# Academic Achievement Differences Between Aerobically Active Versus Inactive Advanced Degree Students

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**ABSTRACT:**

**This paper explores the hypothesis that post-graduate students with different levels of aerobic activity would have different levels of academic achievement. Research conducted in two learning environments with two post-graduate student populations representing different income demographic groups provides insight into a possible relationship between income, aerobic activity, and academic achievement. The longitudinal survey used for this work was conducted between 1998 and 2007; the survey continues in 2008.**

**A quantitative research method was used involving group performance results among a population of more than 1,000 post-graduate students at two universities in the state of Texas. Students were in the same Masters of Business Administration (MBA) graduate course at both universities, and the course was taught by the same professor at both institutions. One of the institutions is a small religion-affiliated private university where the class is taught in both a brick-and-mortar classroom environment, as well as an Internet-only course. The other is a mid-sized state-affiliated university where the class is taught using a hybrid model of brick-and-mortar classroom and Internet sessions.**

**Key words:**
**Aerobic activity, academic achievement, income, graduate student**

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## Introduction

The literature does not contain research that correlates engagement in aerobic activity to academic achievement at the post-graduate student level. Riordan's 1997 study of high school students' academic achievement relative to extracurricular sports activities showed a correlation of better achievement in direct relation to sports activities (16). Pajares and Urdan's 2006 research of middle-school students engaged in extracurricular sports activities also showed a correlation of academic achievement in relation to sports activities (14). Mishler also explored the ''relationship of moderate daily physical activity to body fat and success in the classroom'' at the high school level within a group limited to students ages 15 to 17 years and found a positive correlation between activity level and academic achievement (13). Frauhiger explored this relationship with six to ten year olds and also found a positive correlation to academic achievement (10).

The literature is absent work that might similarly display a correlation between aerobic activity and income level and academic achievement and income level. Earlier work conducted by the American Medical Association (AMA) and the Association of American Medical Colleges' Student and Applicant Information Management (SAIM) attempted to correlate income level and academic achievement (2,3) and in the mid-1990's, a correlation began to emerge (4); it became more pronounced by 2000 (5).

The literature suggests that post-graduate students display patterns of satisficing behavior (1) and one would not expect to see correlated patterns of achievement. Using Agosto's theory, and expanding on Riordan's work, this research explores the hypothesis that post-graduate students with different levels of aerobic activity would have different levels of academic achievement—clear patterns of achievement.

This work represents initial research using two post-graduate student populations within two different learning environments. Quantitative research methodology was used with group performance results among a population of more than 1,000 post-graduate students at two universities in the state of Texas. Students were within the same Masters of Business Administration (MBA) graduate course at both universities, and the course was taught by the same professor at both institutions. Environmentally, one of the institutions is a small religion-affiliated private university where the class is taught in both a brick-and-mortar classroom environment, as well as an Internet-only course. The other is a mid-sized state-affiliated university where the class is taught using a hybrid model of brick-and-mortar classroom and Internet sessions. This provides two income demographic groups within two different learning environments and allows insight into a possible relationship between income, aerobic activity, and academic achievement. The longitudinal survey was conducted from 1998 to 2007.

This research is specific to distance running and cycling activity. For the purposes of this study, distance running is defined as more than 20 cumulative miles of running per week and distance cycling is more than 70 cumulative miles of cycling per week. The study does not define aerobic activity as doing both of these activities. The 1998 to 2007 study does include data from other levels of activity; however, those are not included in this work.

Earlier work (8) suggests that small private universities attract students with stronger academic records and a higher household income almost double that of the average—greater than $100,000—and, therefore, those students should outperform their counterparts at public universities. Literature that is more recent has challenged that view on the basis that students with strong academic credentials will naturally seek a more challenging academic environment (15).

One basis for that argument is that public universities generally have a larger student population which the students perceive they can compete against (6,11,17) and bring those elite competitive traits to their business careers (21,18).

**The Environments**

This research uses student performance within the same three credit hour graduate level management course that is taught at both universities. The same professor using the same text is common to all environments at both universities as is all course content regardless of delivery modality. The students at both universities have the same deliverables for course completion and those deliverables are identical across all course schedule and term length variations.

The private university has a graduate enrollment of less than 2,000 students and the mid-sized state-affiliated university has a graduate enrollment of approximately 11,000 students. Graduate class sizes are different between the two universities. There is an average class size of less than 20 students at the private university and, depending on campus location in Texas, either 20-25 students or 40-45 students at the state-affiliated university. The private university has an average MBA tuition cost of $27,000 and the state-affiliated university has an average MBA tuition cost of $14,000. The course is taught in the private university in a variety of modalities including only brick-and-mortar classroom environment, a blend of brick-and-mortar classroom instruction with content delivered via the Internet, and only Internet delivery. The physical location for the private university's brick-and-mortar classes is the greater Dallas-Fort Worth, Texas, metropolitan area ("Metroplex").

The average student at the private university is 33.7 years old and has a household income of greater than $80,000. Approximately 98% have full-time day jobs and work for a Fortune 500 company with an average placement in the mid-tier of corporate management. The student population is gender balanced with 52% males and 48% females. Student occupations are clustered primarily within the 7000 series of Standard Industrial Classifications for North America (22,20). The 7000 series includes service sector and high-technology industries.

The course taught at the state-affiliated university also uses a variety of delivery modalities, typically brick-and-mortar classes combined with Internet content delivery. The physical locations for the classes are also in the Dallas-Fort Worth Metroplex and include locations in Denton, Ft. Worth, and Plano. The university also has a location in Houston, Texas. Data from all locations is included in the survey.

The average student at the state-affiliated university is 31.6 years old and has a household income of greater than $40,000. Approximately 98% have full-time day jobs within the medical industry with an average placement in the mid-tier management. The student population for this class is gender-centric towards females, approximately 72% female and 28% male. Student occupations are strongly clustered among the Health Services 8000 series of Standard Industrial Classification.

**Methodology**

The average of all student grades for each term at each of the universities was calculated and plotted against one another as shown below (Figure 1).

Data for the state-affiliated university is only available for the prior three terms; however, data from the private university is available for terms starting in 1998. In total, there are 716 students in the private university data population and 305 students in the state-affiliated university data population.

**Findings**

Grades at the state-affiliated university tended to be higher than those at the small private university. This is contra to Figlio but in accord with Wolverton, Bayer, and Peterson (21,6,15). The student population is demographically equal across both universities except in two significant aspects. The first is the heavy concentration of medical professionals within the state-affiliated university and gender imbalance with a predominantly female population. The literature suggests a possible causal effect relative to gender. In the United States, females outperform males in measures of reading achievement while generally under-perform in areas of science and mathematics (7). One major class of explanations for these gaps involves the gender-based interactions between students and teachers based on gender differences; however, the evidence on whether these interactions actually matter is limited and has contradictory conclusions (9). Dee argued that assignment to a same-gender teacher might favorably influence student achievement, professor perceptions of that achievement, and student engagement. In this research, the professor was male and the state-affiliated university's students predominantly female. Therefore, Dee's argument may be a valid

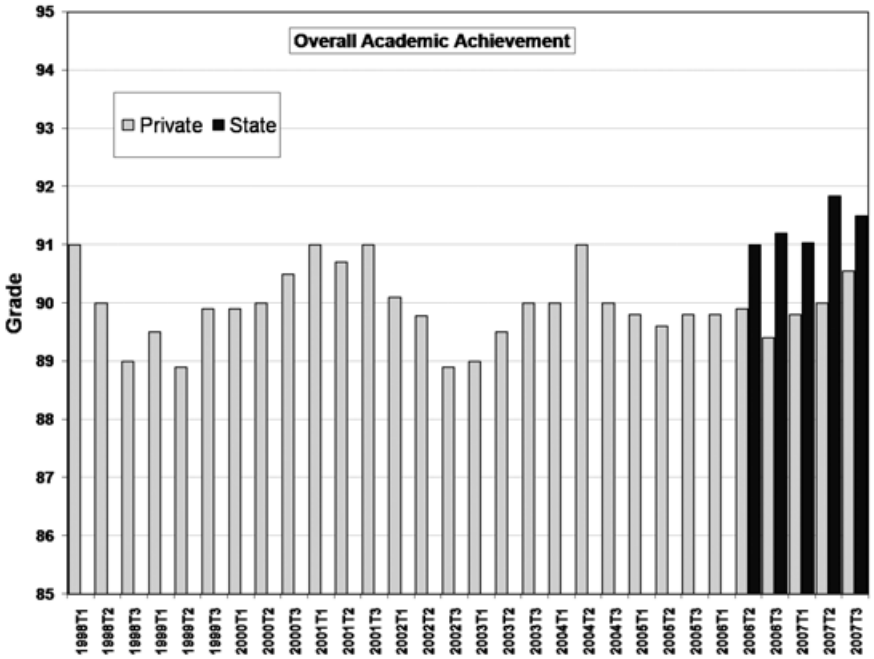


*Figure 1. Comparison of graduate student grades between a small private university and a medium size state-affiliated university.*

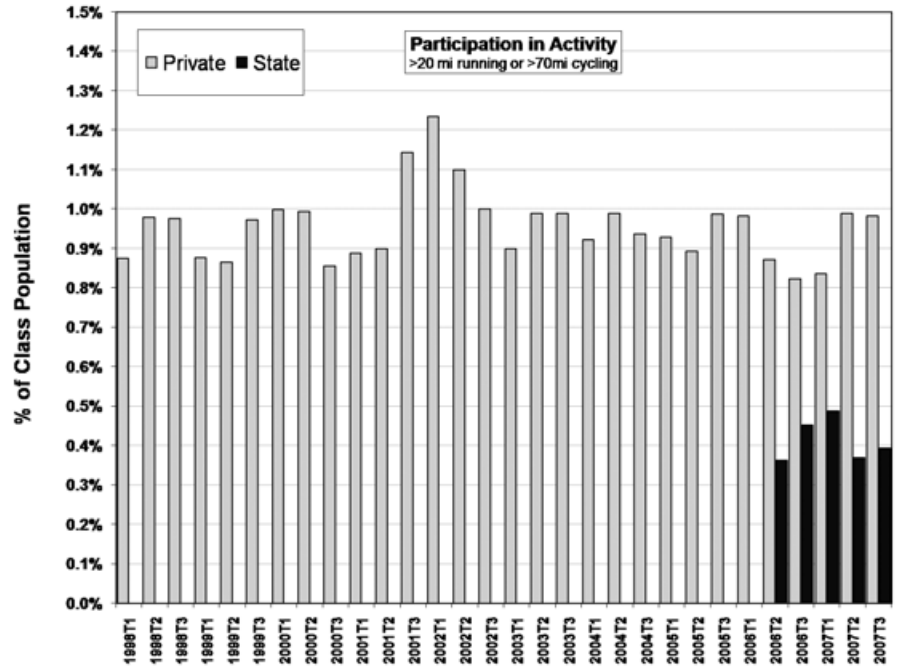


*Figure 2. Comparison of post-graduate student participation in aerobic activity.*

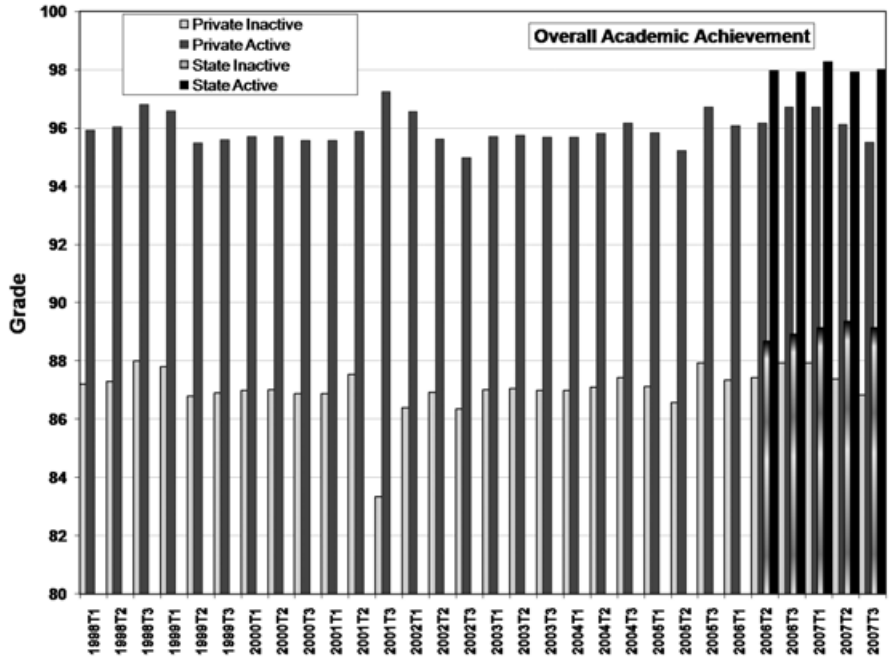


*Figure 3. Comparison of post-graduate student grades between inactive and active students participating in aerobic activity.*

explanation of the average achievement results, but not activity versus academic achievement results.

The other aspect which might help explain the results is the state-affiliated university's students are almost totally within the SIC 8000 business sector—medical services. As such, there may be a causal relationship with the critical thinking demanded within that business sector and the critical thinking demanded within the specific management course included in this research. Further research to determine a more precise causality for the results contained in this research would add to the literature and it's suggested that Dee's theory be explored further. In addition, research to determine any causal relationship between student performances in this particular course across many university populations would also add to the body of literature.

The participation level also correlates to the income demographic—higher income provides more participation. One must consider the aerobic activities surveyed and the difference in the gender balance between the populations. Considering the balance is equal in the private university versus a higher female population in the state university, these data do not provide the evidence to correlate income level and activity participation level, although they are a possible indicator (Figure 2).

For distance running and or cycling, these data for participation levels—although less than 1% of the post-graduate student populations—are well above Swan's 2005 findings for the general U.S. population (19). It is possible that the exercise level is also correlated to graduate and post-graduate education. These data disclose a clear correlation between aerobic activity and academic performance (Figure 3).

Post-graduate students within both populations had academic achievements consistently higher than the inactive student populations. Interestingly, within these data, no student engaged in the aerobic activities surveyed achieved less than the highest grade for inactive students within the same semester in any year within the survey data.

**Implications and Future Research**

There is an interesting phenomenon in the third trimester period in 2001. During that period, terrorist attacks on the U.S. occurred and there appears to be a corresponding decline in academic achievement for inactive students. Within the same period, students engaged in the aerobic activities surveyed, showed an increase in academic achievement—contra to their inactive counterparts. The literature does suggest that coping strategies are more pronounced in college students who have higher levels of physical activity (12); however, that work explored long-term stress factors and not singular epochal events. Further research directed towards coping ability within populations of post-graduate students both with and without levels of physical activity would benefit the literature.

The body of literature—inclusive of this work—clearly indicates that higher levels of aerobic activity have both a pronounced and positive impact on aca-

*Continued on page 13*

most pools where water aerobics are taught. The aquarunners make it difficult to keep your feet submerged in the water and provide intense resistance for you to work against when running.

**Warm-Up:**
10 minutes easy (60-70% MHR) without aquarunners
**Workout:**
After completing the warm up, attach the aquarunners to your feet and begin to run. Run hard for 1 minute, focusing on maintaining good running form. Run easy or walk for 1 minute. Repeat 10-15 times. As you feel more comfortable, you can extend the hills by adding 15 seconds at a time to the intervals.
**Cool-Down:**
10 minutes easy (60-70% MHR) without aquarunners

**The Recovery Run**

This workout can replace a recovery run that typically follows a long run or tough day of speed work. The purpose of this workout is to exit the pool feeling refreshed and energized. The pool-based recovery run should be no longer in duration than what your training plan calls for.

**Warm-Up:**
10 minutes easy (60-70% MHR)
**Workout:**
Gradually speed up your pace to 75-80% MHR and maintain this effort level for 20-40 minutes.
**Cool-Down:**
10 minutes easy (60-70% MHR)

**Wide to Narrow Form-Check Workout**

**Warm-Up:**
10 minutes easy (60-70% MHR)
**Workout:**
For a couple lengths of the pool, make yourself as wide as possible. Run with your feet turned out or in to push more water. Cup your hands and swing your arms at an angle to push more water behind you. In short, do things to make you less aerodynamic. These are things that would slow you down and possibly lead to injury on land where gravity is at work. After a couple of minutes of "wide running", make yourself more sleek and aerodynamic, running exactly as you would on land. Maintain this form for 5 to 10 minutes, taking note of how the water feels against your body. Do you feel more resistance against one arm or leg than the other? Do your feet glide through the water, or does one foot drag slowly. For the next 5 to 10 minutes, try to maintain form that is symmetrical and sleek. When you do this, you should feel like it takes much longer to complete one length of the pool, because you are not pushing through the water.
**Cool-Down:**
10 minutes easy (60-70% MHR)

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*Continued from page 7*

demic achievement. Additional research is needed to further define the relationship between aerobic activity and coping ability, specifically to explore the research question of whether it is the activity itself that is used as the mechanism to cope—"I'll go run"—or perhaps the student engaged in such activity encounters perceptions of adversity with a much different adversity quotient. Further research would help clarify the relationship.

Another relationship that is inherent to the student populations used for this work is the income level differential between the two populations. There is an apparent correlation between a higher income level and degree of aerobic activity when the data of the two student populations are compared. Further research into the underlying mechanisms of this correlation would also benefit the literature.

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