



Quantitative Data Analysis

Considerations | Techniques | Issues



Two Scenarios

Scenario One

- Learning objectives are stated
- An instrument is selected
- Assessment data collected
- Data remain grossly under-analyzed, and therefore under-utilized

Scenario Two

- An instrument is selected
- Assessment data collected
- Results analyzed
- BUT...the outcome objectives aren't clearly specified and results are analyzed anyway

Where are we?



Assumptions

- Everyone will do this kind of stuff at some point
- You are interested in conducting your own analyses (I know this may be a stretch 😊)
- You may hate statistics, but you like knowing about your programs!
- In situations in which the analyses get complicated, there is support for you



Today's Plan

- Everyone will be able to state four analytic strategies
- Everyone will be able to identify which of the four strategies is appropriate given a hypothetical scenario
- Everyone will know the statistical approaches necessary to implement each of the four strategies
- Everyone will have a cursory understanding of some issues that one may encounter while analyzing data under each of the four strategies



The Four Analytic Strategies

1. **Differences:** Do students learn or develop more if they participate in a program compared to other students who did not participate?
2. **Relationships:** What is the relationship between assessment outcomes and relevant program indicators (i.e., course grades, peer ratings)?
3. **Change:** Do students change over time?
4. **Expectation:** Do students meet our expectations or a given level of competency?

Let's say this was our quantitative instrument:

Assessment of My Program

As a student who participated in my program, please respond to the following question.

(1) On a scale of 1 to 10, how much did this program **change your life**?

1	2	3	4	5	6	7	8	9	10
Not at all									Totally

Thank you for participating!

Our Sample of Students

***New* Pilot Program Participations (25 students)**

- Jessica Alba
- Jennifer Aniston
- Mischa Barton
- Halle Berry
- Orlando Bloom
- Penelope Cruz
- Hilary Duff
- Mariska Hargitay, Law & Order: SVU
- Tyler Hilton, One Tree Hill
- Scarlett Johansson
- Angelina Jolie
- Alicia Keys
- Lindsay Lohan
- Jennifer Lopez
- Matthew McConaughey
- Sienna Miller, Alfie
- Sandra Oh, Sideways, Grey's Anatomy
- Clive Owen, Sin City, Closer
- Brad Pitt
- Julia Roberts
- Jessica Simpson
- Usher
- Dwyane Wade, Miami Heat basketball player
- Oprah Winfrey
- Ziyi Zhang, House of Flying Daggers

Regular Old Program Participations (25 students)

- Drew Barrymore
- David Beckham, International soccer star
- Patrick Dempsey, Grey's Anatomy
- Johnny Depp
- Sara Evans, Country singer
- Colin Farrell
- Jamie Foxx
- Tim Green, former NFL star and best-selling author
- Josh Holloway, Lost
- Juanes, Colombian musician
- Heidi Klum
- Jude Law
- Eva Longoria
- Ann-Margret
- Eva Mendes, Hitch
- Jesse Metcalfe, Desperate Housewives
- Catalina Sandino Moreno, Maria Full of Grace
- Sophie Okonedo, Hotel Rwanda
- Tyler Perry, Diary of a Mad Black Woman author
- Seal
- Maria Sharapova, Russian tennis player
- Elizabeth Smart, Utah teen
- Martha Stewart
- Hilary Swank



DIFFERENCES

→ *Differences*
Relationships
Change
Expectation

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Differences

- Involves outlining expected differences in student performance that should result if our program is effective
- Answers the research questions:
 - “Do students learn or develop more if they have participated in a course or program compared to students who did not participate?”*
 - “Do particular students do better or worse in the program than other students?”*

Differences: Our Results

Participated in New Program? ▼	Number of People	Average of Score
Yes	25	6.44
No	25	5.36
Grand Total	50	5.90

Differences

- Okay, but how do we do this?

Here is an option:

- (1) Get the average score for a group
 - Add up all the scores for that group
 - Divide that by the number of people in the group
- (2) Compare the two scores
- Done!

Participated in Pilot Program		
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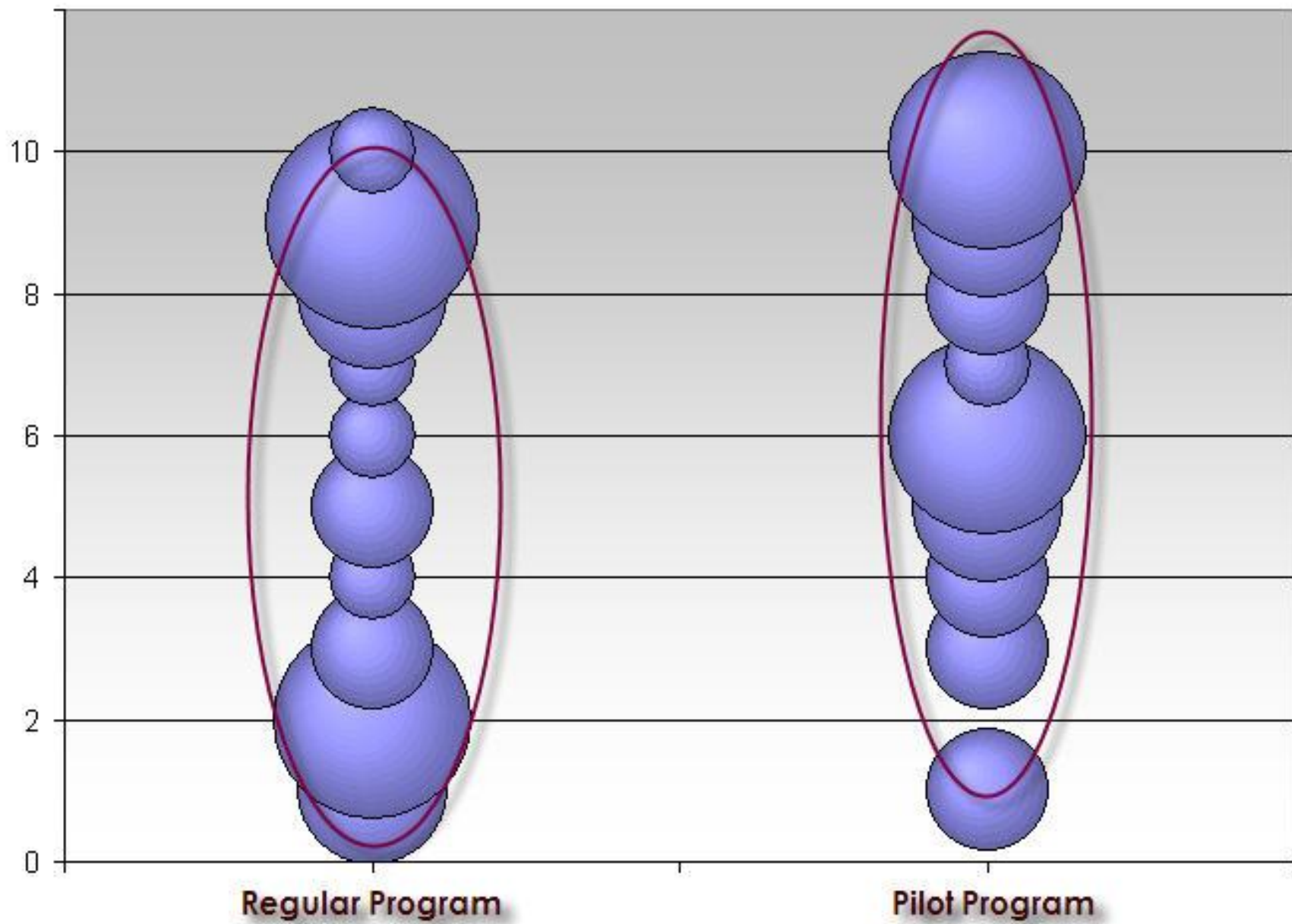
Name	Score	Running Total
Jessica Alba	9	9
Jennifer Aniston	10	19
Mischa Barton	9	28
Halle Berry	9	37
Orlando Bloom	10	47
Penelope Cruz	6	53
Hilary Duff	10	63
Mariska Hargitay, Law & Order: SVU	1	64
Tyler Hilton, One Tree Hill	8	72
Scarlett Johansson	10	82
Angelina Jolie	10	92
Alicia Keys	1	93
Lindsay Lohan	6	99
Jennifer Lopez	4	103
Matthew McConaughey	5	108
Sienna Miller, Alfie	7	115
Sandra Oh, Sideways, Grey's Anatomy	5	120
Clive Owen, Sin City, Closer	6	126
Brad Pitt	6	132
Julia Roberts	8	140
Jessica Simpson	5	145
Usher	3	148
Dwyane Wade, Miami Heat basketball player	3	151
Oprah Winfrey	6	157
Ziyi Zhang, House of Flying Daggers	4	161
		161

$$\frac{161}{25 \text{ people}} = 6.44$$

Did Not Participate in Pilot Program		
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Name	Score	Running Total
Drew Barrymore	3	3
David Beckham, International soccer star	8	11
Patrick Dempsey, Grey's Anatomy	9	20
Johnny Depp	5	25
Sara Evans, Country singer	9	34
Colin Farrell	2	36
Jamie Foxx	6	42
Tim Green, former NFL star and best-selling author	1	43
Josh Holloway, Lost	8	51
Juanes, Colombian musician	9	60
Heidi Klum	9	69
Jude Law	2	71
Eva Longoria	2	73
Ann-Margret	3	76
Eva Mendes, Hitch	10	86
Jesse Metcalfe, Desperate Housewives	7	93
Catalina Sandino Moreno, Maria Full of Grace	9	102
Sophie Okonedo, Hotel Rwanda	9	111
Tyler Perry, Diary of a Mad Black Woman author	2	113
Seal	8	121
Maria Sharapova, Russian tennis player	4	125
Elizabeth Smart, Utah teen	2	127
Martha Stewart	5	132
Hilary Swank	1	133
Kate Winslet	1	134
		134

$$\frac{134}{25 \text{ people}} = 5.36$$





RELATIONSHIPS

Differences

→ *Relationships*

Change

Expectation

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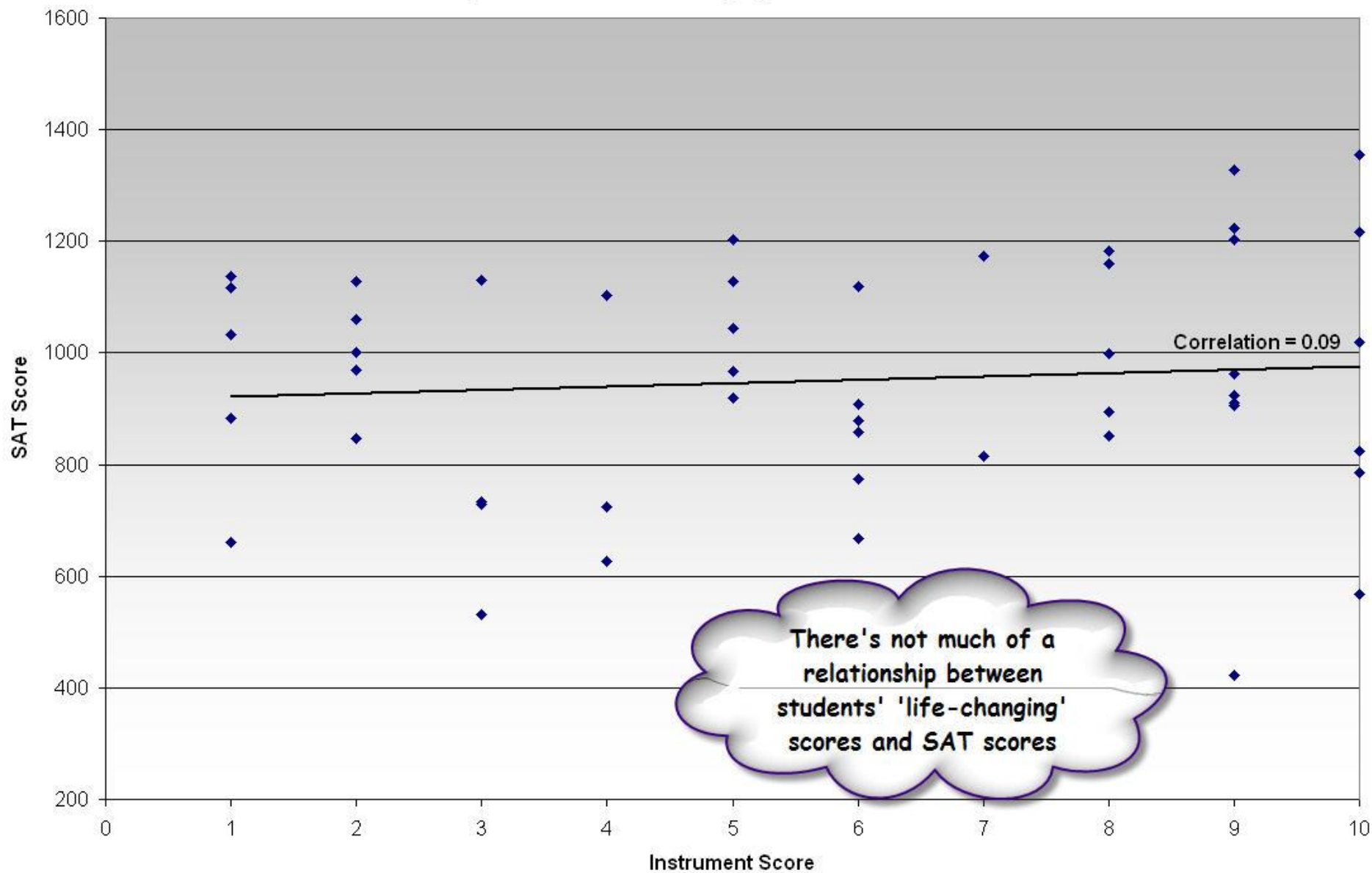
Relationships

- We expect to see a positive correlation between some measurement of program outcomes and other student characteristics.
- Answers the research question:
“What is the relationship between assessment outcome measures and some other measure of ability or behavior?”

Relationships

- Remind me about this “correlation” thing...
 - The correlation between two scores (e.g., score on our instrument and SAT score) represents the relationship between the two instruments.
 - Correlations range from -1 to +1
 - A correlation of +1 means there’s a perfect positive relationship between two things: “Students with **higher** ‘life-changing’ scores have **higher** SAT scores”
 - A correlation of -1 means there’s a perfect negative relationship between two things: “Students with **higher** ‘life-changing’ scores have **lower** SAT scores”
 - A correlation of 0 means there’s **no relationship** between the two things: “Knowing a student’s life-changing score tells you nothing about a student’s SAT score”

Relationship Between 'Life-Changing' Score and SAT Score



Relationships

- Okay, but how do we do this?
→ You must know both scores for each individual student.

Here are some options to calculate correlations:

- ☐ (1) Excel – “Data Analysis” Option
 - Download the “analysis toolpack”, then click Tools → Data Analysis
- ☐ (2) Excel – Chart Option
 - Create a scatter plot chart using the two scores
 - Click on the scattered dots, then click Chart → Add Trendline → Options Tab → Check the box for “Display R-Squared value on chart”
 - Take the square root of the value that pops up on your graph
- ☐ (3) SPSS
- ☐ (4) Ask Kim or Tracie 😊



CHANGE

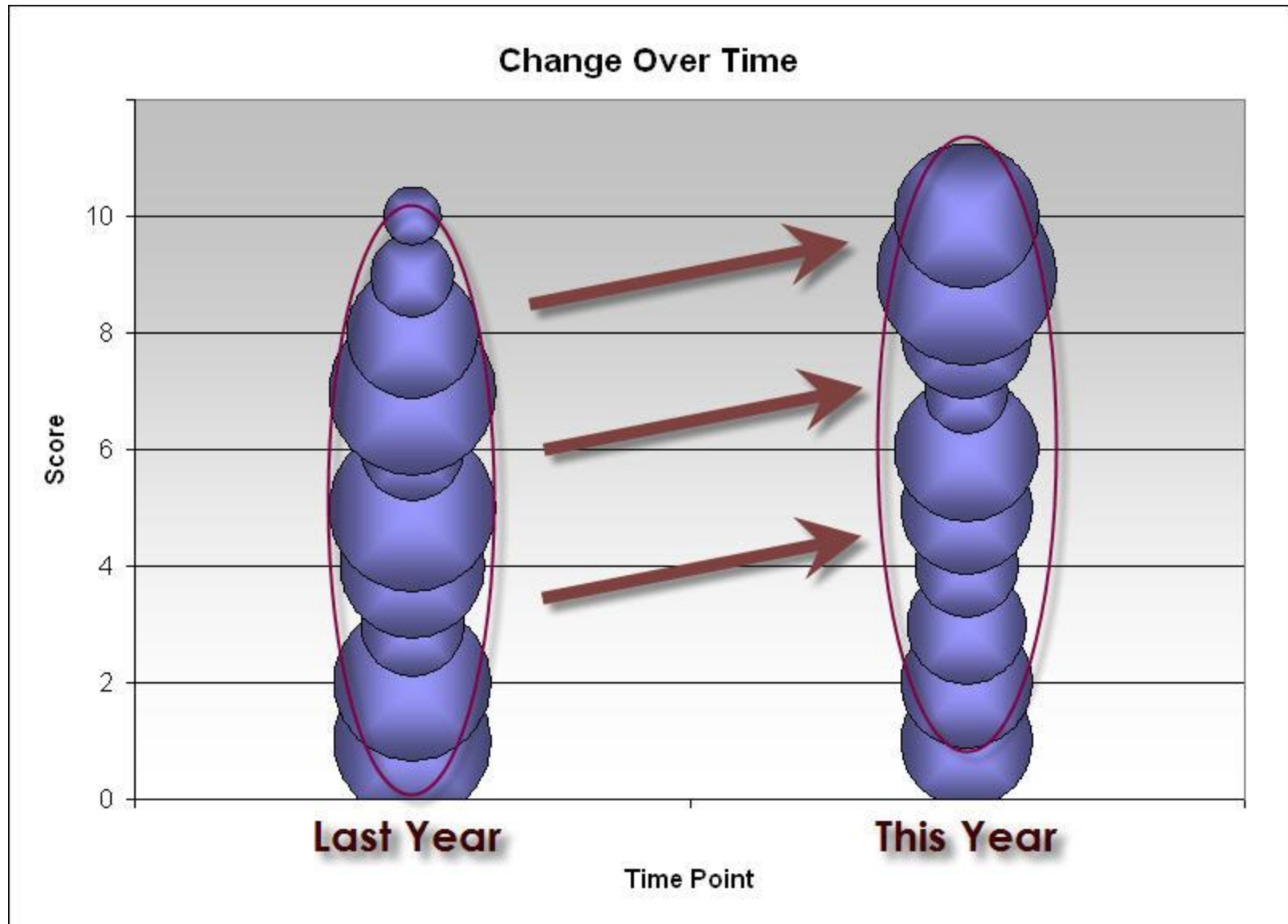
Differences
Relationships
→ *Change*
Expectation

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Change

- The expectation is that, as a result of a program, students will show marked improvement from pretest to posttest
- Answers the research question:
“Did students change over time”

	Average of Score Last Year	Average of Score This Year
Total	4.72	5.9



Change

Okay, but how do we do this?

- You must know both the ‘pretest’ score and ‘posttest’ score for each individual student.
- This is basically the same as “Differences”, but instead of looking at the average scores for two different groups of students, you’re looking at the average scores for the same group of students, but at two time points.
- People will often subtract the two scores to show how much change took place.



Expectation

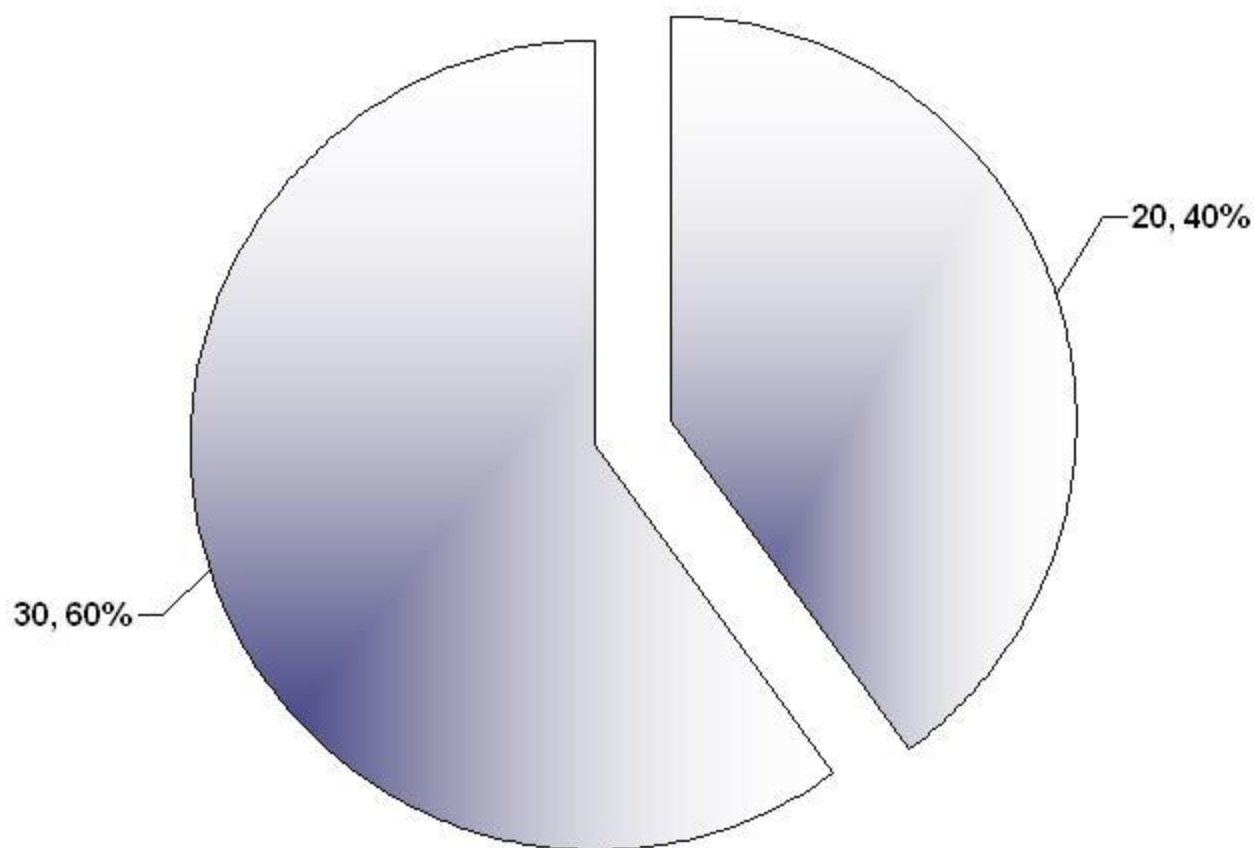
Differences
Relationships
Change
→ *Expectation*


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Expectation

- The expectation is that achievement of established standards indicates quality
- Answers the research question:
“Do our students meet expectations?”

Met Competency?	Number of People	Percentage of Total Group
Yes	20	40%
No	30	60%
Grand Total	50	100%





Pop Quiz!

- *Differences*
- *Relationships*
- *Change*
- *Expectation*

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A. Are the 29 Alternative Spring Break leaders in Spring 2007 scoring higher on the Civic Engagement 10-item test than the 20 Alternative Spring Break Leaders from the year before?

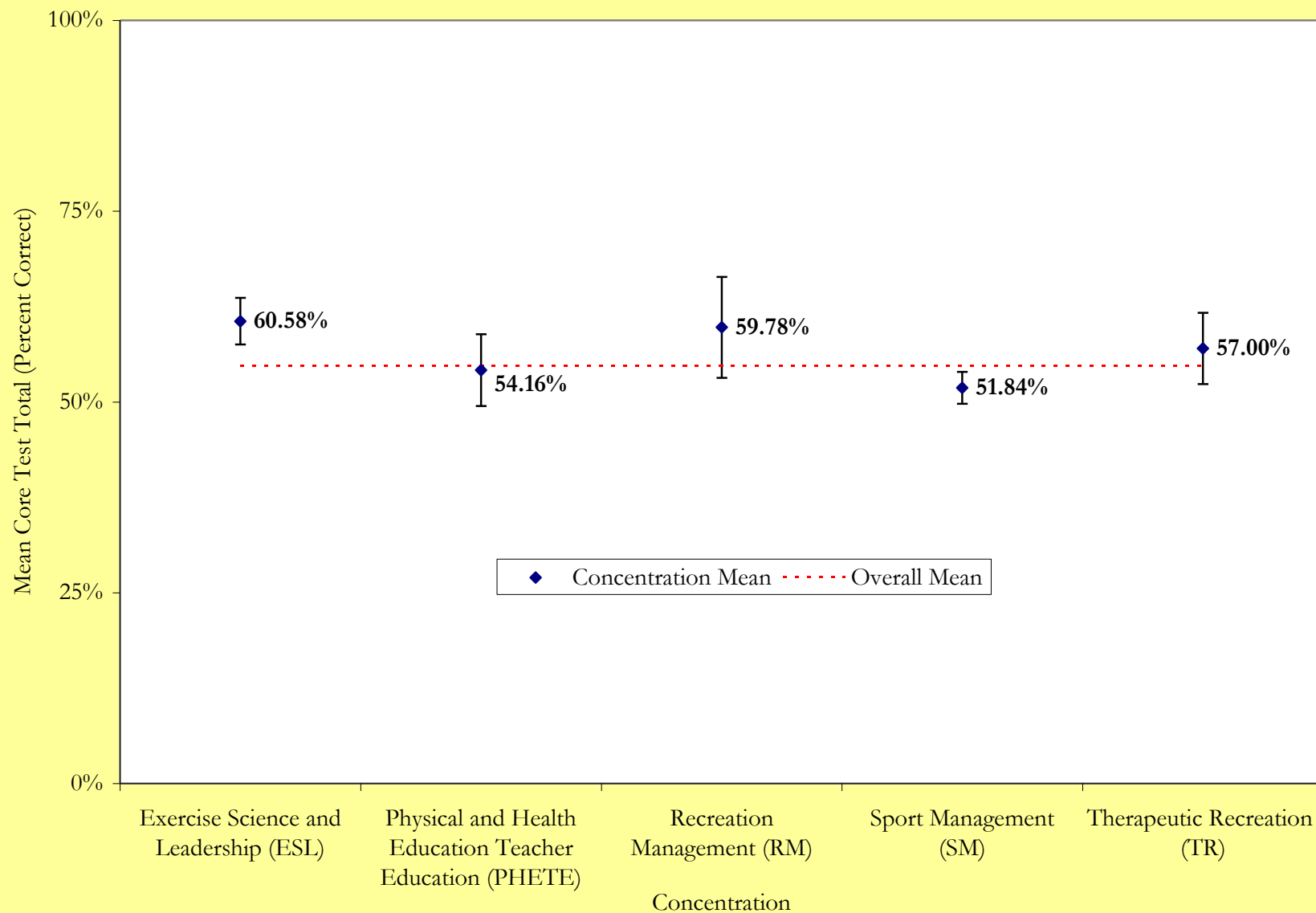
- **Differences!** Compare averages of different groups


Yes, this year's leaders scored higher ($M = 6.72$) than last year's ($M = 6.65$).

B. Are Recreation Center student supervisors from five different units scoring differently on a test used to assess their “core” rec center knowledge?

■ **Differences!** Compare averages of different groups

Concentration Name (Acronym)	# Unique Items	N	Mean	SD	Min	Max
Exercise Science and Leadership (ESL)	50	24	60.58%	7.66%	50%	74%
Physical and Health Education Teacher Education (PHETE)	50	13	54.16%	8.66%	42%	74%
Recreation Management (RM)	50	9	59.78%	10.12%	44%	74%
Sport Management (SM)	50	64	51.84%	8.54%	22%	68%
Therapeutic Recreation (TR)	50	4	57.00%	4.76%	52%	62%
Overall	50	114	54.78%	9.08%	22%	74%






C. On the Career and Academic Advising test, what percent of incoming freshmen in Fall 2007 met or exceeded the score necessary to be considered as having “proficient” knowledge of the university’s career and academic advising policies and resources?

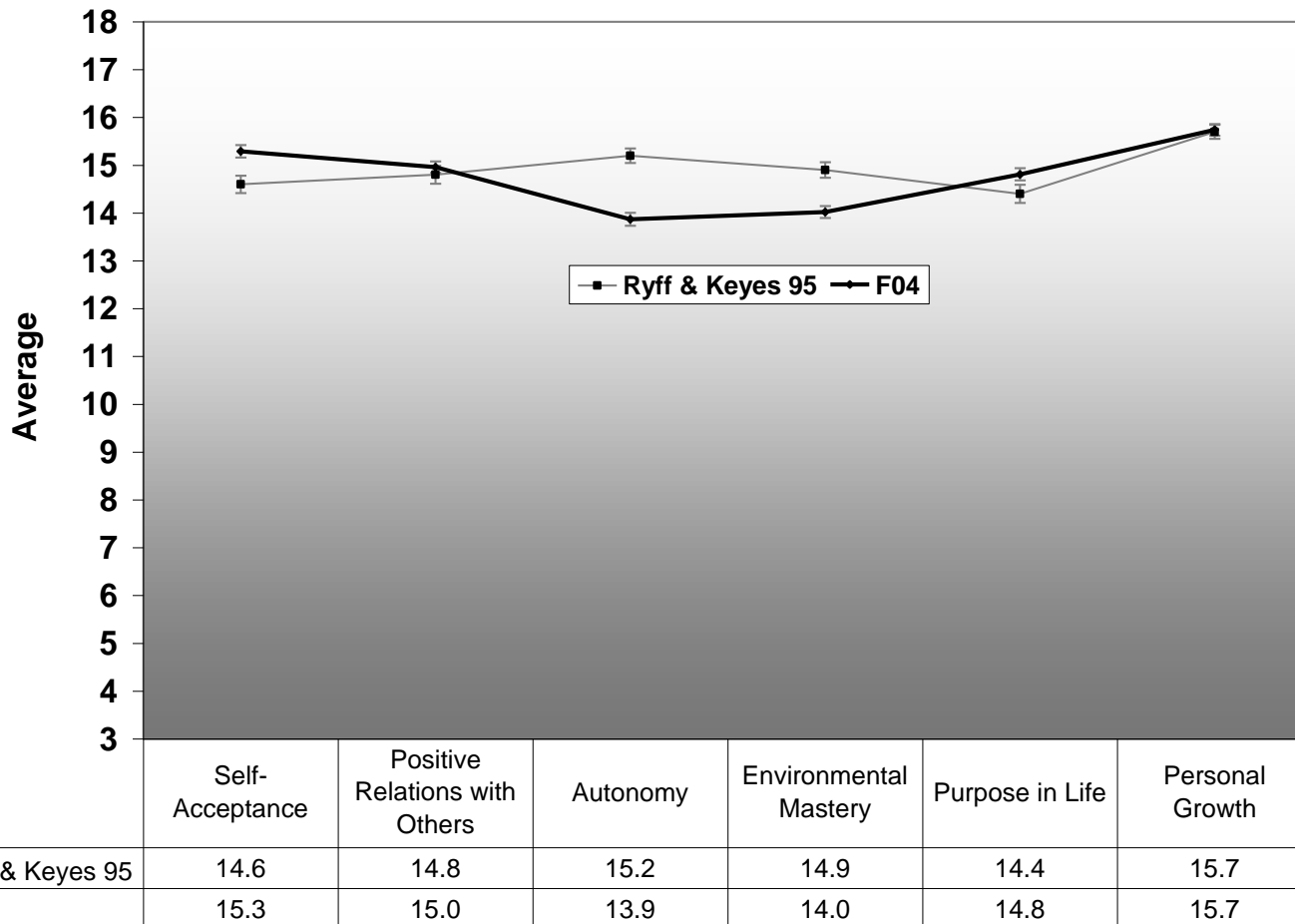
■ **Expectation!** Percent of students meeting a standard

Of the 2862 students attempting the test, 2751 (96%) met or exceeded the “proficient” standard.



D. Are the well-being levels (as measured using six subscales - e.g., self-acceptance, autonomy, etc.) of incoming NYU freshmen different than the well-being levels of adults?

- **Differences!** Compare averages of different groups (NYU students vs. adults)
- More than one variable (6 subscales)




While the **practical significance** of the differences for Self-Acceptance and Purpose in Life are considered small ($d=.14$ and $d=.25$), the differences for Autonomy ($d=.50$) and Environmental Mastery ($d=.35$) are considered medium and small to medium, respectively.

Similarities

NYU Incoming Freshmen seem to be similar to the adult sample (N = 1100) in Positive Relations with Others and Personal Growth.

Differences

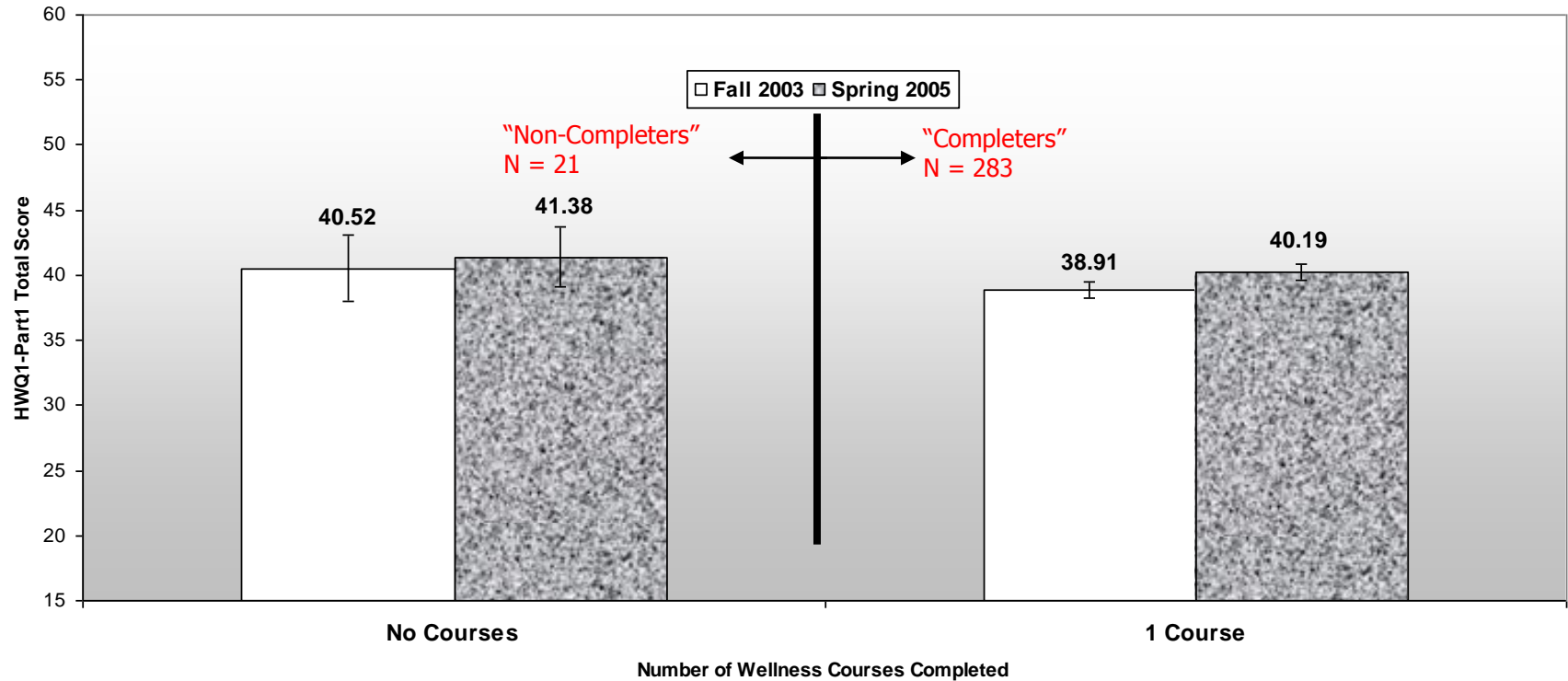
NYU incoming freshmen have significantly lower Autonomy and Environmental Mastery well-being compared to the adult sample and significantly higher Self-Acceptance and Purpose in Life.




E. Are students scoring higher on the Health and Wellness Questionnaire as sophomores compared to when they were freshmen? Does the difference depend on whether or not they have completed a wellness course offered by the Health Center?

■ **Change AND Differences!** Comparing Means Across Different Occasions for Different Groups

HWQ1-Part1 Mean Total Scores from Fall 2003 and Spring 2005
by Number of Wellness Courses Completed





F. Are students who go through our transfer orientation program feeling as attached (a) to the university itself and (b) the people at the university when compared to 'traditional' students who go through the regular freshman orientation program?

■ **Differences!** Compare averages of different groups

Means, standard deviations, and effect sizes for the attachment subscales by type of student

	Non-Transfer Student (N=618)		Transfer Student (N=81)		
	Mean ¹	Standard Deviation	Mean ¹	Standard Deviation	Cohen's <i>d</i>
Group Attachment	3.82	.78	3.68	.78	.19
Member Attachment	3.47	.70	3.00	.88	.65

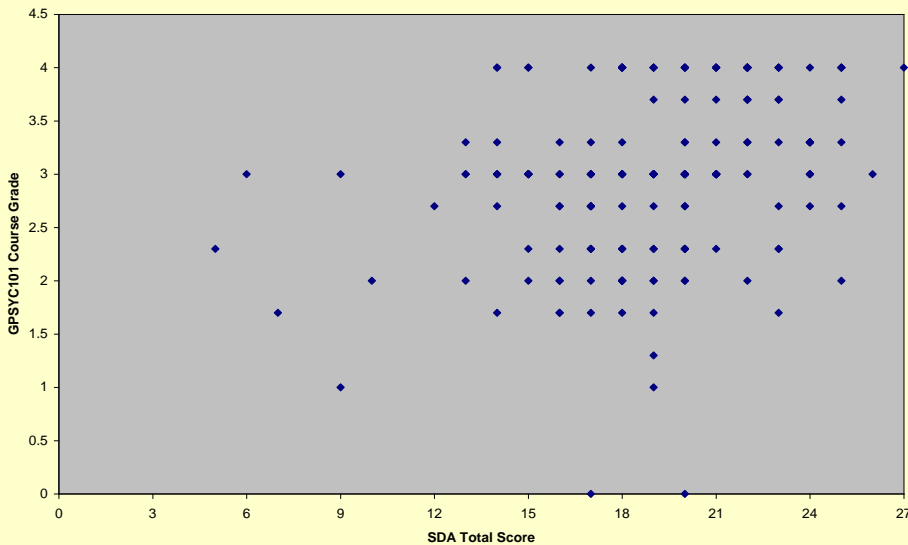
	Involved (N=89)		Not Involved ² (N=613)		
Group Attachment	4.12	.61	3.77	.79	.45
Member Attachment	3.75	.59	3.67	.75	.11

Note. ¹The mean subscales scores were computed so they could range from 1 to 5. ²Students in the “not involved” category simply were not members of various groups that traditionally “give back” to the university (e.g., student government association, campus tour guides).

G. *Bonus* - “We are worried that our faculty are assigning high grades, but that students aren’t learning what they should learn. How would I answer this using the 27-item Sociocultural Domain Assessment (SDA)?”

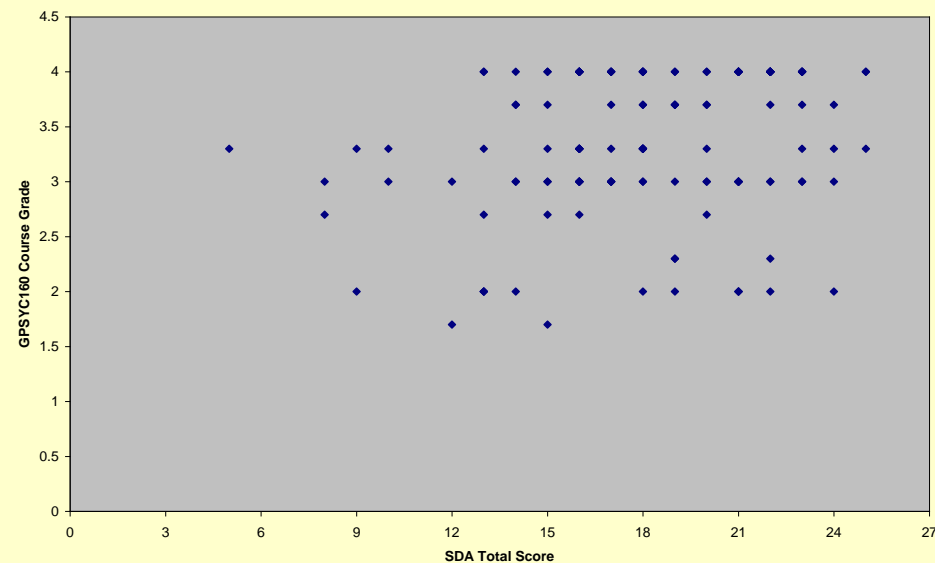
■ Relationships! ...between two variables

Relationship Between GSYC101 Course Grade and SDA Total Score



$$r = .31$$

Relationship Between GSYC160 Course Grade and SDA Total Score



$$r = .23$$

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