The Unit 9 Lab is a series of questions about a study conducted by a professor of kinesiology at Michigan State University. Three different perspectives on this study are provided in this document:

- An excerpt from a Huffington Post article about the study;
- A short abstract of the official study published in the *Recreational Sports Journal*, which is the official journal of the NIRSA (National Intramural-Recreational Sports Association);
- The flyer produced by the researchers to advertise the benefits of a Campus Recreation and Fitness Facilities membership (CRFF) to Michigan State University students.

Carefully read these three excerpts and then answer the questions that follow at the end of this document.

If You Want A Higher GPA, Study Shows You Should Join A Gym

The Huffington Post | By Nina Friend
Posted: 07/11/2014 2:57 pm EDT Updated: 07/11/2014 2:59 pm EDT

Can pumping iron pump your grade point average? New research from Michigan State University says yes.

An MSU study released this week compares 4,843 freshman and sophomores on the basis of whether they had membership to the school's recreational sports and fitness centers. The findings are significant: the students who belonged to the gym had higher GPAs than those who didn't.

James Pivarnik, the lead researcher of the study and a professor of kinesiology and epidemiology at MSU, explained students' cumulative GPAs were 0.13 points higher. Although the number may not appear significant, it could "mean the difference to those students on the cusp of getting into graduate school or even advancing to the next academic year."

Pivarnik found that students with a gym membership, in addition to having higher GPAs, had more credits completed by the end of their freshman year and stayed in school longer, helping to boost the school's retention rate. …

http://www.huffingtonpost.com/2014/07/11/gym-higher-gpa-msu-study_n_5575054.html

Recreational Sports Journal: The Official Journal of the NIRSA
RSJ Volume 38, Issue 1, April
Original Research

Academic Success and Retention: The Role of Recreational Sports Fitness Facilities

2014, 38, 14 – 22

http://dx.doi.org/10.1123/rsj.2013-0010

This study evaluated the role of a university recreational sports and fitness center, in students' academic success. Study participants included freshmen at a large Midwestern university (n = 4,843; 56% women; 67% white). Recreational sports fitness facility members (students who purchased a recreational sports fitness facilities membership in their first semester; n = 1,138) were compared with nonmembers (students who did not purchase a recreational sports fitness facility membership in their first semester; n = 3,705). $M \pm SD$ and percentages were calculated for all variables of interest. Differences between groups were analyzed using t tests and percentages. Members had significantly higher high school grade point averages (GPA) (p = .002). After four consecutive semesters, members had significantly higher cumulative college GPA ($p \leq .0001$) and cumulative credits completed ($p \leq .0001$). Significantly more members than nonmembers were enrolled in school after two completed years, 89% and 85%, respectively. Results show recreational sports fitness facility membership is associated with, and may be beneficial to, college students' academic success.

Authors: Samantha J. Danbert, James M. Pivarnik, Richard N. McNeil, Ira J. Washington

http://journals.humankinetics.com/rsj-back-issues/rsj-volume-38-issue-1-april/academic-success-and-retention-the-role-of-recreational-sports-fitness-facilities

ACADEMIC SUCCESS:
THE ROLE OF CAMPUS RECREATION FITNESS FACILITIES

Samanta J. Danbert, James M. Pivarnik, Richard N. McNeil, & Ira J. Washington
Recreation Sports and Fitness Services, Michigan State University

INTRODUCTION

Engaging in fitness activities makes an educational difference! Campus Recreation and Fitness Facilities (CRFF) give college students the means to participate in daily physical activity, which is important to current health and chronic disease prevention. However, as demonstrated in recent research jointly conducted between the Department of Recreational Sports and Fitness Services and the Department of Kinesiology, participating in recreational activities also is related to student success, specifically academic success (e.g., grade point average, credits completed, first to second and first to third year retention, class standing).

More than 75 group fitness classes are offered each week !

THE STUDENTS

4843 Michigan State first year students participated

- 56% women; 44% men
- 67% Caucasian; 33% Students of Color

Sample split into two groups:

- Purchased a CRFF membership (N=1138)
- Did not purchase a CRFF membership (N=3705)

More than 9,000 students purchase fitness memberships

RESULTS

	CRFF Members	CRFF Non-Members
Number	1138	3705
Gender (% Female)	41.2%	60.1%
High school GPA	3.55 (± .38) *	3.52 (± .30)
Pre-college GPA	2.99 (± .52) *	2.9 (± .36)
Collegiate GPA	3.13 (± .52) *	3.00 (± .59)
College credits completed	56.6 (± 8.9) *	54.1 (± 11.3)
1-year retention	91% *	88%
2-year retention	89% *	85%
Class standing	74% *	60%

* significant difference between groups ($p<0.002$)

WHAT WE LEARNED

- After four consecutive semesters, CRFF members completed more college credits than non-members.
- CRFF members had higher 1-year and 2-year retention rates than non-members.
- After two consecutive semesters, more CRFF members achieved sophomore status than non-members.
- CRFF members began college with a higher precollege GPA and maintained a higher collegiate GPA while in college.

Questions to answer:

1) Jessica Utts in her article "What Educated Citizens Should Know About Statistics and Probability"[1] writes,

   Probably the most common misinterpretation of statistical studies in the news is to conclude that when a relationship is statistically significant, a change in an explanatory variable is the *cause* of a change in the response variable. This conclusion is appropriate only under very restricted conditions, such as for large randomized experiments. For single observational studies, it is rarely appropriate to conclude that one variable caused a change in another. Therefore, it is important for students of statistics to understand the distinction between randomized experiments and observational studies, and to understand how the potential for confounding variables limits the conclusions that can be made from observational studies.

   a) How do the MSU flyer and the Huffington Post article illustrate the common misinterpretation that Utts describes? How does the abstract of the study published in the Recreational Sports Journal do a better job?

      Be specific. In your answer discuss the study's design and cite language from the MSU flyer and the Huffington Post article that is problematic given the study's design; also cite language from the RSJ abstract that is more accurate and explain why.

   b) In this study gym membership is the explanatory variable. College GPA is one of the response variables. However, there is one serious confounding variable that probably does a better job explaining the higher college GPA for gym members. Read carefully and identify this confounding variable. Explain why it is probably confounding the relationship between gym membership and college GPA.

2) The researchers conducted several t-tests.

   a) Are the conditions for use of a t-test met by this data? Explain.

   b) Why is it important to verify that conditions are met?

3) In the RSJ summary of the original research, it says, "After four consecutive semesters, members had significantly higher cumulative college GPA ($p \leq .0001$) and cumulative credits completed ($p \leq .0001$)."

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[1] Utts, J. What Educated Citizens Should Know About Statistics and Probability. *The American Statistician, May 2003, Vol. 57, No. 2*

a) What does the term “significantly higher” mean to a statistician?

b) In the Huffington Post article, it says, “James Pivarnik, the lead researcher of the study and a professor of kinesiology and epidemiology at MSU, explained students' cumulative GPAs were 0.13 points higher.” In this study, why is such a small difference in GPAs statistically significant?

4) In the article “What Educated Citizens Should Know About Statistics and Probability”, Jessica Utts writes, “Students need to understand that a statistically significant finding may not have much *practical* importance. This is especially likely to be a problem when the sample size is large, so it is easy to reject the null hypothesis even if there is a very small effect.”

   In the flyer the results from this study are being used to encourage students to buy a membership to the Recreational Sports and Fitness Center. Membership fees range from $70 to $260.
   (Source: http://recsports.msu.edu/Fitness/Memberships.html)

   a) How does Pivarnik, the study’s author, address the issue of practical importance?

   b) Do you think the GPA difference found in this study is of practical importance? Why or why not?