Correlations

Week 6, Psych 350 - R. Chris Fraley
http://www.yourpersonality.net/psych350/fall2015/

Answering Descriptive Questions in Multivariate Research

- When we are studying more than one variable, we are typically asking one (or more) of the following two questions:

  - How does a person's score on the first variable compare to his or her score on a second variable?

  - How do scores on one variable vary as a function of scores on a second variable?

# Correlations in Personality Research

- Many research questions that are addressed in personality psychology are concerned with the relationship between two or more variables.

Some examples

- How does dating/marital satisfaction vary as a function of personality traits, such as emotional stability?

- Are people who are relatively sociable as children also likely to be relatively sociable as adults?

- What is the relationship between individual differences in violent video game playing and aggressive behavior in adolescents?

Graphic presentation

- Many of the relationships we'll focus on in this course are of the *linear* variety.

- The relationship between two variables can be represented as a line.

aggressive behavior
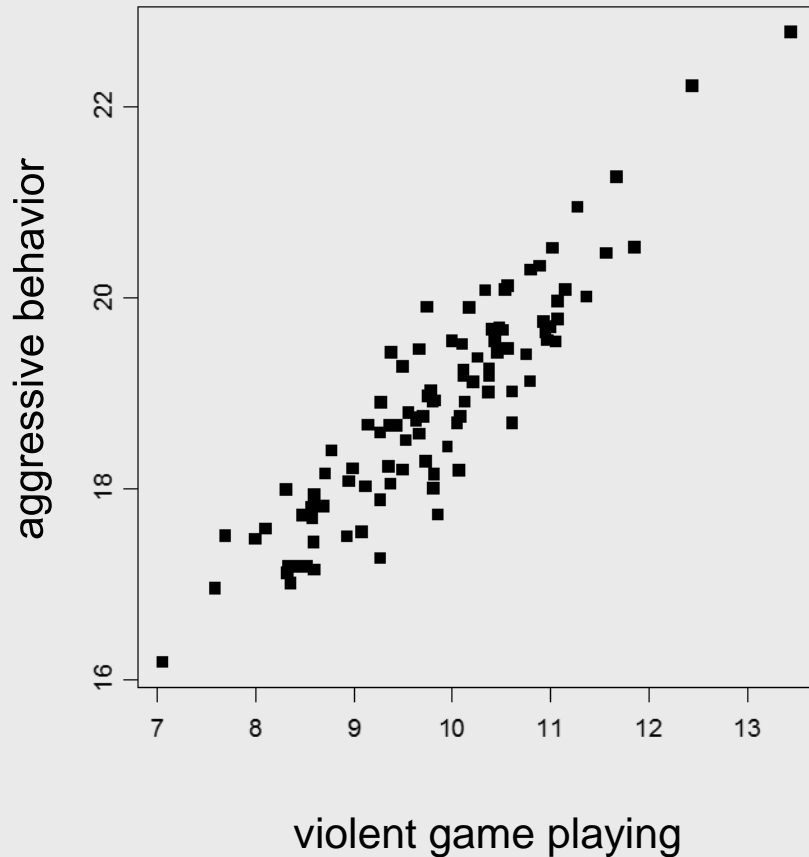
violent video game playing
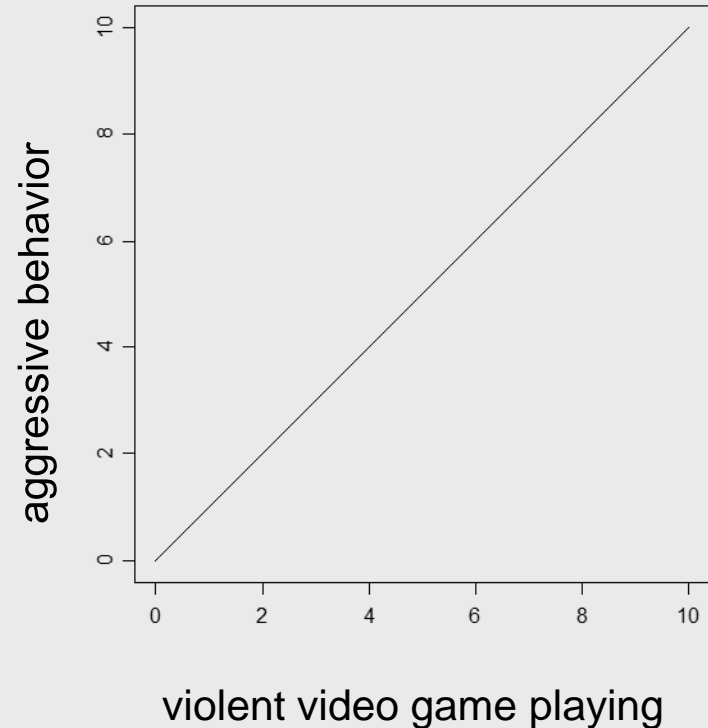
- Linear relationships can be negative or positive.
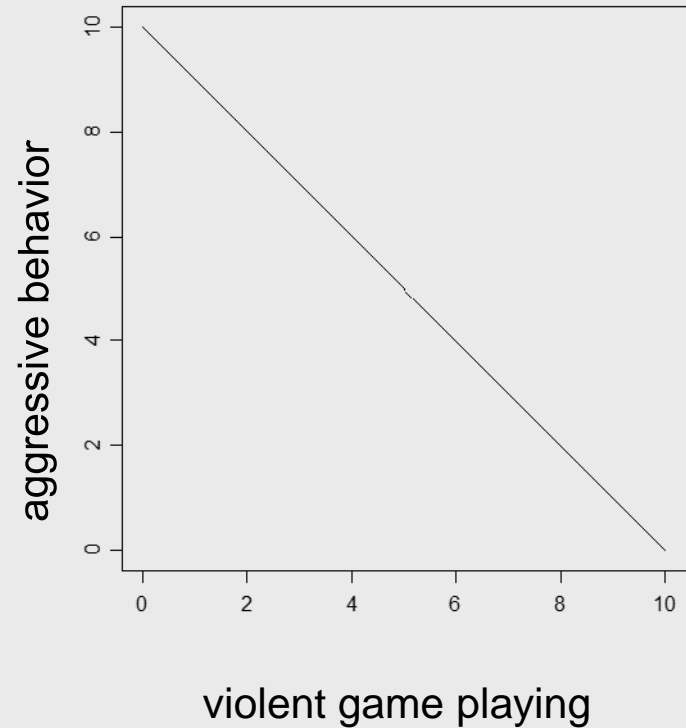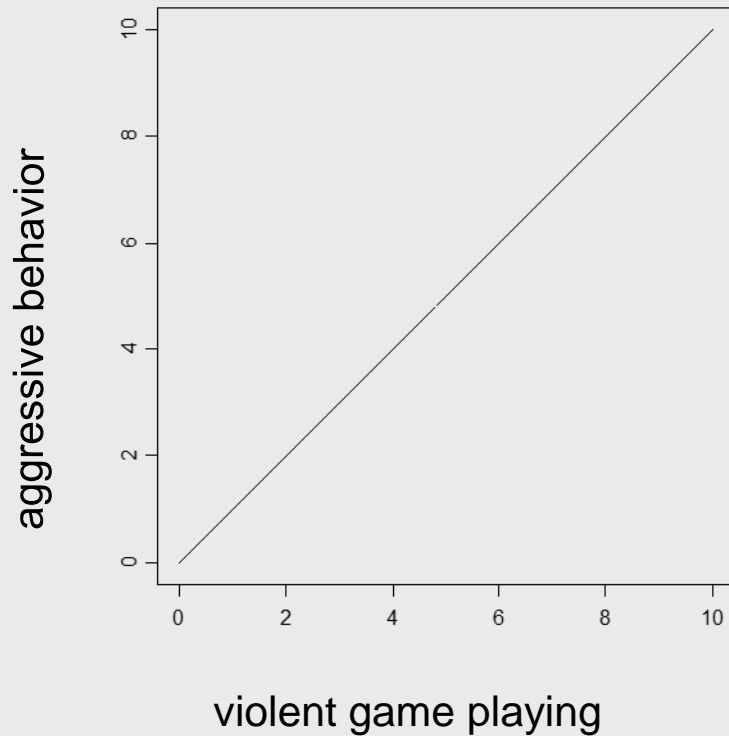
- How do we determine whether there is a positive or negative relationship between two variables?
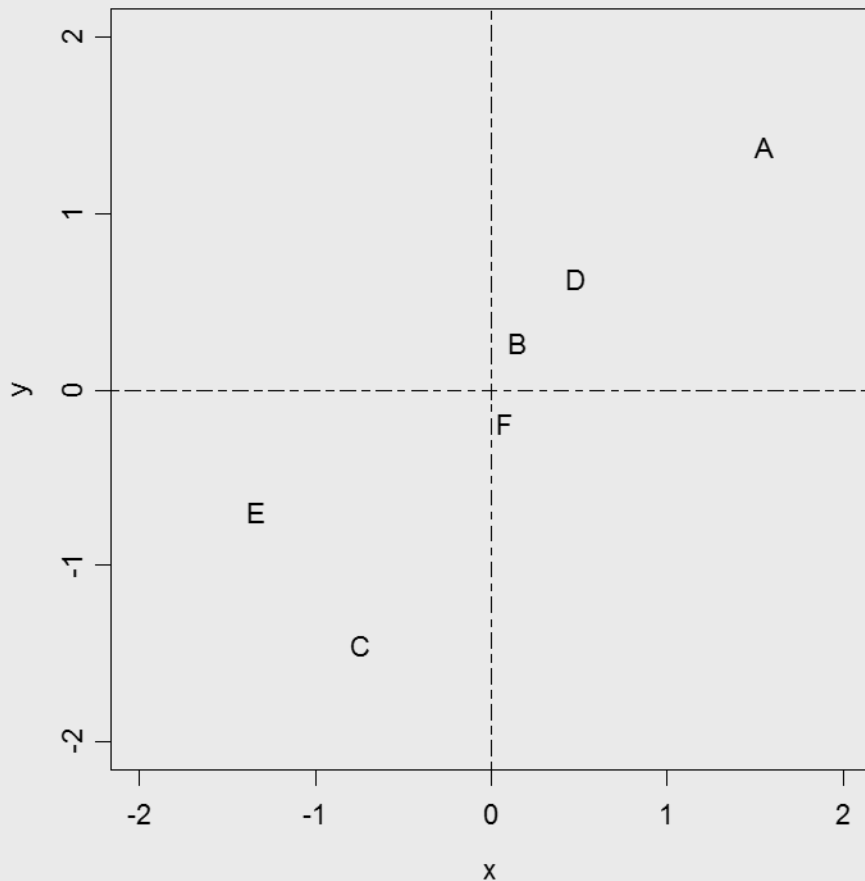
Scatter plots

One way of determining the form of the relationship between two variables is to create a **scatter plot** or a **scatter graph**.

The form of the relationship (i.e., whether it is positive or negative) can often be seen by inspecting the graph.
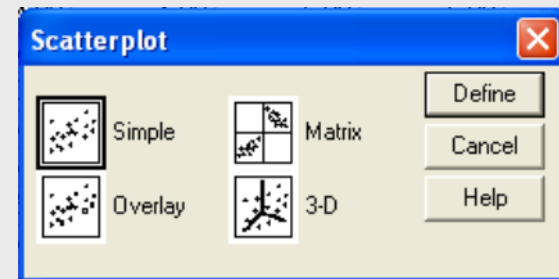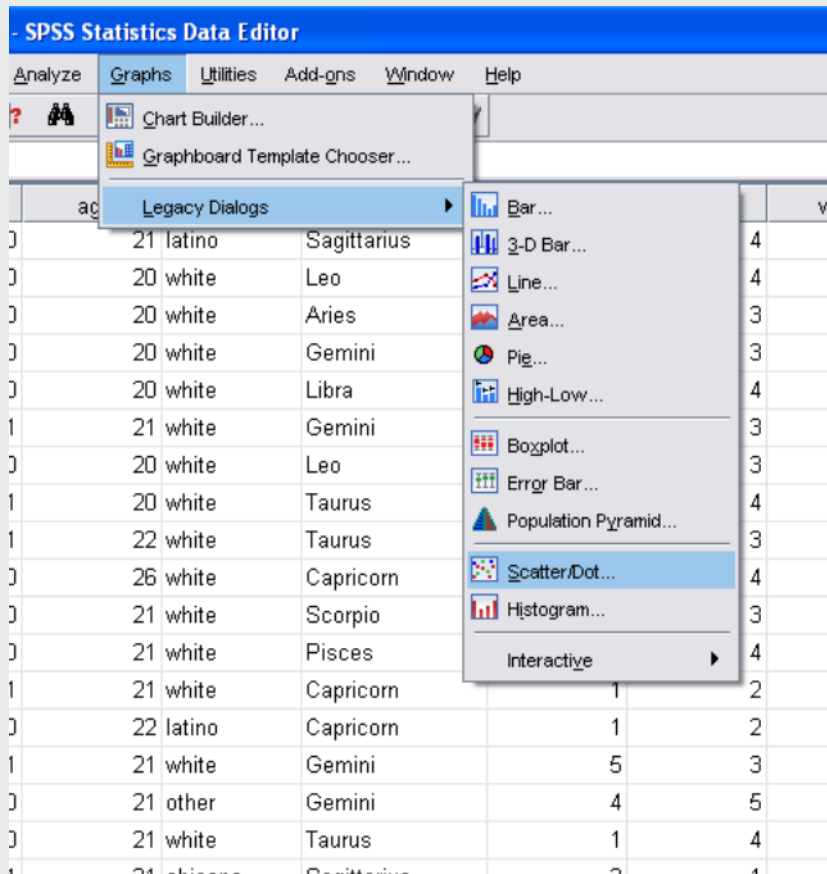
How to create a scatter plot

Use one variable as the *x*-axis (the horizontal axis) and the other as the *y*-axis (the vertical axis).

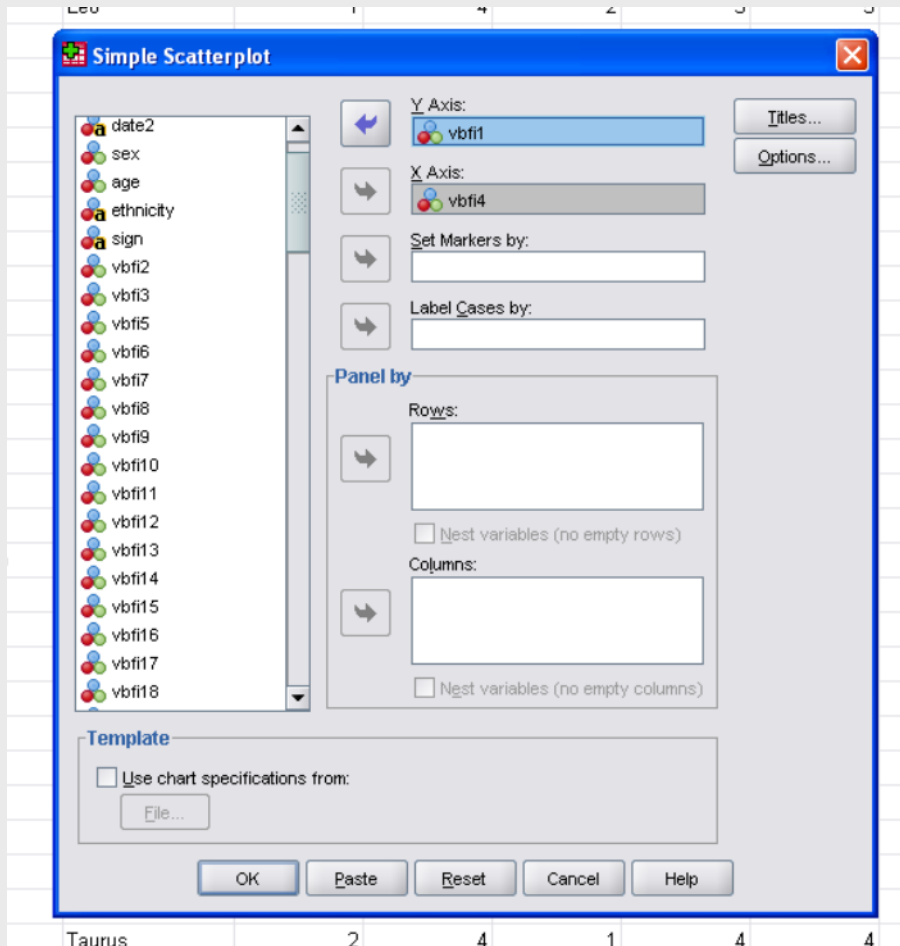Plot each person in this two dimensional space as a set of (*x*, *y*) coordinates.

Person	Zx	Zy
A	1.55	1.39
B	0.15	0.28
C	-0.75	-1.44
D	0.48	0.64
E	-1.34	-0.69
F	0.08	-0.19

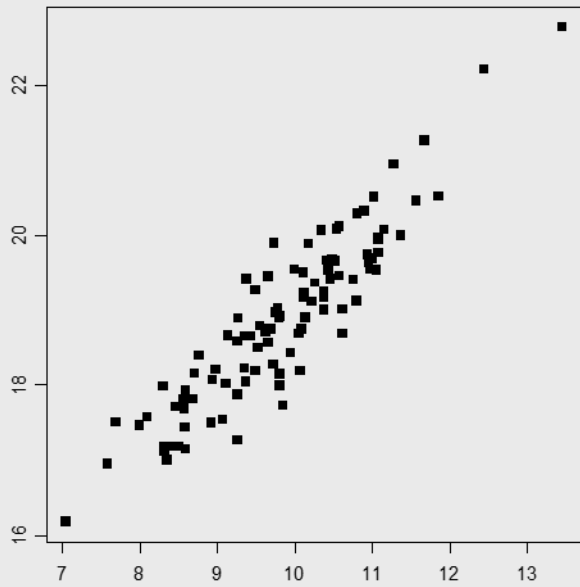# How to create a scatter plot in SPSS

How to create a scatter plot in SPSS
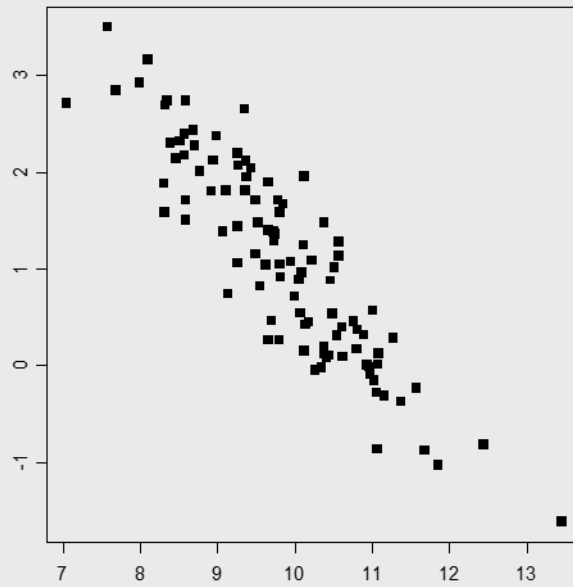

- Select the two variables of interest.
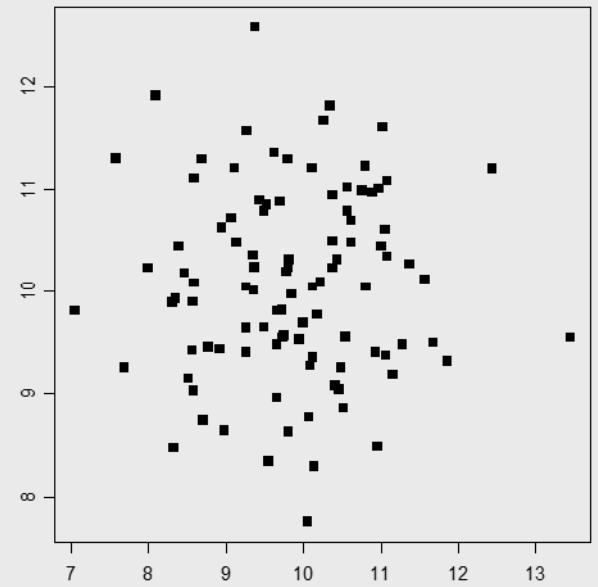- Click the "ok" button.

positive relationship   negative relationship   no relationship

Quantifying the relationship

- How can we quantify the linear relationship between two variables?

- One way to do so is with a commonly used statistic called the **correlation coefficient** (often denoted as *r*).

Some useful properties of the correlation coefficient

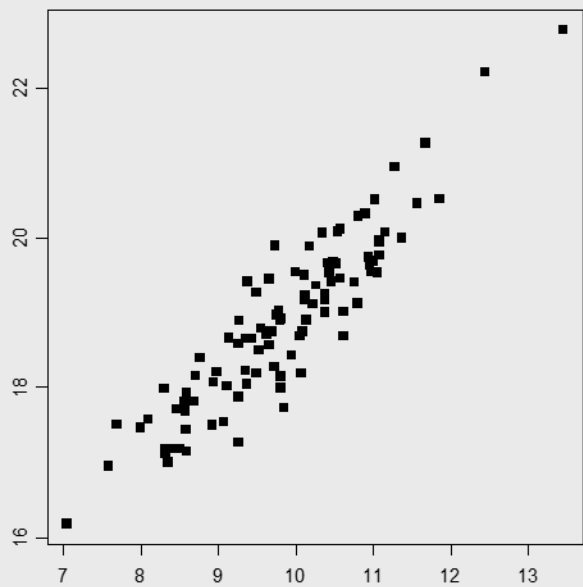(1) Correlation coefficients range between –1 and + 1.

Note: In this respect, r is useful in the same way that z-scores are useful: they both use a standardized metric.

Some useful properties of the correlation coefficient

(2) The value of the correlation conveys information about the form of the relationship between the two variables.

- When $r > 0$, the relationship between the two variables is positive.

- When $r < 0$, the relationship between the two variables is negative--an inverse relationship (higher scores on x correspond to lower scores on y).

- When $r = 0$, there is no relationship between the two variables.
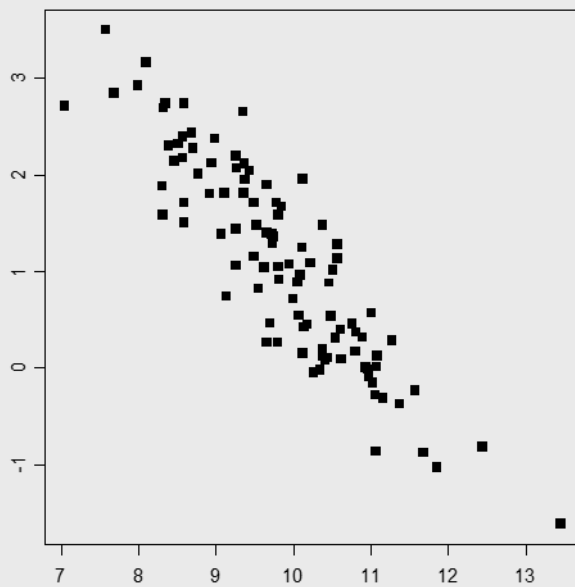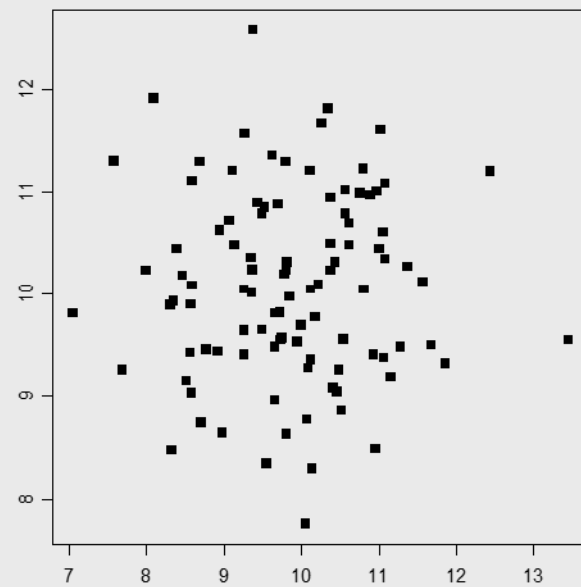
r = .80   *r* = -.80   *r* = 0

Some useful properties of the correlation coefficient

(3) The correlation coefficient can be interpreted as the slope of the line that maps the relationship between two standardized variables.

slope as rise over run

$r = .50$

takes you
up .5 on y

rise

run

moving from
0 to 1 on x
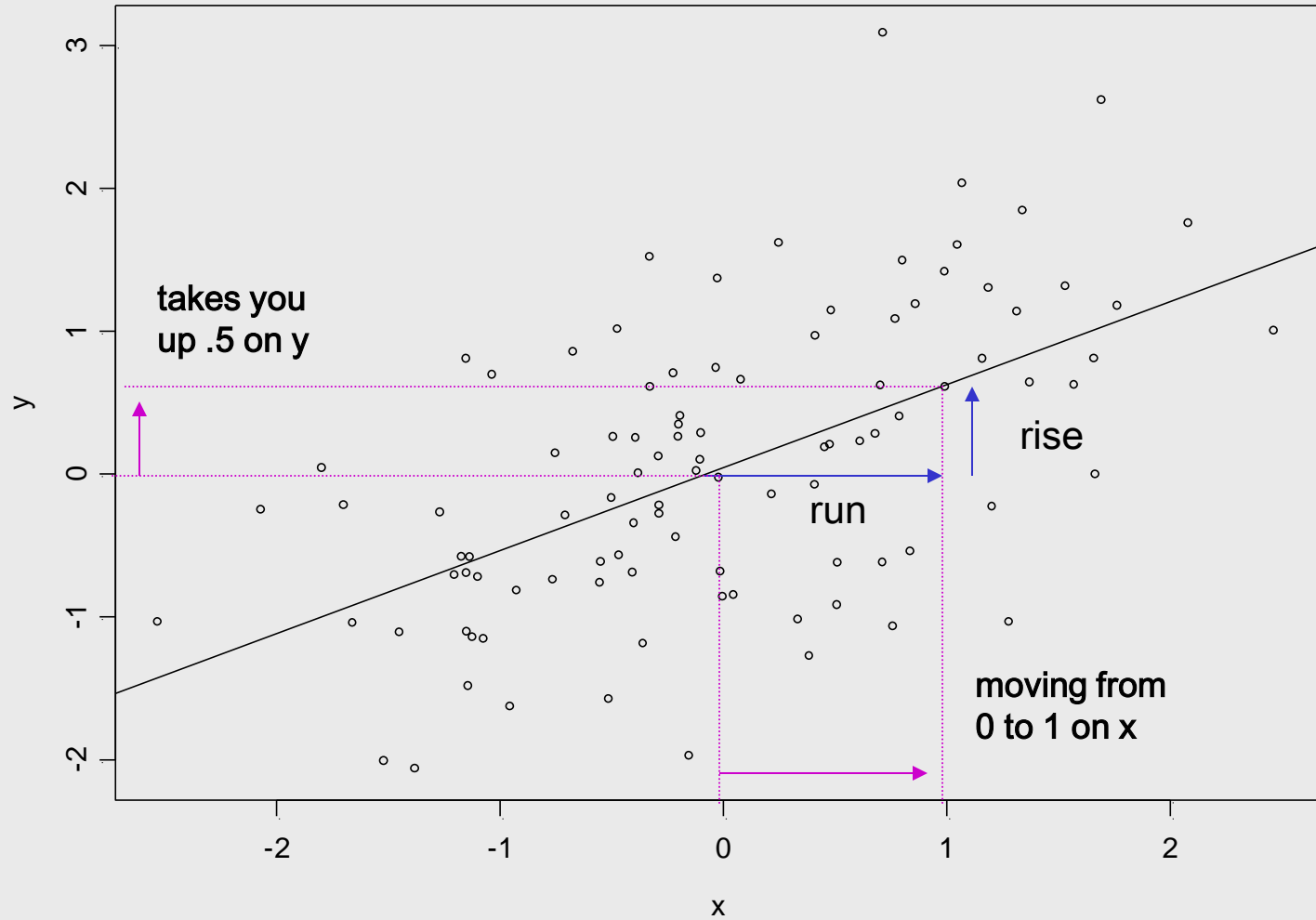
How do you compute a correlation coefficient?

$$\frac{\sum z_X z_Y}{N} = r$$

- First, transform each variable to a standardized form (i.e., z-scores).

- Multiply each person's z-scores together.

- Finally, average those products across people.

Example

Person	Violent game playing (z-scores): Z_x	Aggressive behavior (z-scores): Z_y	$Z_x Z_y$
Combo	1	1	1
Jesse	1	1	1
Pete	-1	-1	1
Badger	-1	-1	1
Average	0	0	1 = $\frac{1}{N}\sum z_x z_y$

Why products? Important Note on 2 x 2
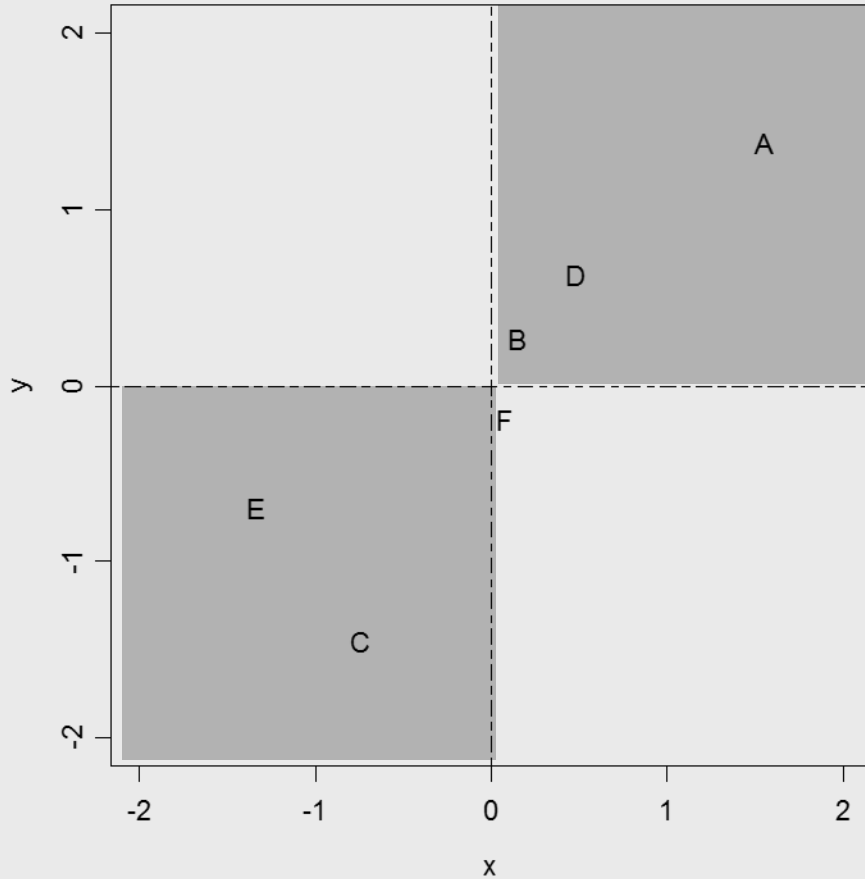
Matching z-scores via products

Person	Zx	Zy
A	1.55	1.39
B	0.15	0.28
C	-0.75	-1.44
D	0.48	0.64
E	-1.34	-0.69
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Important Note on 2 x 2
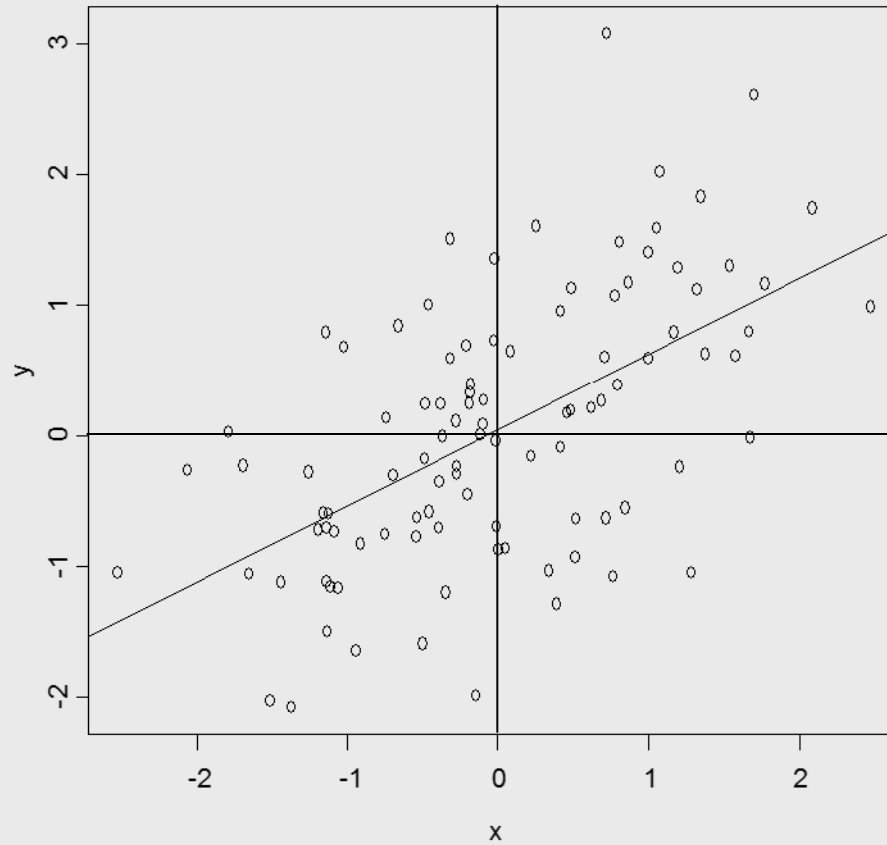
Computing Correlations in SPSS
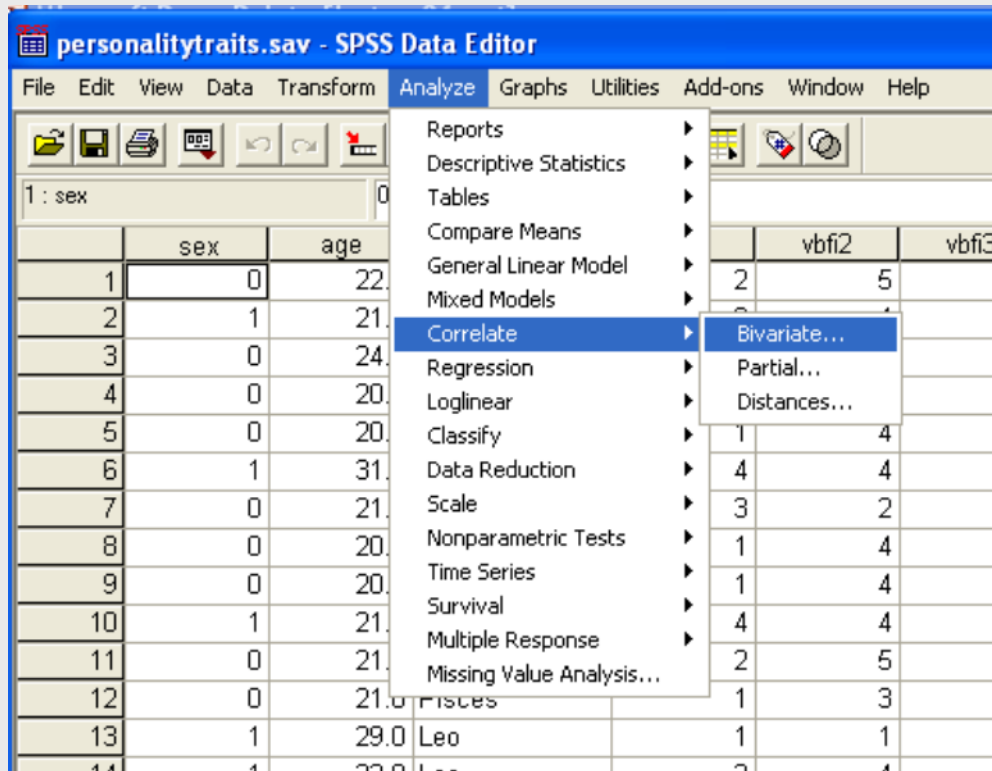
- Go to the "Analyze" menu.
- Select "Correlate"
- Select "Bivariate…"

Computing Correlations in SPSS

- Select the variables you want to correlate

- Shoot them over to the right-most window

- Click on the "Ok" button.

Magnitude of correlations

- When is a correlation "big" versus "small?"
- Cohen's standards:
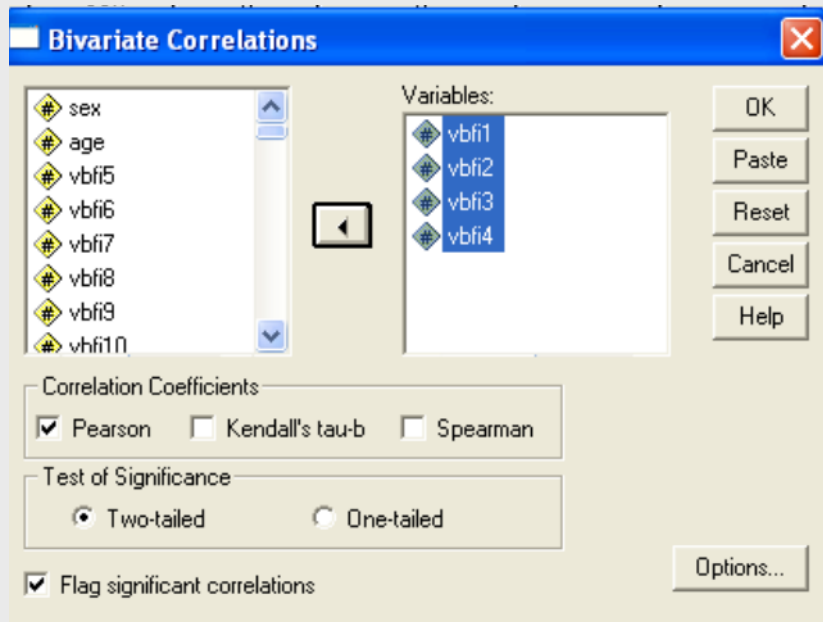 - .1 small
  - .3 medium
  - > .5 large

What are typical correlations in personality psychology?

Typical sample sizes and effect sizes in studies conducted in personality psychology.

	Mdn	*M*	*SD*	*Range*
N	120	179	159	15 – 508
r	.21	.24	.17	0 – .96

Note. The absolute value of *r* was used in the calculations reported here. Data are based on articles published in the 2004 volumes of *JPSP:PPID* and *JP*.

A selection of effect sizes from various domains of research

Variables	r
Effect of sugar consumption on the behavior and cognitive process of children	.00
Chemotherapy and surviving breast cancer	.03
Coronary artery bypass surgery for stable heart disease and survival at 5 years	.08
Combat exposure in Vietnam and subsequent PTSD within 18 years	.11
Self-disclosure and likeability	.14
Post-high school grades and job performance	.16
Psychotherapy and subsequent well-being	.32
Social conformity under the Asch line judgment task	.42
Attachment security of parent and quality of offspring attachment	.47
Gender and height for U.S. Adults	.67

Note. Table adapted from Table 1 of Meyer et al. (2001).

Magnitude of correlations

- "real world" correlations are rarely get larger than .30.

- Why is this the case?
  - Any one variable can be influenced by a hundred other variables. To the degree to which a variable is multi-determined, the correlation between it and any one variable must be small.