Lecture 18: Descriptive Statistics

Monday, October 30, 2023

Your Teaching Fellows:

003/004:	Zahra Abolghasem	Bronwen Grocott
	Vasileia Karasavva	Ni An
010:	Thalia Lang	Malina Lemmons
	Ruoning Li	Irene Wen

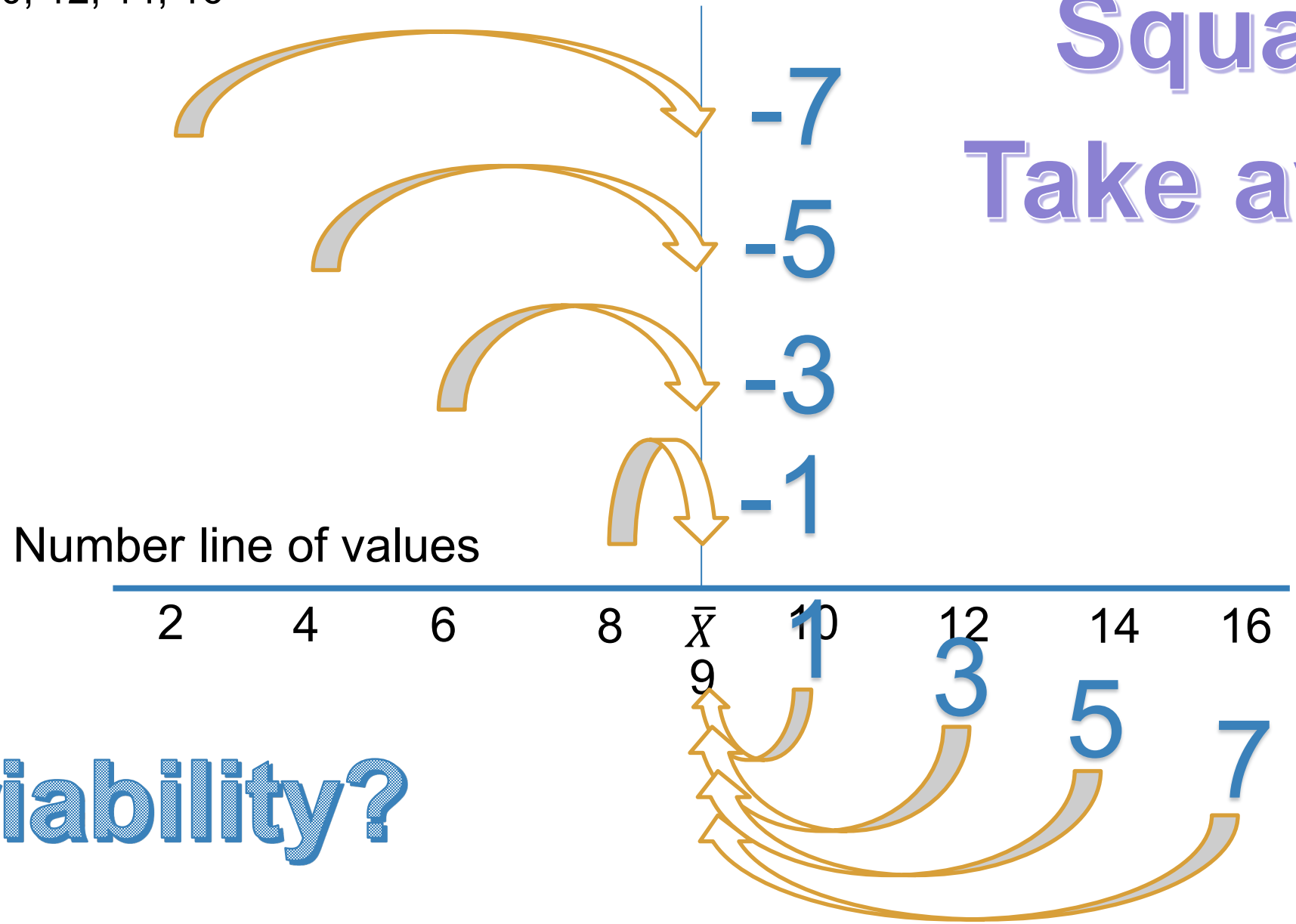
Lectures: MWF 12:00 PM – 1:00 PM (003); 1:00 PM – 2:00 PM (004); 2:00 PM – 3:00 PM (010)
Office hours: Tuesdays 2:00 PM – 4:00 PM

Measures of Variability

- Variability
  - The spread of distribution of scores
- Measures
  - Range (Max – Min)
  - Variance (s^2)
    - Sum of squared deviations around mean divided by N – 1
    - Need it for later analyses
  - Standard Deviation (*s* or *SD*) = $\sqrt{s^2}$
    - Square root of variance
    - On average, the deviations of each score from the mean

2, 4, 6, 8, 10, 12, 14, 16

Squared
Take average



Variability?

Measures of Variability

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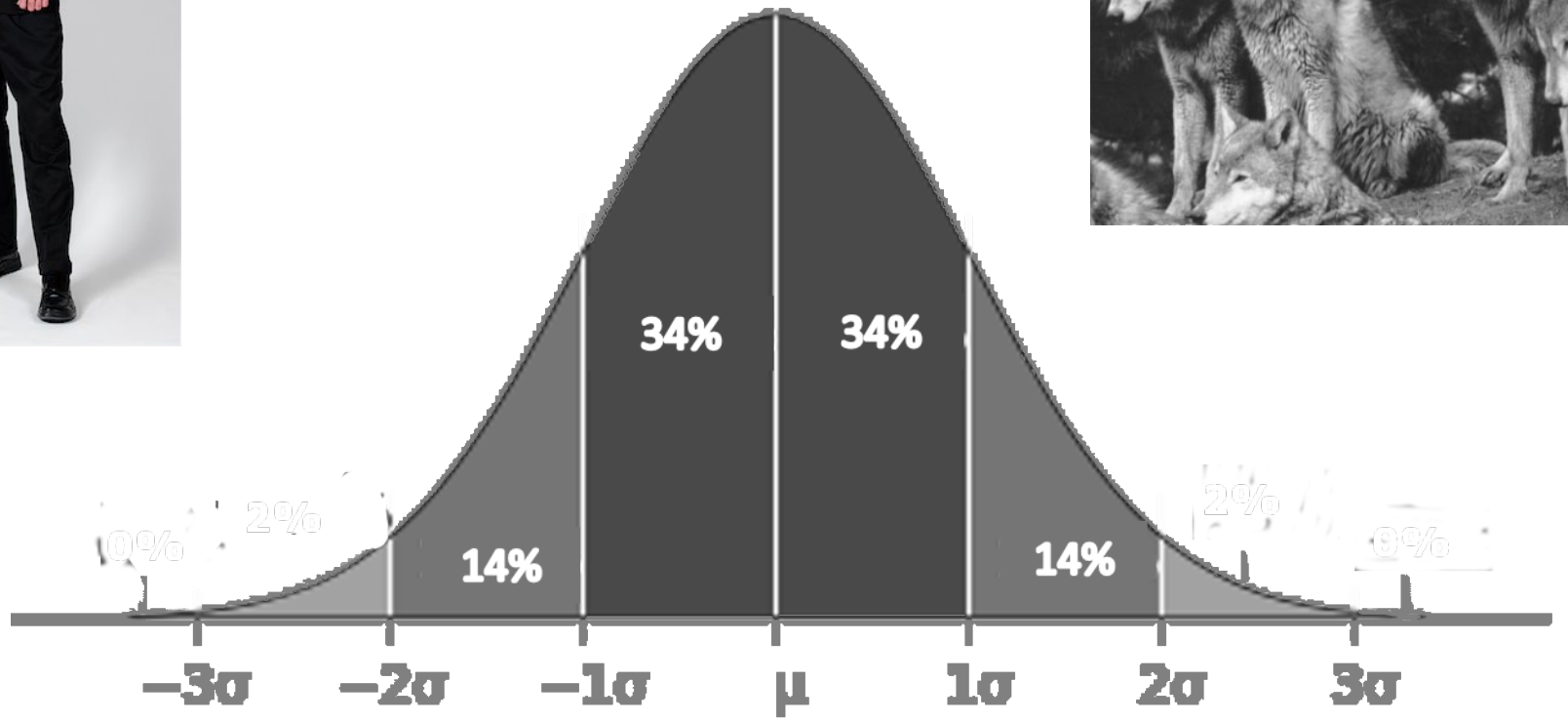
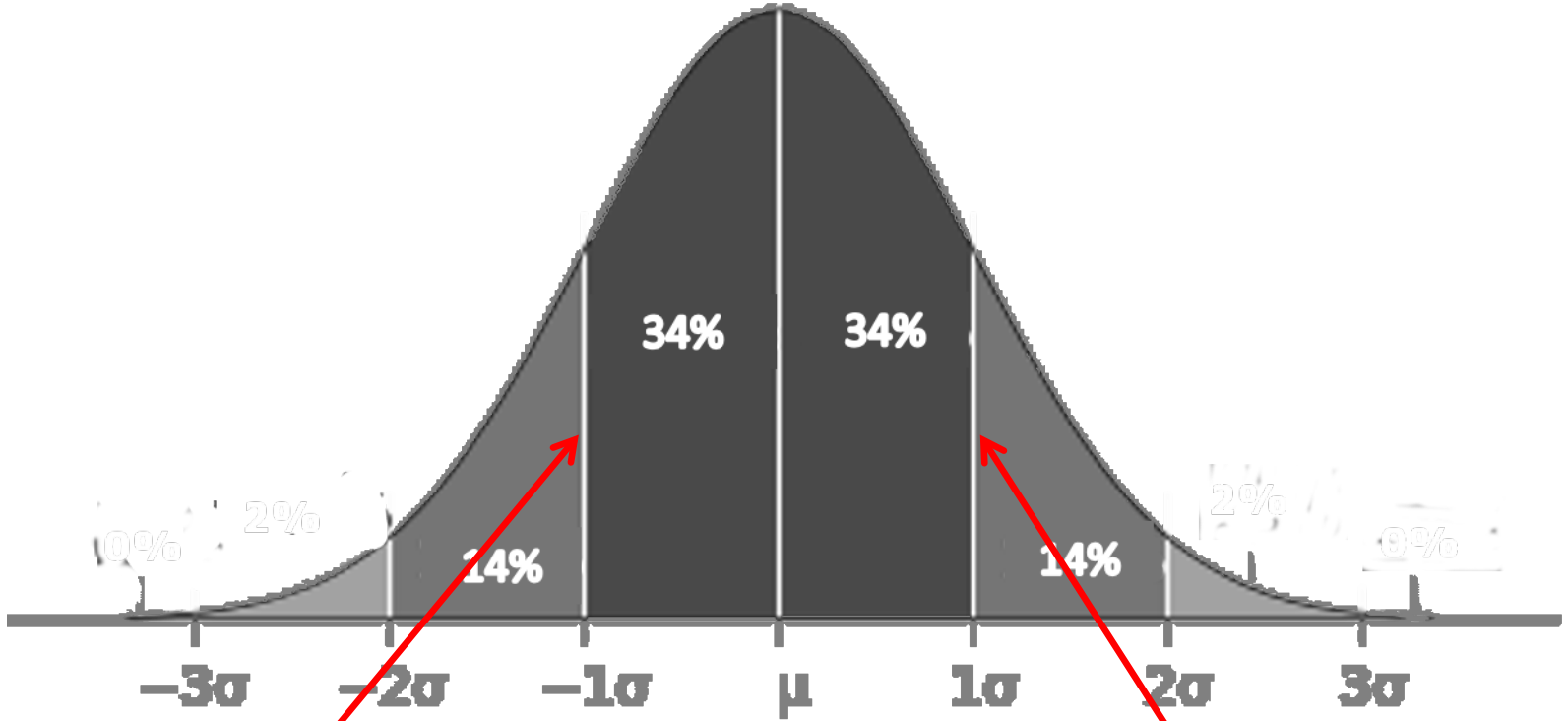
Normal Distribution

Bell Curve

Standard Curve



Normal Distribution



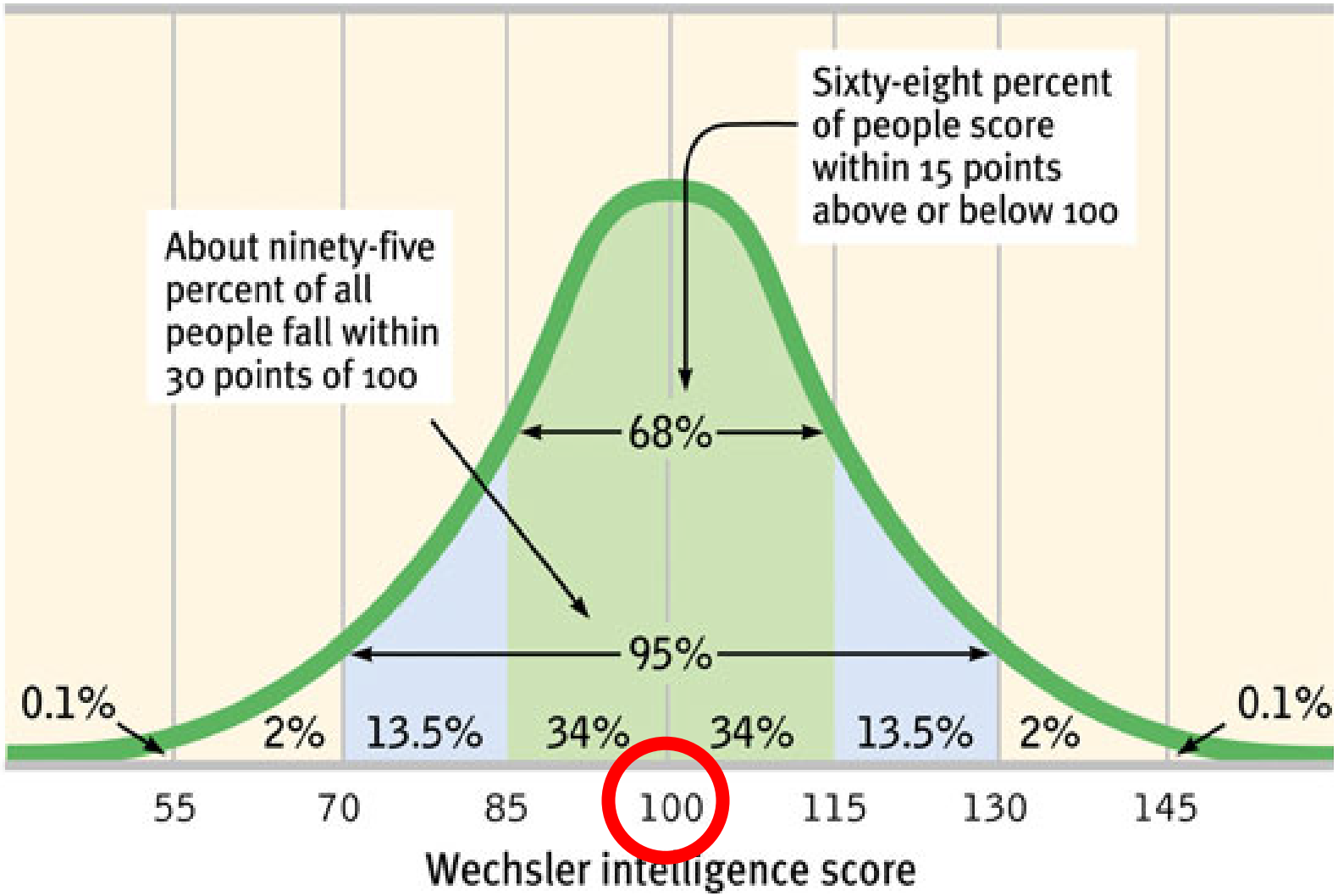
-1 SD
Below the mean

Mean
(50%)

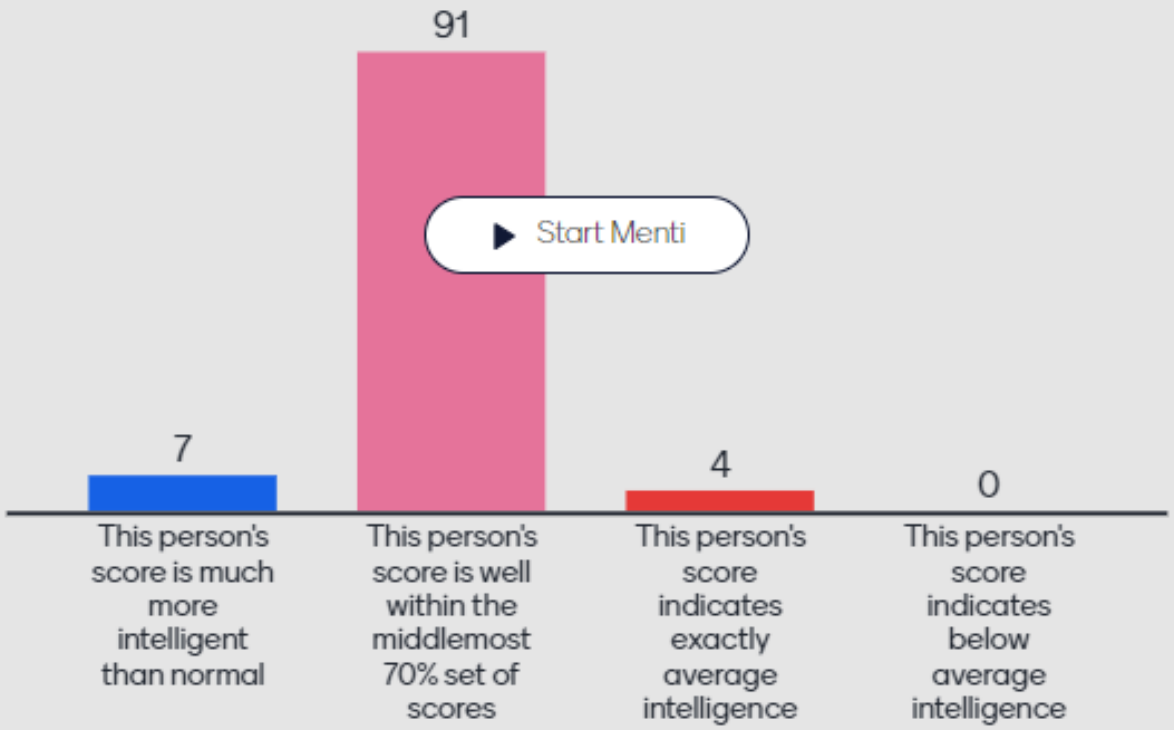
= Median
= Mode

+1 SD
Above the mean

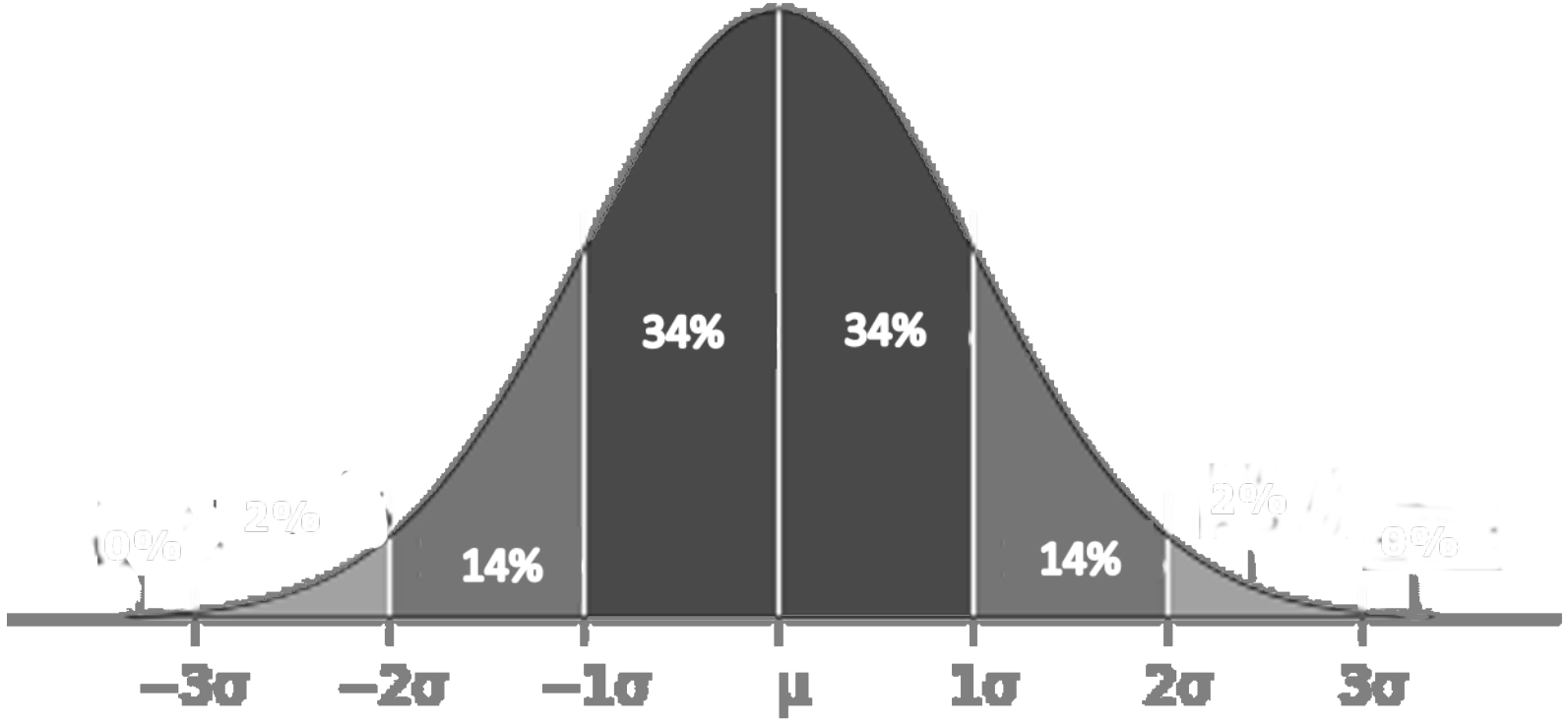
Normal Distribution



What does an intelligence score of 105 mean? Choose the best answer

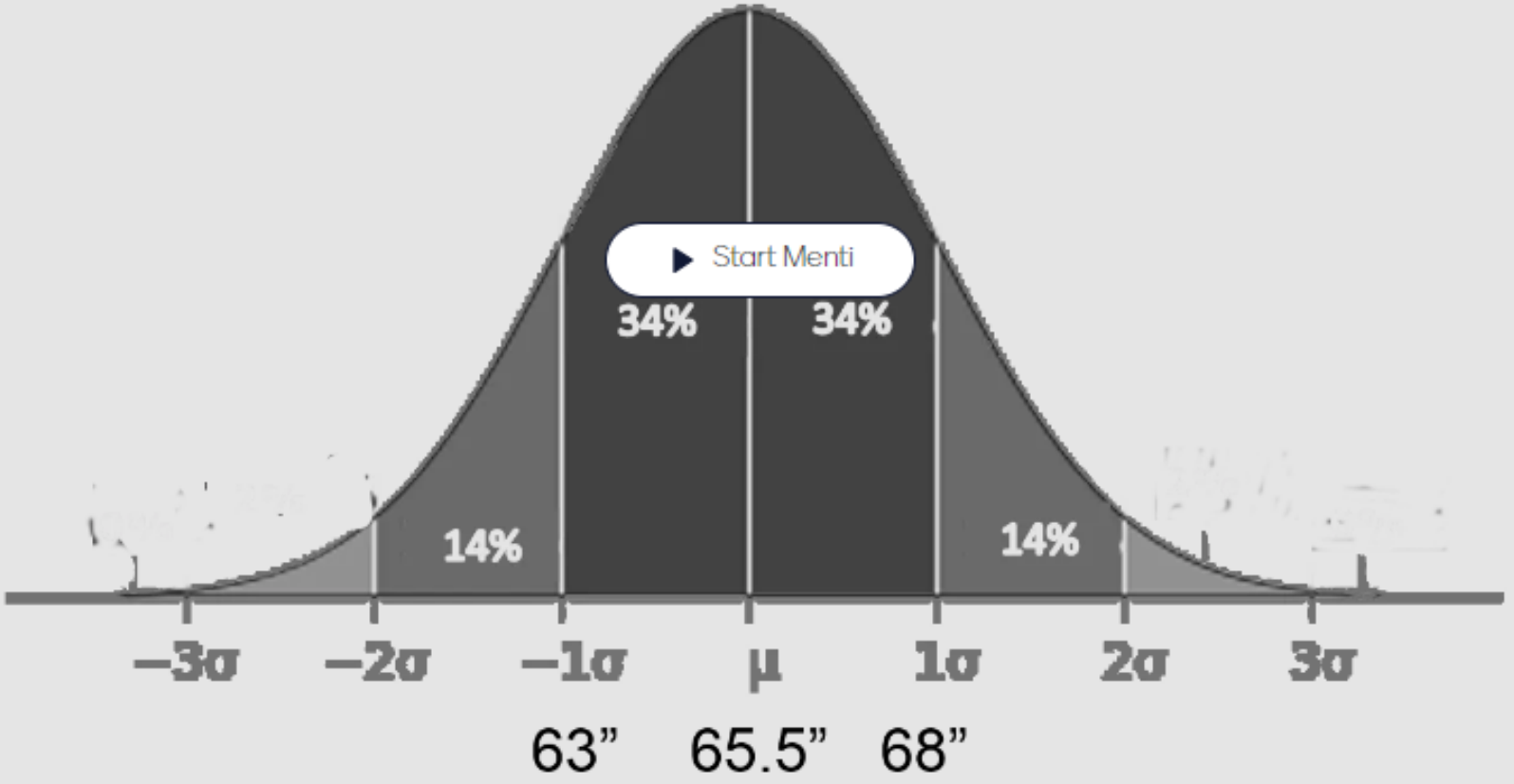


Normal Distribution

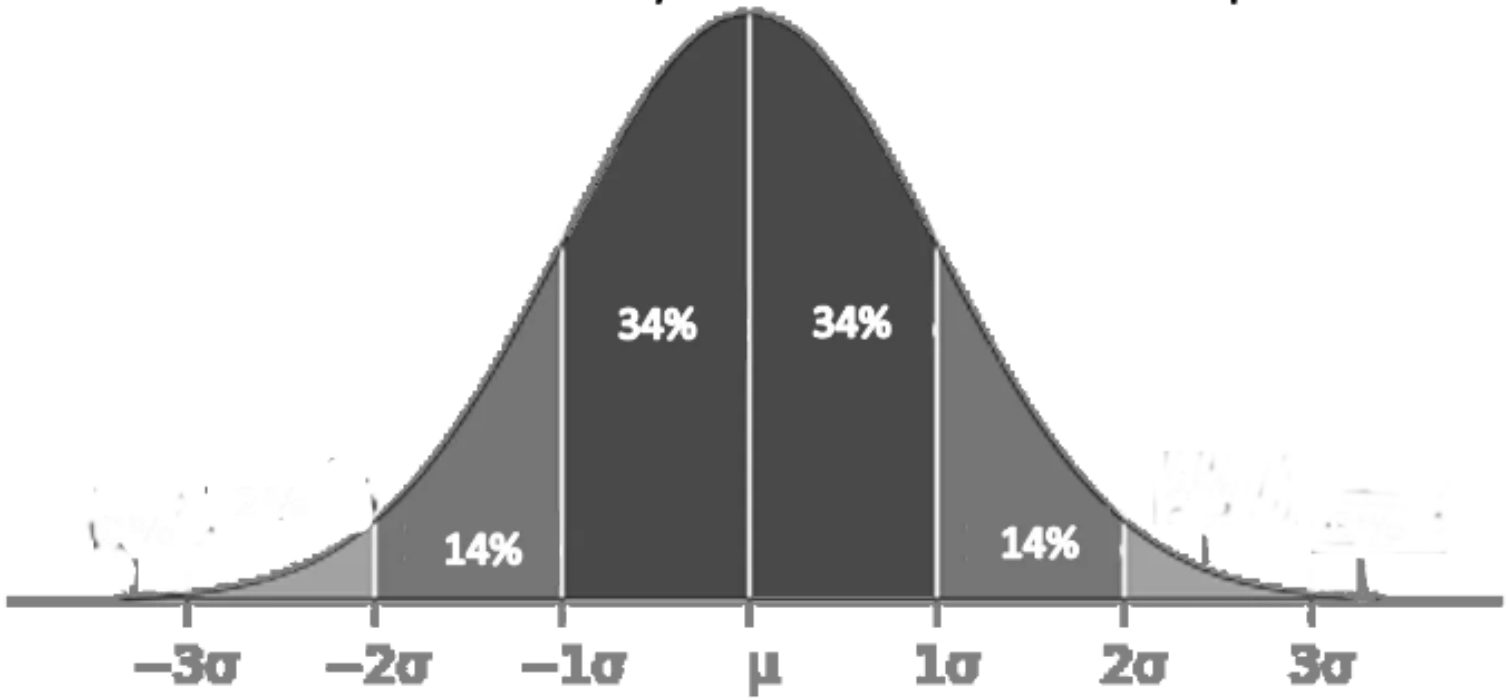


	-1SD	Mean	+1SD
SD = $4000	$19 000	$23 000	$27 000

This is a normal distribution of women's height in the U.S in inches. What is the SD of women's height in the U.S.?



Mona, Eric, and John entered a track meet. Eric ran 10 laps in 15 minutes, which is faster than only 16% of competitors. Mona ran faster than exactly half of all the competitors. His time was 3 minutes faster than Eric's. Assuming that lap times are normally distributed, what was the lap time for John, who finished faster than exactly 98% of all the competitors?



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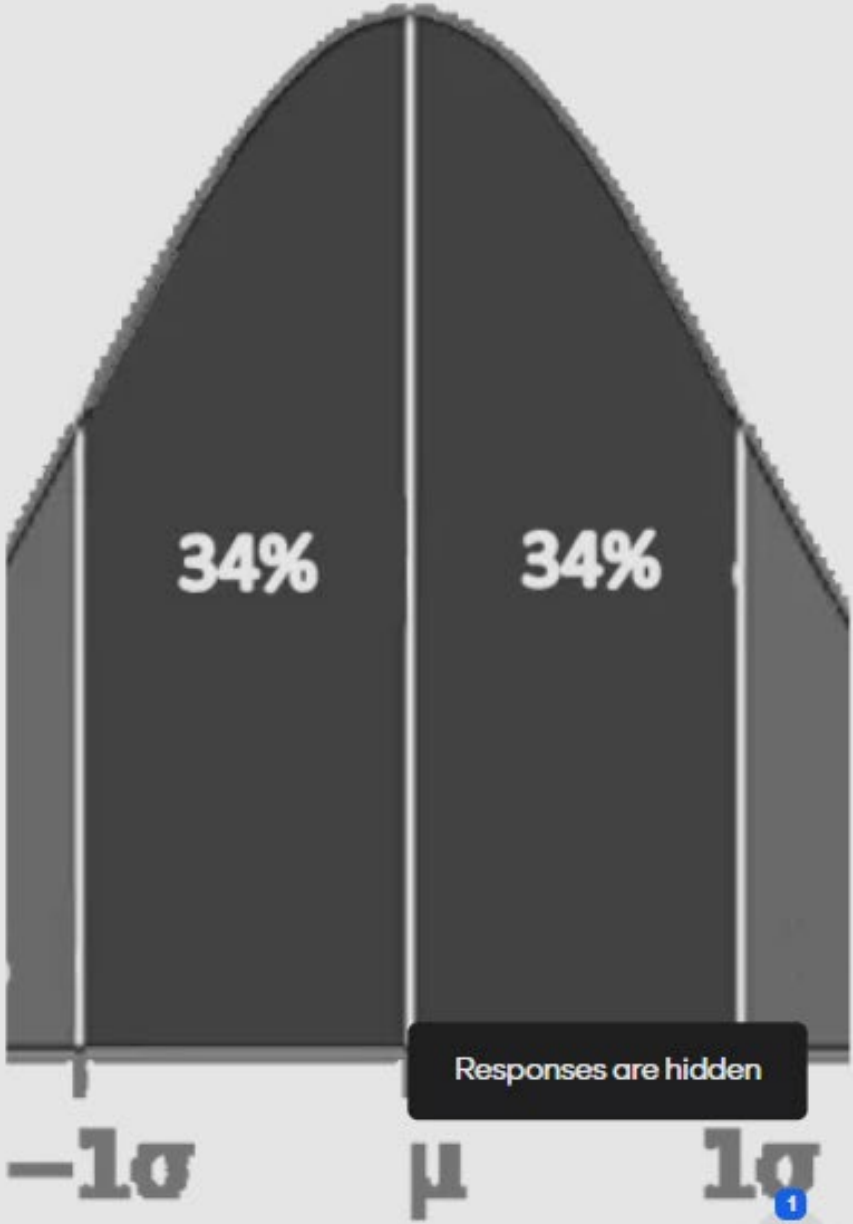
Mentimeter

If the mean of a distribution is 5, what does a standard deviation of 2.62 mean?

Start Menti

0	0	0	0	0
34% of scores fall between 2.38 and 5	68% of scores fall between 2.38 and 7.62	96% of scores fall between -0.24 and 10.24	14% of scores fall between 7.62 and 10.24	All of the above



Learning objectives

- By the end of today, you'll be able to
  - Compare and contrast regression and correlation
  - Predict a score using a regression line
  - Define multiple correlation
  - Describe how partial correlation helps us address the third variable problem
  - Generate a null hypothesis and a research hypothesis

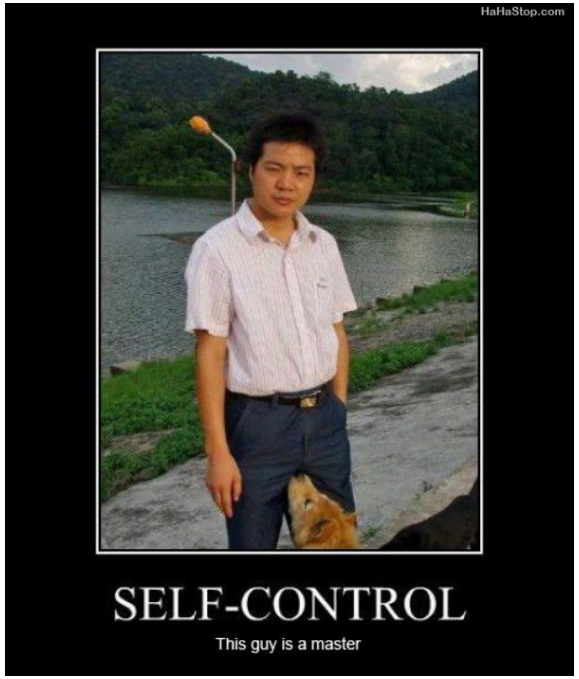
Descriptive Statistics

- Measures of central tendency
  - Mean, Median, Mode
- Measures of variability
  - Range, variance, standard deviation
- Measures of relationships
  - Correlation (r) and r^2
  - Multiple regression
  - Multiple correlation (R) and R^2
  - Partial correlation

Correlation

- Correlation coefficient
  - A numerical index that reflects the degree of *linear* relationship between two variables
  - Pearson *r*

Example: Delay of Gratification



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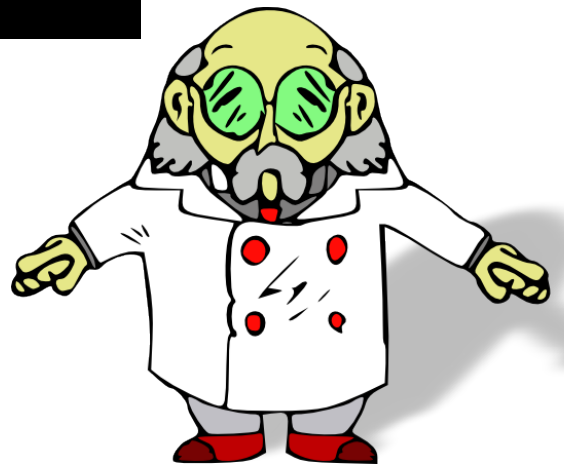

Delay of Gratification


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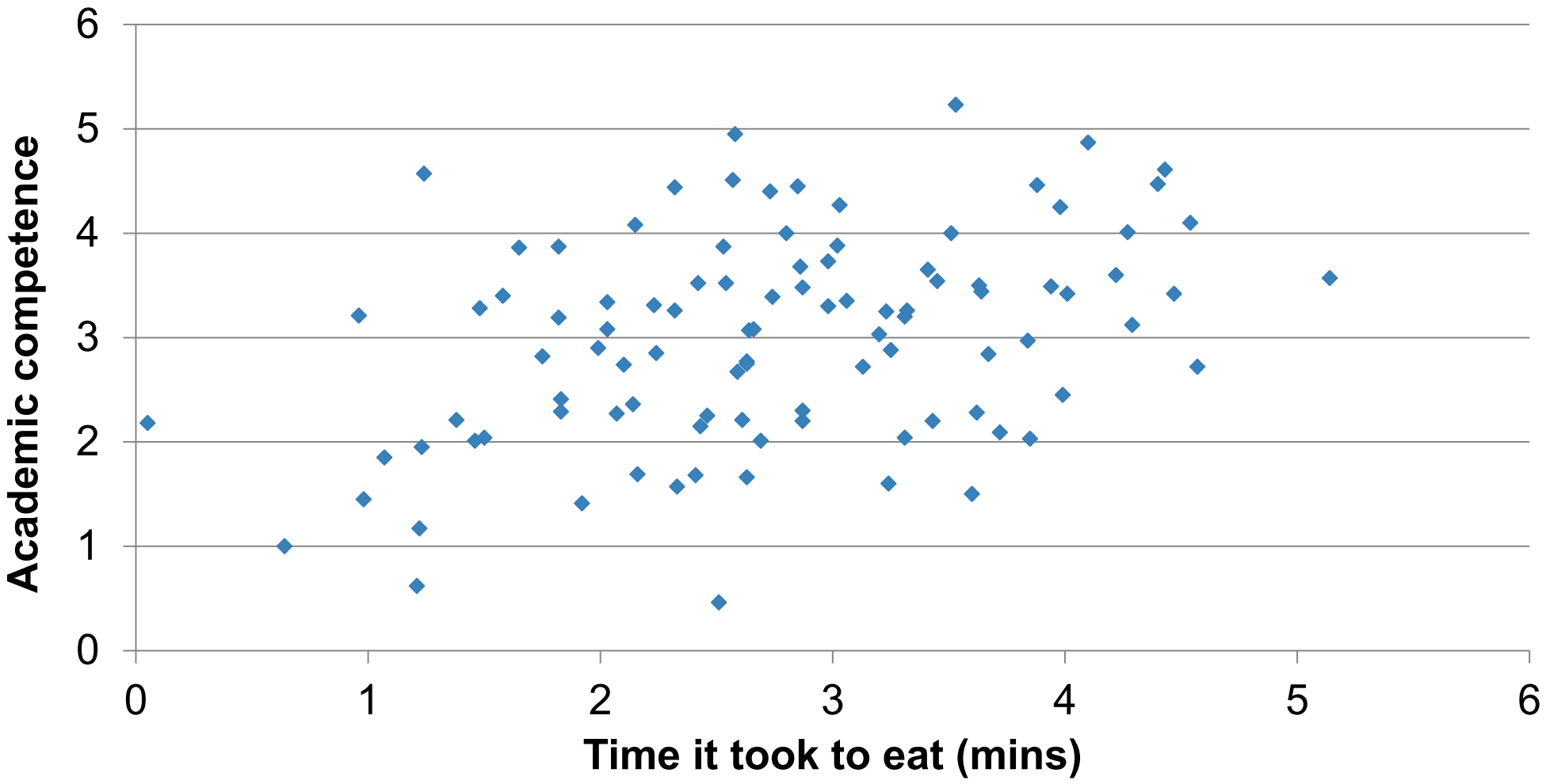
Delay of Gratification

- Variable 1:
  - Ability to delay gratification at age 5
- Variable 2:
  - Academic competence (rated by parents) at age 15

- Pearson *r* = .39
- Rough standards for interpreting correlations:
  - $0 \leq |r| < .40$ = small
  - $.40 \leq |r| < .60$ = medium
  - $.60 \leq |r| \leq 1.00$= large

Mischel, Shoda, & Peake, 1988

Delay of Gratification



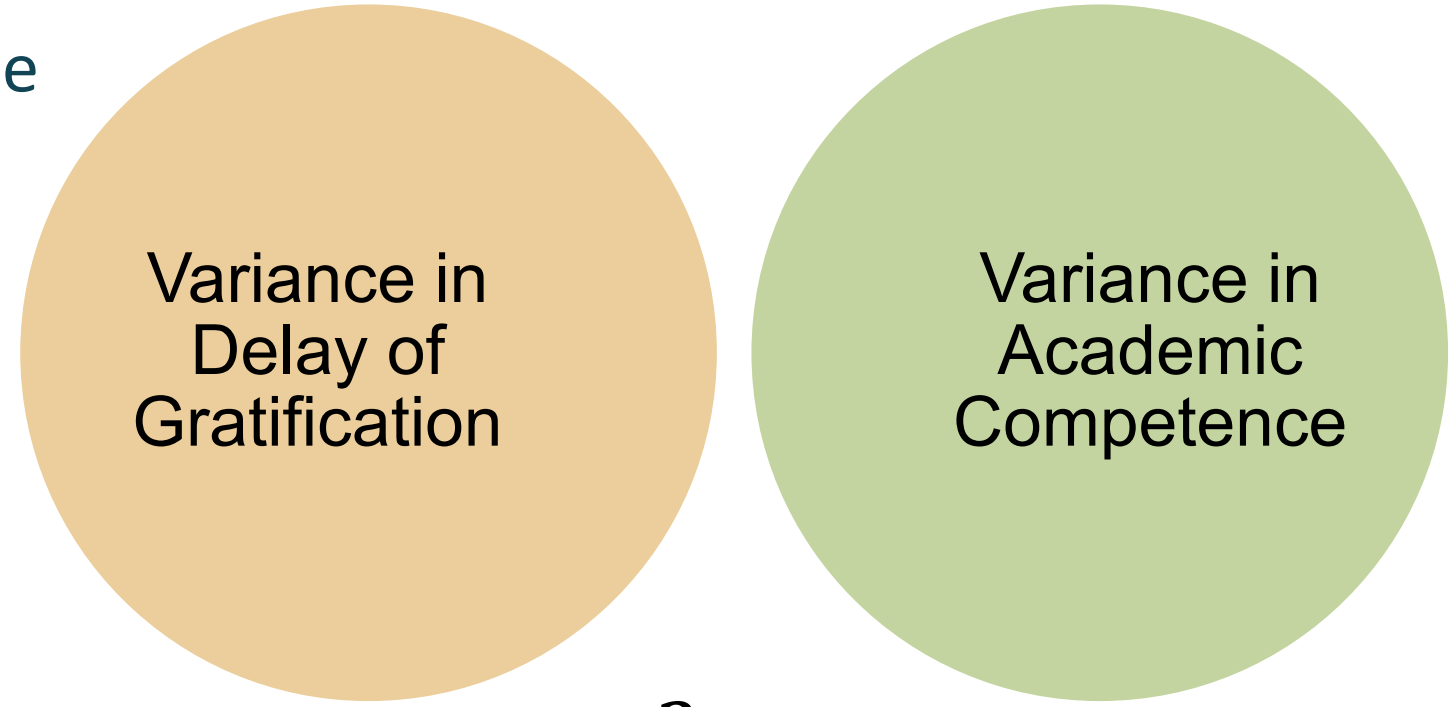
$r = .39$

$r^2 = .15$

Coefficient of Determination

Coefficient of Determination

- Shared variance



$If\ r^2 = 0$

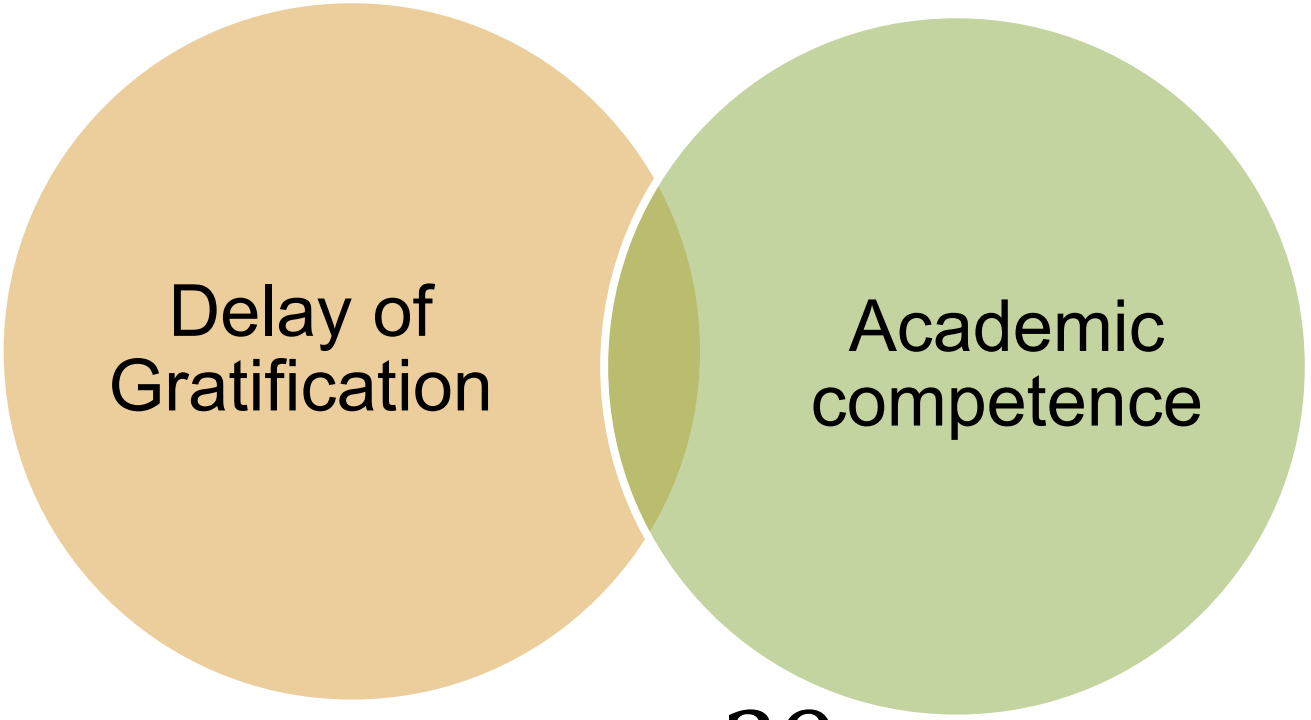
No Overlap

Coefficient of Determination

$$r^2 = 1.00$$

Complete Overlap

Coefficient of Determination



$$r = .39$$

$$r^2 = .15$$

- % of variability in y accounted for by variability in x
- % of variability in y predictable by variability in x