Project Fit America

A Statistical Analysis by:
Sonoma State University, California

Conducted for:
Montgomery Elementary
Montgomery, New York

Report by:
Eric Polverari

Abstract

For the Spring semester of 2021, the students in the Sonoma State University Mathematics and Statistics Consulting department received data for schools that participated in the Project Fit America (PFA) program in 2017-2018. Founded by Stacey Cook, PFA's goal is to improve overall fitness for students in elementary and middle schools. The statistical analysis in this report is for Montgomery Elementary, located in Montgomery, New York. In order to evaluate the effectiveness of the program, fitness tests are conducted to measure cardiovascular endurance, upper body strength, abdominal strength, and explosive leg strength. In order to determine if students improved their fitness level due to the PFA program, the schools tested the students prior to the implementation of the program and after the completion of the program. After analyzing the data for

the third grade students, we can conclude that there was no significant improvement made for the Progressive Aerobic Cardiovascular Endurance Run (PACER) test, but there was significant improvement made for the flexed arm hang, vault bar, and sit-ups test. After analyzing the data for fourth graders, we can conclude that there was significant improvement made for the Progressive Aerobic Cardiovascular Endurance Run (PACER), flexed arm hang, vault bar, and sit-ups test.

Introduction

Project Fit America is a national agency that works with schools and front line educators to create new opportunities for kids to be active, fit and healthy. PFA does this by creating and administering exemplary fitness in education programming in elementary and middle schools across the United States. PFA was founded in 1990 and have donated to over 1,000 schools in 400 cities and 46 states. Since founding the sponsorship drive, PFA has raised $15,822,322.00. PFA is funded by sponsors that includes hospitals and healthcare organizations. The process of how PFA selects schools is accomplished through a narrative submission, or custom grant program (available in the fall and spring semesters). A school that is a part of PFA receives outdoor fitness equipment, indoor mobile fitness equipment, lesson plan support materials, and a core curriculum. The total funding required to sponsor a pilot and

model school program is $18,206. This is inclusive of the entire two-year program with absolutely no hidden or additional costs.

If a school wants to have PFA, the best action a school can take is to send PFA a letter on their school letterhead telling PFA why they need PFA and why this project is important to their school. PFA also encourages schools to take a moment and fill out the registration form on the PFA web site.

PFA's goal and driving purpose is to create new and sustainable opportunities for kids to be active, fit and healthy as part of the everyday school experience. This is accomplished through educational programs and equipment that will allow the school to successfully teach fitness education year after year. PFA will provide and implement the following components at the selected school(s):

- State-of-the-art outdoor, above ground fitness equipment.

  UCLA specifically designed to address all the deficit areas where children fail fitness tests. The equipment becomes the permanent property of the school.

- Indoor Mobile Fitness Equipment

- 1,000 Fitness Cups

  These are fitness cups for explosive cardio, team work, challenge and cooperation with the kids. These cups are a PFA innovation.

- A squad set of 3 lb weights hoops

They are weighted, multicolored and feel like wetsuit material. Great for sustaining upper body strength training and cardio.

- A squad set of 5 – 3 lb medicine balls

- A squad set of 5 – 6 lb medicine balls

- A squad set of 5 – 2 lb weighted jump ropes.

• Lesson Plan Supper Materials:

- Pacer Cadence CD [Pacer (Progression Aerobic Cardiovascular Endurance Run)]

  This activity provides outstanding cardiovascular conditioning and training as kids shuttle run from 43-60 feet to a "beeped cadence" trying to get from one end of the measured run to the next before the beep goes off. The beeps progressively become faster and kids have a blast earning rewards to the number of up and back laps they could do. Even the students who hate to run, love this cardio challenging activity.

- 6 sets of Laminated Skeleton Bones

  For use in one of our most popular Fitness Cup Lesson plans, $10.00 and a Bone.

- $250.00 Play money

  For use with Fitness Cup lesson plan, $10.00 and a bone.

- PE Music CD

  Favorite music that teachers and kids love which builds nicely into the "movement and dance" component of our program.

- Certificates, Ribbons, Starters Kits for Chart and Challenge

  Student accomplishment display. We provide these reward and incentives to each PE Teacher so they can create motivating wall charts and hallway

displays that get the kids super excited to participate in activities and have their name featured for all to see!

- Set of Laminated Fitness Task Cards
- Set of Laminated Chart and Challenge Wall Headers

The staff works directly with each school to assure the measurement component is fulfilled. Each school will pre and posttest one class at 3 different grade levels and follow those students through the program. This is an all-day eight hour session to commence the program in year one and a second all day booster session in year two. The PFA Mentor Teacher is assigned to a school to train teachers. The PFA Mentor Teacher is there for a two-year period and works both on site as well as via mobile and online. This allows each school to progress and sustain their programming to higher levels and allows for the kind of support needed to launch any new endeavor. If needed, a substitute teacher fee is paid to the school to aid support to the PE teacher(s) on the day of the in-service.

These tests are administered to the students at the beginning of the fall semester, prior to implementing PFA and at the end of the spring semester after using the program. The data is analyzed by Sonoma State University, Department of Mathematics and Statistical Consulting and reports are compiled for each school as well as national school averages. The goal of this statistical analysis is to determine the effectiveness of the PFA program by statistically testing for significant improvement in students' performance of the PFA fitness activities.

Data Collection

The completed Excel spreadsheet contains information on Montgomery

Elementary, located in Montgomery, New York. We get this data from the school. The

data was collected by Douglas Luciano Christine Giudice for the academic year of

2017-2018. Each school will complete both pre and post PFA implementation

measurements of one class, at two different grade levels and will follow the students

through the program. The Excel spreadsheet contains data for the PACER (Progressive

Aerobic Cardiovascular Endurance Run), flexed arm hang, vault bar, and sit-ups tests.

For this school, there were 109 students recorded for the PACER, flexed arm hang, sit-

ups, and vault bar test with 23 third graders and 86 fourth graders tested. A valid data point involves a student having both a pre-test and post-test score. If a student is missing either or both, that data point is considered invalid and is not included in the testing process. This data set has 109 value scores for each test. If a student misses a test and doesn't return to class, they are either marked with an "I", meaning injured, or an "M", meaning they moved.

The online template that the data collectors use to store their data is on an excel file. Each sheet has a list of the students by a number, their birthdate, grade, and pre and post test scores. The PACER is recorded is number of laps run, the flexed arm hang is recorded in time by minutes and seconds, The vault bar is recorded each time a student lands a jump, and the sit-ups is recorded as the number completed in 2 minutes.

For the PACER data, the students ran the 20 meter test. This exercise is used for Cardio testing. There are no dates entered for when the pre and post test scores were recorded. Every student has a pre and post test score.

For the flexed arm hang, every student has a pre and post test score. This exercise is used for strength testing. There are no dates entered for when the pre and post test scores were recorded.

The vault bar test is used for cardio testing. There are no dates entered for when the pre and post test scores were recorded. Every student has a pre and post test score.

The sit-ups test is used for abdominal strength testing. There are no dates entered for when the pre and post test scores were recorded. Every student has a pre and post test score.

Data Analysis

For this report, the data that was collected is for Montgomery Elementary, located in Montgomery, New York. The grade levels that this report included to conduct the statistical analysis is for 3rd and 4th graders. In order to test the data, there must be valid data points, which consist of the difference between a student's posttest score and pretest score The original data set had 109 total observations and after careful inspection of each observation, I concluded that they were all valid scores. However, for the PACER data for both grade levels, there's some concern that the numbers have been entered incorrectly, where pre and post test scores were switched, as the average difference between the means results in a negative value. Perhaps this is correct, but we will precede to adjust the test scores, while noting the potential error in our data.

For 3rd graders, we had 23 valid scores for each fitness activity test (Flexed Arm Hang, PACER, Sit-Ups, Vault Bar) and for 4th graders, we had 79 valid scores for the

Flexed Arm Hang fitness activity, 86 valid scores the PACER test, 84 valid scores for the Sit-Ups fitness activity and 85 valid scores for the Vault Bar test.

In order to perform a statistical analysis on this data set, a statistical programming package called SPSS was used. As it was not necessary to perform any data modifications, I proceeded to conduct a statistical analysis for each exercise. Each fitness activity is evaluated for each grade level, so we'll have eight separate results to explain. We'll start by looking at how the 3rd grade level students performed.

The first fitness activity I conducted for the 3rd grade level was a test on the PACER, which measures a student's cardiovascular strength. We test to see if their mean improvement in laps run for the PACER is statistically significant. Since the sample was less than 30, I performed a Shapiro-Wilk Test to test Normality of the difference data. The test resulted in a p-value less than our significance level of 0.05, so we cannot assume the data follows a normal distribution and I performed a paired sign test to see if their median improvement in laps run for the PACER is statistically significant. The paired sign test did not have a p-value less than the significance level of 0.05, so we don't have evidence to suggest that the PFA program significantly improved the students' cardiovascular strength.

The second fitness activity that was tested for the 3rd grade level was the Flexed Arm Hang test, which measures a student's upper body strength. We test to see if their mean improvement in minutes and seconds held for the flexed arm hang is statistically significant. Since the sample was less than 30, I performed a Shapiro-Wilk Test to test Normality of the difference data. The test resulted in a p-value less than our significance level of 0.05, so we cannot assume the data follows a normal distribution and I

performed a paired sign test to see if their median improvement in minutes and seconds held for the flexed arm hang is statistically significant. The paired sign test did have a p-value less than the significance level of 0.05, so we have evidence to conclude that the PFA program significantly improved the students' cardiovascular strength.

The third fitness activity that was tested for the 3rd grade level was the Vault Bar test, which measures the students' explosive leg strength. We test to see if their mean improvement in jumps landed for the vault bar test is statistically significant. Since the sample was less than 30, I performed a Shapiro-Wilk Test to test Normality of the difference data. The test returned a p-value greater than our significance level of 0.05, so we can assume the data follows a normal distribution and I performed a Paired T-test. The Paired T-test showed a p-value that was less than the significance level of 0.05, so we have evidence to suggest that the PFA program significantly improved the students' explosive leg strength.

The fourth fitness activity that was tested for the 3rd grade level was the Sit-Ups test, which measures a student's abdominal strength. We test to see if the improvement in their mean number of repetitions performed doing sit-ups is statistically significant. Since the sample was less than 30, I performed a Shapiro-Wilk Test to test Normality of the difference data. The test resulted in a p-value less than our significance level of 0.05, so we cannot assume the data follows a normal distribution and I performed a paired sign test to see if their median improvement in number of repetitions performed doing sit-ups is statistically significant. The paired sign test did have a p-value less than the significance level of 0.05, so we have evidence to suggest that the PFA program

significantly improved the students' abdominal strength. Next, we'll look at how the fourth graders performed.

The first fitness activity that was tested for the 4th grade level was the PACER, which measures a student's cardiovascular strength. We test to see if their mean improvement in laps run for the PACER is statistically significant. Since the sample was larger than 30, the central limit theorem states that we can perform a Paired T-test. The Paired T-test showed a p-value that was less than the significance level of 0.05, so we have evidence to suggest that the PFA program significantly improved a student's cardiovascular strength.

The second fitness activity that was tested for the 4th grade level was the Flexed Arm Hang test, which measures a student's upper body strength. We test to see if their mean improvement in minutes and seconds held for the flexed arm hang is statistically significant. Since the sample was larger than 30, the central limit theorem states that we can perform a Paired T-test. The Paired T-test showed a p-value that was less than the significance level of 0.05, so we have evidence to suggest that the PFA program significantly improved a student's cardiovascular strength.

The third fitness activity that was tested for the 4th grade level was the Vault Bar test, which measures the students' explosive leg strength. We test to see if their mean improvement in jumps landed for the vault bar test is statistically significant. Since the sample was larger than 30, the central limit theorem states that we can perform a Paired T-test. The Paired T-test showed a p-value that was less than the significance

level of 0.05, so we have evidence to suggest that the PFA program significantly improved a student's cardiovascular strength.

The fourth and last fitness activity that was tested for the 4th grade level was the Sit Ups test, which measures a student's abdominal strength. We test to see if the improvement in their mean number of repetitions performed doing sit-ups is statistically significant. Since the sample was larger than 30, the central limit theorem states that we can perform a Paired T-test. The Paired T-test showed a p-value that was less than the significance level of 0.05, so we have evidence to suggest that the PFA program significantly improved a student's cardiovascular strength.

Conclusion

After analyzing the data and performing the appropriate hypothesis test, we can conclude that, the third grade students did not show a significant improvement in the median number of laps, but did show a significant improvement in the median number of seconds completed for the flexed arm hang, which measures upper body strength, the mean number of repetitions completed for the sit-ups test, which measures abdominal strength, and mean number of jumps for the vault bar test, which measures lower body strength. After analyzing the data performing the appropriate hypothesis test for fourth grade students, we can conclude that they showed significant improvement in the mean number of PACER laps, which measures cardiovascular endurance, the mean number of seconds completed for the flexed arm hang, which measures upper body strength, the mean number of repetitions completed for the sit-ups test, which measures abdominal strength, and mean number of jumps for the vault bar test, which

measures lower body strength. While it's possible the PFA program helped these students improve their fitness levels, we cannot conclude with full confidence that the improvement between the post and pre test scores is solely due to the PFA program because of a variety of factors, such as extracurricular activity or students becoming more well-adjusted to the test after its completion compared to having little or no knowledge of how to perform the test prior to the implementation of the program. Some of the tests also had some other flaws. The sample used for each test was not random and therefore the results can't be generalized to a wider group of students. Some samples were relatively small, so a few scores could have a significant effect on the means. Also, there was not a controlled group to compare results to, so we do not know if the program used was effective compared to schools that did not participate in the program.

Appendix A

Project Fit America 2017/2018 Testing

School Name: Montgomery Elementary

City, State: Montgomery, New York

Phone Number: 845-457-2400

Name of Individual Collecting Data:Douglas Luciano Christine Giudice

Post Testing Recording Instructions:
Absent Students Must be Tested When They Return to Class
I=Injured M=Moved
Enter in Corresponding Pre- or Post-Test box

Student Information	Pacer (Record in Laps)			
	15 Meter		OR	20 Meter	x
	Please enter an X in Pacer you are using			

#	Student ID Number	Birthdate	Grade Level	Gender (M/F)	PRE Date	PRE Test	POST Date	POST Test	Percent Improvement
0	Example	5/31/2009	4	F	######	7	######	11	57%
1	1002843	6/18/2010	3	m	######	47	######	31	-34.0%
2	1002847	4/7/2010	3	f	######	24	######	11	-54.2%
3	1001935	11/22/2009	3	f	######	25	######	11	-56.0%
4	1002857	3/7/2010	3	f	######	29		26	-10.3%
5	1005062	2/26/2010	3	f	######	28		26	-7.1%
6	1002859	9/5/2010	3	m	######	34		21	-38.2%
7	1004528	4/15/2009	3	f	######	39		34	-12.8%
8	1003430	2/1/2010	3	m	######	45		34	-24.4%
9	1002608	8/4/2010	3	f	######	17		20	17.6%
10	1003226	12/20/2009	3	f	######	40		41	2.5%
11	1002906	10/11/2010	3	f	######	15		17	13.3%
12	1004301	4/21/2010	3	f	######	15		17	13.3%
13	1002877	7/10/2010	3	m	######	8		14	75.0%
14	1003432	6/24/2010	3	m	######	28		28	0.0%
15	1002912	4/6/2010	3	f	######	24		26	8.3%
16	1003185	8/24/2010	3	m	######	40		45	12.5%
17	1002885	4/12/2010	3	m	######	27		28	3.7%
18	1001988	11/17/2009	3	m	######	46		47	2.2%
19	1002313	5/8/2010	3	f	######	45		46	2.2%
20	1005063	10/12/2010	3	f	######	16		31	93.8%
21	1003413	7/20/2010	3	m	######	23		25	8.7%
22	1002898	5/1/2010	3	f	######	29		30	3.4%
23	1003426	1/9/2010	3	m	######	14		23	64.3%
24	1002259	7/4/2009	4	f	######	43		46	7.0%
25	1002721	6/11/2009	4	f	######	20		36	80.0%
26	1003017	4/10/2009	4	m	######	41		47	14.6%
27	1003424	11/23/2009	4	f	######	22		17	-22.7%
28	1002725	7/12/2009	4	m	######	44		21	-52.3%
29	1003664	2/8/2009	4	m	######	22		15	-31.8%
30	1002808	6/26/2009	4	f	######	23		16	-30.4%
31	1002763	1/8/2009	4	f	######	44		15	-65.9%
32	1003008	10/16/2009	4	f	######	34		16	-52.9%

33	1001453	6/13/2009	4	f	######	47		32	-31.9%
34	1002282	3/5/2009	4	f	######	24		28	16.7%
35	1002768	11/16/2009	4	m	######	38		25	-34.2%
36	1002290	2/3/2008	4	f	######	23		16	-30.4%
37	1003619	1/7/2009	4	m	######	73		43	-41.1%
38	1001823	5/13/2009	4	f	######	41		38	-7.3%
39	1003105	1/10/2009	4	m	######	22		11	-50.0%
40	1002776	9/24/2009	4	m	######	56		21	-62.5%
41	1002782	5/12/2009	4	f	######	27		32	18.5%
42	1002737	12/23/2008	4	m	######	73		41	-43.8%
43	1002783	5/28/2009	4	m	######	31		24	-22.6%
44	1003638	11/13/2009	4	f	######	33		23	-30.3%
45	1002343	2/17/2009	4	m	######	84		47	-44.0%
46	1003731	7/25/2009	4	m	######	17		8	-52.9%
47	1002726	5/13/2009	4	f	######	28		17	-39.3%
48	1002108	1/24/2008	4	f	######	23		26	13.0%
49	1002974	3/11/2009	4	m	######	62		59	-4.8%
50	1003673	6/8/2009	4	f	######	32		17	-46.9%
51	1002786	8/18/2009	4	m	######	39		19	-51.3%
52	1001481	4/24/2009	4	f	######	52		52	0.0%
53	1002773	7/22/2009	4	m	######	48		22	-54.2%
54	1002241	9/26/2008	4	m	######	32		22	-31.3%
55	1001442	5/28/2009	4	f	######	43		24	-44.2%
56	1002771	6/27/2009	4	f	######	14		14	0.0%
57	1002325	2/11/2009	4	m	######	42		40	-4.8%
58	1002772	10/24/2009	4	m	######	41		32	-22.0%
59	1005580	2/25/2009	4	f	######	27		29	7.4%
60	1005015	10/18/2009	4	f	######	26		20	-23.1%
61	1002128	9/16/2008	4	f	######	44		40	-9.1%
62	1002376	12/25/2008	4	f	######	14		15	7.1%
63	1002780	12/17/2008	4	f	######	47		36	-23.4%
64	1002329	5/12/2009	4	m	######	32		35	9.4%
65	1002994	4/6/2009	4	m	######	67		26	-61.2%
66	1005121	7/13/2009	4	m	######	40		27	-32.5%
67	1002761	6/5/2009	4	m	######	30		32	6.7%
68	1002722	5/6/2009	4	m	######	22		23	4.5%
69	1005487	10/11/2009	4	f	######	14		13	-7.1%
70	1003224	1/23/2009	4	f	######	17		22	29.4%

71	1001615	4/14/2009	4	f	######	42		46	9.5%
72	1002244	8/9/2008	4	m	######	20		21	5.0%
73	1004296	8/21/2009	4	m	######	27		24	-11.1%
74	1005678	10/2/2009	4	f	######	30		34	13.3%
75	1002767	9/14/2009	4	f	######	17		15	-11.8%
76	1001404	1/14/2009	4	m	######	48		37	-22.9%
77	1005571	11/17/2009	4	m	######	32		43	34.4%
78	1002769	3/13/2009	4	f	######	26		26	0.0%
79	1002770	7/30/2009	4	f	######	18		19	5.6%
80	1002309	7/28/2009	4	f	######	14		23	64.3%
81	1002025	7/24/2009	4	f	######	42		44	4.8%
82	1002811	8/13/2009	4	f	######	36		34	-5.6%
83	1003011	8/6/2009	4	m	######	14		16	14.3%
84	1002779	4/18/2009	4	m	######	33		31	-6.1%
85	1002335	2/7/2009	4	f	######	41		47	14.6%
86	102349	3/27/2009	4	f	######	50		55	10.0%
87	1005179	3/17/2009	4	m	######	20		23	15.0%
88	1002784	9/30/2009	4	m	######	32		35	9.4%
89	1002723	9/28/2009	4	f	######	21		9	-57.1%
90	1003675	8/16/2009	4	m	######	43		20	-53.5%
91	1002764	9/6/2009	4	m	######	25		20	-20.0%
92	1002110	11/20/2008	4	m	######	52		31	-40.4%
93	1001454	6/13/2009	4	f	######	41		37	-9.8%
94	1002765	1/9/2009	4	m	######	73		56	-23.3%
95	1005635	7/29/2009	4	m	######	24		13	-45.8%
96	1002117	9/29/2008	4	f	######	51		42	-17.6%
97	1004203	3/19/2009	4	f	######	72		46	-36.1%
98	1002775	7/17/2009	4	m	######	24		24	0.0%
99	1003322	10/12/2009	4	f	######	43		29	-32.6%
100	1002742	6/24/2009	4	m	######	65		49	-24.6%
101	1002319	5/13/2009	4	f	######	20		31	55.0%
102	1002940	4/20/2009	4	f	######	52		37	-28.8%
103	1002777	1/31/2009	4	m	######	25		27	8.0%
104	1002778	10/7/2009	4	f	######	16		21	31.3%
105	1004192	10/27/2009	4	f	######	39		24	-38.5%
106	1002226	10/12/2009	4	f	######	18		14	-22.2%
107	1005330	10/8/2009	4	m	######	18		22	22.2%
108	1002454	12/19/2008	4	f	######	21		14	-33.3%

| 109 | 1003624 | 4/12/2009 | 4 | m | ###### | 64 | | 52 | -18.8% |

Project Fit America 2017/2018 Testing

School Name:

City, State:

Phone Number:

Name of Individual Collecting Data:

Post Testing Recording Instructions: *Absent Students Must be Tested When They Return to Class* *I=Injured M=Moved* *Enter in Corresponding Pre- or Post-Test box*

Student Information					**Flexed Arm Hang** Every student is required to perform this test. Enter time in minutes : seconds				
#	Student ID Number	Birthdate	Grade Level	Gender (M/F)	PRE Date	PRE Test	POST Date	POST Test	Percent Improvement
0	Example	5/31/2009	4	F	######	00:10	######	00:30	200%
1	1002843	6/18/2010	3	m	######	00:20		00:24	20%
2	1002847	4/7/2010	3	f	######	00:16		00:17	6%
3	1001935	11/22/2009	3	f	######	00:05		00:06	20%
4	1002857	3/7/2010	3	f	######	00:10		00:13	30%
5	1005062	2/26/2010	3	f	######	00:10		00:11	10%
6	1002859	9/5/2010	3	m	######	00:10		00:13	30%
7	1004528	4/15/2009	3	f	######	00:08		00:16	100%
8	1003430	2/1/2010	3	m	######	00:11		00:16	45%
9	1002608	8/4/2010	3	f	######	00:02		00:04	100%
10	1003226	12/20/2009	3	f	######	00:22		00:31	41%
11	1002906	10/11/2010	3	f	######	00:01		00:03	200%
12	1004301	4/21/2010	3	f	######	00:01		00:01	0%
13	1002877	7/10/2010	3	m	######	00:03		00:03	0%
14	1003432	6/24/2010	3	m	######	00:01		00:05	400%
15	1002912	4/6/2010	3	f	######	00:07		00:10	43%
16	1003185	8/24/2010	3	m	######	00:14		00:22	57%
17	1002885	4/12/2010	3	m	######	00:38		00:47	24%

18	1001988	11/17/2009	3	m	######	00:26		00:35	35%
19	1002313	5/8/2010	3	f	######	00:17		00:27	59%
20	1005063	10/12/2010	3	f	######	00:08		00:23	188%
21	1003413	7/20/2010	3	m	######	00:15		00:14	-7%
22	1002898	5/1/2010	3	f	######	00:07		00:16	129%
23	1003426	1/9/2010	3	m	######	00:14		00:16	14%
24	1002259	7/4/2009	4	f	######	00:12		00:29	142%
25	1002721	6/11/2009	4	f	######	00:01		00:08	700%
26	1003017	4/10/2009	4	m	######	00:05		00:06	20%
27	1003424	11/23/2009	4	f	######	00:01		00:02	100%
28	1002725	7/12/2009	4	m	######	00:04		00:07	75%
29	1003664	2/8/2009	4	m	######	00:00		00:18	#DIV/0!
30	1002808	6/26/2009	4	f	######	00:10		00:03	-70%
31	1002763	1/8/2009	4	f	######	00:07		00:07	0%
32	1003008	10/16/2009	4	f	######	00:04		00:05	25%
33	1001453	6/13/2009	4	f	######	00:27		00:14	-48%
34	1002282	3/5/2009	4	f	######	00:07		00:05	-29%
35	1002768	11/16/2009	4	m	######	00:04		00:06	50%
36	1002290	2/3/2008	4	f	######	00:04		00:04	0%
37	1003619	1/7/2009	4	m	######	00:12		00:16	33%
38	1001823	5/13/2009	4	f	######	00:02		00:02	0%
39	1003105	1/10/2009	4	m	######	00:05		00:10	100%
40	1002776	9/24/2009	4	m	######	00:05		00:04	-20%
41	1002782	5/12/2009	4	f	######	00:08		00:05	-38%
42	1002737	12/23/2008	4	m	######	00:10		00:15	50%
43	1002783	5/28/2009	4	m	######	00:01		00:02	100%
44	1003638	11/13/2009	4	f	######	00:07		00:05	-29%
45	1002343	2/17/2009	4	m	######	00:11		00:24	118%
46	1003731	7/25/2009	4	m	######	00:00		00:00	#DIV/0!
47	1002726	5/13/2009	4	f	######	00:20		00:37	85%
48	1002108	1/24/2008	4	f	######	00:15		00:22	47%
49	1002974	3/11/2009	4	m	######	00:31		00:41	32%
50	1003673	6/8/2009	4	f	######	00:08		00:17	113%
51	1002786	8/18/2009	4	m	######	00:11		00:17	55%
52	1001481	4/24/2009	4	f	######	00:11		00:18	64%
53	1002773	7/22/2009	4	m	######	00:10		00:10	0%
54	1002241	9/26/2008	4	m	######	00:01		00:02	100%
55	1001442	5/28/2009	4	f	######	00:14		00:18	29%

56	1002771	6/27/2009	4	f	######	00:01		00:03	200%
57	1002325	2/11/2009	4	m	######	00:06		00:06	0%
58	1002772	10/24/2009	4	m	######	00:11		00:15	36%
59	1005580	2/25/2009	4	f	######	00:08		00:17	113%
60	1005015	10/18/2009	4	f	######	00:07		00:09	29%
61	1002128	9/16/2008	4	f	######	00:19		00:16	-16%
62	1002376	12/25/2008	4	f	######	00:01		00:07	600%
63	1002780	12/17/2008	4	f	######	00:13		00:13	0%
64	1002329	5/12/2009	4	m	######	00:00		00:04	#DIV/0!
65	1002994	4/6/2009	4	m	######	00:20		00:23	15%
66	1005121	7/13/2009	4	m	######	00:22		00:30	36%
67	1002761	6/5/2009	4	m	######	00:04		00:04	0%
68	1002722	5/6/2009	4	m	######	00:02		00:03	50%
69	1005487	10/11/2009	4	f	######	00:03		00:03	0%
70	1003224	1/23/2009	4	f	######	00:06		00:05	-17%
71	1001615	4/14/2009	4	f	######	00:13		00:17	31%
72	1002244	8/9/2008	4	m	######	00:00		00:01	#DIV/0!
73	1004296	8/21/2009	4	m	######	00:03		00:07	133%
74	1005678	10/2/2009	4	f	######	00:06		00:08	33%
75	1002767	9/14/2009	4	f	######	00:06		00:10	67%
76	1001404	1/14/2009	4	m	######	00:24		00:34	42%
77	1005571	11/17/2009	4	m	######	00:08		00:14	75%
78	1002769	3/13/2009	4	f	######	00:12		00:13	8%
79	1002770	7/30/2009	4	f	######	00:00		00:03	#DIV/0!
80	1002309	7/28/2009	4	f	######	00:02		00:05	150%
81	1002025	7/24/2009	4	f	######	00:08		00:10	25%
82	1002811	8/13/2009	4	f	######	00:12		00:12	0%
83	1003011	8/6/2009	4	m	######	00:02		00:09	350%
84	1002779	4/18/2009	4	m	######	00:13		00:20	54%
85	1002335	2/7/2009	4	f	######	00:14		00:22	57%
86	102349	3/27/2009	4	f	######	00:27		00:34	26%
87	1005179	3/17/2009	4	m	######	00:01		00:08	700%
88	1002784	9/30/2009	4	m	######	00:09		00:14	56%
89	1002723	9/28/2009	4	f	######	00:02		00:04	100%
90	1003675	8/16/2009	4	m	######	00:07		00:04	-43%
91	1002764	9/6/2009	4	m	######	00:12		00:09	-25%
92	1002110	11/20/2008	4	m	######	00:12		00:09	-25%
93	1001454	6/13/2009	4	f	######	00:14		00:17	21%

#	Student ID Number	Birthdate	Grade Level	Gender (M/F)	PRE Date	PRE Test	POST Date	POST Test	Percent Improvement
94	1002765	1/9/2009	4	m	######	00:21		00:28	33%
95	1005635	7/29/2009	4	m	######	00:13		00:14	8%
96	1002117	9/29/2008	4	f	######	00:16		00:20	25%
97	1004203	3/19/2009	4	f	######	00:26		00:18	-31%
98	1002775	7/17/2009	4	m	######	00:09		00:11	22%
99	1003322	10/12/2009	4	f	######	00:12		00:31	158%
100	1002742	6/24/2009	4	m	######	00:17		00:10	-41%
101	1002319	5/13/2009	4	f	######	00:23		00:26	13%
102	1002940	4/20/2009	4	f	######	00:44		00:53	20%
103	1002777	1/31/2009	4	m	######	00:20		00:21	5%
104	1002778	10/7/2009	4	f	######	00:09		00:10	11%
105	1004192	10/27/2009	4	f	######	00:28		00:38	36%
106	1002226	10/12/2009	4	f	######	00:00		00:01	#DIV/0!
107	1005330	10/8/2009	4	m	######	00:00		00:06	#DIV/0!
108	1002454	12/19/2008	4	f	######	00:03		00:08	167%
109	1003624	4/12/2009	4	m	######	00:15		00:17	13%

Project Fit America 2017/2018 Testing

School Name:

City, State:

Phone Number:

Name of Individual Collecting Data:

Post Testing Recording Instructions:
Absent Students Must be Tested When They Return to Class

I=Injured M=Moved

Enter in Corresponding Pre- or Post-Test box

	Student Information				**VAULT BAR -** Count each time a student lands as a jump. Record "0" for students who could not perform a vault jump.				
#	Student ID Number	Birthdate	Grade Level	Gender (M/F)	PRE Date	PRE Test	POST Date	POST Test	Percent Improvement
0	Example	5/31/2009	4	F	######	2	######	4	100%
1	1002843	6/18/2010	3	m	######	9	######	13	44%
2	1002847	4/7/2010	3	f	######	8		9	13%
3	1001935	11/22/2009	3	f	######	9		11	22%

4	1002857	3/7/2010	3	f	######	6		7	17%
5	1005062	2/26/2010	3	f	######	1		6	500%
6	1002859	9/5/2010	3	m	######	16		28	75%
7	1004528	4/15/2009	3	f	######	6		17	183%
8	1003430	2/1/2010	3	m	######	14		17	21%
9	1002608	8/4/2010	3	f	######	4		8	100%
10	1003226	12/20/2009	3	f	######	10		22	120%
11	1002906	10/11/2010	3	f	######	3		8	167%
12	1004301	4/21/2010	3	f	######	5		7	40%
13	1002877	7/10/2010	3	m	######	3		6	100%
14	1003432	6/24/2010	3	m	######	7		15	114%
15	1002912	4/6/2010	3	f	######	15		26	73%
16	1003185	8/24/2010	3	m	######	6		8	33%
17	1002885	4/12/2010	3	m	######	19		34	79%
18	1001988	11/17/2009	3	m	######	11		22	100%
19	1002313	5/8/2010	3	f	######	5		14	180%
20	1005063	10/12/2010	3	f	######	11		18	64%
21	1003413	7/20/2010	3	m	######	2		8	300%
22	1002898	5/1/2010	3	f	######	15		32	113%
23	1003426	1/9/2010	3	m	######	3		13	333%
24	1002259	7/4/2009	4	f	######	12		17	42%
25	1002721	6/11/2009	4	f	######	9		20	122%
26	1003017	4/10/2009	4	m	######	3		12	300%
27	1003424	11/23/2009	4	f	######	3		9	200%
28	1002725	7/12/2009	4	m	######	9		21	133%
29	1003664	2/8/2009	4	m	######	10		12	20%
30	1002808	6/26/2009	4	f	######	1		8	700%
31	1002763	1/8/2009	4	f	######	8		16	100%
32	1003008	10/16/2009	4	f	######	1		4	300%
33	1001453	6/13/2009	4	f	######	2		17	750%
34	1002282	3/5/2009	4	f	######	3		17	467%
35	1002768	11/16/2009	4	m	######	1		13	1200%
36	1002290	2/3/2008	4	f	######	12		9	-25%
37	1003619	1/7/2009	4	m	######	19		26	37%
38	1001823	5/13/2009	4	f	######	2		5	150%
39	1003105	1/10/2009	4	m	######	7		10	43%
40	1002776	9/24/2009	4	m	######	15		18	20%
41	1002782	5/12/2009	4	f	######	9		24	167%

42	1002737	12/23/2008	4	m	######	4		12	200%
43	1002783	5/28/2009	4	m	######	1		5	400%
44	1003638	11/13/2009	4	f	######	3		18	500%
45	1002343	2/17/2009	4	m	######	11		10	-9%
46	1003731	7/25/2009	4	m	######	1		3	200%
47	1002726	5/13/2009	4	f	######	4		12	200%
48	1002108	1/24/2008	4	f	######	6		7	17%
49	1002974	3/11/2009	4	m	######	15		29	93%
50	1003673	6/8/2009	4	f	######	2		9	350%
51	1002786	8/18/2009	4	m	######	9		9	0%
52	1001481	4/24/2009	4	f	######	5		18	260%
53	1002773	7/22/2009	4	m	######	6		12	100%
54	1002241	9/26/2008	4	m	######	2		4	100%
55	1001442	5/28/2009	4	f	######	6		12	100%
56	1002771	6/27/2009	4	f	######	1		1	0%
57	1002325	2/11/2009	4	m	######	5		12	140%
58	1002772	10/24/2009	4	m	######	3		35	1067%
59	1005580	2/25/2009	4	f	######	5		15	200%
60	1005015	10/18/2009	4	f	######	3		21	600%
61	1002128	9/16/2008	4	f	######	1		2	100%
62	1002376	12/25/2008	4	f	######	10		3	-70%
63	1002780	12/17/2008	4	f	######	1		7	600%
64	1002329	5/12/2009	4	m	######	6		4	-33%
65	1002994	4/6/2009	4	m	######	12		8	-33%
66	1005121	7/13/2009	4	m	######	13		20	54%
67	1002761	6/5/2009	4	m	######	11		19	73%
68	1002722	5/6/2009	4	m	######	4		3	-25%
69	1005487	10/11/2009	4	f	######	6		18	200%
70	1003224	1/23/2009	4	f	######	1		12	1100%
71	1001615	4/14/2009	4	f	######	3		16	433%
72	1002244	8/9/2008	4	m	######	1		3	200%
73	1004296	8/21/2009	4	m	######	4		5	25%
74	1005678	10/2/2009	4	f	######	1		2	100%
75	1002767	9/14/2009	4	f	######	23		8	-65%
76	1001404	1/14/2009	4	m	######	6		4	-33%
77	1005571	11/17/2009	4	m	######	3		9	200%
78	1002769	3/13/2009	4	f	######	1		1	0%
79	1002770	7/30/2009	4	f	######	5		3	-40%

80	1002309	7/28/2009	4	f	######	3		6	100%
81	1002025	7/24/2009	4	f	######	0		10	#DIV/0!
82	1002811	8/13/2009	4	f	######	3		6	100%
83	1003011	8/6/2009	4	m	######	11		15	36%
84	1002779	4/18/2009	4	m	######	10		13	30%
85	1002335	2/7/2009	4	f	######	14		23	64%
86	102349	3/27/2009	4	f	######	3		14	367%
87	1005179	3/17/2009	4	m	######	7		31	343%
88	1002784	9/30/2009	4	m	######	5		22	340%
89	1002723	9/28/2009	4	f	######	6		8	33%
90	1003675	8/16/2009	4	m	######	31		22	-29%
91	1002764	9/6/2009	4	m	######	6		7	17%
92	1002110	11/20/2008	4	m	######	8		11	38%
93	1001454	6/13/2009	4	f	######	14		15	7%
94	1002765	1/9/2009	4	m	######	13		33	154%
95	1005635	7/29/2009	4	m	######	11		2	-82%
96	1002117	9/29/2008	4	f	######	10		36	260%
97	1004203	3/19/2009	4	f	######	33		19	-42%
98	1002775	7/17/2009	4	m	######	7		9	29%
99	1003322	10/12/2009	4	f	######	8		18	125%
100	1002742	6/24/2009	4	m	######	4		15	275%
101	1002319	5/13/2009	4	f	######	1		8	700%
102	1002940	4/20/2009	4	f	######	11		22	100%
103	1002777	1/31/2009	4	m	######	1		2	100%
104	1002778	10/7/2009	4	f	######	5		8	60%
105	1004192	10/27/2009	4	f	######	4		17	325%
106	1002226	10/12/2009	4	f	######	2		4	100%
107	1005330	10/8/2009	4	m	######	16		21	31%
108	1002454	12/19/2008	4	f	######	8		4	-50%
109	1003624	4/12/2009	4	m	######	4		15	275%

Project Fit America 2018/2019 Testing

School Name: Montgomery Elementary

City, State: Montgomery, New York

Phone Number: 845-457-2400

Name of Individual Collecting Data: Douglas Luciano, Christine Giudice

Post Testing Recording Instructions:

					Sit-Ups				
					Timed for 2 Minutes - Enter number completed				
#	Student ID Number	Birthdate	Grade Level	Gender (M/F)	PRE Date	PRE Test	POST Date	POST Test	Percent Improvement
0				m	######	20	######	16	-20%
1	1002843	6/18/2010	3	m	######	48	######	51	6%
2	1002847	4/7/2010	3	f	######	41	######	44	7%
3	1001935	11/22/2009	3	f	######	28		35	25%
4	1002857	3/7/2010	3	f	######	24		50	108%
5	1005062	2/26/2010	3	f	######	25		27	8%
6	1002859	9/5/2010	3	m	######	48		49	2%
7	1004528	4/15/2009	3	f	######	19		52	174%
8	1003430	2/1/2010	3	m	######	45		66	47%
9	1002608	8/4/2010	3	f	######	26		42	62%
10	1003226	12/20/2009	3	f	######	34		56	65%
11	1002906	10/11/2010	3	f	######	19		32	68%
12	1004301	4/21/2010	3	f	######	17		18	6%
13	1002877	7/10/2010	3	m	######	31		32	3%
14	1003432	6/24/2010	3	m	######	38		42	11%
15	1002912	4/6/2010	3	f	######	24		26	8%
16	1003185	8/24/2010	3	m	######	46		50	9%
17	1002885	4/12/2010	3	m	######	43		64	49%
18	1001988	11/17/2009	3	m	######	58		59	2%
19	1002313	5/8/2010	3	f	######	38		41	8%
20	1005063	10/12/2010	3	f	######	20		48	140%
21	1003413	7/20/2010	3	m	######	46		52	13%
22	1002898	5/1/2010	3	f	######	41		55	34%
23	1003426	1/9/2010	3	m	######	16		45	181%
24	1002259	7/4/2009	4	f	######	51		42	-18%
25	1002721	6/11/2009	4	f	######	28		36	29%
26	1003017	4/10/2009	4	m	######	31		47	52%
27	1003424	11/23/2009	4	f	######	28		33	18%
28	1002725	7/12/2009	4	m	######	27		42	56%

Absent Students Must be Tested When They Return to Class
I=Injured M=Moved
Enter in Corresponding Pre- or Post-Test box

Student Information

29	1003664	2/8/2009	4	m	######	30		58	93%
30	1002808	6/26/2009	4	f	######	24		32	33%
31	1002763	1/8/2009	4	f	######	31		43	39%
32	1003008	10/16/2009	4	f	######	22		34	55%
33	1001453	6/13/2009	4	f	######	29		62	114%
34	1002282	3/5/2009	4	f	######	38		65	71%
35	1002768	11/16/2009	4	m	######	39		54	38%
36	1002290	2/3/2008	4	f	######	44		58	32%
37	1003619	1/7/2009	4	m	######	24		48	100%
38	1001823	5/13/2009	4	f	######	0		26	#DIV/0!
39	1003105	1/10/2009	4	m	######	30		46	53%
40	1002776	9/24/2009	4	m	######	40		35	-13%
41	1002782	5/12/2009	4	f	######	23		34	48%
42	1002737	12/23/2008	4	m	######	52		76	46%
43	1002783	5/28/2009	4	m	######	27		41	52%
44	1003638	11/13/2009	4	f	######	33		45	36%
45	1002343	2/17/2009	4	m	######	34		54	59%
46	1003731	7/25/2009	4	m	######	0		8	#DIV/0!
47	1002726	5/13/2009	4	f	######	74		48	-35%
48	1002108	1/24/2008	4	f	######	21		42	100%
49	1002974	3/11/2009	4	m	######	33		56	70%
50	1003673	6/8/2009	4	f	######	23		41	78%
51	1002786	8/18/2009	4	m	######	23		21	-9%
52	1001481	4/24/2009	4	f	######	55		53	-4%
53	1002773	7/22/2009	4	m	######	53		59	11%
54	1002241	9/26/2008	4	m	######	45		40	-11%
55	1001442	5/28/2009	4	f	######	58		53	-9%
56	1002771	6/27/2009	4	f	######	30		30	0%
57	1002325	2/11/2009	4	m	######	35		40	14%
58	1002772	10/24/2009	4	m	######	31		38	23%
59	1005580	2/25/2009	4	f	######	44		50	14%
60	1005015	10/18/2009	4	f	######	45		31	-31%
61	1002128	9/16/2008	4	f	######	39		44	13%
62	1002376	12/25/2008	4	f	######	24		28	17%
63	1002780	12/17/2008	4	f	######	32		43	34%
64	1002329	5/12/2009	4	m	######	40		30	-25%
65	1002994	4/6/2009	4	m	######	52		50	-4%
66	1005121	7/13/2009	4	m	######	27		57	111%

67	1002761	6/5/2009	4	m	######	43		61	42%
68	1002722	5/6/2009	4	m	######	30		45	50%
69	1005487	10/11/2009	4	f	######	12		20	67%
70	1003224	1/23/2009	4	f	######	37		41	11%
71	1001615	4/14/2009	4	f	######	44		76	73%
72	1002244	8/9/2008	4	m	######	41		41	0%
73	1004296	8/21/2009	4	m	######	53		46	-13%
74	1005678	10/2/2009	4	f	######	21		54	157%
75	1002767	9/14/2009	4	f	######	43		47	9%
76	1001404	1/14/2009	4	m	######	47		43	-9%
77	1005571	11/17/2009	4	m	######	36		33	-8%
78	1002769	3/13/2009	4	f	######	51		57	12%
79	1002770	7/30/2009	4	f	######	10		41	310%
80	1002309	7/28/2009	4	f	######	48		53	10%
81	1002025	7/24/2009	4	f	######	17		39	129%
82	1002811	8/13/2009	4	f	######	33		47	42%
83	1003011	8/6/2009	4	m	######	33		40	21%
84	1002779	4/18/2009	4	m	######	34		37	9%
85	1002335	2/7/2009	4	f	######	38		43	13%
86	102349	3/27/2009	4	f	######	30		46	53%
87	1005179	3/17/2009	4	m	######	32		38	19%
88	1002784	9/30/2009	4	m	######	53		48	-9%
89	1002723	9/28/2009	4	f	######	41		45	10%
90	1003675	8/16/2009	4	m	######	57		39	-32%
91	1002764	9/6/2009	4	m	######	32		39	22%
92	1002110	11/20/2008	4	m	######	41		37	-10%
93	1001454	6/13/2009	4	f	######	38		32	-16%
94	1002765	1/9/2009	4	m	######	50		59	18%
95	1005635	7/29/2009	4	m	######	53		54	2%
96	1002117	9/29/2008	4	f	######	43		60	40%
97	1004203	3/19/2009	4	f	######	54		40	-26%
98	1002775	7/17/2009	4	m	######	41		54	32%
99	1003322	10/12/2009	4	f	######	46		55	20%
100	1002742	6/24/2009	4	m	######	44		45	2%
101	1002319	5/13/2009	4	f	######	44		53	20%
102	1002940	4/20/2009	4	f	######	45		66	47%
103	1002777	1/31/2009	4	m	######	63		76	21%
104	1002778	10/7/2009	4	f	######	44		58	32%

105	1004192	10/27/2009	4	f	######	44			61	39%
106	1002226	10/12/2009	4	f	######	29			31	7%
107	1005330	10/8/2009	4	m	######	37			22	-41%
108	1002454	12/19/2008	4	f	######	21			24	14%
109	1003624	4/12/2009	4	m	######	41			54	32%

Appendix B

Appendix B: Glossary

List of Symbols

Symbol	Description
$\approx$	Approximately equal to
n	Sample Size
H_0	Null Hypothesis
H_a	Alternative Hypothesis
μ	Population Mean
μ_{pre}	Population Mean of Pre-Scores

μ_{post}	Population Mean of Post-Scores
$\bar{x}$	Sample Mean
σ	Population Standard Deviation
s	Sample Standard Deviation
SW	Shapiro-Wilk Test Statistic
W	Wilcoxon Signed-Rank Test Statistic
t	Paired t Test Statistic
α	Significance Level

Alternative Hypothesis (H_a): When performing a hypothesis test, the alternative hypothesis is what the researcher is gathering evidence to support. When testing for improvement the alternative hypothesis implies there is an improvement at the end of the program. *See: Hypothesis Test, Null Hypothesis.*

Boxplot: A graphical display of a set of data that can be used to determine the distribution of the data as well as any possible outliers.

Central Limit Theorem: The central limit theorem states that the larger the sample size (n), the more nearly normally distributed the population of all possible sample means. This is one advantage to having a larger sample size. *See: Distribution, Normal Distribution, PairedSamples T-test, Sample, and Sample Size.*

Confidence Intervals: An estimate of a population value determined by using data from a sample and a predetermined confidence level. *See: Confidence Level, Data, Mean, Paired Data, Population Parameter and Sample.*

Confidence Level: A measure of the reliability of the confidence interval's estimation of the population value. It is the probability that a population value is contained in the confidence interval and is also used to create the confidence interval using data from a sample. *See: Confidence Interval, Population Parameter, Probability, Reliability, Sample, and Sample Statistic.*

Control Group: A comparative group that receives no treatment, or a neutral treatment, to better assess the validity of the experiment. The control group would not participate in PFA activities but would still collect pre-scores and post-scores to provide comparative data. In this case, a control group would allow us to determine if improvements are due to PFA or to natural developmental changes in the participants throughout the year. *See: PostScores, Pre-Scores, and Validity*.

Critical Value: When trying to show an improvement, the critical value is the amount of difference necessary in order to conclude that the improvement was statistically significant. *See: Sample and Statistically Significant.*

Data: A collection of information from which conclusions may be drawn.

Distribution: A description of the relative number of times each possible outcome occurs.

Histogram: A graph used to visualize the data, for example, its shape or distribution. *See: Data and Distribution.*

Hypothesis Test: A method of analyzing data. For example, we used either the Paired t-Test or the Paired Wilcoxon Signed-Rank test when trying to show improvements in the mean scores. *See: Alternative Hypothesis, Data, Mean, Null Hypothesis, Paired t-Test, Paired Wilcoxon Signed-Rank Test, and Probability.*

Mean/Average (μ, x̄): Determined by adding up all values in the data and dividing the sum by the number of observations. Mu (μ) denotes the population mean and x-bar (x̄) denotes the sample mean. *See: Data and Population.*

Natural Sampling Variability: Natural sampling variability is the differences seen between samples taken from the same population. *See: Population, Sample, and Variation.*

Nonparametric Test: A category of hypothesis tests that are performed when the population is not normally distributed or when the sample size is small. For example, when our population is not normally distributed and our sample size is small, we use the Paired Wilcoxon Signed-Rank test. *See: Hypothesis Test, Normal Distribution, Paired Wilcoxon Signed-Rank Test Population, Sample, and Sample Size.*

Normality or Normal Distribution: A probability distribution where the highest probabilities are concentrated around the mean and decrease as the values deviate from the mean. A normal distribution has a distinct bell shaped curve. When necessary we use the ShapiroWilk Test to test for normality before deciding which paired hypothesis test to use for analysis. *See: Mean, Probability, Probability Distribution and Shapiro-Wilk Test.*

Null Hypothesis (H_o): What you start out assuming is true about the population when performing a hypothesis test. When testing for improvement we start out believing there is no improvement and that the mean for the pre-scores is equal to the mean for the postscores. *See: Hypothesis Test, Mean, and Population, Post-Score, and Pre-Score.*

Outlier: A data value that is not close to the remaining data values. An outlier can have a large effect on the value of the mean. A boxplot can be used to detect possible outliers. *See: Mean, boxplot.*

Paired Data: Two sets of data are paired when each observation in one data set is related to one observation in the other data set. For example, our paired data are the pre and postdata sets that are linked by the participants. If a student does not have a pre and postscore recorded, then their score is not paired and is removed from the sample before analysis.

Paired t-Test: A hypothesis test used to test the mean of a set of paired data. This test is often used to compare "pre" and "post" scores in experiments to determine whether statistically significant change has occurred. This hypothesis test requires that the paired data come from a normally distributed population or has a sufficiently large sample size. *See: Central Limit Theorem, Hypothesis Test, Mean, Normal Distribution, Paired Data, Sample, Sample Size, and Statistically Significant.*

Paired Wilcoxon Signed-Rank Test: A nonparametric alternative to the Paired-Samples t-test. It is used to test the mean of a set of paired data and is often used to compare pre-scores and post- scores in experiments to determine whether statistically significant change has occurred. This test does not require that the data come from a normally distributed population or have a sufficiently large sample size. *See: Central Limit Theorem, Hypothesis Test, Mean, Nonparametric Test, Paired Data, Paired-Samples T-test, Sample, Sample Size, and Statistically Significant.*

Population: The collection of all students who are potential participants in Project Fit America.

Population Parameter: A measure of some attribute of a population. For example, the population mean and population proportion are population parameters. *See: Mean, Population, and Sample Statistic.*

Post-Score: The fitness test score that was collected at the end of the academic after the completion the year-long Project Fit America program.

Pre-Score: The fitness test score that was collected at the beginning of the academic year before the students began the Project Fit America program.

Probability: A value ranging from 0 to 1, inclusive, that measures the likelihood that an event will occur.

Probability Distribution: A table, chart, graph, or equation that links all possible values of a variable with an indication of their probabilities of occurrence. An example is the normal distribution. *See: Distribution, Normal Distribution, and Probability*.

P-Value: The p-value is a probability which is between 0 and 1. The p-value indicates the probability the observed sample results were caused by natural sampling variability if the null hypothesis is true. The lower the p-value, the more likely it is that the difference between groups was caused by the treatment and not caused by natural sampling variability. The higher the p-value the less likely that the difference was caused by treatment and more likely caused by natural sampling variability. *See: Natural Sampling Variability, Probability, Sample, and Statistically Significant.*

Reliability: Refers to the consistency that a measurement yields similar results again and again. For example, in order for our analysis to be reliable, the scores for each fitness test must be measured and collected consistently.

Sample: The actual data collected from the participants with both pre and post-scores. For quantitative data, typically a sample is considered large if it is greater than or equal to 30 units and is considered small if it is less than 30 units. *See: Data, Population, PostScores, and Pre-Scores.*

Sample Size (n): Refers to the number of valid observations in a sample. For paired data the sample size is the number of valid pairs of data.

Sample Statistic: A measure of some attribute of a sample. For example, the sample mean and sample proportion are sample statistics. *See: Mean, Population Parameter, and Sample.*

Shapiro-Wilk Test: A hypothesis test that is used to compare a sample with a reference probability distribution, such as a normal distribution. For quantitative data in which the sample size is less than 30, this is used as a preliminary test in order to determine the appropriate hypothesis test when testing for improvement. *See: Normal Distribution, Population, and Sample.*

Significance Level (α): A probability with values between 0 and 1 that we compare with the pvalue in order to determine whether the results are statistically significant. It indicates the tolerance level for the p-value. The significance level is typically set before the experiment begins. *See: Natural Sampling Variability, Probability, P-Value, and Statistically Significant*

Simple Random Sample: A sampling method in which all possible units in a population have an equal probability of being sampled. *See: Population, Probability, and Sample.*

Skewness: Describes a distribution that is not symmetric. In a histogram this would be seen as showing the data as more concentrated on the left or the right. *See: Histogram.*

Standard Deviation (σ, s): A measurement that measures how much the data deviates from the mean in standardized units. The population standard deviation is represented by σ, and the sample standard deviation is represented by s. *See: Data, Mean, and Variation.*

Stata: A computer program used for statistical analysis.

Statistical Package for Social Sciences (IBM SPSS): A computer program used for statistical analysis.

Statistically Significant: The results of a hypothesis test are statistically significant if there is a very small chance that the sample results occurred by natural sampling variability if the null hypothesis is true. We use the significance level to determine how small the p-value needs to be in order for the results to be considered statistically significant. If the p-value is lower than the significance level than we would consider the results statistically significant.

See: Hypothesis Test, Natural Sampling Variability, P-Value, Sample, and Significance Level.

Test Statistic: A numerical value calculated from the data that is used to determine whether the evidence suggests there was a statistically significant change. *See: Statistically Significant.*

Validity: The degree to which the study or experiment measures what it is supposed to measure. For instance, do the fitness tests performed actually measure physical fitness improvement?

Variability: An indication of how widely spread or how closely clustered the data values are to each other. *See: Data and Standard Deviation.*

Appendix C

Histogram

Mean = 1.13
Std. Dev. = 7.736
N = 23

Frequency (y-axis)
diff2 (x-axis)

Since our sample size is fewer than 30, we don't assume this is a large enough sample to say the central limit theorem applies, so we are going to conduct a Shapiro-Wilk test for normality.

Shapiro-Wilk Test for Normality of Differences:

H0: The sample came from a normally distributed population
H1: The sample did not come from a normal population
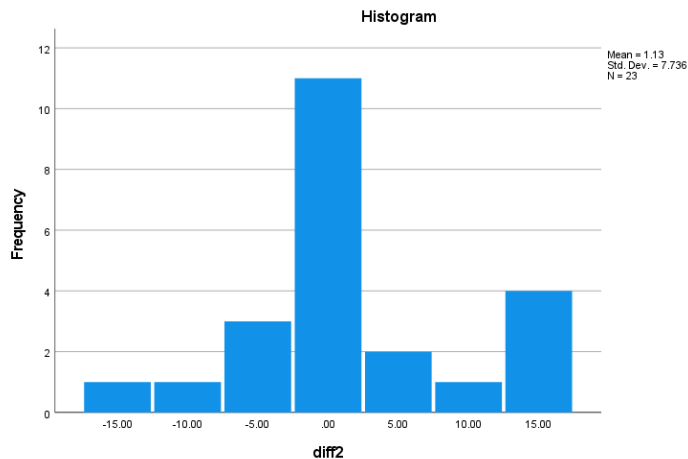
Significance level α = 0.05, t-Statistic = 0.912, p-value = 0.044.

Conclusion: Since we got a p-value less than the significance level, we reject the null hypothesis and assume that the sample did not come from a normal population. Thus, we can't perform a Paired T-test, but we can perform a paired sign test.

Paired Sign test for Improvement in Median PACER Laps

H0: There was no increase in the median number of 20-meter PACER laps performed after implementation of the PFA program.

H1: There was an increase in the median number of 20-meter PACER laps performed after implementation of the PFA program.

Significance level α = 0.05, p-value: 0.143.

Conclusion: Since the p-value is greater than the significance level, we do not reject the null hypothesis and we conclude that there was no increase in the median number of 20-meter PACER laps performed after implementation of the PFA program.

School: Montgomery Elementary
Grade: 3rd
Name of Individual Collecting data: Douglas Luciano Christine Giudice
Fitness Activity: Flexed Arm Hang
Sample Size: 23
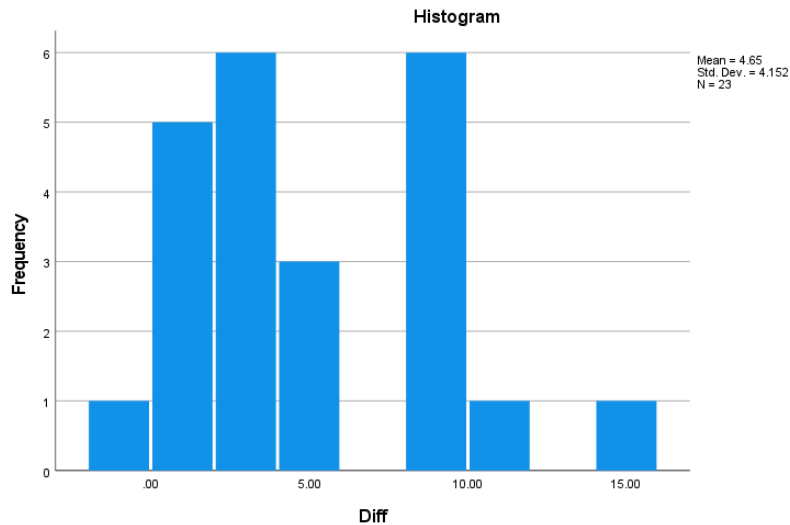
Histogram

Mean = 4.65
Std. Dev. = 4.152
N = 23

Since our sample size is fewer than 30, we don't assume this is a large enough sample to say the central limit theorem applies, so we are going to conduct a Shapiro-Wilk test for normality.

Shapiro-Wilk Test for Normality of Differences:

H0: The sample came from a normally distributed population

H1: The sample did not come from a normal population

Significance level α = 0.05, t-Statistic = 0.910, p-value = 0.042.

Conclusion: Since we got a p-value less than the significance level, we reject the null hypothesis and assume that the sample did not come from a normal population. Thus, we can't perform a Paired T-test, but we can perform a paired sign test.

Paired Sign test for Improvement in Median Flexed Arm Hang time

H0: There was no increase in the median Flexed Arm Hang time after implementation of the PFA program.

H1: There was an increase in the median Flexed Arm Hang time after implementation of

the PFA program.

Significance level α = 0.05, p-value: <0.000.

Conclusion: Since the p-value is less than the significance level, we reject the null hypothesis and we conclude that there was an increase in the median Flexed Arm Hang time after implementation of the PFA program.

School: Montgomery Elementary
Grade: 3rd
Name of Individual Collecting data: Douglas Luciano Christine Giudice
Fitness Activity: Vault Bar
Sample Size: 23
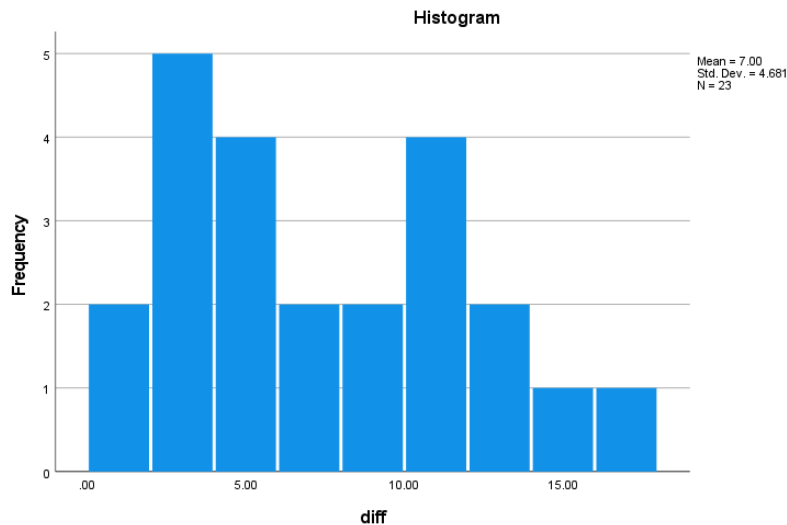
Since our sample size is fewer than 30, we don't assume this is a large enough sample to say the central limit theorem applies, so we are going to conduct a Shapiro-Wilk test for normality.

Shapiro-Wilk Test for Normality of Differences:

H0: The sample came from a normally distributed population

H1: The sample did not come from a normal population

Significance level α = 0.05, Shapiro-Wilk test Statistic = 0.932, p-value = 0.121.

Conclusion: Since we got a p-value greater than the significance level, we do not reject the null hypothesis and assume that the sample came from a normally distributed population. Thus, we can perform a Paired T-test.

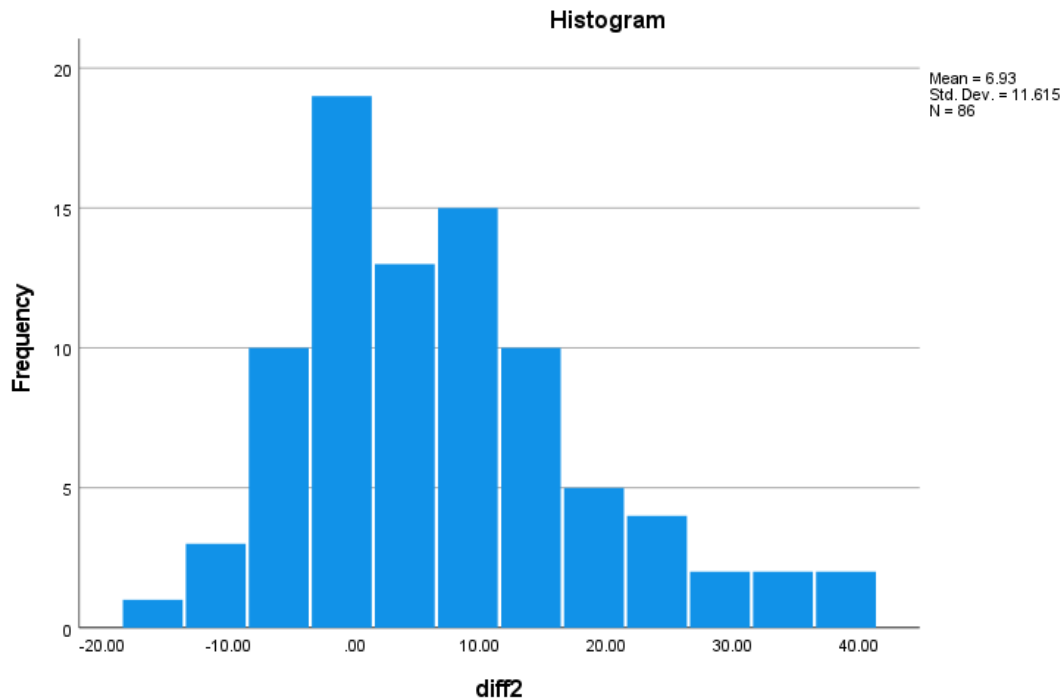Paired T-test for Improvement in Mean Vault Bar jumps

H0: There was no increase in the mean number of Vault Bar Jumps after the implementation of the PFA program

H1: There was an increase in the mean number of Vault Bar Jumps after the

implementation of the PFA program

Significance level α = 0.05, t-statistic = -7.172, p-value: <0.000.

Conclusion: Since the p-value is less than the significance level, we reject the null hypothesis and we conclude that there was an increase in the mean number of Vault Bar Jumps after the implementation of the PFA program

School: Montgomery Elementary
Grade: 3rd
Name of Individual Collecting data: Douglas Luciano Christine Giudice
Fitness Activity: Sit-ups
Sample Size: 23
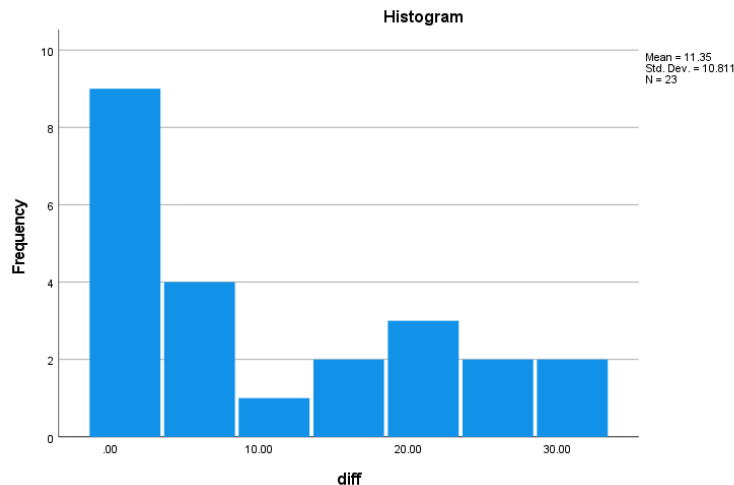
Histogram

Mean = 11.35
Std. Dev. = 10.811
N = 23

Since our sample size is fewer than 30, we don't assume this is a large enough sample to say the central limit theorem applies, so we are going to conduct a Shapiro-Wilk test for normality.

Shapiro-Wilk Test for Normality of Differences:

H0: The sample came from a normally distributed population

H1: The sample did not come from a normal population

Significance level α = 0.05, t-Statistic = 0.843, p-value = 0.002.

Conclusion: Since we got a p-value less than the significance level, we reject the null hypothesis and assume that the sample did not come from a normal population. Thus, we can't perform a Paired T-test, but we can perform a paired sign test.
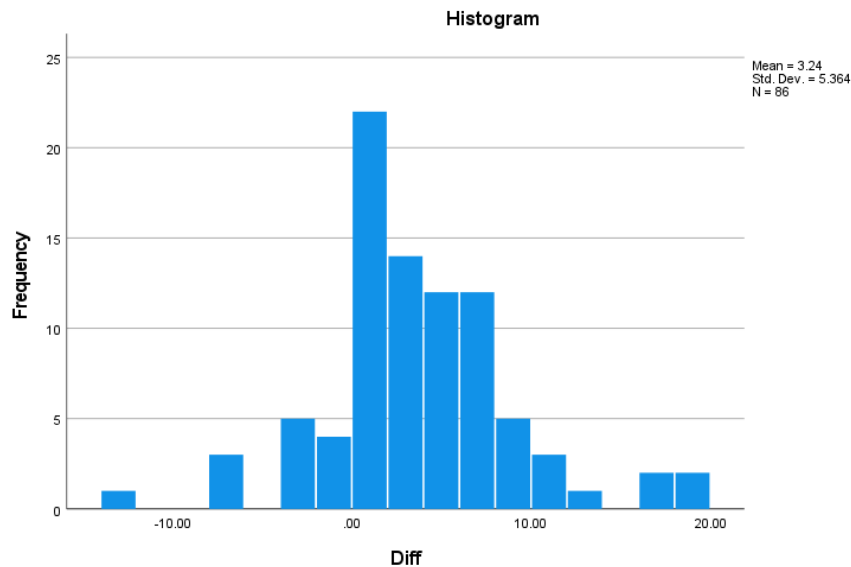
Paired Sign test for Improvement in Median Number of Sit-ups

H0: There was no increase in the median number of Sit-ups after implementation of the PFA program.

H1: There was an increase in the median number of Sit-ups after implementation of the PFA program.

Significance level α = 0.05, p-value: 0.000.

Conclusion: Since the p-value is less than the significance level, we reject the null hypothesis and we conclude that there was an increase in the median number of Sit-ups after implementation of the PFA program.

School: Montgomery Elementary
Grade: 4th
Name of Individual Collecting data: Douglas Luciano Christine Giudice
Fitness Activity: PACER
Sample Size: 86

Histogram

Since our sample size is greater than 30, we can use the central limit theorem to justify performing a Paired T-test.
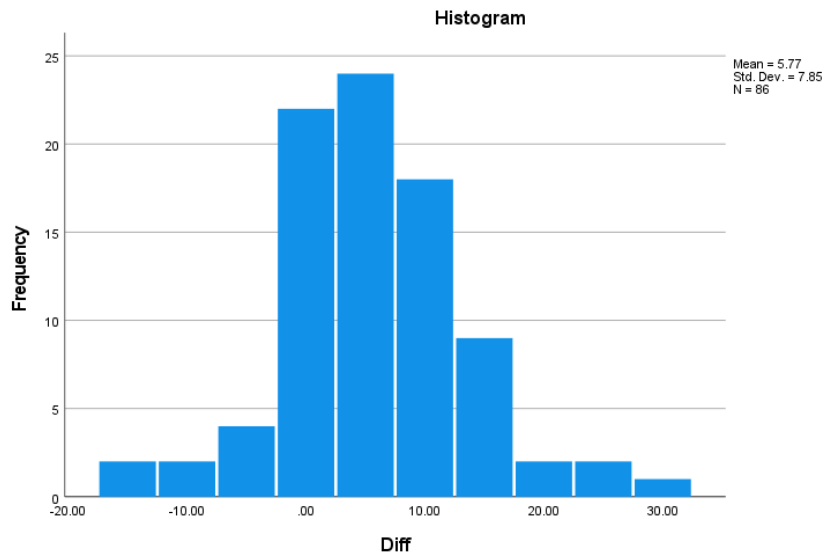
Paired T-test for Improvement in Mean PACER Laps

H0: There was no increase in the mean number of 20-meter PACER laps performed after implementation of the PFA program.

H1: There was an increase in the mean number of 20-meter PACER laps performed after implementation of the PFA program.

Significance level α = 0.05, t statistic = 5.533, p-value: <0.000.

Conclusion: Since the p-value is less than the significance level, we reject the null hypothesis and we conclude that there was an increase in the mean number of 20-meter PACER laps performed after implementation of the PFA program.

School: Montgomery Elementary
Grade: 4th
Name of Individual Collecting data: Douglas Luciano Christine Giudice
Fitness Activity: Flexed Arm Hang
Sample Size: 86

Histogram

Mean = 3.24
Std. Dev. = 5.364
N = 86

Since our sample size is greater than 30, we can use the central limit theorem to justify performing a Paired T-test.

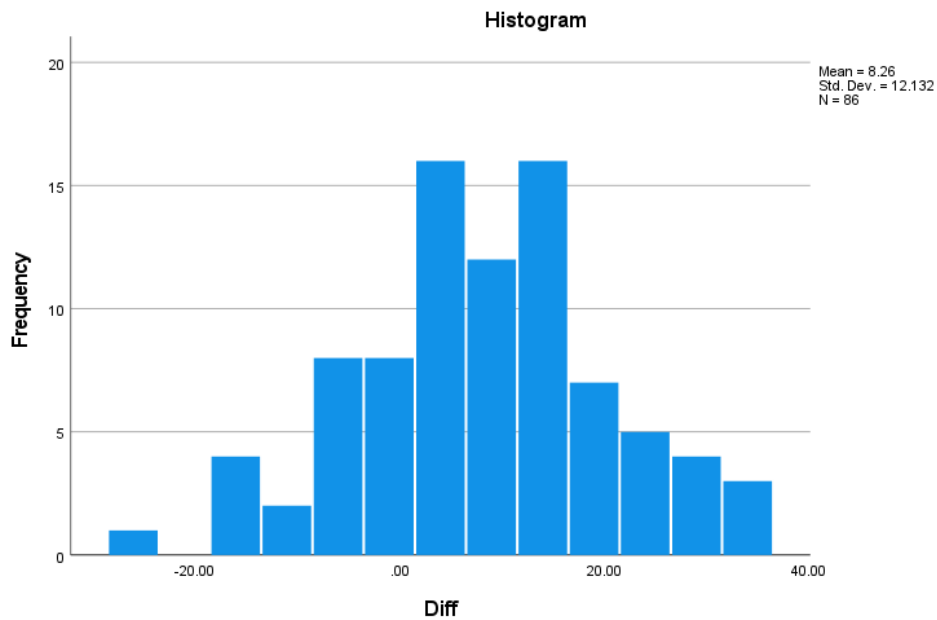Paired T-test for Improvement in Mean Flexed Arm Hang time

H0: There was no increase in the mean Flexed Arm Hang time after implementation of the PFA program.

H1: There was an increase in the mean Flexed Arm Hang time after implementation of the PFA program.

Significance level α = 0.05, t statistic = -5.609, p-value: <0.000.

Conclusion: Since the p-value is less than the significance level, we reject the null hypothesis and we conclude that there was an increase in the mean Flexed Arm Hang time after implementation of the PFA program.

School: Montgomery Elementary
Grade: 4th
Name of Individual Collecting data: Douglas Luciano Christine Giudice
Fitness Activity: Vault Bar
Sample Size: 86

Histogram

Mean = 5.77
Std. Dev. = 7.85
N = 86

Since our sample size is greater than 30, we can use the central limit theorem to justify performing a Paired T-test.

Paired T-test for Improvement in Vault Bar jumps

H0: There was no increase in the mean number of Vault Bar Jumps after the implementation of the PFA program

H1: There was an increase in the mean number of Vault Bar Jumps after the implementation of the PFA program

Significance level α = 0.05, t-statistic = -6.814, p-value: <0.000.

Conclusion: Since the p-value is less than the significance level, we reject the null hypothesis and we conclude that there was an increase in the mean number of Vault Bar Jumps after the implementation of the PFA program

School: Montgomery Elementary
Grade: 4th
Name of Individual Collecting data: Douglas Luciano Christine Giudice
Fitness Activity: Sit-ups
Sample Size: 86

Histogram

Mean = 8.26
Std. Dev. = 12.132
N = 86

Since our sample size is greater than 30, we can use the central limit theorem to justify performing a Paired T-test.

Paired T-test for Improvement in Mean Number of Sit-ups

H0: There was no increase in the mean number of Sit-ups after implementation of the PFA program.

H1: There was an increase in the mean number of Sit-ups after implementation of the PFA program.

Significance level $\alpha = 0.05$, t statistic = -6.311, p-value: <0.000.

Conclusion: Since the p-value is less than the significance level, we reject the null hypothesis and we conclude that there was an increase in the mean number of Sit-ups after implementation of the PFA program.

Appendix D

Cardio Testing

PACER Test (Progressive Aerobic Cardiovascular Endurance Run): A course of 15 meters or 20 meters is marked off with cones. Students run across the area and cross the cone line before a beep is played on a CD. At the sound of the beep, they turn around and go back to the other end. If students get to the end before the beep, they must wait for the beep before running in the other direction. Students are allowed to miss two times before they must stop. They may also choose to come off the activity when they have reached their level of perceived exhaustion.

Paced Full Mile Run/Walk: Students are timed to see how long it takes them to run and/or walk a mile.

Upper Body Strength Testing

Flexed Arm Hang: The student begins with chin over the bar, but not touching the bar. Their hands can over or under grip. Students are told to hold the position as long as possible. The amount of time a student can hold the position is recorded.

Abdominal Strength Testing

Sit-ups: Students' knees are bent at 45 degree angle, arms placed across the chest with either hand located on either shoulder. Their arms must remain crossed and hands must remain on the shoulders for the sit-up to count. The student's elbows must touch thighs but cannot touch ground on the way up. Students are timed for 60 seconds and the number of correctly performed sit-ups is recorded.

Explosive Leg Strength Test

Vault Bar Procedure: Students begin with both hands on the vault bar and jump over the vault bar without removing hands. Both feet must land together on each side of vault bar at the same time. Count each time the student lands on each side as one (1) jump. Continue counting until the student stops or until both feet do not land at the same time. Record the number of jumps that the student can perform. A 0 should be entered for students who cannot perform a vault bar jump. This test is not a timed test.