Associations between Health-Related Fitness and Academic Achievement (2011 to 2014)

A Report from the Texas Youth Fitness Project

Kelly Allums-Featherston, The Cooper Institute
Yang Bai, Iowa State University
Gregory Welk, Iowa State University

Overview and Summary of Key Findings

The promotion of physical activity and physical fitness in youth is important to reduce the risk of chronic diseases later in life. There is also increasing evidence to support associations between physical activity / physical fitness and indicators of academic achievement. This report summarizes associations between health-related physical fitness and academic achievement using four years of data from the Texas Education Association. The focus of these analyses was on two specific health-related fitness assessments [aerobic capacity (AC) and body composition (BC)]. The associations were examined using two different analytic techniques to provide a more comprehensive evaluation.

Spearman correlations were computed by age, gender and year to examine the overall relationships with academic achievement. The associations varied by fitness test and academic test (as well as by gender and grade). Partial correlations controlling for key school level factors (socio-economic status, percent minority, and school enrollment) revealed weak correlations (i.e., < 0.20) for most comparisons. Consistent with previous findings, the associations were strongest in middle school students (6th to 8th graders). Stronger associations were generally found for body composition, compared to aerobic capacity. When results were stratified by level of Healthy Fitness Zone (HFZ) achievement (low, medium and high), schools with higher levels of HFZ achievement tended to have higher levels of academic achievement but results varied by test, grade and age. Overall, body composition had a stronger association with math achievement and associations were stronger in middle school grades than elementary grades. Similar analysis was applied to data from 2011 and 2014 to evaluate the impact of fitness achievement on school attendance. AC had moderate associations with attendance, even after controlling for several confounders. When results were stratified by level of AC HFZ achievement, schools with high levels of HFZ achievement tended to have higher attendance rates. No association was found between BC and attendance.

The results of the analyses provide continued evidence supporting links between health-related fitness and academic achievement (as well as modest associations with attendance). However, the varied relationships make it difficult to draw definitive conclusions. Additional research with individual measures offers potential to better understand the relationships.

Contents

Methods and Results 4
2011 Results (TAKS) 10
Spearman Correlations with Academic Achievement (TAKS) 10
Figure 1. SY2011 Spearman Correlations with TAKS Achievement—Girls 10
Figure 2. SY2011 Spearman (Partial) Correlations with TAKS Achievement—Girls 11
Figure 3. SY2011 Spearman Correlations with TAKS Achievement—Boys 12
Figure 4. SY2011 Spearman (Partial) Correlations with TAKS Achievement — Boys 13
Academic Achievement Stratified by Fitness Level - 2011 14
Figure 5. 4th Grade Results – SY2011 14
Figure 6. 5th Grade Results– SY2011 15
Figure 7. 6th Grade Results– SY2011 16
Figure 8. 7th Grade Results– SY2011 17
Figure 9. 8th Grade Results– SY2011 18
2012 Results (STAAR) 19
Spearman Correlations with Academic Achievement (STAAR) 19
Figure 10. SY2012 Spearman Correlation with STAAR - girls 19
Figure 11. SY2012 Spearman (Partial) Correlations with STAAR — Girls 20
Figure 12. SY2012 Spearman Correlations with STAAR — Boys 21
Figure 13. SY2012 Spearman (Partial) Correlation with STAAR — Boys 22
Academic Achievement Stratified by Fitness Level – STAAR - 2012 23
Figure 14. 4th Grade Results– SY2012 23
Figure 15. 5th Grade Results– SY2012 24
Figure 16. 6th Grade Results– SY2012 25
Figure 17. 7th Grade Results– SY2012 26
Figure 18. 8th Grade Results– SY2012 27
2013 – Results (STAAR) 28
Spearman Correlations with Academic Achievement (STAAR) 28
Figure 19. SY2013 Spearman Correlations with STAAR – Girls 28
Figure 20. SY2013 Spearman (Partial) Correlations with STAAR — Girls 29
Figure 21. SY2013 Spearman Correlations with STAAR — Boys 30

Figure 22. SY2013 Spearman (Partial) Correlations with STAAR — Boys 31
Academic Achievement Stratified by Fitness Level – STAAR - 2013 32
Figure 23. 4th Grade Results– SY2013 32
Figure 24. 5th Grade Results– SY2013 33
Figure 25. 6th Grade Results– SY2013 34
Figure 26. 7th Grade Results– SY2013 35
Figure 27. 8th Grade Results– SY2013 36
2014 Results (STAAR) 37
Spearman Correlations with Academic Achievement (STAAR) 37
Figure 28. SY2014 Spearman Correlation with STAAR - girls 37
Figure 29. SY2014 Spearman (Partial) Correlations with STAAR — Girls 38
Figure 30. SY2014 Spearman Correlations with STAAR — Boys 39
Figure 31. SY2014 Spearman (Partial) Correlation with STAAR — Boys 40
Academic Achievement Stratified by Fitness Level – STAAR - 2014 41
Figure 32. 4th Grade Results– SY2014 41
Figure 33. 5th Grade Results– SY2014 42
Figure 34. 6th Grade Results– SY2014 43
Figure 35. 7th Grade Results– SY2014 44
Figure 36. 8th Grade Results– SY2014 45
2011 Results (Attendance) 46
Attendance Stratified by Aerobic Capacity Level 46
Figure 37. 46
2012 Results (Attendance) 47
Attendance Stratified by Aerobic Capacity Level 47
Figure 38. 47
2013 Results (Attendance) 48
Attendance Stratified by Aerobic Capacity Level 48
Figure 39. 48
2014 Results (Attendance) 49
Attendance Stratified by Aerobic Capacity Level 49
Figure 40. 49

Methods and Results

The data from the Texas Youth Fitness Project make it possible to systematically examine health-related fitness and links with academic achievement in the state of Texas. This report summarizes the associations between two specific health-related fitness assessments (Aerobic Capacity-AC and Body Composition-BC) and two academic assessments (math and reading) for four different years of data collected by the Texas Education Association (2010/2011, 2011/2012, 2012/2013, and 2013/2014). The fitness data were screened using established procedures to ensure that results from individual schools provided generalizable results by both grade and gender.[1] This resulted in a sample of 2,761 elementary schools and 1,530 middle schools in 2011, 2,749 elementary schools and 1,173 middle schools in 2012, and 2,532 elementary and 1,073 middle schools in 2013. The 2014 sample included for comparison with AC data are 1,314 elementary schools and 580 middle schools, whereas the 2014 sample included for comparison with BC data are 2,501 elementary schools and 1,107 middle schools[2] The association between AC, BC and attendance was also studied with data from 2011, 2012, 2013, and 2014. A similar analytical approach was applied to fitness and attendance data.

The evaluation focused on the associations between percent of students that achieved the established FITNESSGRAM® Healthy Fitness Zone® (HFZ) with the percent of students that achieved Level II Satisfactory--Phase-in 1 for the reading and math standards test. The TAKS test was administered to students in 2011, while the STAAR test was used for the majority of students in 2012, 2013, and 2014. Though the tests are similar, direct comparisons of achievement between the two tests should not be made. Student achievement from 4th to 8th grade were included in this report, as there were available grade level data on both academic achievement and physical fitness (e.g., 5th grade math and reading with 5th grade aerobic capacity and body composition). The "End of Course" (EOC) exam data from the STAAR test are available for students in grades 9th to 12th grade. However, students take EOC exams based on curriculum that has been completed rather than identified grade level (e.g., 9th and 10th grade students could take English I). Due to the inability to directly link academic and fitness data by grade, analyses of associations between academic and fitness data were not completed for grades 9th to 12th grade.

Two specific analyses were conducted for each year of data. One set of analyses examined correlations between % of youth achieving the age specific HFZ and the % of youth achieving the age specific academic standards. Spearman correlations were used to deal with data that was not normally distributed. Analyses were conducted with and without controlling for other school level factors in order to determine the impact of these variables on the results. The "partial" correlations that control for school level variables provide a more appropriate (and more conservative) view of the associations since it removes shared variance due to factors such as socio-economic status.

[1] Methods used to screen the data were summarized in a separate report documenting the levels and patterns of health-related fitness achievement based on the 2011, 2012, 2013, and 2014 FITNESSGRAM data.

[2] 2014 AC data includes only data submitted to the Texas Education Agency (TEA) via the Physical Fitness Assessment Initiative (PFAI; approximately 2,400,000 youth; 2/3 of Texas students), data submitted using the FITNESSGRAM (FG) version 10 software were excluded to prevent comparisons of AC data using different health-related fitness standards and/or calculations. 2014 BC data includes all data submitted to the TEA regardless of submission channel (i.e., PFAI or FG), as the same health-related standards were able to be applied for all BC data.

The other set of analyses used more sophisticated general linear models to examine the relationship between health-related fitness and academic achievement. For these analyses, both AC and BC were categorized into tertiles (i.e., high, medium, and low AC and BC achievement groups), respectively. Least square means of math and reading achievement were reported by three fitness levels after adjusting for the school demographic characteristics (i.e., SES, minority rate, and school size). These analyses provide more easily interpretable findings since they directly compare schools with high, medium and low levels of school level fitness achievement on indicators of academic achievement.

Some key summaries are below:

i. Fitness Associations with Math, Reading

1. **Results from Spearman Correlation Analyses:**
   Spearman correlations were computed by age, gender and year to examine the overall relationships. The association between health-related fitness and academic achievement varied by fitness test and academic test (as well as by gender and grade). Correlations were low to moderate with higher correlations generally noted for body composition (range: 0.17 to 0.50) than aerobic capacity (range: 0.11 to 0.47). Partial correlations controlling for key school levels factors (socio-economic status, percent minority, and school enrollment) reduced the correlations for both BC (range: 0.02 to 0.19) and AC (range: 0 to 0.16). This is not surprising since it is known that SES and other school characteristics can influence both health-related fitness and academic achievement. Associations were consistently higher for older middle school students (6^{th} to 8^{th} grade). Details on the findings for each year are summarized below:

   - 2011
     - Girls: Spearman correlations ranged from 0.11 to 0.39 for AC and from 0.2 to 0.48 for BC (Figure 1). The corresponding ranges for the partial correlations were 0 to 0.12 and 0.06 to 0.19, respectively (Figure 2). Higher correlations were consistently reported for older youth.
     - Boys: Spearman correlations ranged from 0.12 to 0.45 for AC and from 0.17 to 0.45 for BC (Figure 3). The corresponding ranges for the partial correlations were 0 to 0.12 and 0.02 to 0.11, respectively (Figure 4). Higher correlations were consistently reported for older youth.
   - 2012
     - Girls: Spearman correlations ranged from 0.18 to 0.39 for AC and from 0.26 to 0.48 for BC (Figure 10). The corresponding ranges for the partial correlations were 0.02 to 0.11 and 0.03 to 0.12, respectively (Figure 11). Higher correlations were consistently reported for older youth.
     - Boys: Spearman correlations ranged from 0.18 to 0.41 for AC and from 0.26 to 0.47 for BC (Figure 12). The corresponding ranges for the partial correlations were 0 to 0.14 and 0 to 0.09, respectively (Figure 13). Higher correlations were consistently reported for older youth.
   - 2013

- Girls: Spearman correlations ranged from 0.18 to 0.42 for AC and from 0.30 to 0.48 for BC (Figure 19). The corresponding ranges for the partial correlations were 0 to 0.08 and 0.08 to 0.17, respectively (Figure 20). Higher correlations were consistently reported for older youth.
- Boys: Spearman correlations ranged from 0.22 to 0.43 for AC and from 0.26 to 0.48 for BC (Figure 21). The corresponding ranges for the partial correlations were 0.03 to 0.16 and 0.02 to 0.13, respectively (Figure 22). Higher correlations were consistently reported for older youth.

- 2014
  - Girls: Spearman correlations ranged from 0.20 to 0.44 for AC and from 0.28 to 0.50 for BC (Figure 28). The corresponding ranges for the partial correlations were 0.02 to 0.14 and 0.07 to 0.15, respectively (Figure 29). Higher correlations were consistently reported for older youth.
  - Boys: Spearman correlations ranged from 0.20 to 0.47 for AC and from 0.26 to 0.45 for BC (Figure 30). The corresponding ranges for the partial correlations were 0 to 0.13 and 0 to 0.16, respectively (Figure 31). Higher correlations were consistently reported for older youth.

2. **Results from General Linear Models.**

General Linear Models were used to compare schools with high, medium and low levels of health-related fitness achievement. Results showed differences between high and low levels of achievement but results again varied by test, grade and age. Specific findings for each year are summarized below (separately for girls and boys).

In 2011, among girls

- Findings for Aerobic Capacity:
  - 4^{th}, 6^{th} and 7^{th} grade girls who were in the high AC achievement schools had significantly higher math achievement rates than their peers from low AC achievement schools (Figures 5a, 7a, 8a, respectively).
- Findings for Body Composition (BC):
  - 5^{th}, 6^{th} and 7^{th} grade girls who were in the high and medium BC achievement had significantly higher math and reading achievement rates than their peers from low BC achievement schools (Figure 6a, 7a, and 8a respectively).
- 7^{th} grade girls who were in high BC achievement schools had significantly higher math and reading achievement rates than their peers from low BC achievement schools (Figure 8a).

In 2011, among boys

- Findings for Aerobic Capacity (AC):
  - 6^{th} and 8^{th} grade boys who were in the high AC achievement schools had statistically significant higher math achievement rates than their peers from medium AC achievement schools (Figures 7b and 9b, respectively).

  - 8th grade boys who were in the high AC achievement schools had statistically significant higher math achievement rates than their peers from low AC achievement schools (Figure 9b).
- Findings for Body Composition (BC):
  - 6th grade boys who were in the high BC achievement schools had statistically significant higher math and reading achievement rates than their peers from low BC achievement schools (Figure 7b).
  - 8th grade boys who were in the high BC achievement schools had statistically significant higher math achievement rates than their peers from medium BC achievement schools (Figure 9b).

In 2012, among girls

- Findings for Aerobic Capacity:
  - 8th grade girls who were in the high AC achievement schools had statistically significant higher math achievement rates than their peers from medium and low AC achievement schools, respectively (Figure 18a).
- Findings for Body Composition (BC):
  - 5th to 8th grade girls who were in the high BC achievement schools had statistically significant higher math achievement rates than their peers from low BC achievement schools (Figures 15a, 16a, 17a, 18a).
  - 7th and 8th grade girls who were in the high BC achievement schools also had statistically significant higher math achievement rates than their peers from medium BC achievement schools (Figure 17a and 18a).

In 2012, among boys

- Findings for Aerobic Capacity:
  - 7th grade boys who were in the high AC achievement schools had statistically significant higher math achievement rates than their peers from medium AC achievement schools (Figures 17b).
  - 7th and 8th grade boys who were in the high AC achievement schools had statistically significant higher reading achievement rates than their peers from medium AC achievement schools (Figures 17b and 18b, respectively).
  - 7th grade boys who were in the medium AC achievement schools had statistically significant higher reading achievement rates than their peers from low AC achievement schools (Figure 17b).
- Findings for Body Composition (BC):
  - 6th and 7th grade boys who were in the medium BC achievement schools had statistically significant higher reading achievement rates than their peers from low BC achievement schools (Figure 16b and 17b).

- 7th grade boys who were in the high BC achievement schools had statistically significant higher reading achievement rates than their peers from low BC achievement schools (Figure 17b).
- 6th grade boys who were in the high BC achievement schools had statistically significant higher math achievement rates than their peers from low and medium BC achievement schools, respectively (Figure 16b).

In 2013, among girls

- Findings for Aerobic Capacity:
  - There were no significant achievement differences for any grades when stratified by AC achievement.
- Findings for Body Composition (BC):
  - 4th and 6th grade girls who were in the medium BC achievement schools had statistically significant higher reading achievement rates than their peers from low BC achievement schools (Figure 23a and 25a).
  - 5th and 7th grade girls who were in the high BC achievement schools had statistically significant higher reading achievement rates than their peers from low BC achievement schools (Figure 24a and 26a).
  - 4th and 7th grade girls who were in the medium and high BC achievement schools had statistically significant higher math achievement rates than their peers from low BC achievement schools (Figure 23a and 26a).
  - 8th grade girls who were in the high BC achievement schools had statistically significant higher math achievement rates than their peers from medium BC achievement schools (Figure 27a).

In 2013, among boys

- Findings for Aerobic Capacity:
  - 6th grade boys who were in the high AC achievement schools had statistically significant higher reading achievement rates than their peers from low AC achievement schools (Figure 25b).
  - 7th grade boys who were in the medium AC achievement schools had statistically significant higher reading achievement rates than their peers from low AC achievement schools (Figure 26b).
- Findings for Body Composition (BC):
  - 6th and 7th grade boys who were in the medium and high BC achievement schools had statistically significant higher reading achievement rates than their peers from low BC achievement schools (Figure 25b and 26b).
  - 6th grade boys who were in the high BC achievement schools had statistically significant higher math achievement rates than their peers from low BC achievement schools (Figure 25b).

In 2014, among girls

- Findings for Aerobic Capacity:

- 5th and 6th grade girls who were in high AC achievement schools had statistically significant higher reading achievement rates than their peers from low AC achievement schools, respectively (Figure 33a and 34a).

- Findings for Body Composition (BC):
  - 5th, 6th, 7th grade girls who were in the high and medium BC achievement schools had statistically significant higher math and reading achievement rates than their peers from low BC achievement schools, with higher rates for reading from medium to low schools (Figures 33a, 34a, 35a).
  - 8th grade girls who were in the high and medium BC achievement schools also had statistically significant higher reading achievement rates than their peers from low BC achievement schools (Figure 36a).

In 2014, among boys

- Findings for Aerobic Capacity:
  - 6th grade boys who were in the high and medium AC achievement schools had statistically significant higher reading achievement rates than their peers from medium and low AC achievement schools respectively, with higher rates in math at the medium AC achievement schools compared to the low AC achievement schools (Figure 34b).
- Findings for Body Composition (BC):
  - 6th and 7th grade boys who were in the high and medium BC achievement schools had statistically significant higher math and reading achievement rates than their peers from low BC achievement schools respectively (Figure 34b, 35b).

ii. Fitness Associations with Attendance

1. **Results from Spearman Correlation Analysis**

   Spearman correlations were computed by gender and year to examine the overall relationships. The association between health-related fitness and academic achievement varied by gender but were consistent across 2011 and 2014. Correlations were moderate between AC and attendance among boys (0.43 in 2011, 0.46 in 2012, 0.43 in 2013, and 0.34 in 2014) who tended to have higher correlations than girls (0.32 in 2011, 0.34 in 2012, 0.32 in 2013, and 0.26 in 2014). Partial correlations controlling for key school levels factors (socio-economic status, percent minority, and school enrollment) did not change the association for both boys (0.42 in 2011, 0.44 in 2012, 0.42 in 2013, and 0.30 in 2014) and girls (0.31 in 2011, 0.32 in 2012, 0.31 in 2013, and 0.22 in 2014).

2. **Results from General Linear Models.**

   A significant association was only found in AC and attendance, thus General Linear Models were only used to compare schools with high, medium and low levels of AC health-related fitness achievement. Results showed that schools with higher AC health-related fitness achievement had significantly higher attendance rates. These patterns were consistent for both boys and girls. However, no patterns were evident when attendance was related to body composition. See Figures 37, 38, 39, and 40.

2011 Results (TAKS)

Spearman Correlations with Academic Achievement (TAKS)

Figure 1. SY2011 Spearman Correlations with TAKS Achievement—Girls

Aerobic Capacity

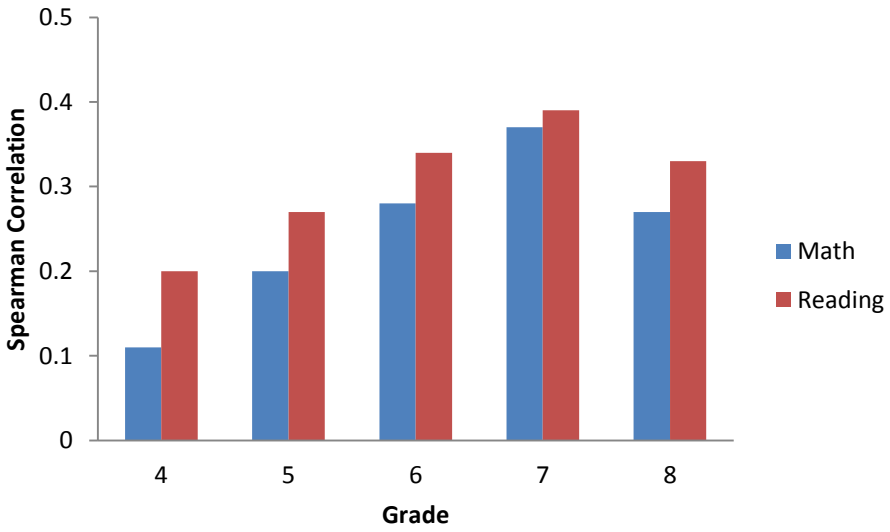

Fig 1a. Spearman correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

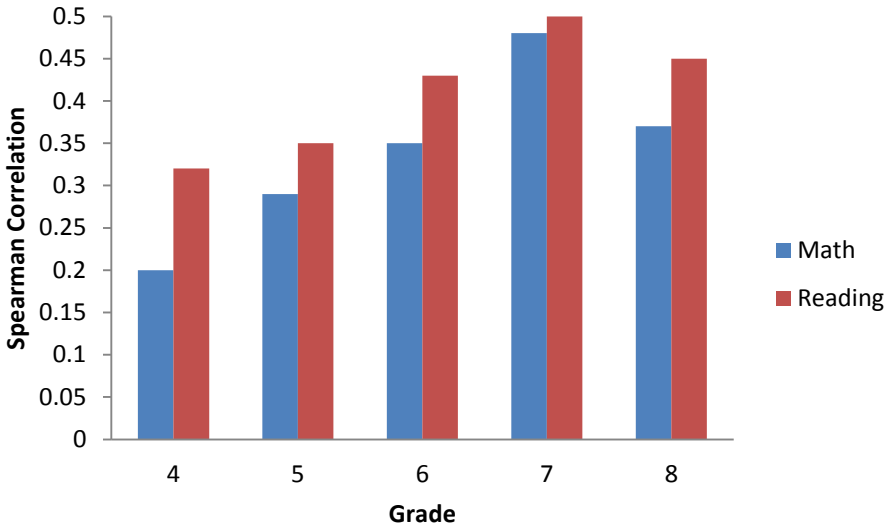

Fig 1b. Spearman correlation between Body Composition HFZ with Math and Reading achievement.

Figure 2. SY2011 Spearman (Partial) Correlations with TAKS Achievement—Girls

Aerobic Capacity

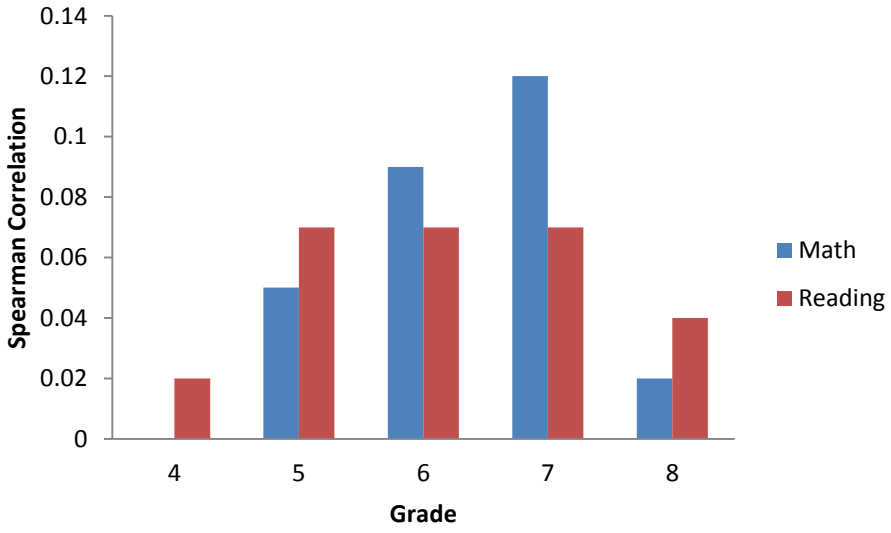

Fig 2a. Spearman partial correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

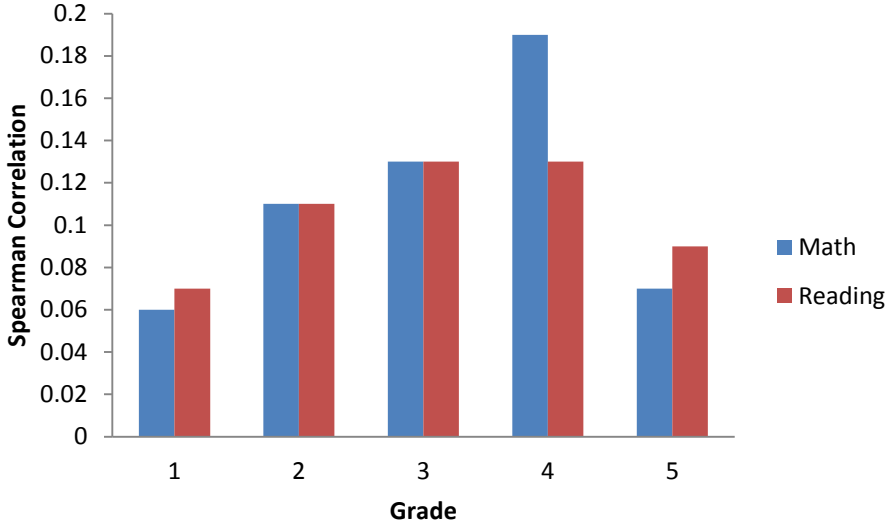

Fig 2b. Spearman partial correlation between body composition HFZ with Math and Reading achievement.

Figure 3. SY2011 Spearman Correlations with TAKS Achievement—Boys

Aerobic Capacity

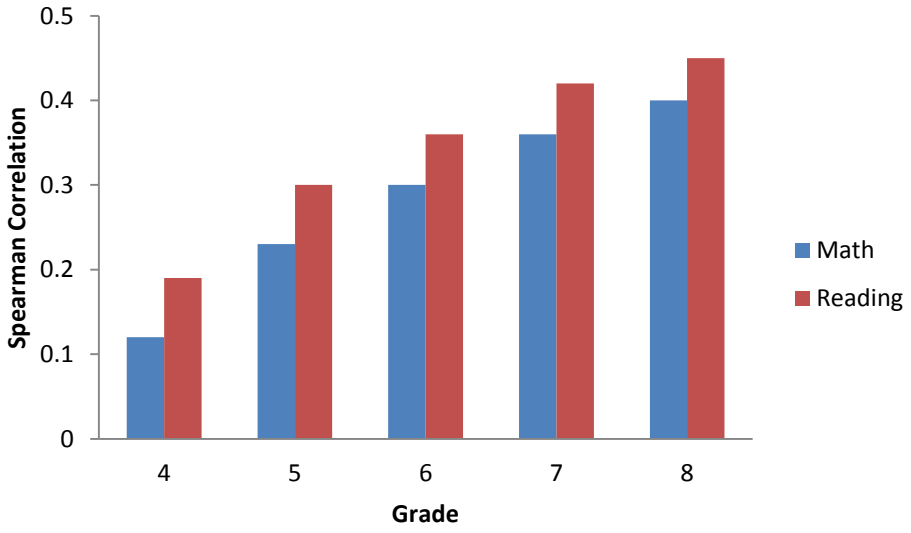

Fig 3a. Spearman correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

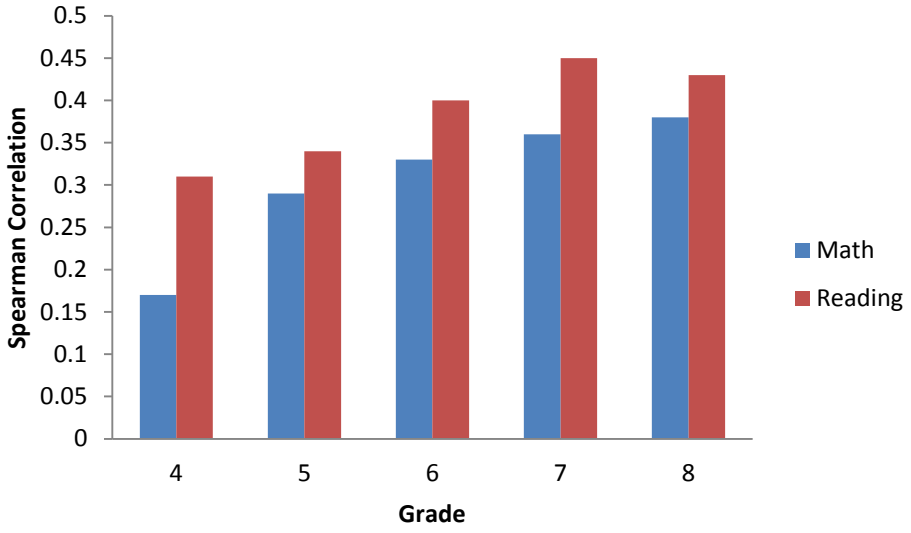

Fig 3b. Spearman correlation between body composition HFZ with Math and Reading achievement.

Figure 4. SY2011 Spearman (Partial) Correlations with TAKS Achievement — Boys

Aerobic Capacity

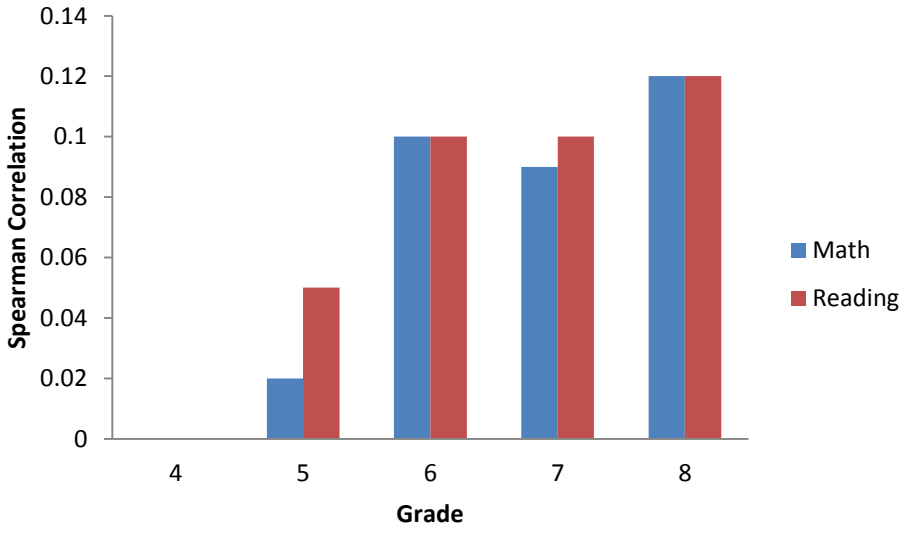

Fig 4a. Spearman partial correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

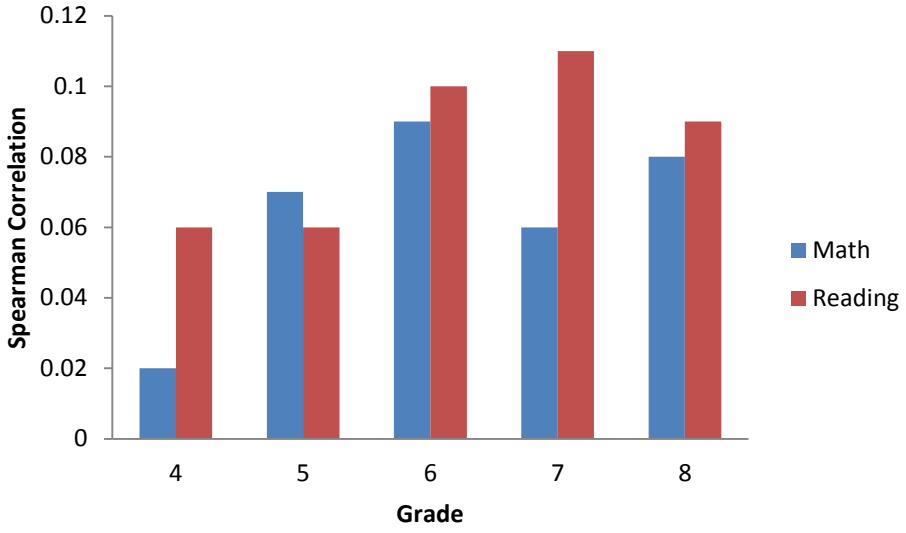

Fig 4b. Spearman partial correlation between body composition HFZ with Math and Reading achievement.

Academic Achievement Stratified by Fitness Level - 2011

Figure 5. 4th Grade Results – SY2011

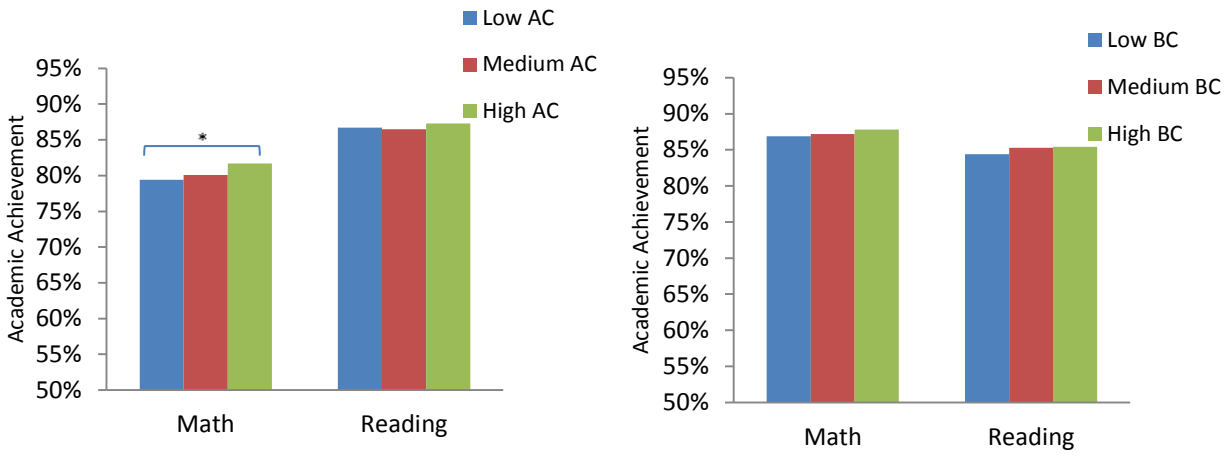

Fig 5a. 4th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

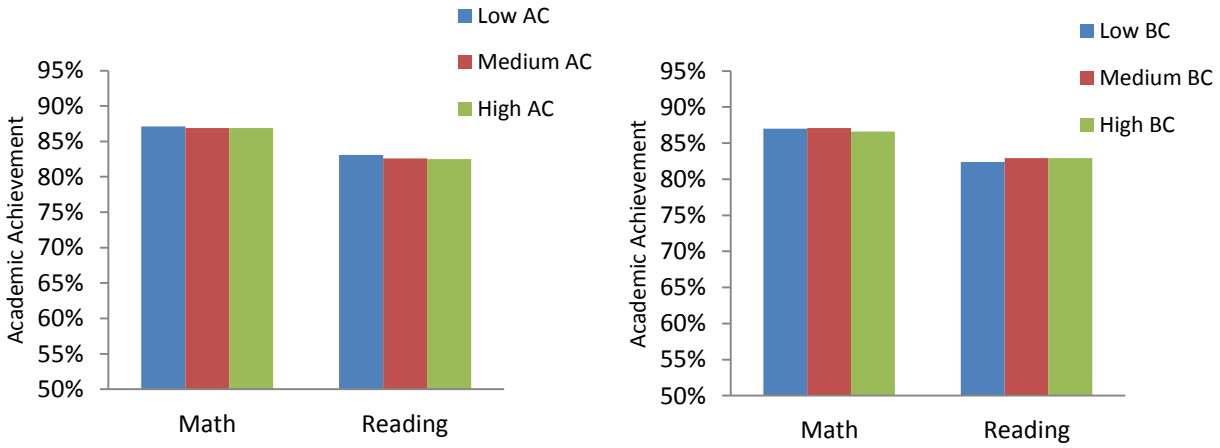

Fig 5b. 4th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

Figure 6. 5th Grade Results– SY2011

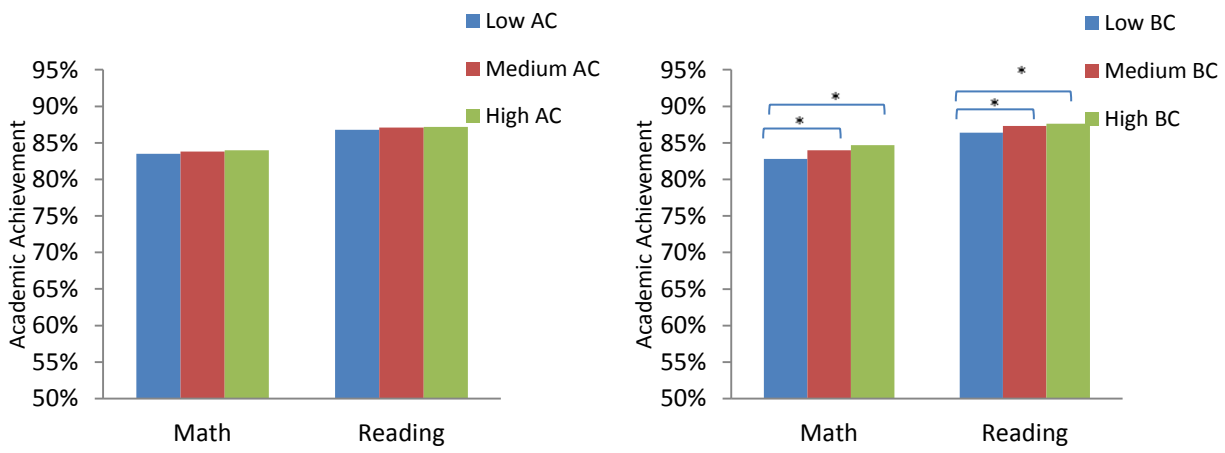

Fig 6a. 5th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

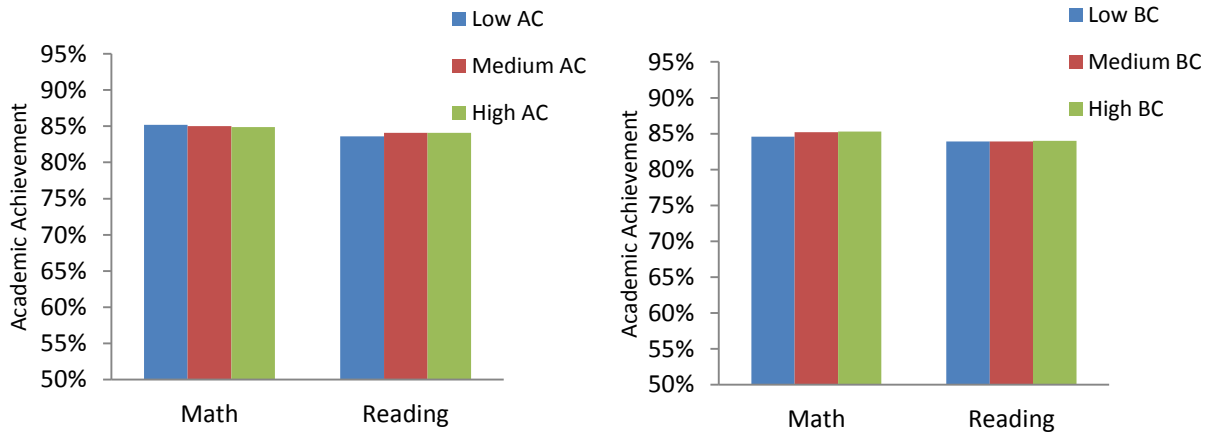

Fig 6b. 5th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

Figure 7. 6th Grade Results– SY2011

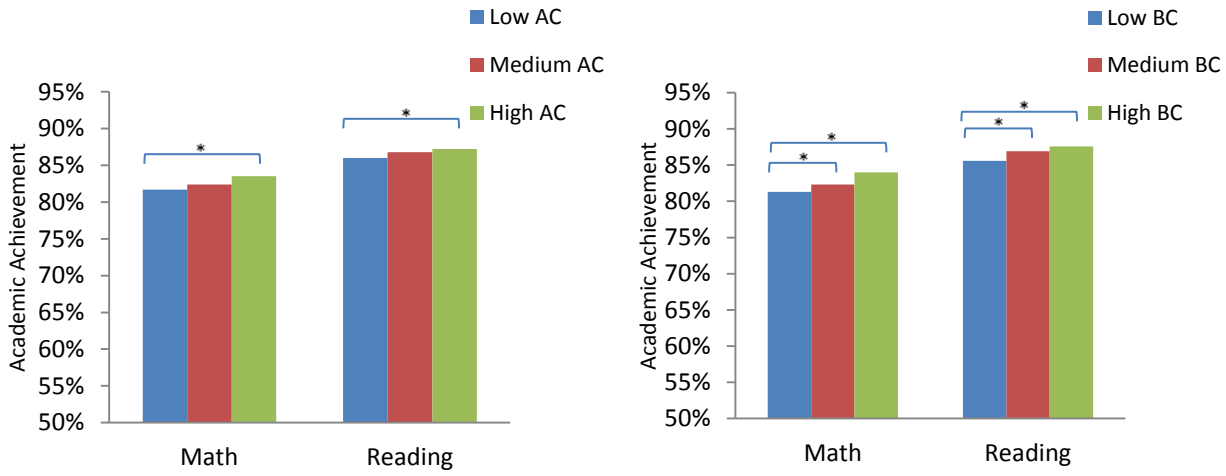

Fig 7a. 6th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

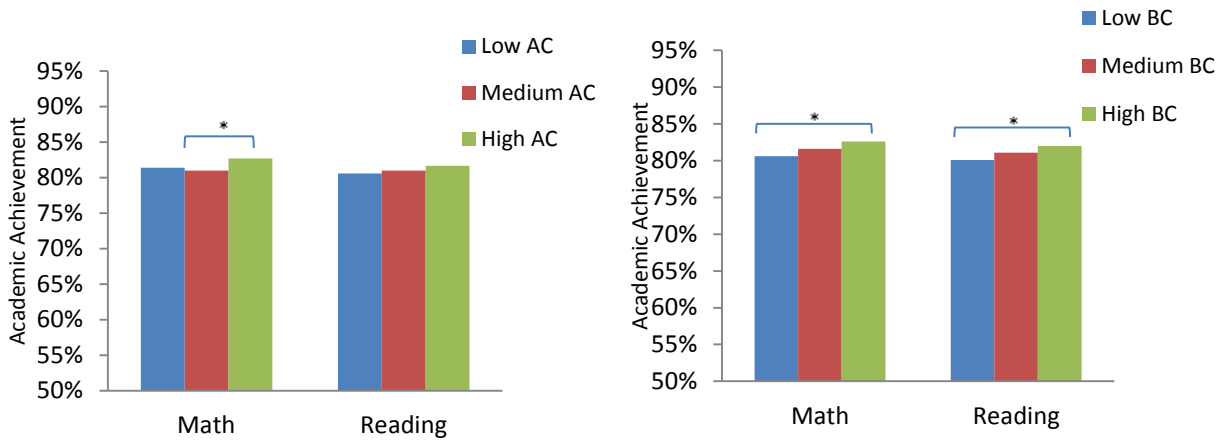

Fig 7b. 6th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

Figure 8. 7th Grade Results– SY2011

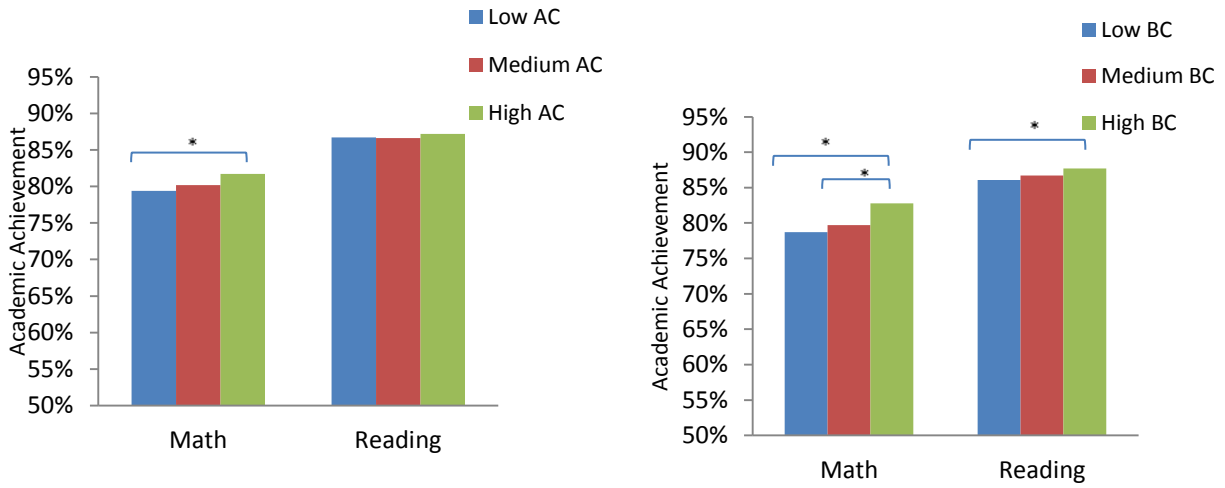

Fig 8a. 7th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

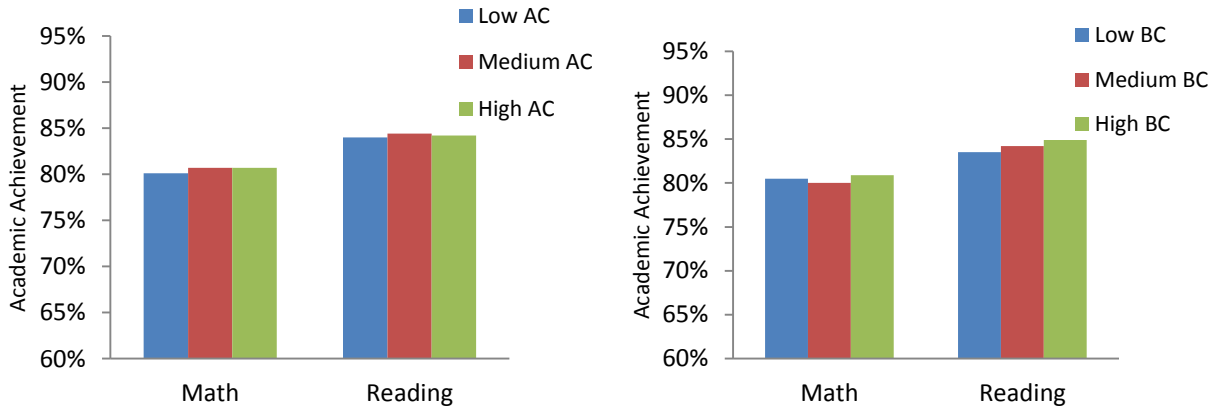

Fig 8b. 7h grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

Figure 9. 8th Grade Results– SY2011

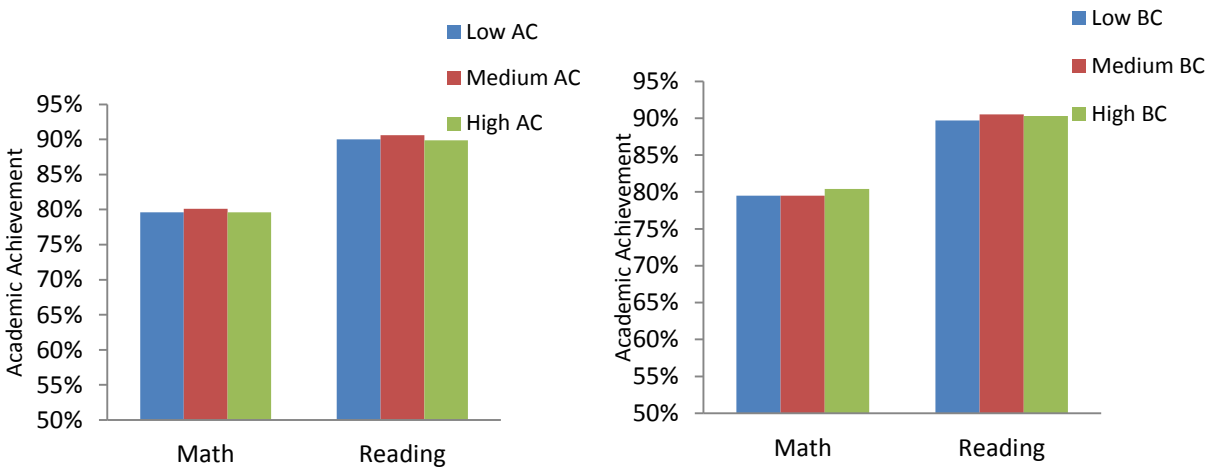

Fig 9a. 8th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

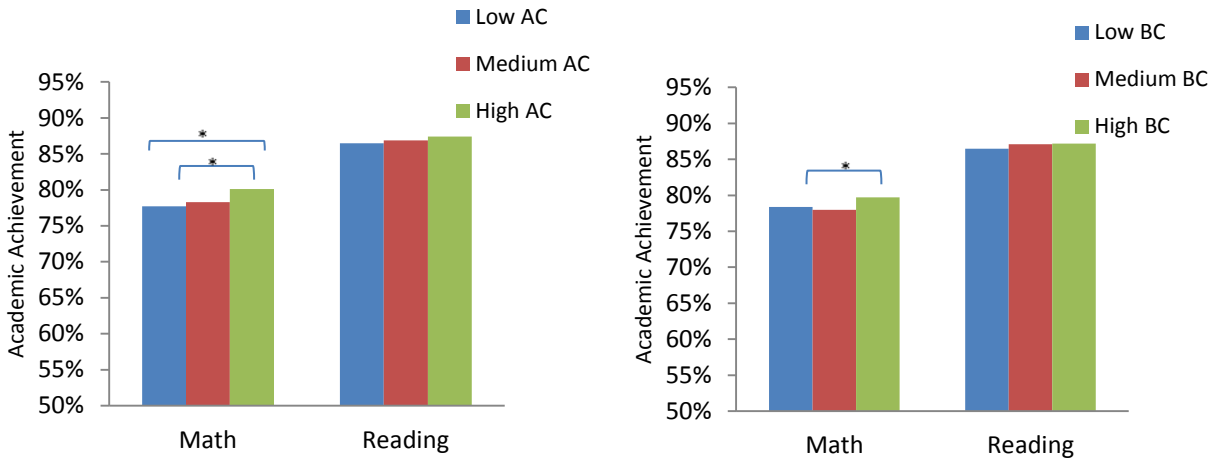

Fig 9b. 8th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

2012 Results (STAAR)

Spearman Correlations with Academic Achievement (STAAR)

Figure 10. SY2012 Spearman Correlation with STAAR - girls

Aerobic Capacity

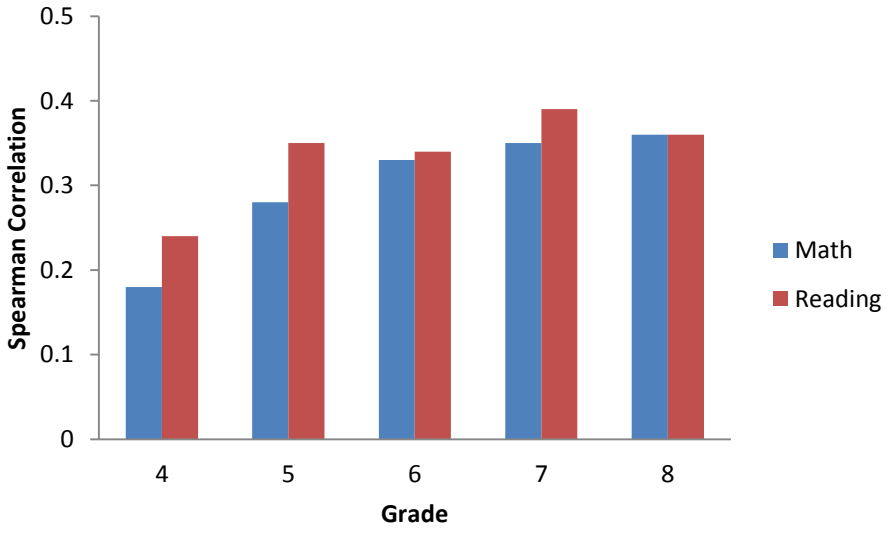

Fig 10a. Spearman correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

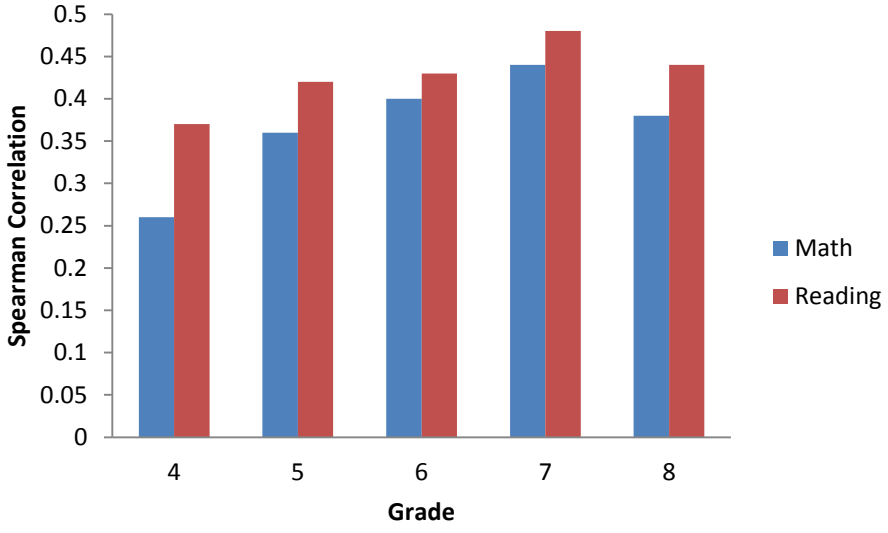

Fig 10b. Spearman correlation between Body Composition HFZ with Math and Reading achievement.

Figure 11. SY2012 Spearman (Partial) Correlations with STAAR — Girls

Aerobic Capacity

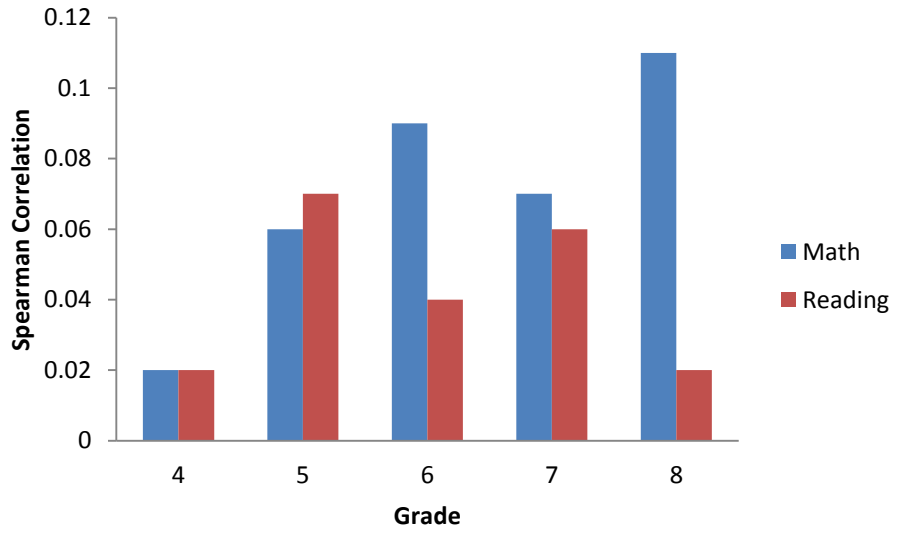

Fig 11a. Spearman partial correlation between aerobic capacity HFZ with Math and Reading achievement, respectively.

Body Composition

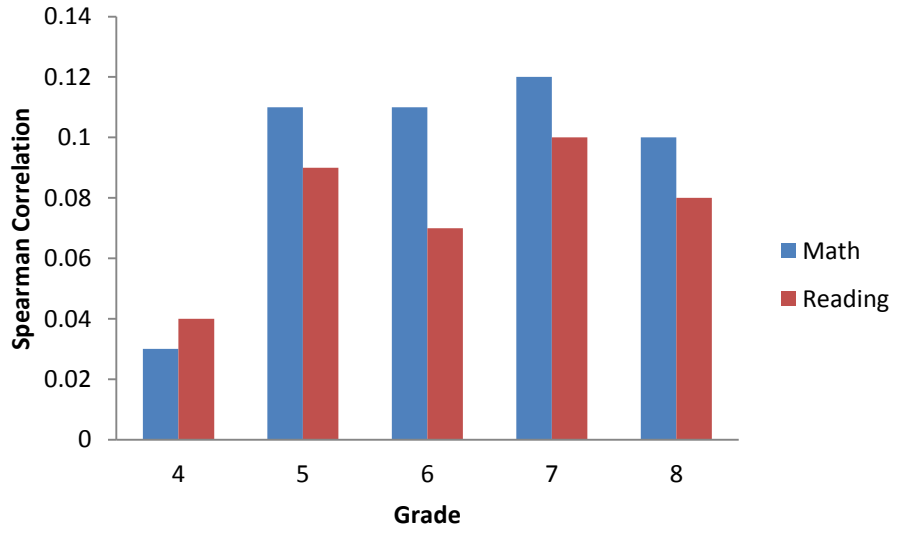

Fig 11b. Spearman partial correlation between body composition HFZ with Math and Reading achievement, respectively.

Figure 12. SY2012 Spearman Correlations with STAAR — Boys

Aerobic Capacity

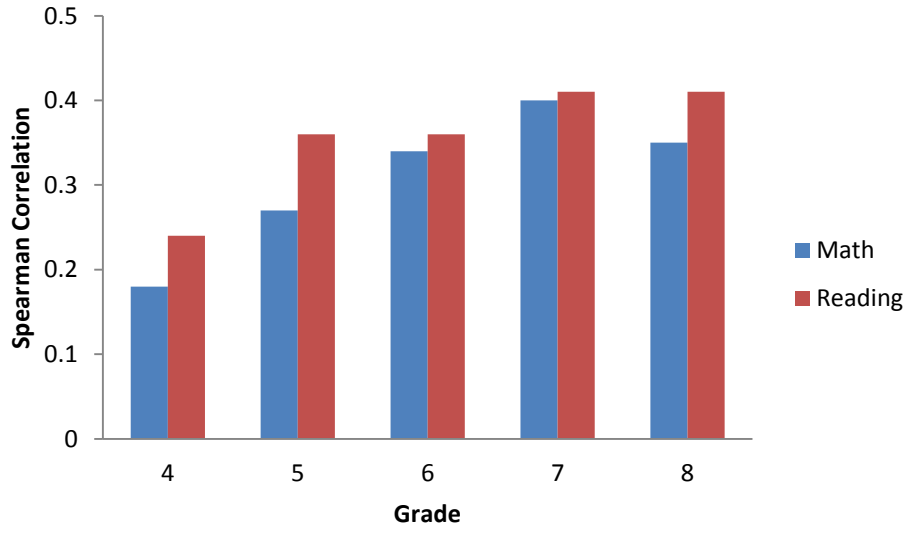

Fig 12a. Spearman correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

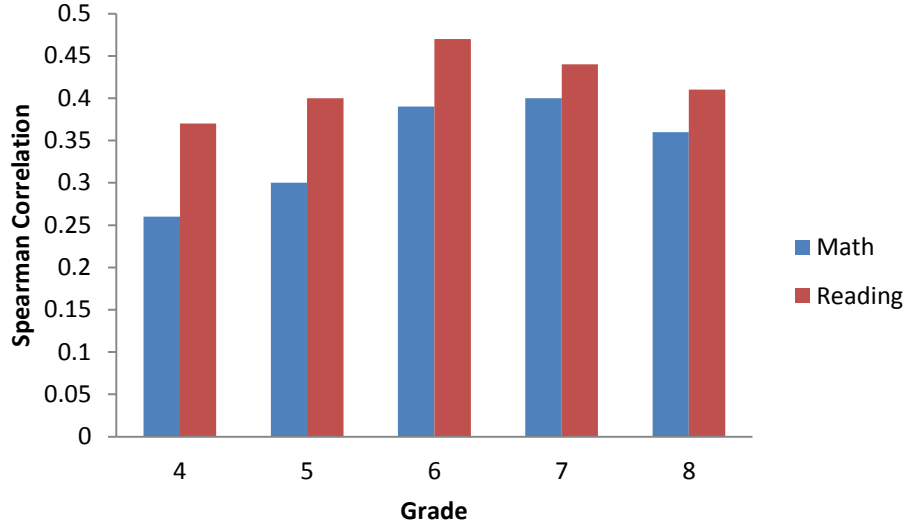

Fig 12b. Spearman correlation between body composition HFZ with Math and Reading achievement.

Figure 13. SY2012 Spearman (Partial) Correlation with STAAR — Boys

Aerobic Capacity

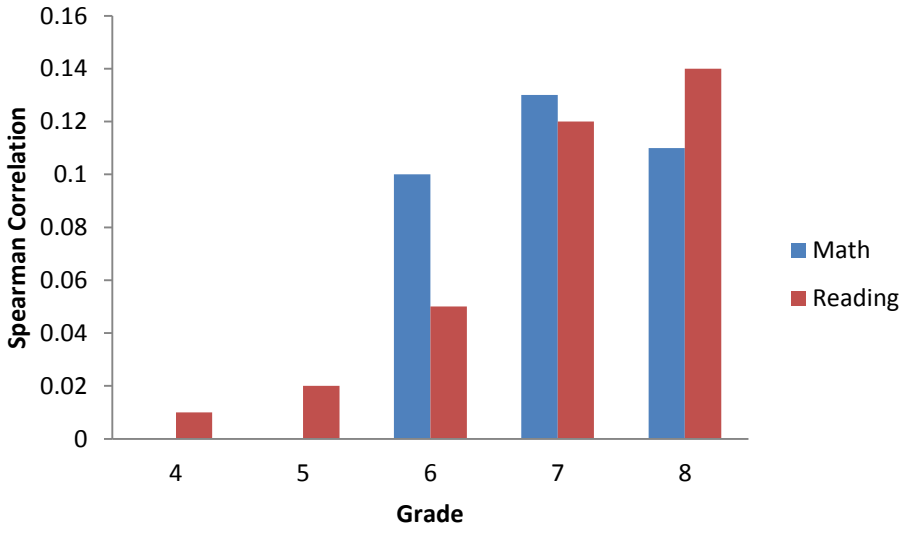

Fig 13a. Spearman partial correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

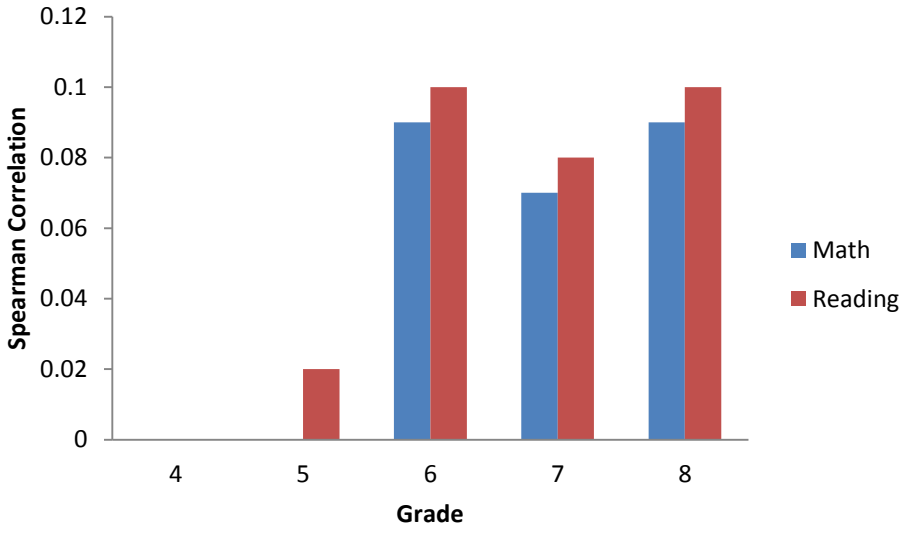

Fig 13b. Spearman partial correlation between body composition HFZ with Math and Reading achievement.

Academic Achievement Stratified by Fitness Level – STAAR - 2012

Figure 14. 4th Grade Results– SY2012

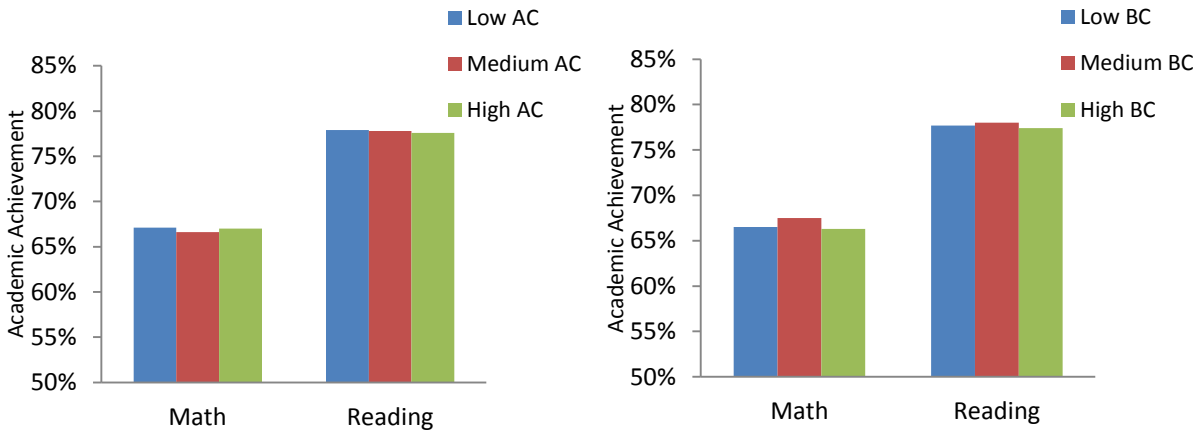

Fig 14a. 4th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

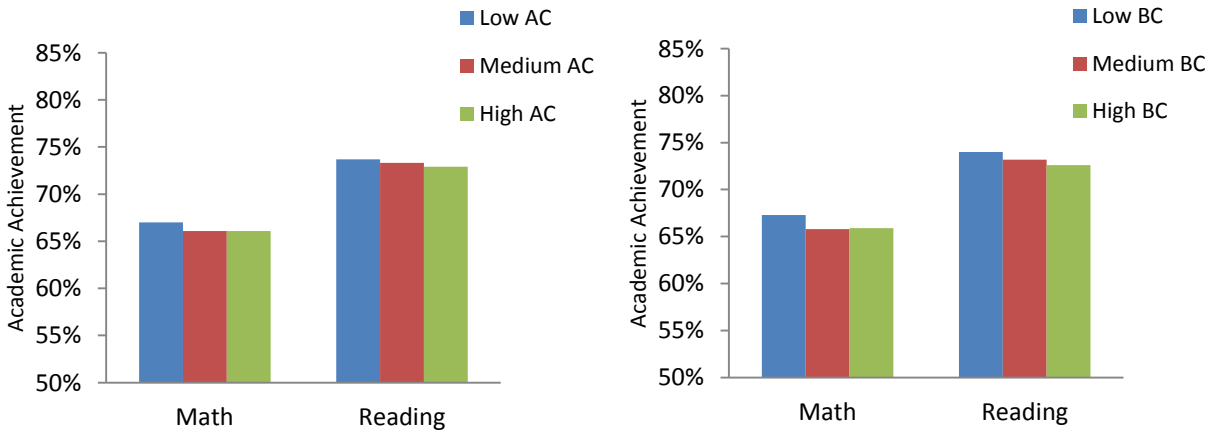

Fig 14b. 4th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

Figure 15. 5th Grade Results– SY2012

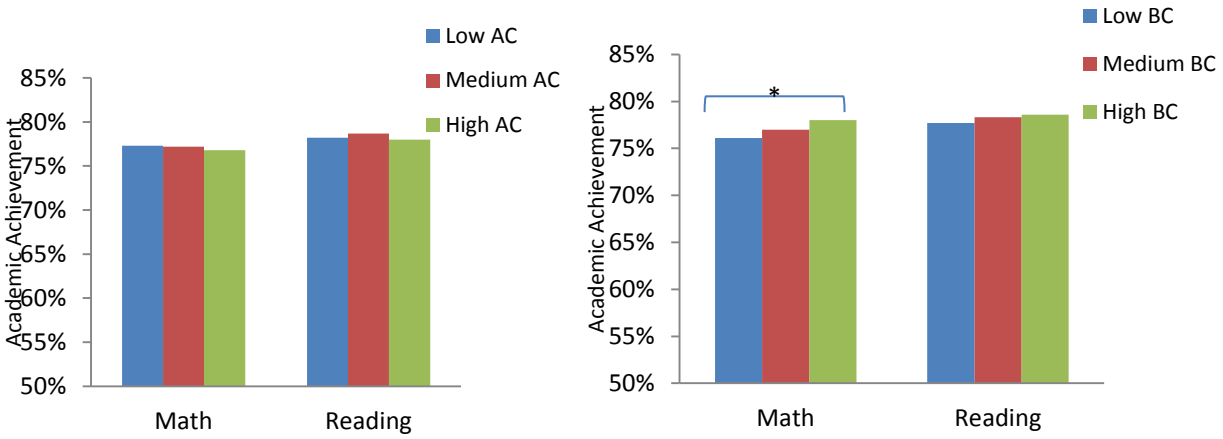

Fig 15a. 5th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

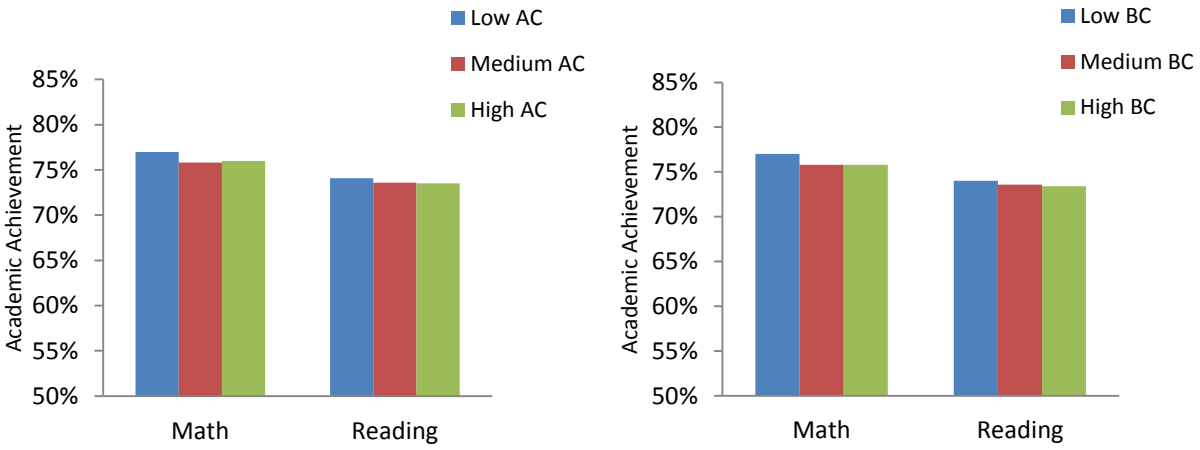

Fig 15b. 5th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

Figure 16. 6th Grade Results– SY2012

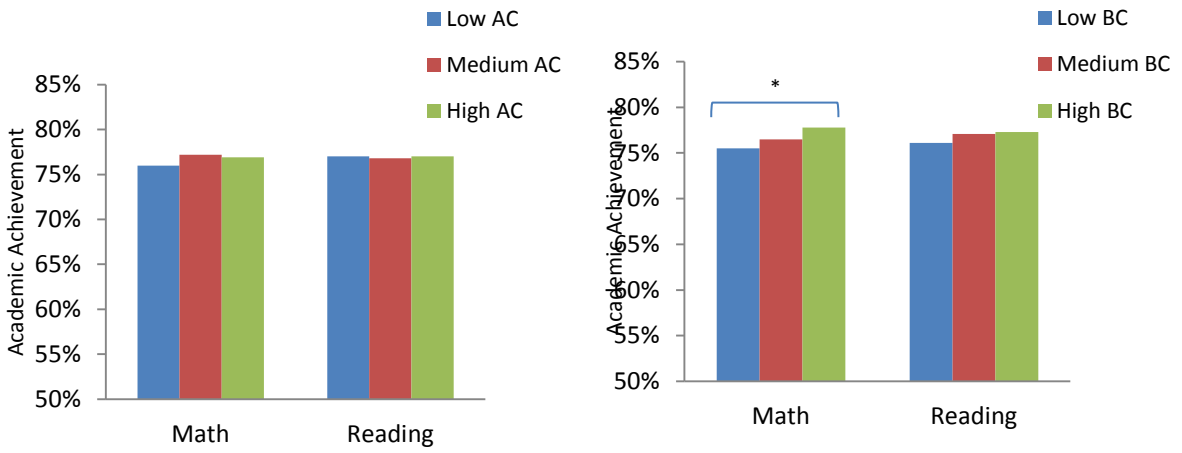

Fig 16a. 6th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

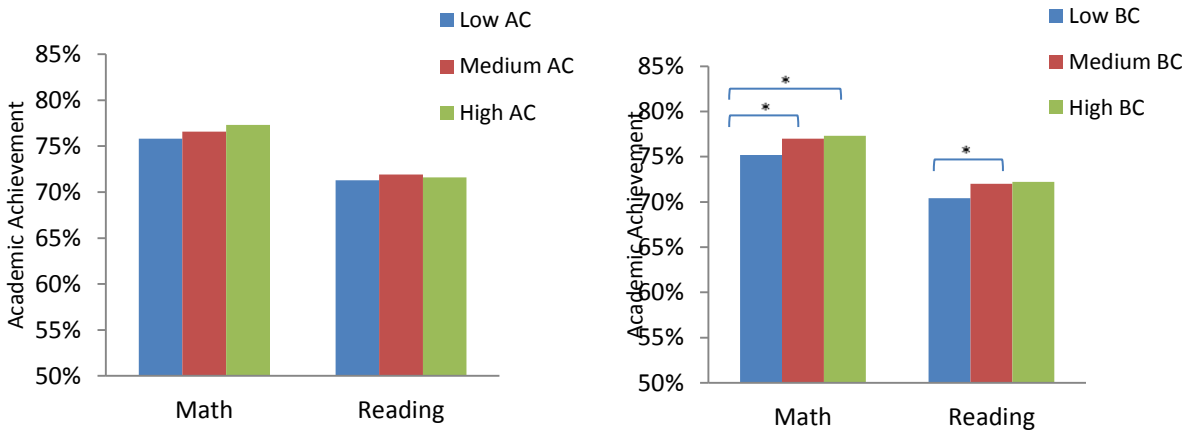

Fig 16b. 6th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

Figure 17. 7th Grade Results– SY2012

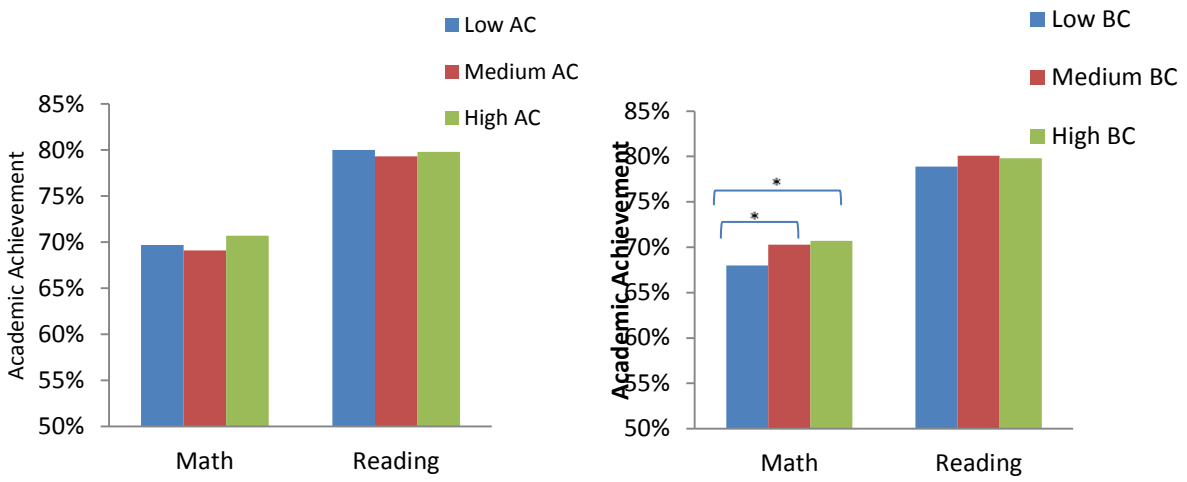

Fig 17a. 7th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

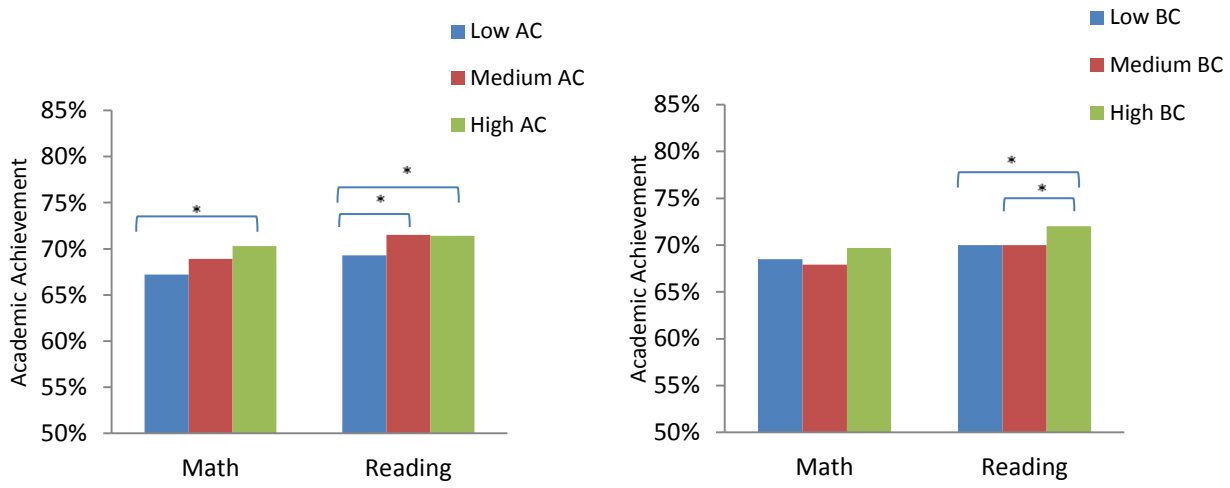

Fig 17b. 7h grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

Figure 18. 8th Grade Results– SY2012

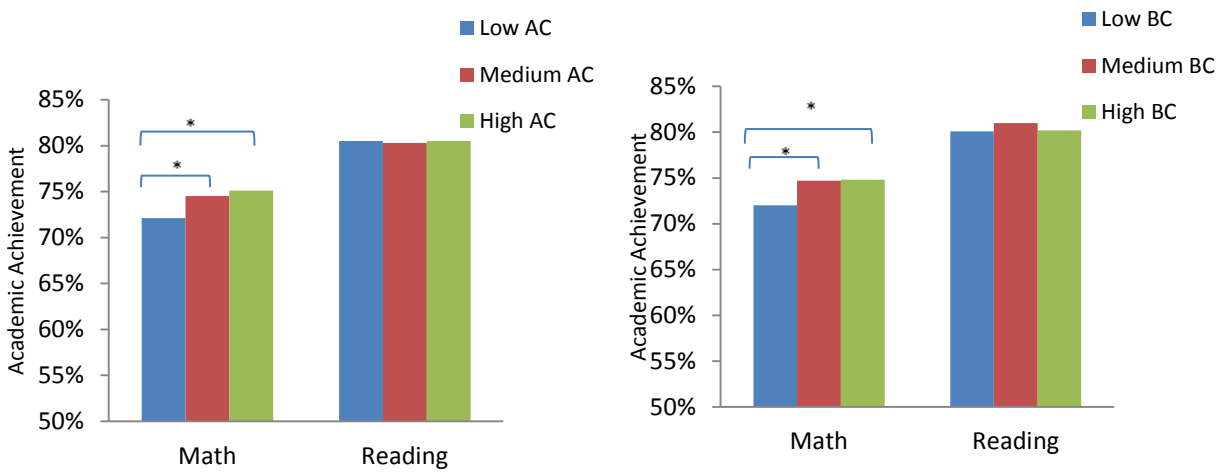

Fig 18a. 8th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

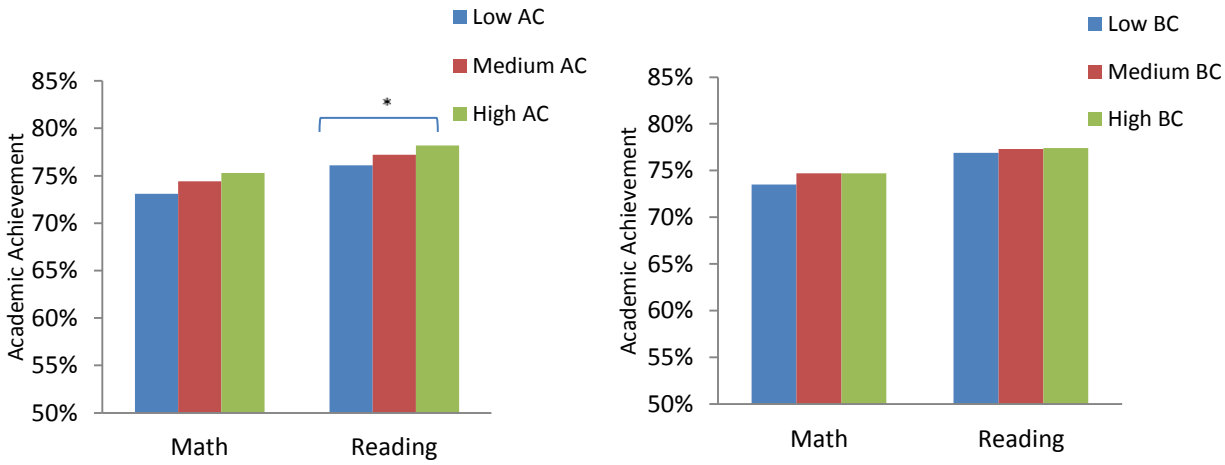

Fig 18b. 8th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

2013 – Results (STAAR)

Spearman Correlations with Academic Achievement (STAAR)

Figure 19. SY2013 Spearman Correlations with STAAR – Girls

Aerobic Capacity

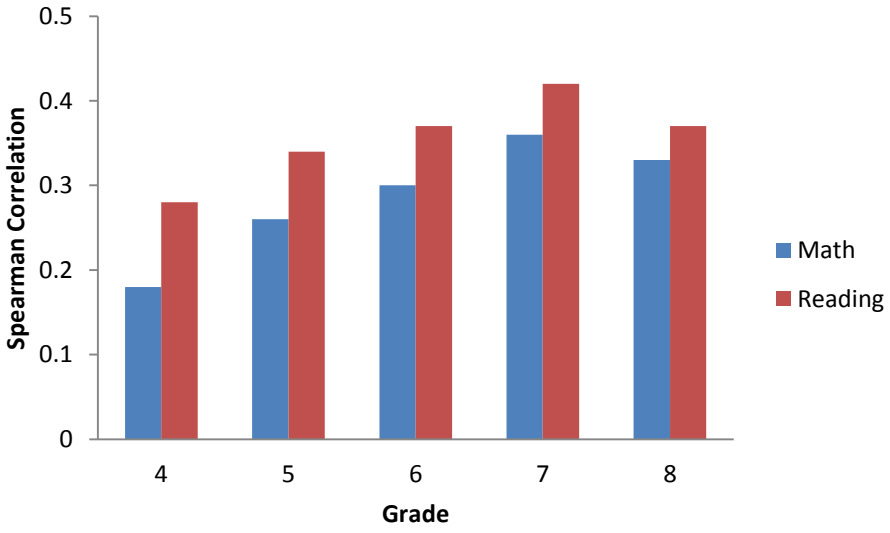

Fig 19a. Spearman correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

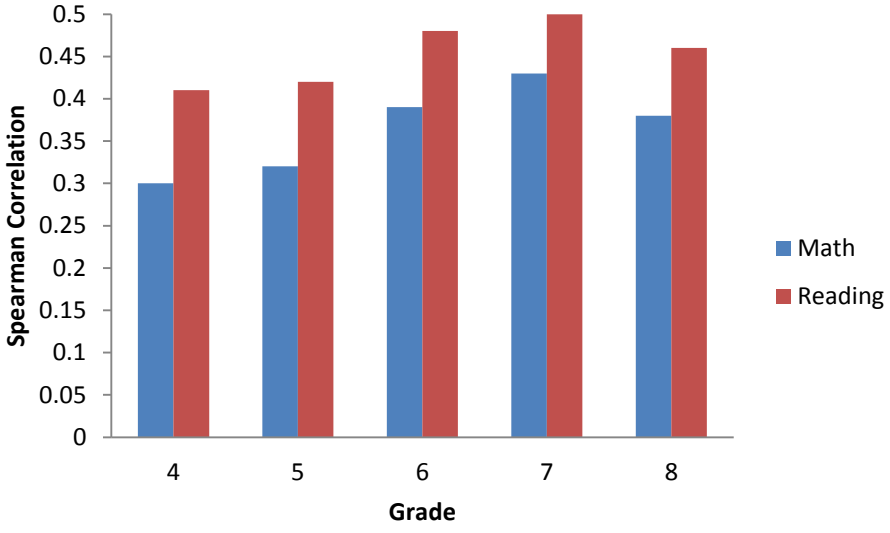

Fig 19b. Spearman correlation between Body Composition HFZ with Math and Reading achievement.

Figure 20. SY2013 Spearman (Partial) Correlations with STAAR — Girls

Aerobic Capacity

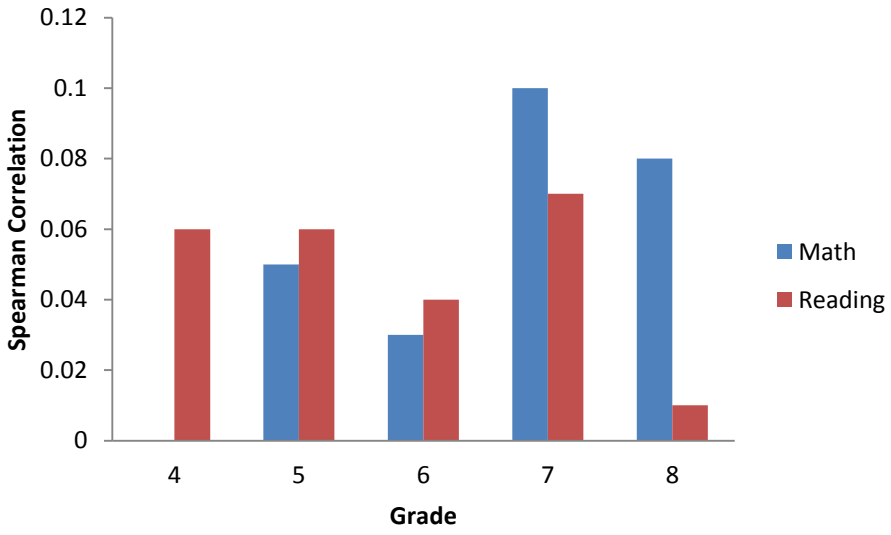

Fig 20a. Spearman partial correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

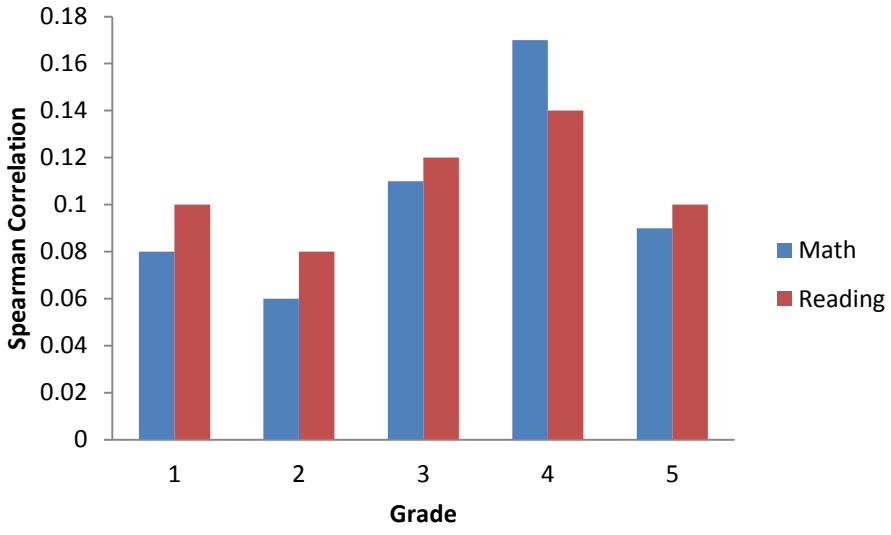

Fig 20b. Spearman partial correlation between body composition HFZ with Math and Reading achievement.

Figure 21. SY2013 Spearman Correlations with STAAR — Boys

Aerobic Capacity

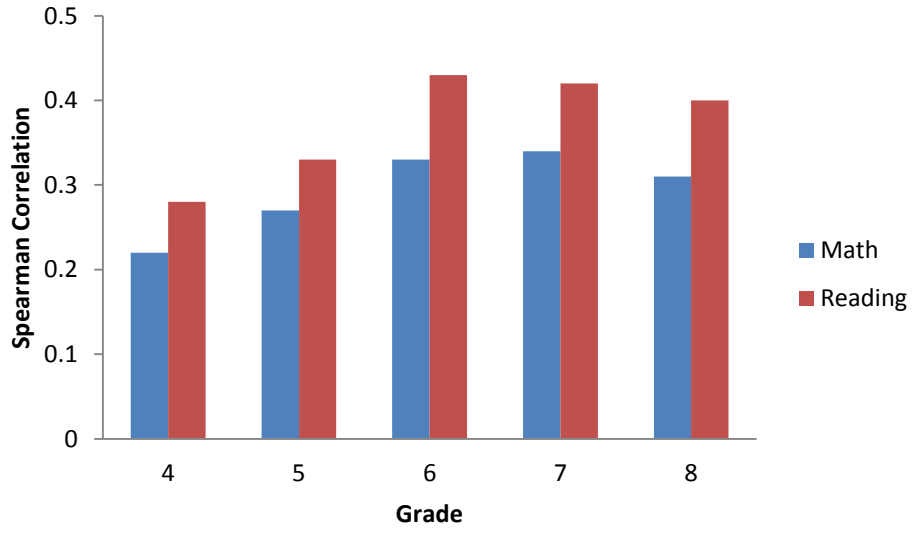

Fig 21a. Spearman correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

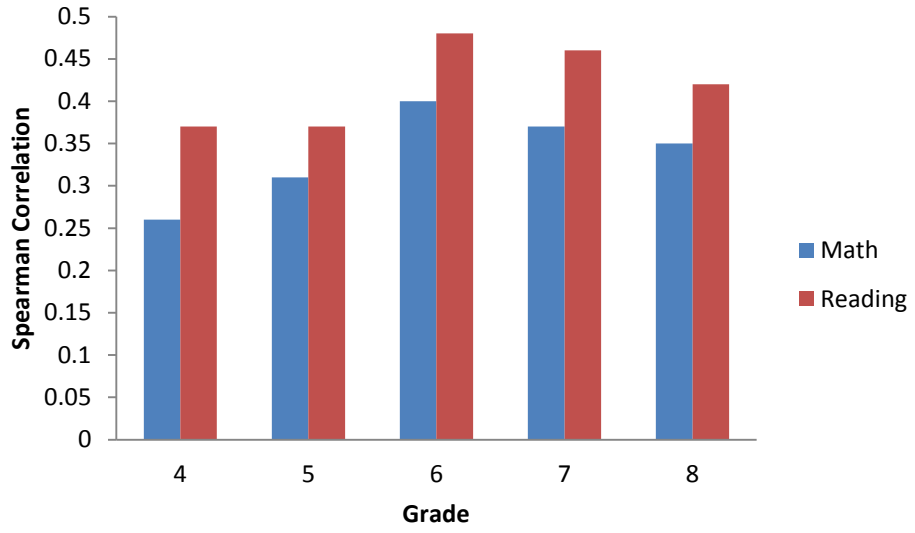

Fig 21b. Spearman correlation between body composition HFZ with Math and Reading achievement.

Figure 22. SY2013 Spearman (Partial) Correlations with STAAR — Boys

Aerobic Capacity

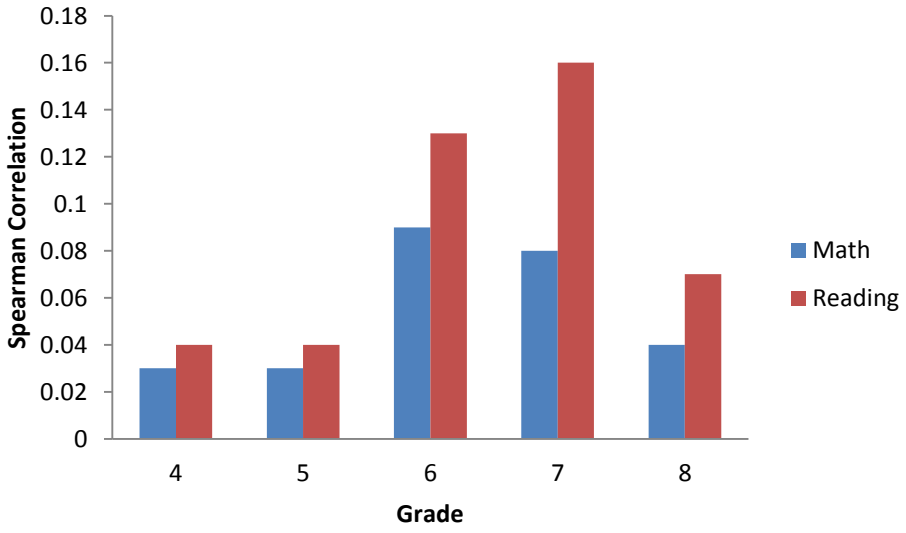

Fig 22a. Spearman partial correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

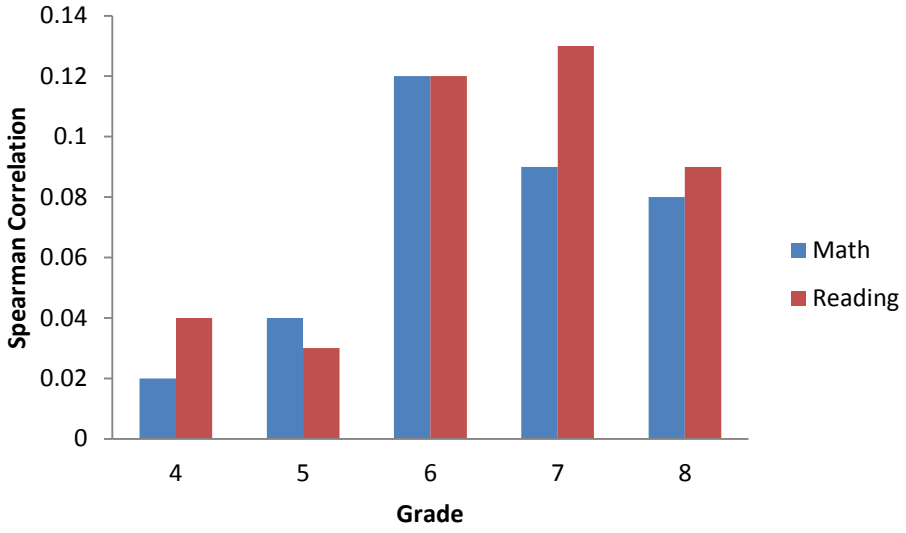

Fig 22b. Spearman partial correlation between body composition HFZ with Math and Reading achievement.

Academic Achievement Stratified by Fitness Level – STAAR - 2013

Figure 23. 4th Grade Results– SY2013

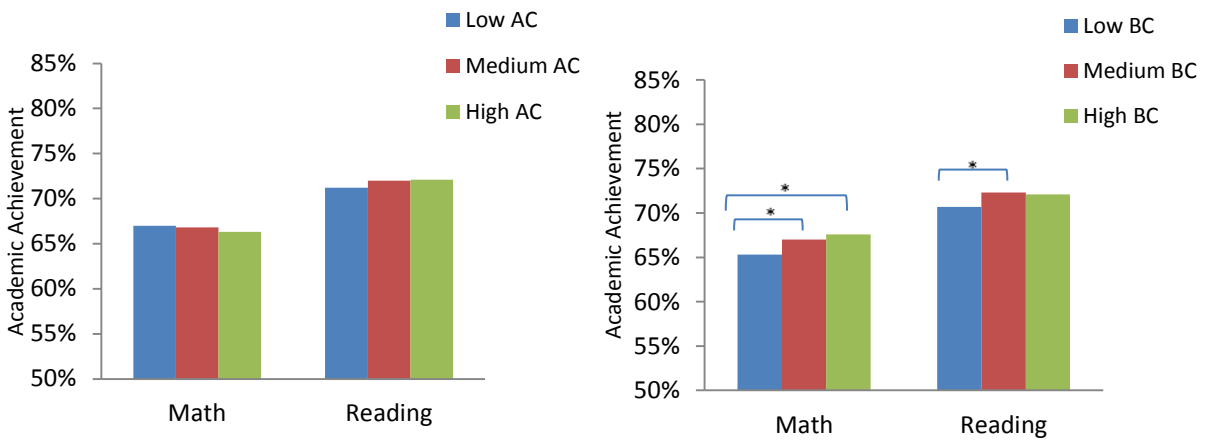

Fig 23a. 4th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

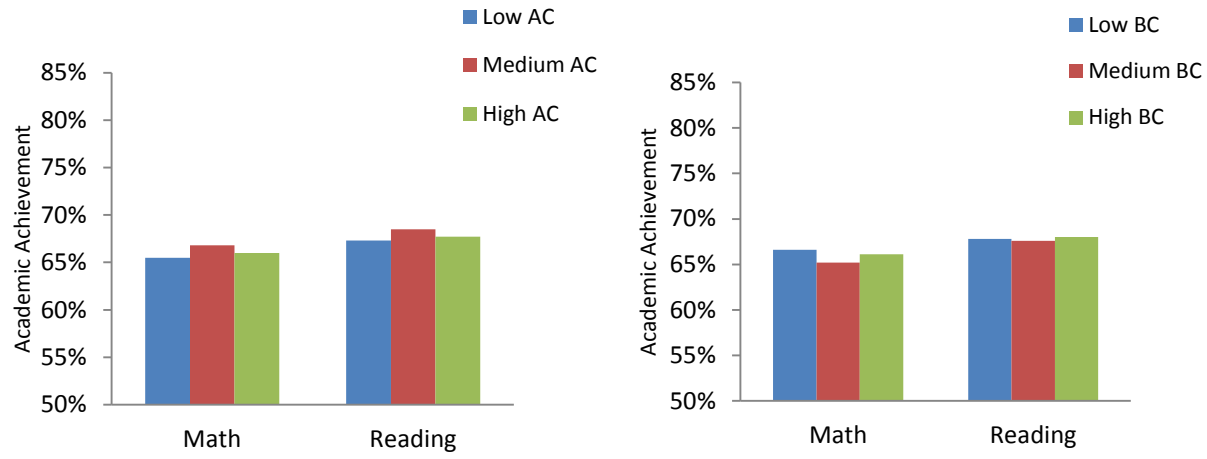

Fig 23b. 4th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

Figure 24. 5th Grade Results– SY2013

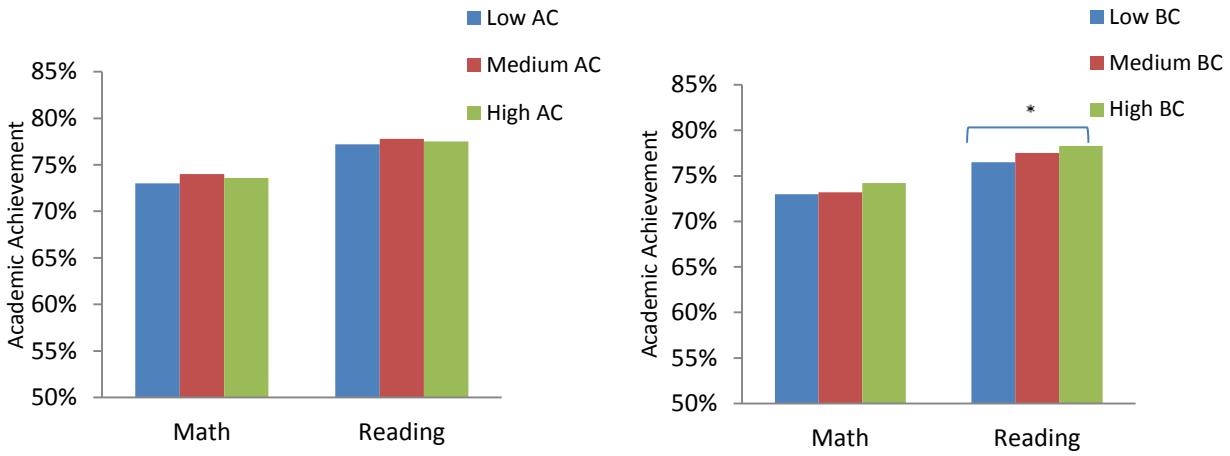

Fig 24a. 5th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

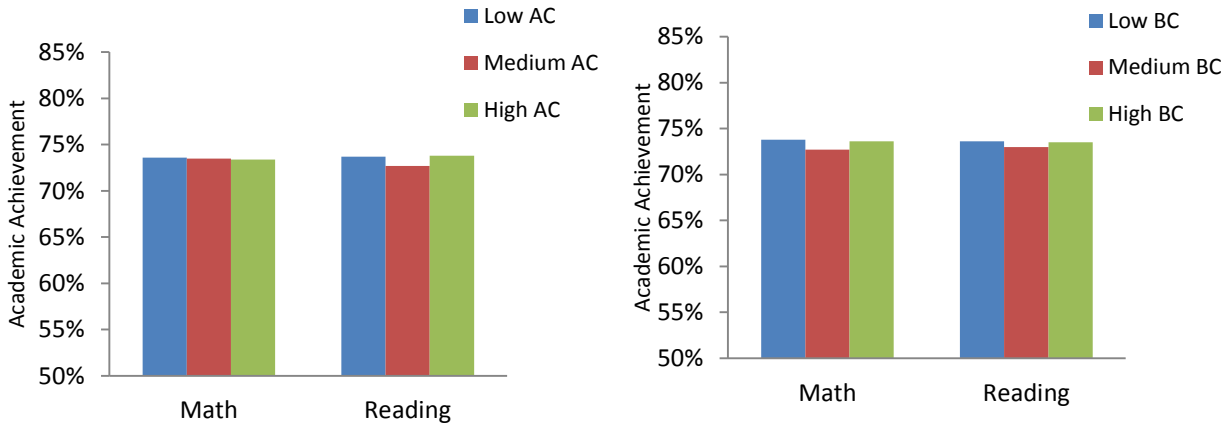

Fig 24b. 5th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

Figure 25. 6th Grade Results– SY2013

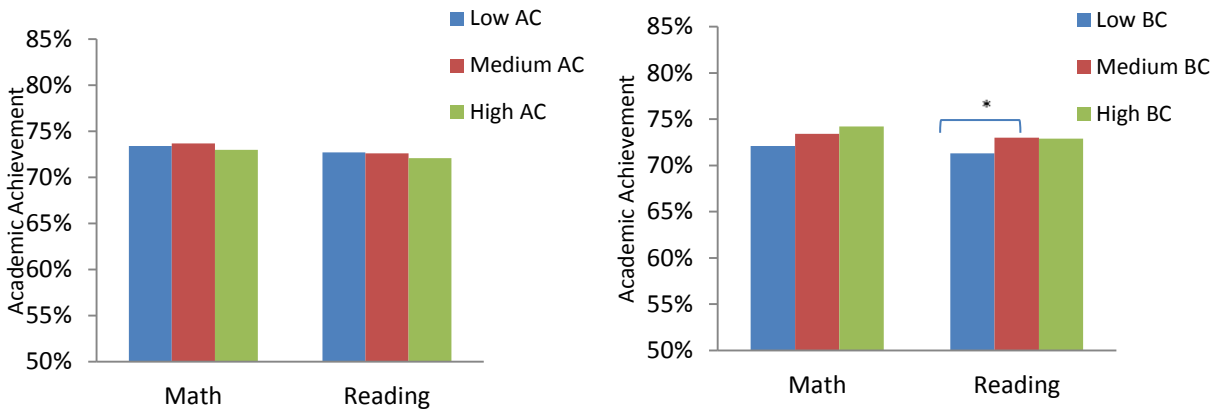

Fig 25a. 6th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

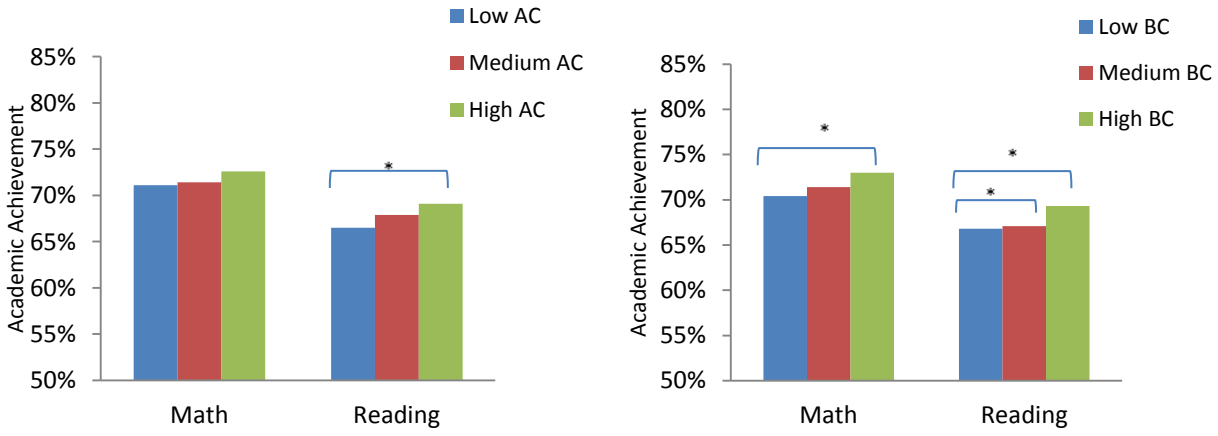

Fig 25b. 6th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

Figure 26. 7th Grade Results– SY2013

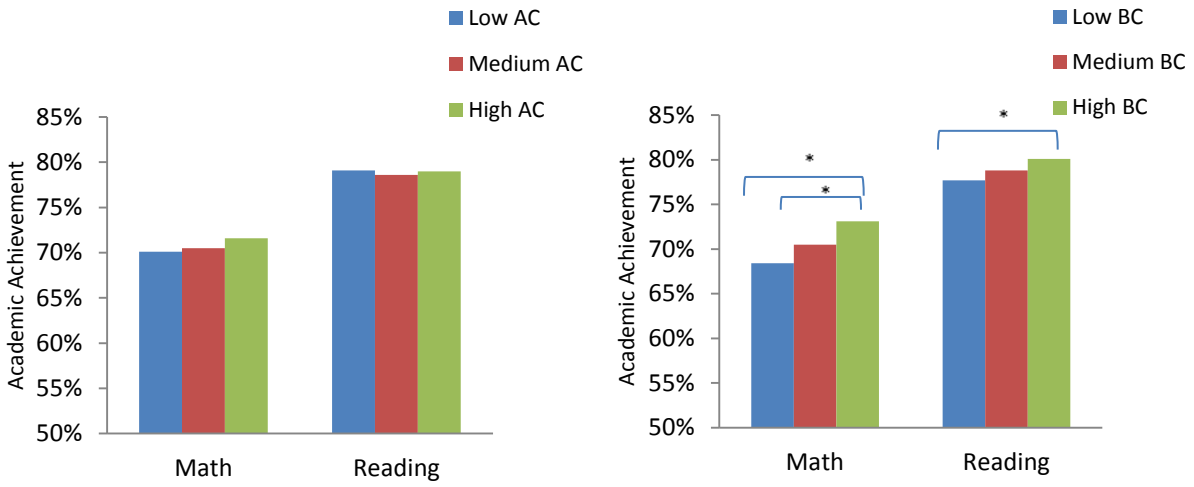

Fig 26a. 7th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

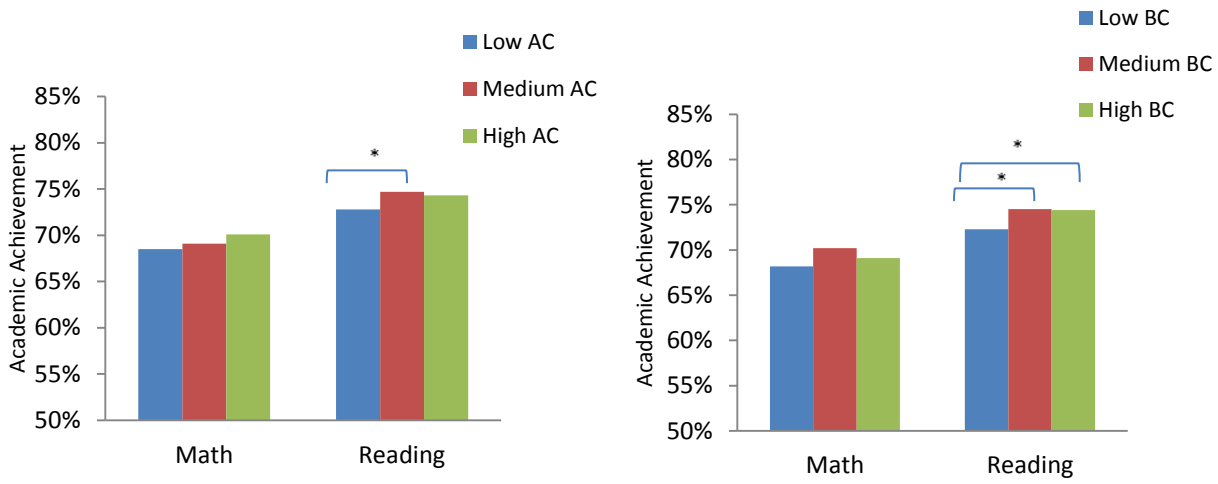

Fig 26b. 7h grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

Figure 27. 8th Grade Results– SY2013

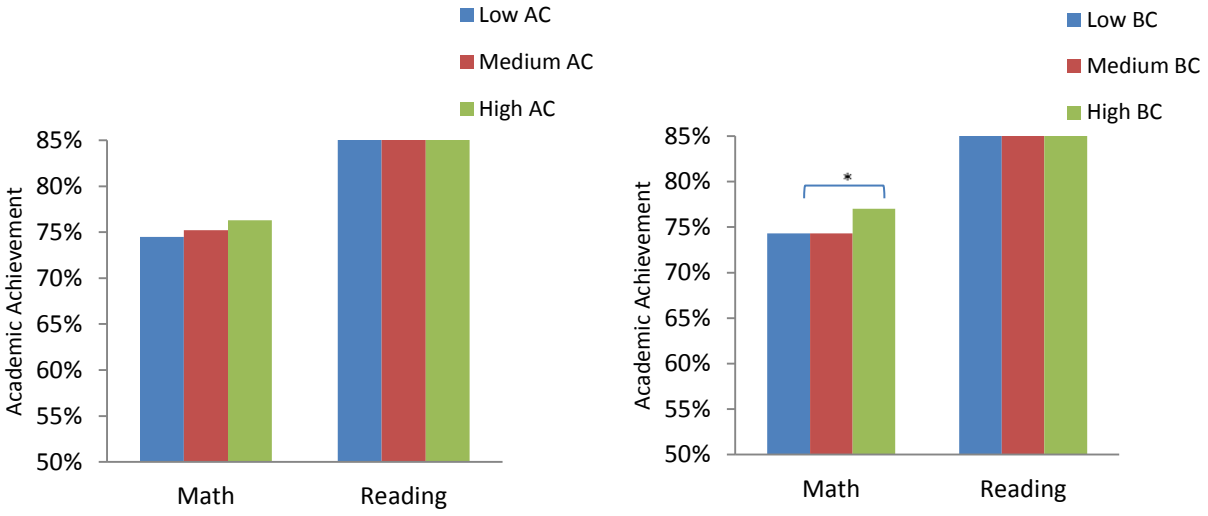

Fig 27a. 8th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

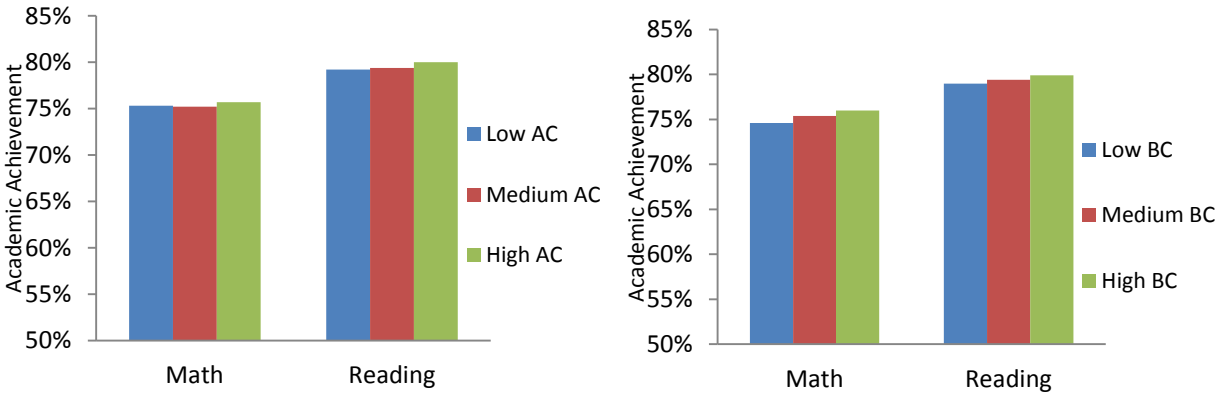

Fig 27b. 8th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

2014 Results (STAAR)

Spearman Correlations with Academic Achievement (STAAR)

Figure 28. SY2014 Spearman Correlation with STAAR - girls

Aerobic Capacity

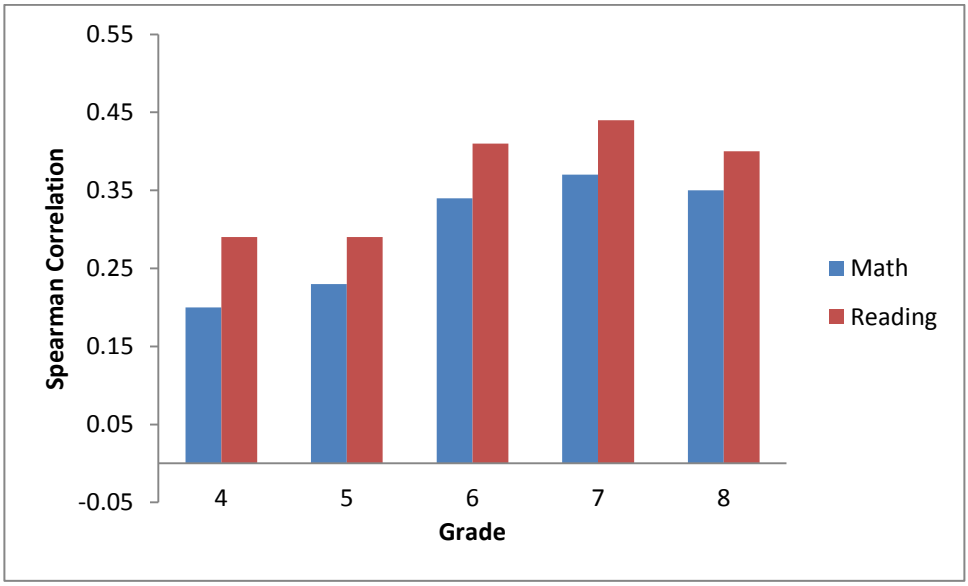

Fig 28a. Spearman correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

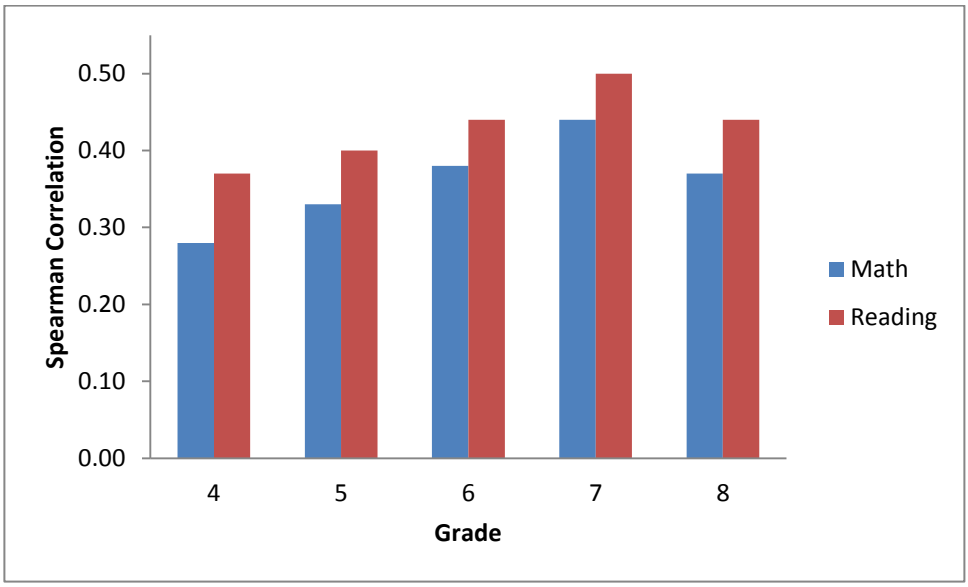

Fig 28b. Spearman correlation between Body Composition HFZ with Math and Reading achievement.

Figure 29. SY2014 Spearman (Partial) Correlations with STAAR — Girls

Aerobic Capacity

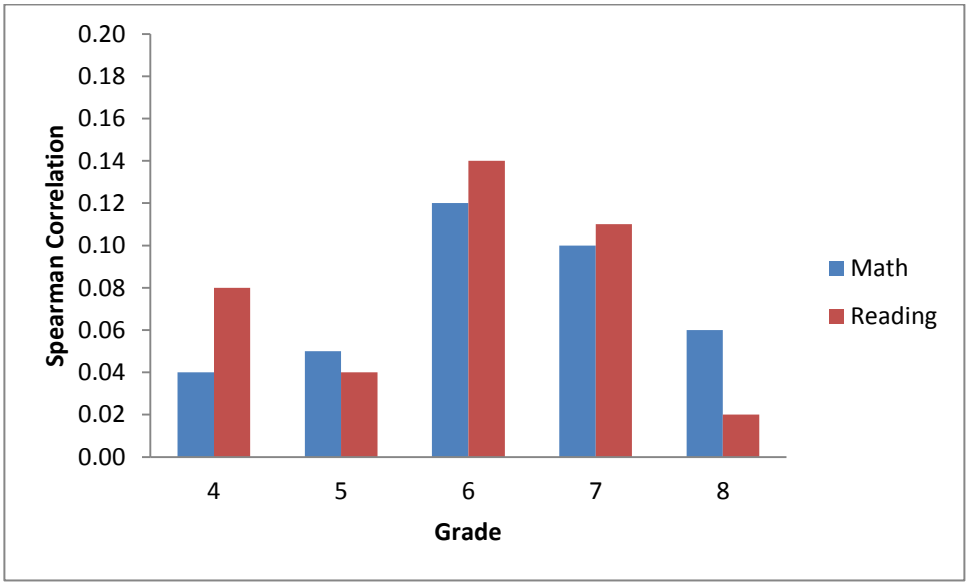

Fig 29a. Spearman partial correlation between aerobic capacity HFZ with Math and Reading achievement, respectively.

Body Composition

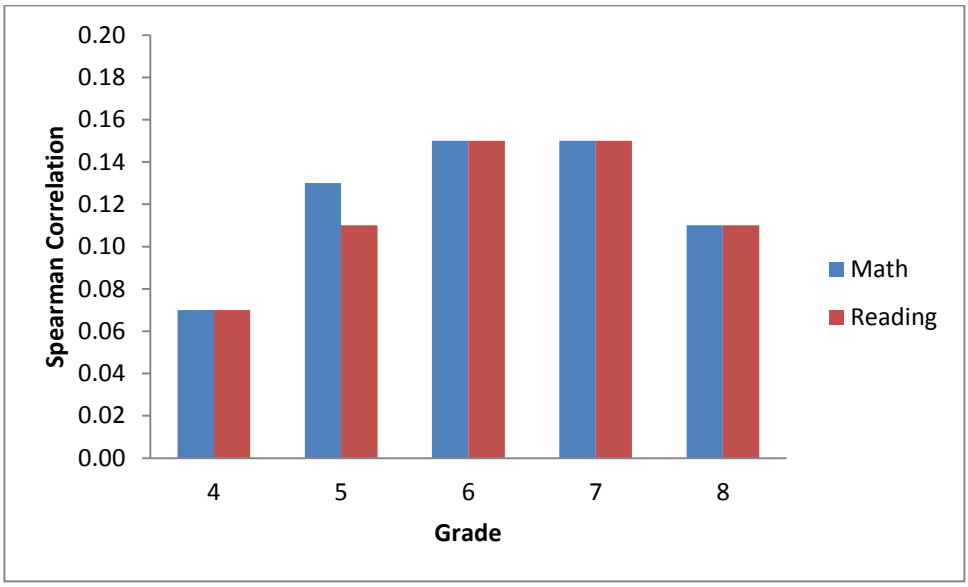

Fig 29b. Spearman partial correlation between body composition HFZ with Math and Reading achievement, respectively.

Figure 30. SY2014 Spearman Correlations with STAAR — Boys

Aerobic Capacity

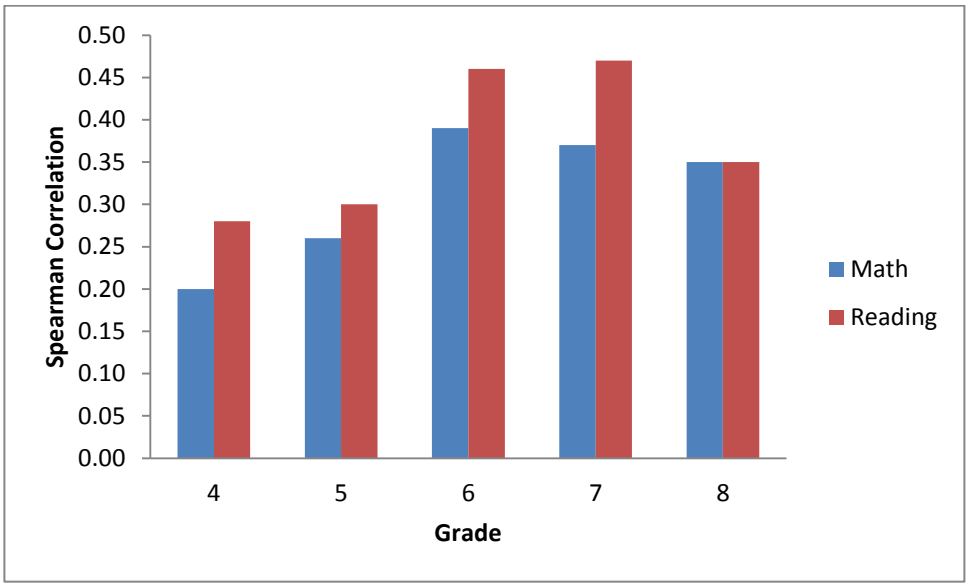

Fig 30a. Spearman correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

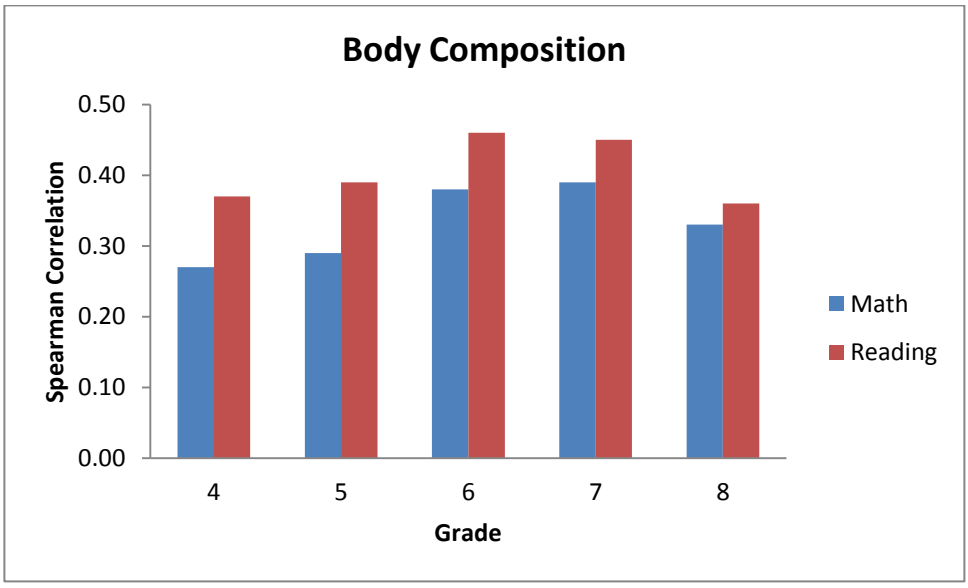

Fig 30b. Spearman correlation between body composition HFZ with Math and Reading achievement.

Figure 31. SY2014 Spearman (Partial) Correlation with STAAR — Boys

Aerobic Capacity

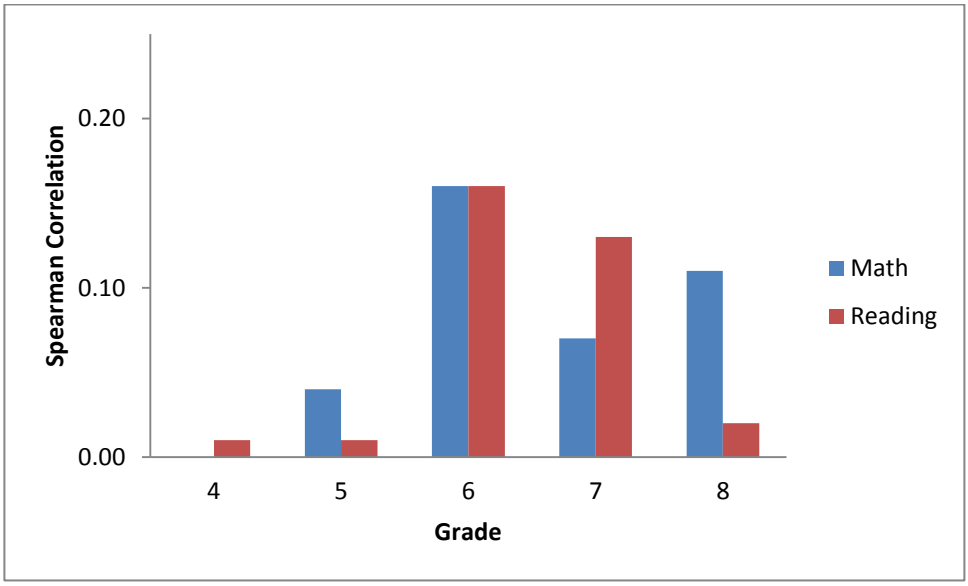

Fig 31a. Spearman partial correlation between aerobic capacity HFZ with Math and Reading achievement.

Body Composition

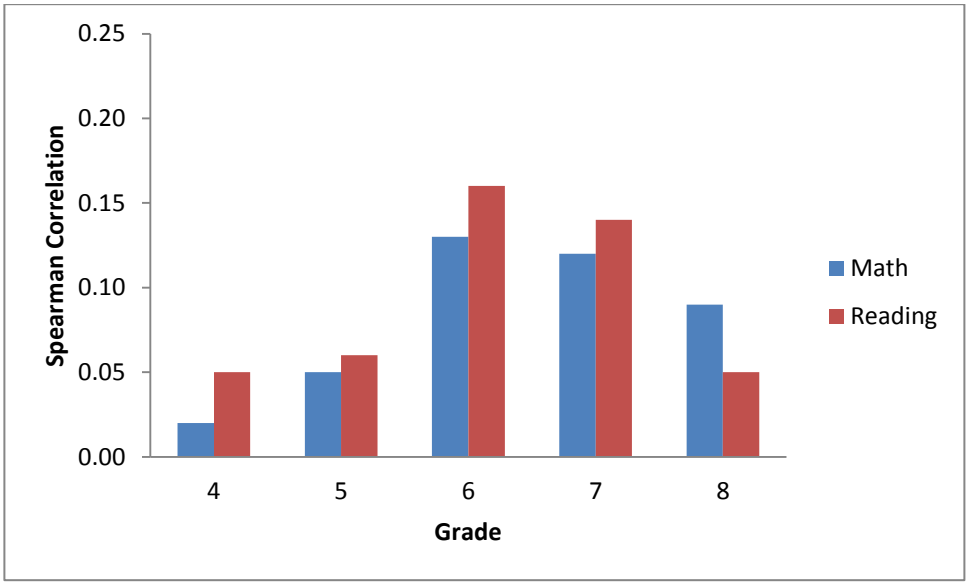

Fig 31b. Spearman partial correlation between body composition HFZ with Math and Reading achievement.

Academic Achievement Stratified by Fitness Level – STAAR - 2014

Figure 32. 4th Grade Results– SY2014

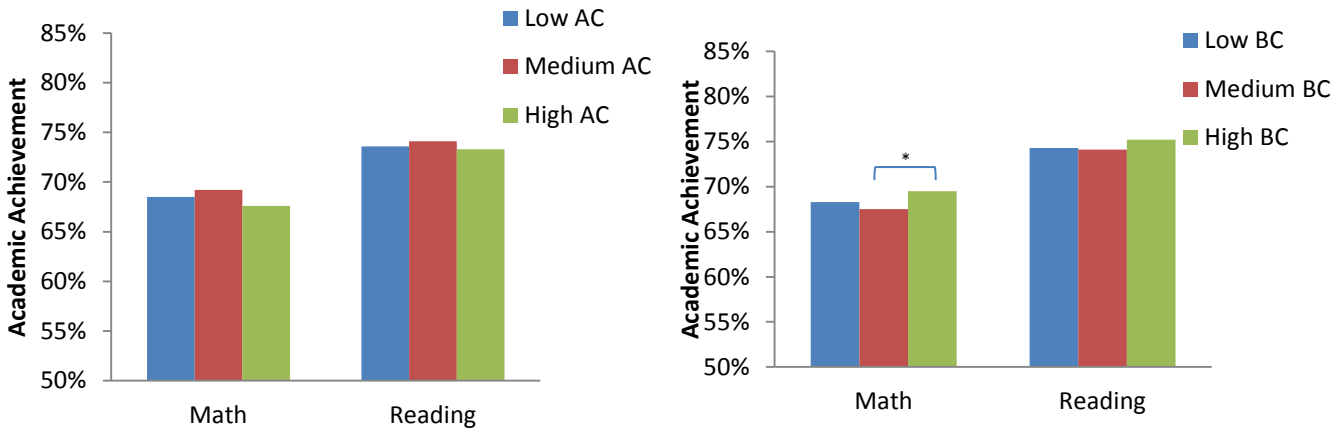

Fig 32a. 4th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). *denotes statistically significant: $p < 0.0167$.

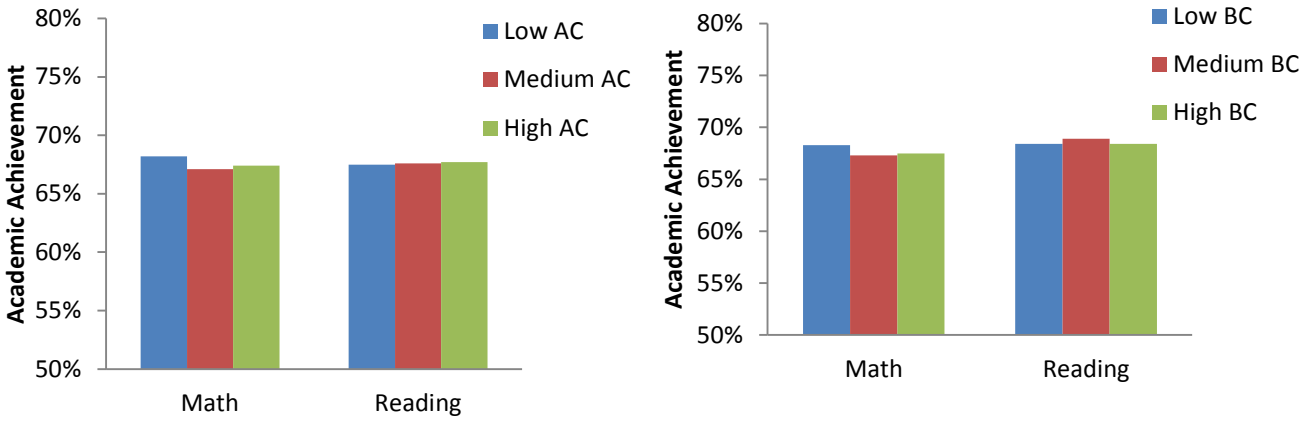

Fig 32b. 4th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

Figure 33. 5th Grade Results– SY2014

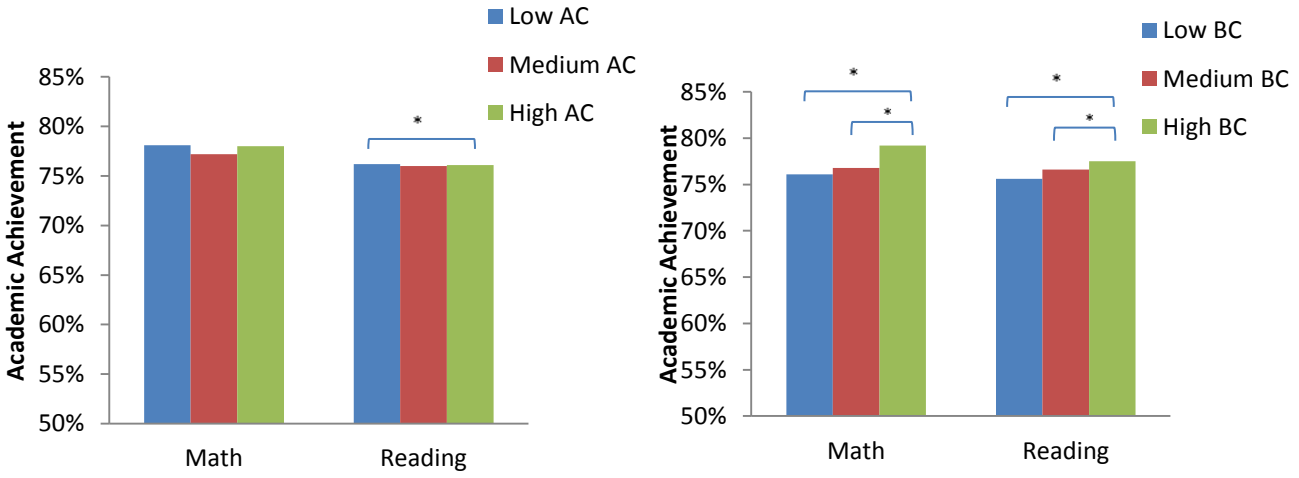

Fig 33a. 5th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

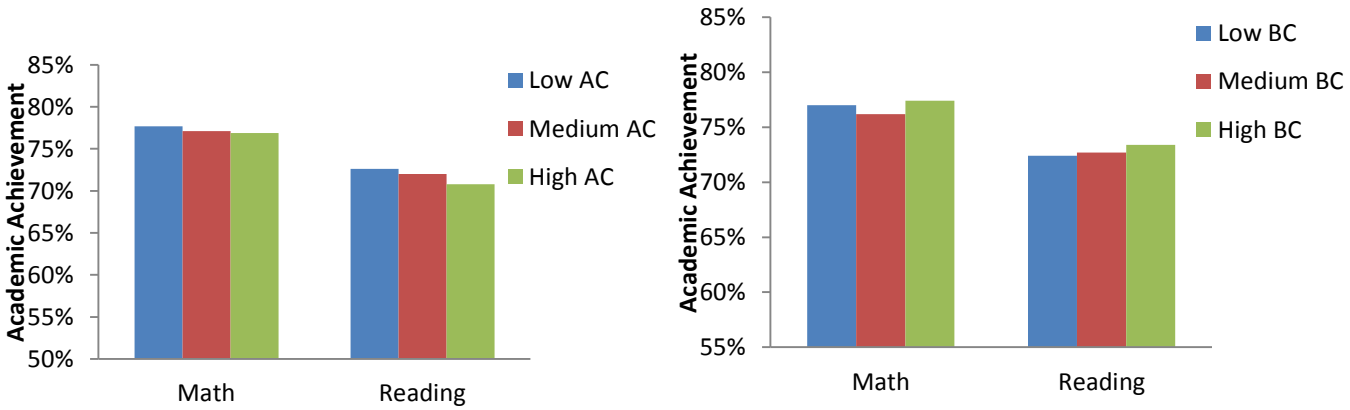

Fig 33b. 5th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

Figure 34. 6th Grade Results– SY2014

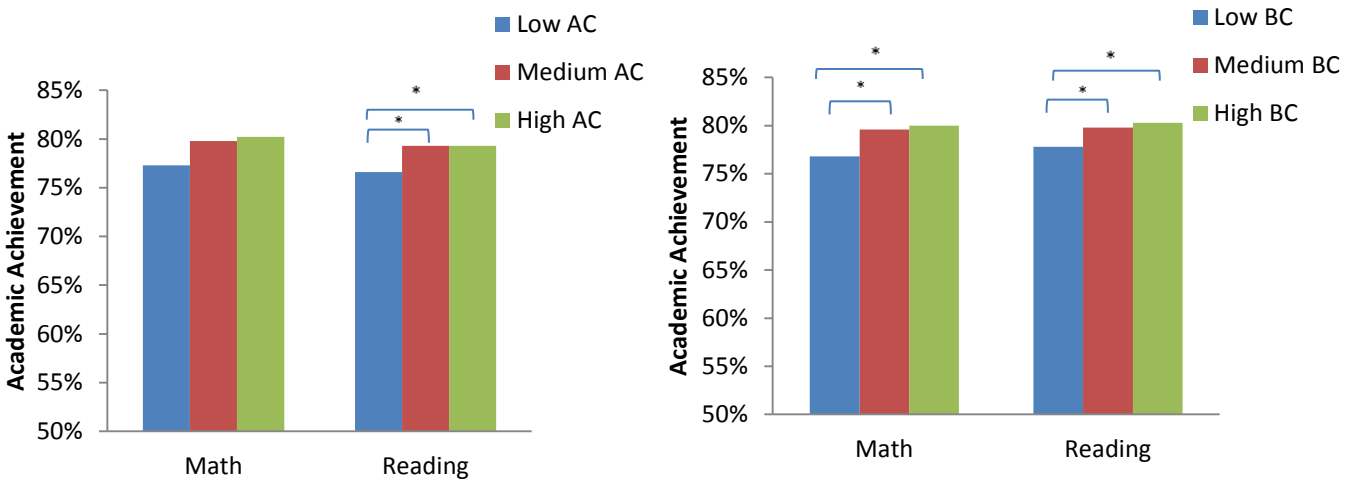

Fig 34a. 6th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

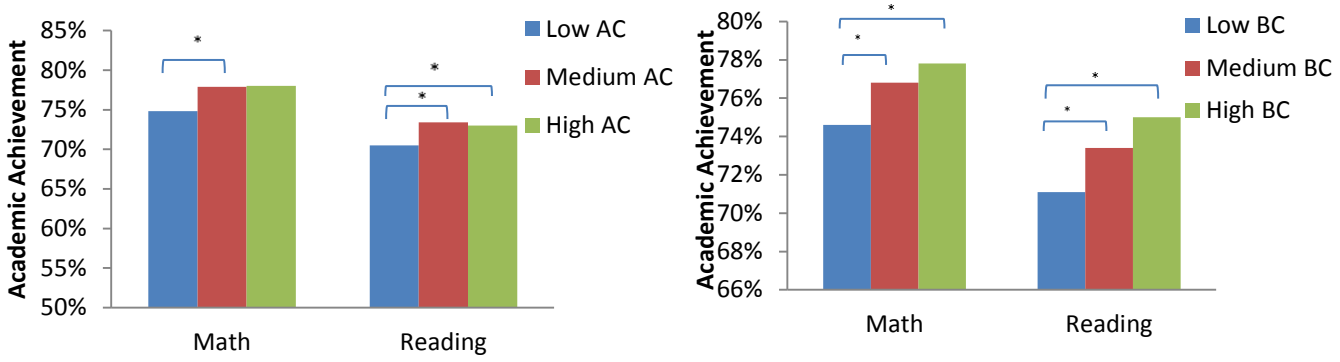

Fig 34b. 6th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

Figure 35. 7th Grade Results– SY2014

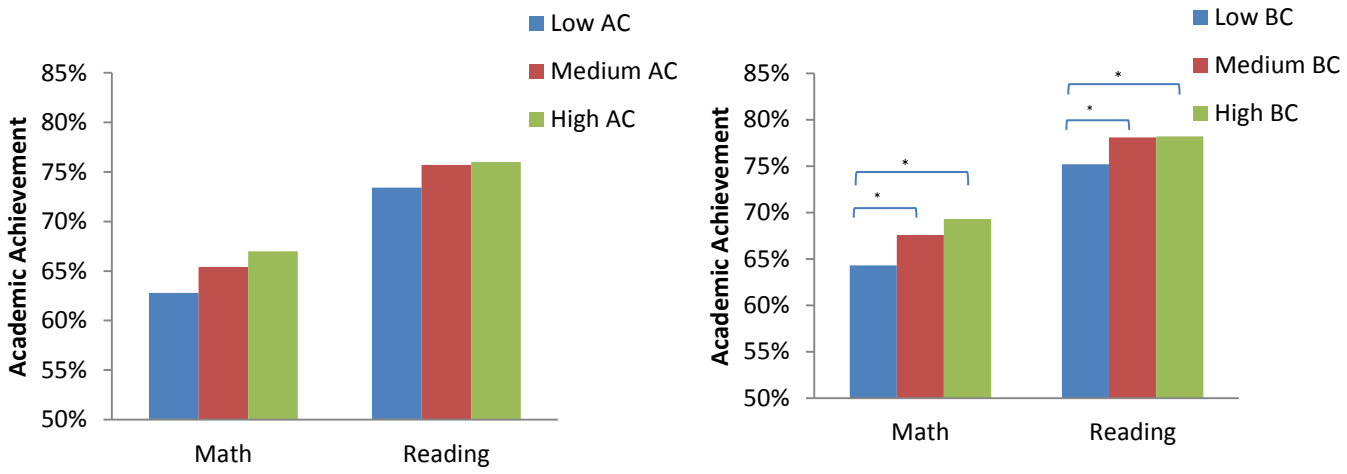

Fig 35a. 7th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

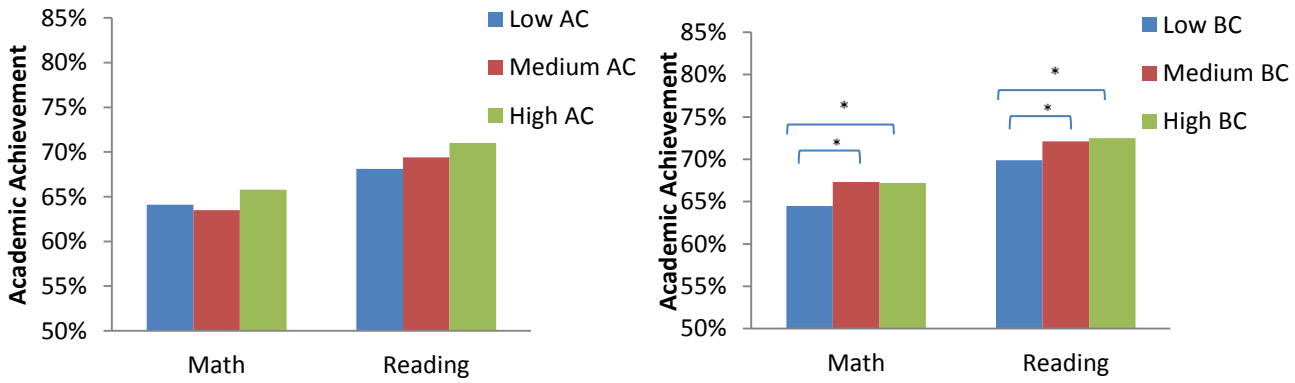

Fig 35b. 7th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

Figure 36. 8th Grade Results– SY2014

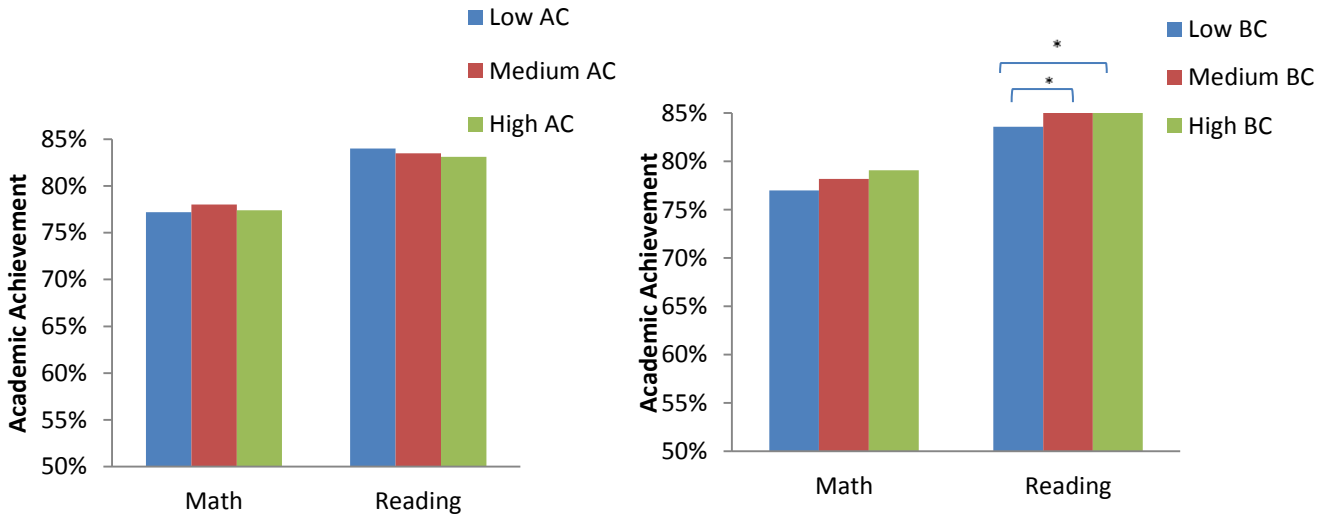

Fig 36a. 8th grade girls Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right). * denotes statistically significant: $p < 0.0167$.

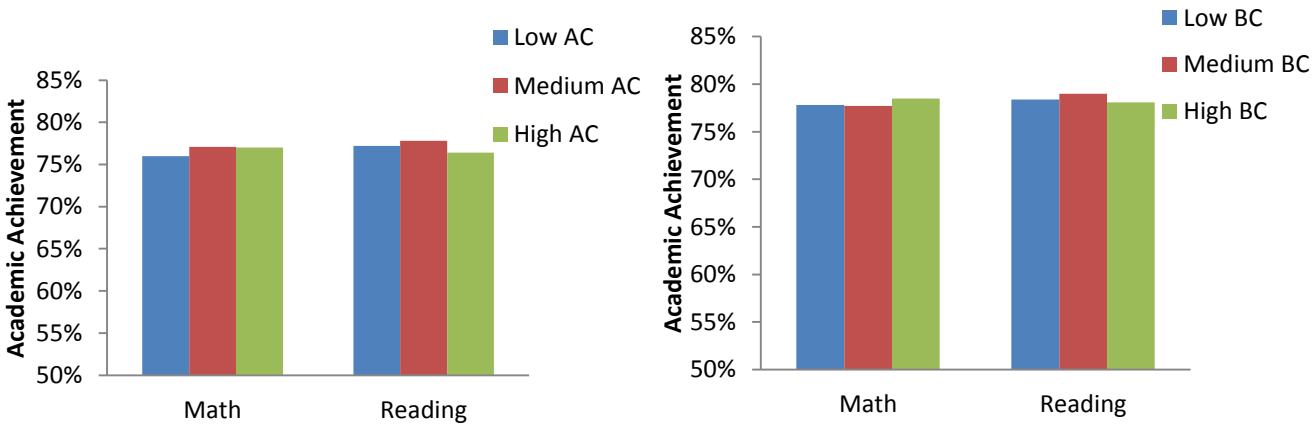

Fig 36b. 8th grade boys Academic Achievement stratified by Fitness Level-Aerobic Capacity (Left) and Body Composition (Right).

2011 Results (Attendance)

Attendance Stratified by Aerobic Capacity Level

Figure 37.

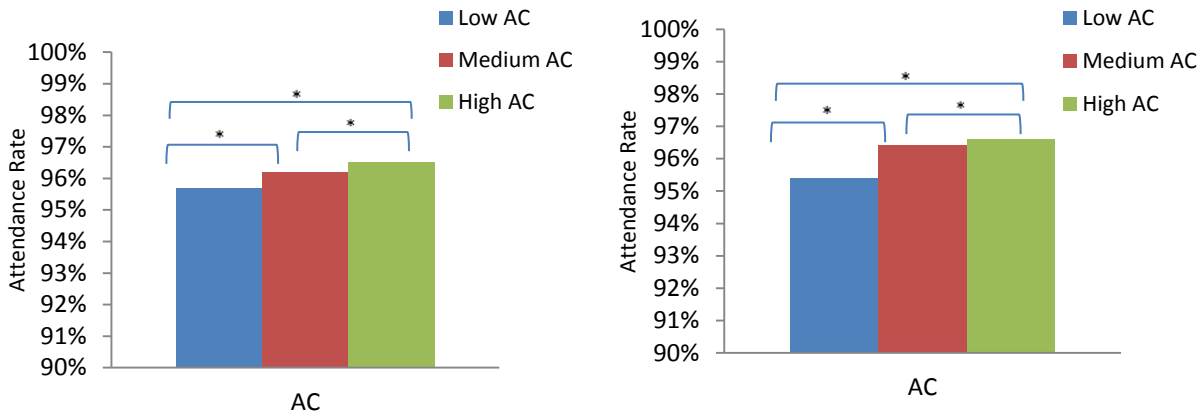

Fig 37. Attendance stratified by Aerobic Capacity by Girls (Left) and Boys (Right). * denotes statistically significant: $p < 0.0167$.

2012 Results (Attendance)

Attendance Stratified by Aerobic Capacity Level

Figure 38.

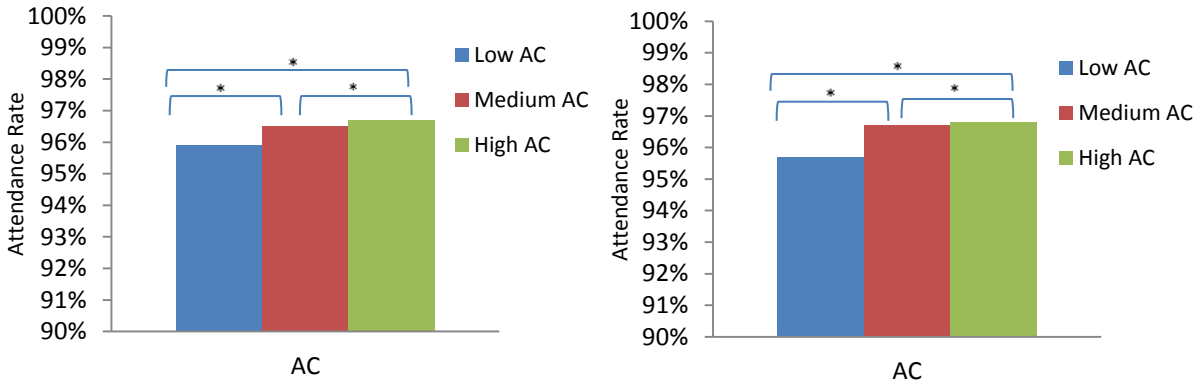

Fig 38. Attendance stratified by Aerobic Capacity by Girls (Left) and Boys (Right).* denotes statistically significant: $p < 0.0167$.

2013 Results (Attendance)

Attendance Stratified by Aerobic Capacity Level

Figure 39.

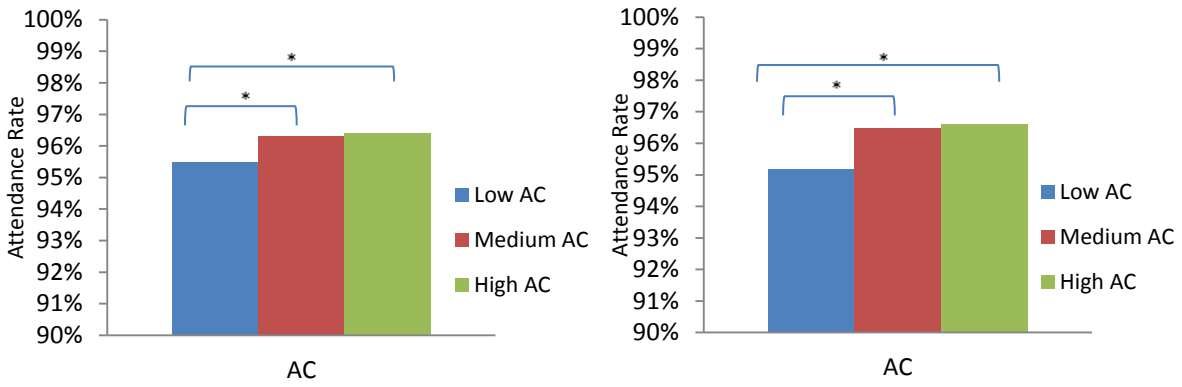

Fig 39. Attendance stratified by Aerobic Capacity by Girls (Left) and Boys (Right). * denotes statistically significant: $p < 0.0167$.

2014 Results (Attendance)

Attendance Stratified by Aerobic Capacity Level

Figure 40.

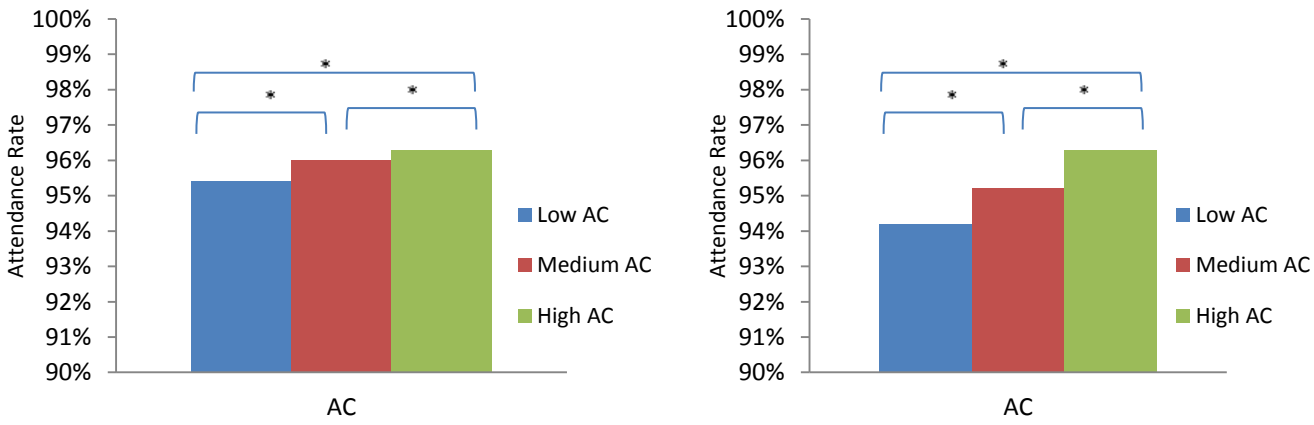

Figure 40. Attendance stratified by Aerobic Capacity by Girls (Left) and Boys (Right).* denotes statistically significant: $p < 0.0167$.