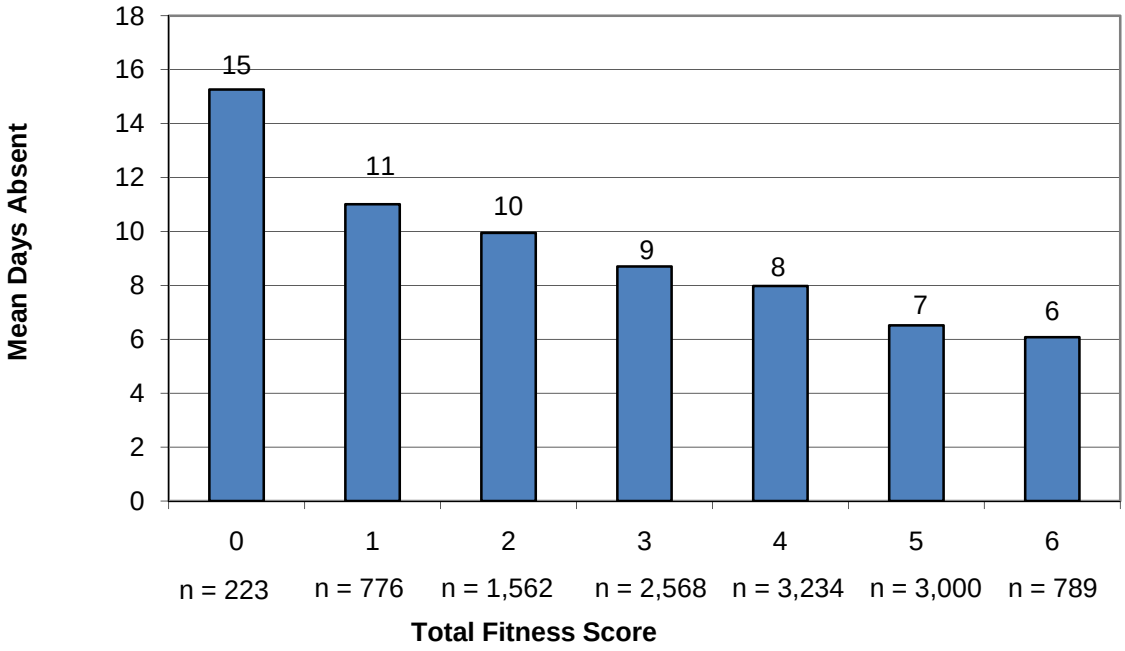
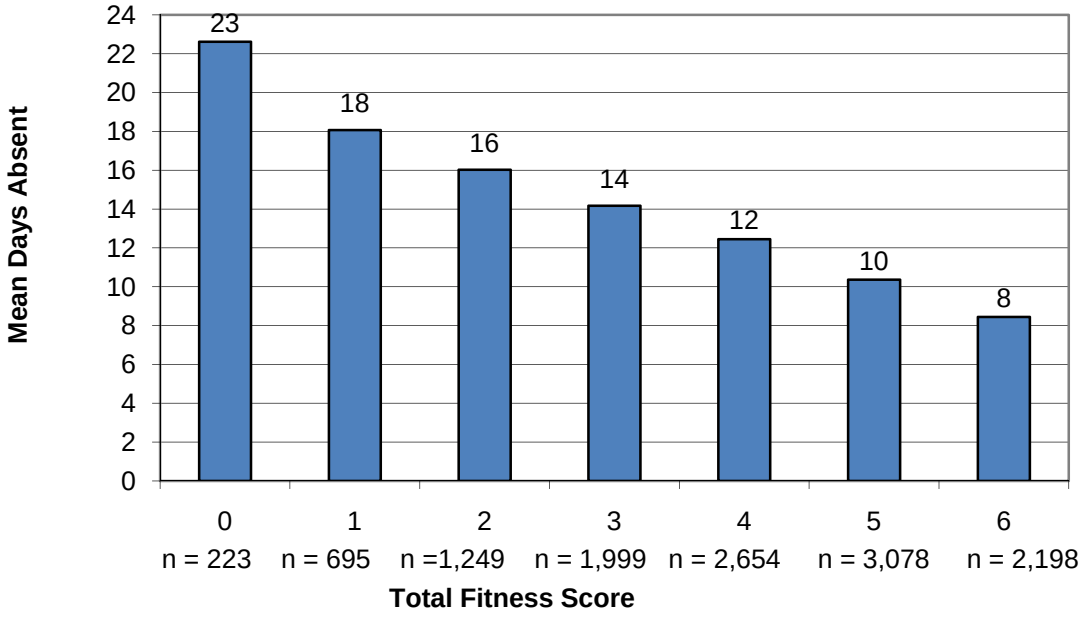


Figure 16. Student Total Fitness and Absences at the High School Level



References

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