How to display data badly

Karl W Broman

Department of Biostatistics & Medical Informatics
University of Wisconsin – Madison

`www.biostat.wisc.edu/~kbroman`

Using Microsoft Excel to obscure your data and annoy your readers

Karl W Broman

Department of Biostatistics & Medical Informatics
University of Wisconsin – Madison

`www.biostat.wisc.edu/~kbroman`

Inspiration

This lecture was inspired by

H Wainer (1984) How to display data badly. American Statistician 38(2): 137–147

Dr. Wainer was the first to elucidate the principles of the bad display of data.

The now widespread use of Microsoft Excel has resulted in remarkable advances in the field.
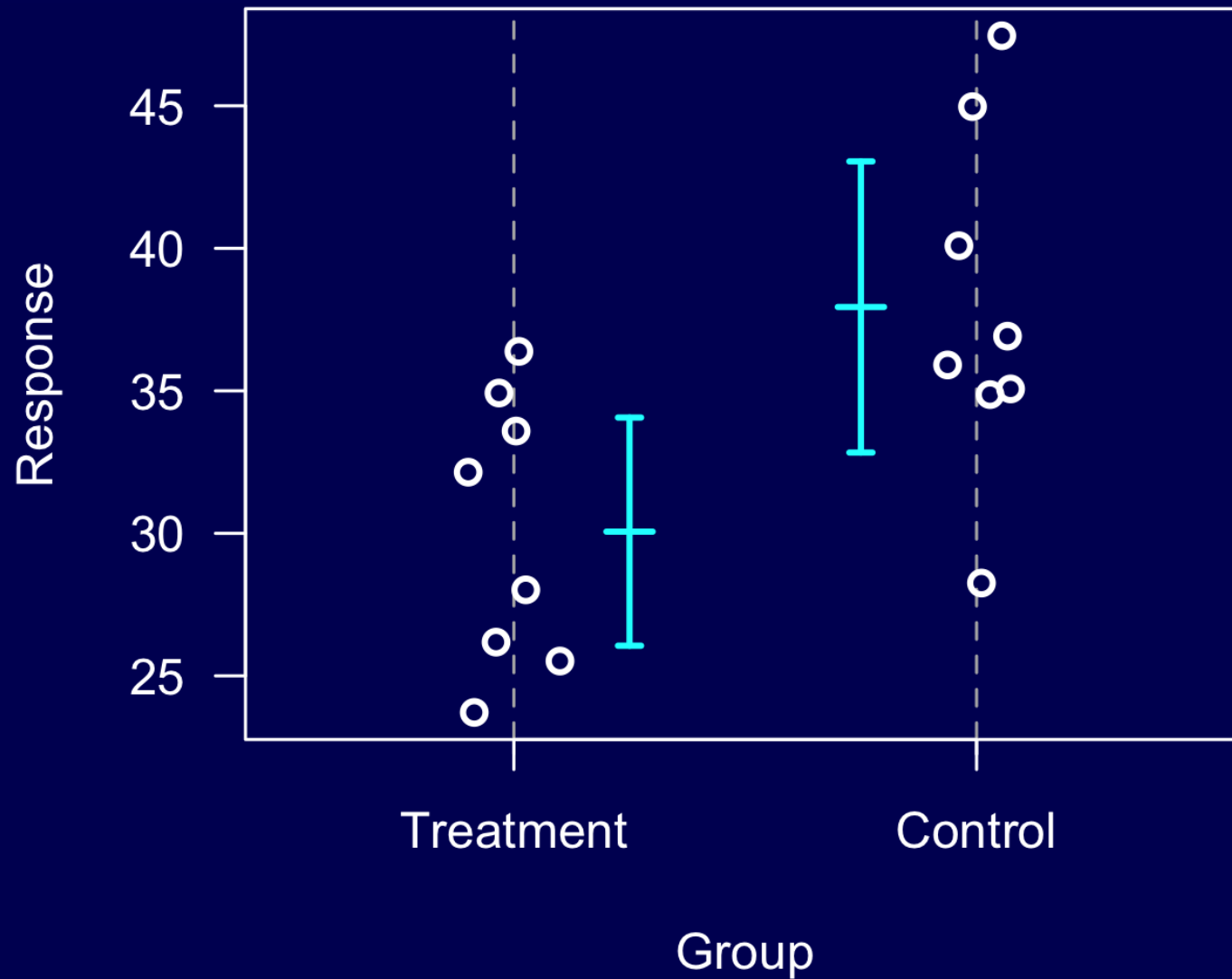
General principles

The aim of good data graphics:
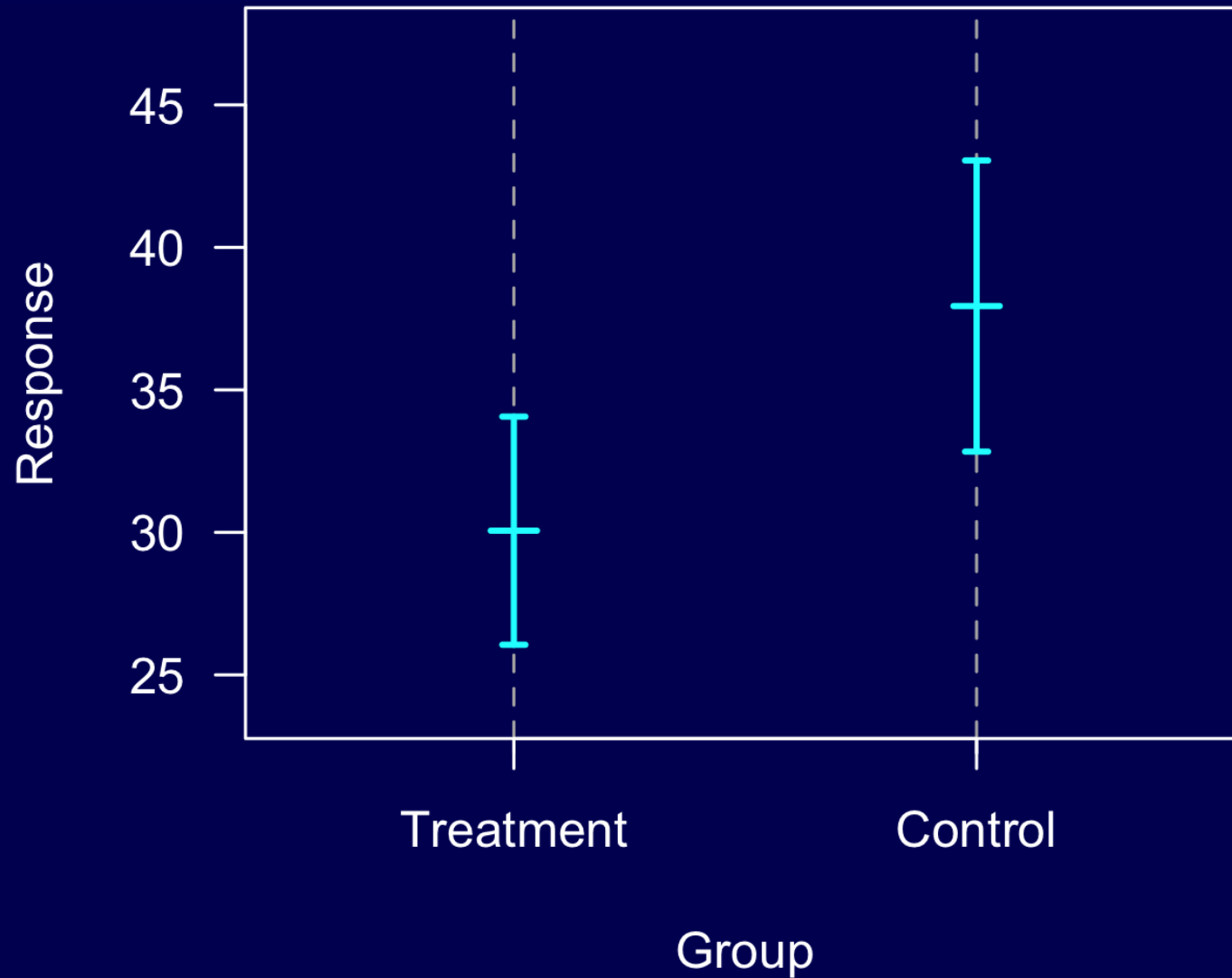
Display data accurately and clearly.

Some rules for displaying data badly:

- Display as little information as possible.
- Obscure what you do show (with chart junk).
- Use pseudo-3d and color gratuitously.
- Make a pie chart (preferably in color and 3d).
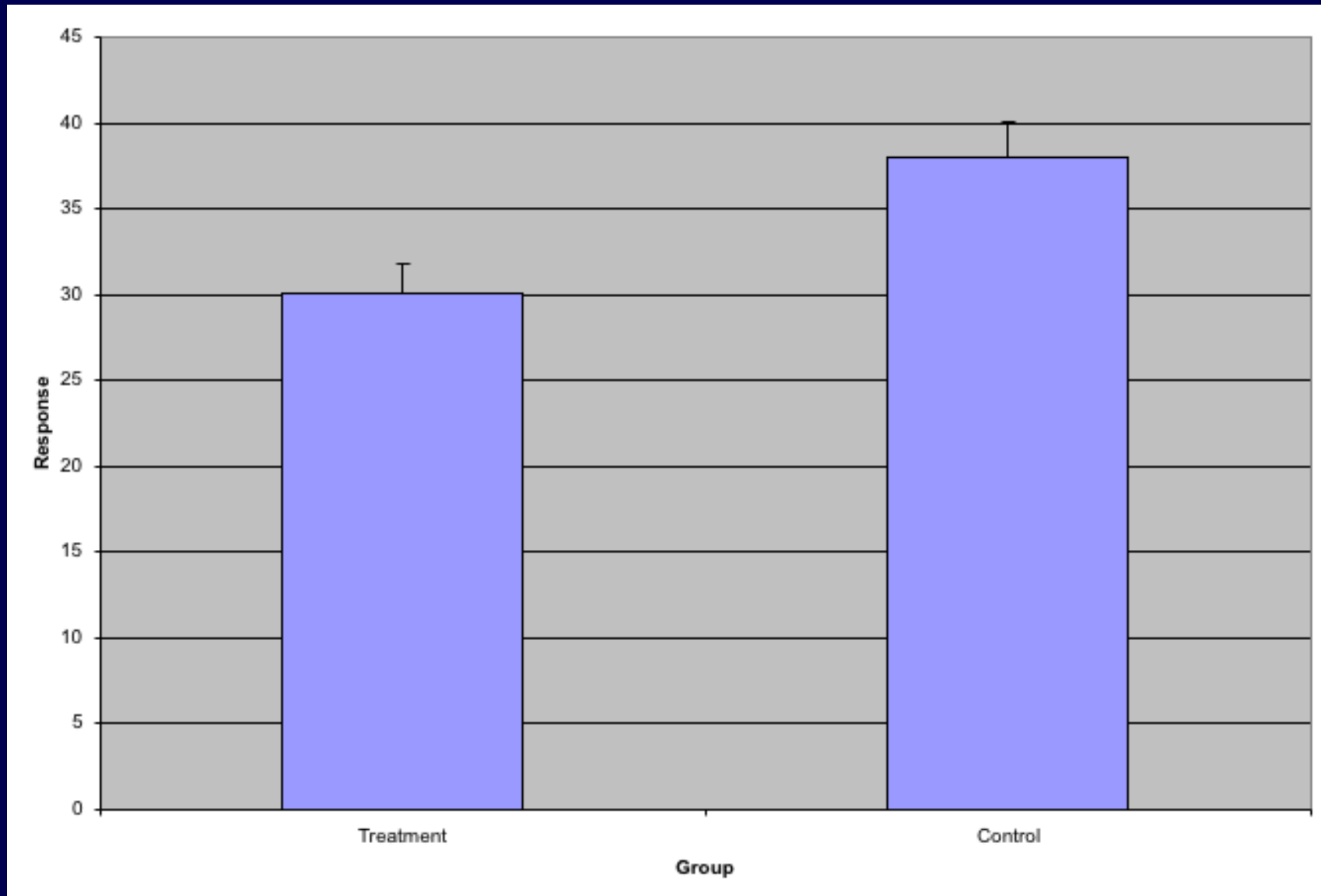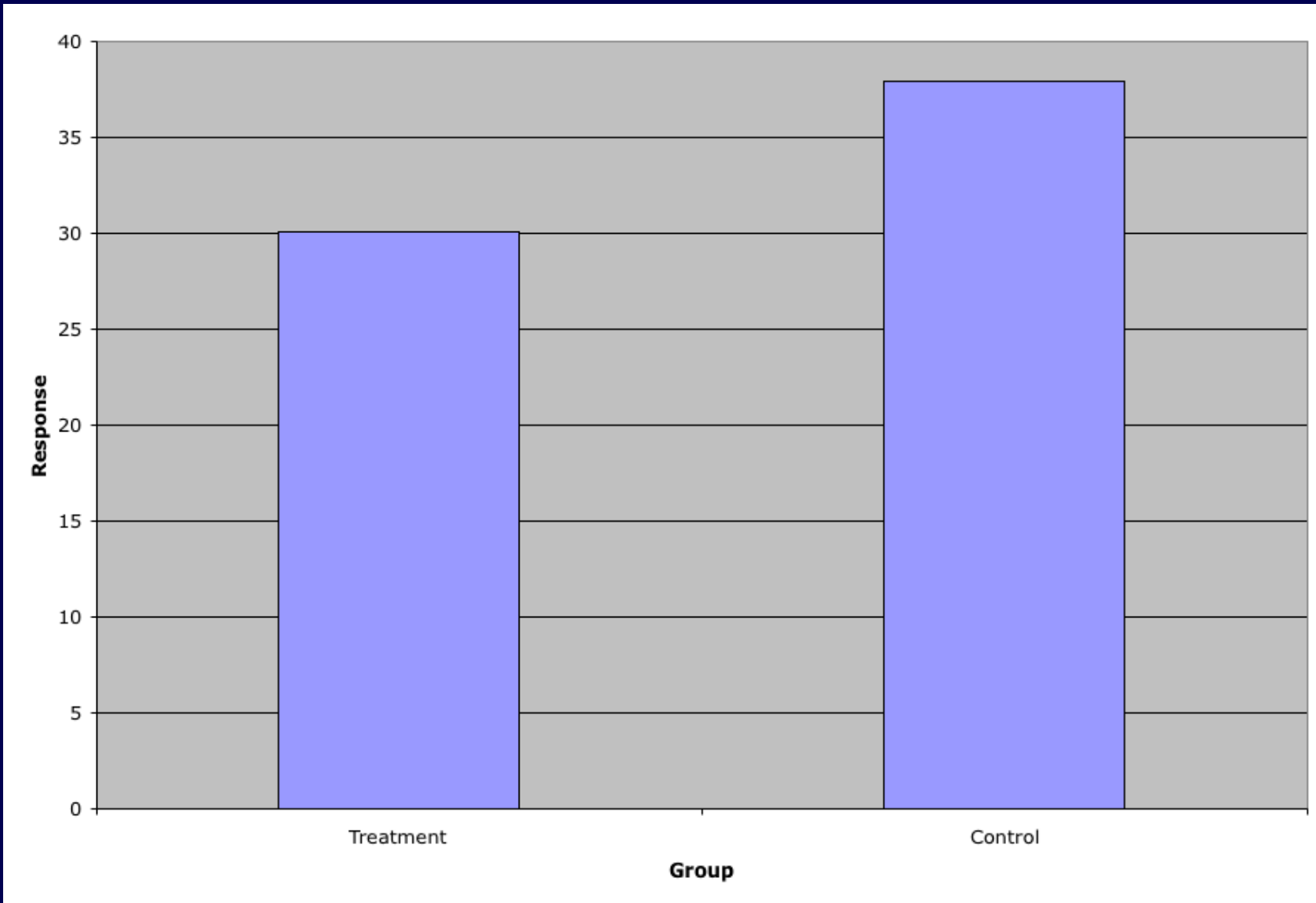- Use a poorly chosen scale.
- Ignore sig figs.
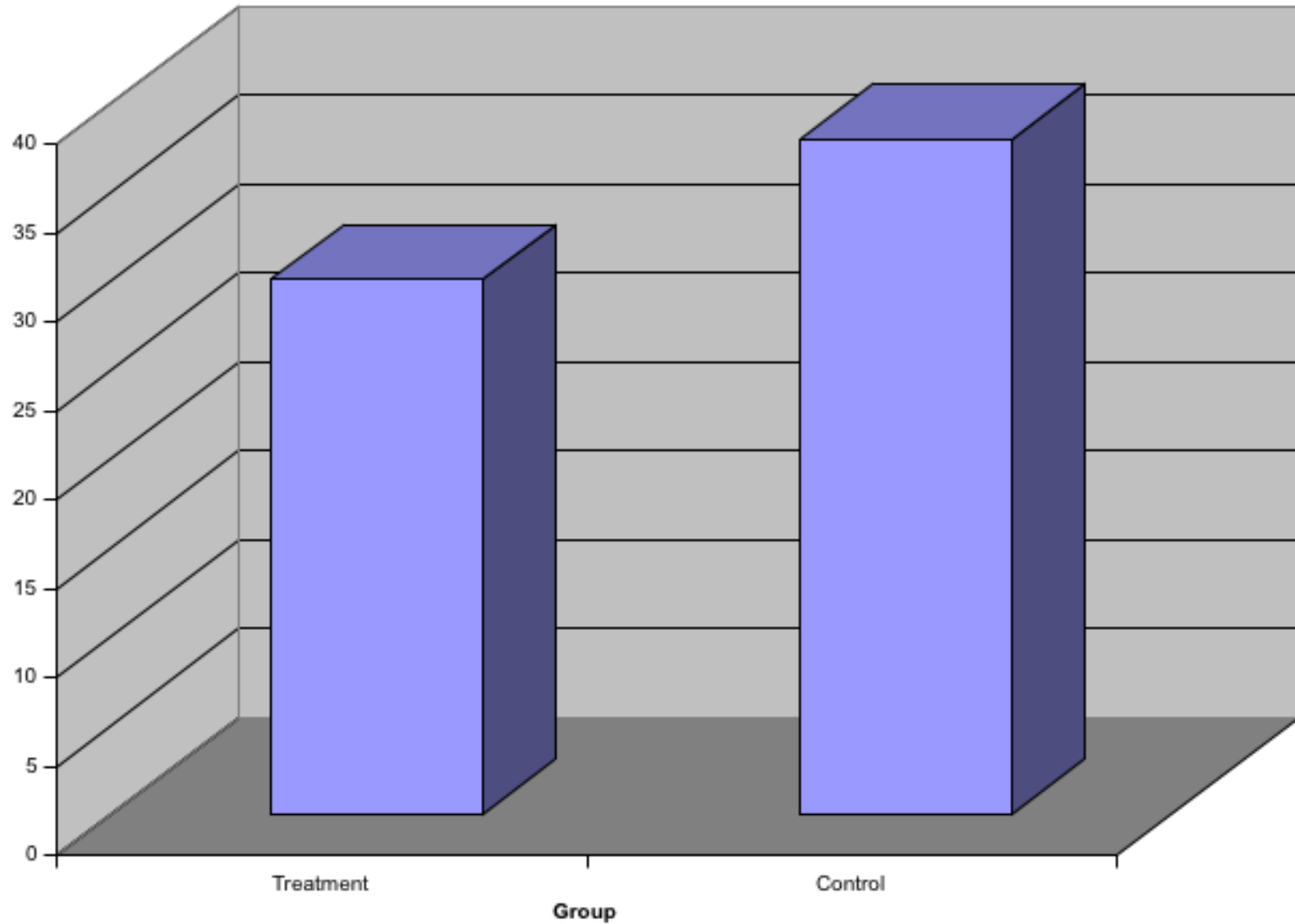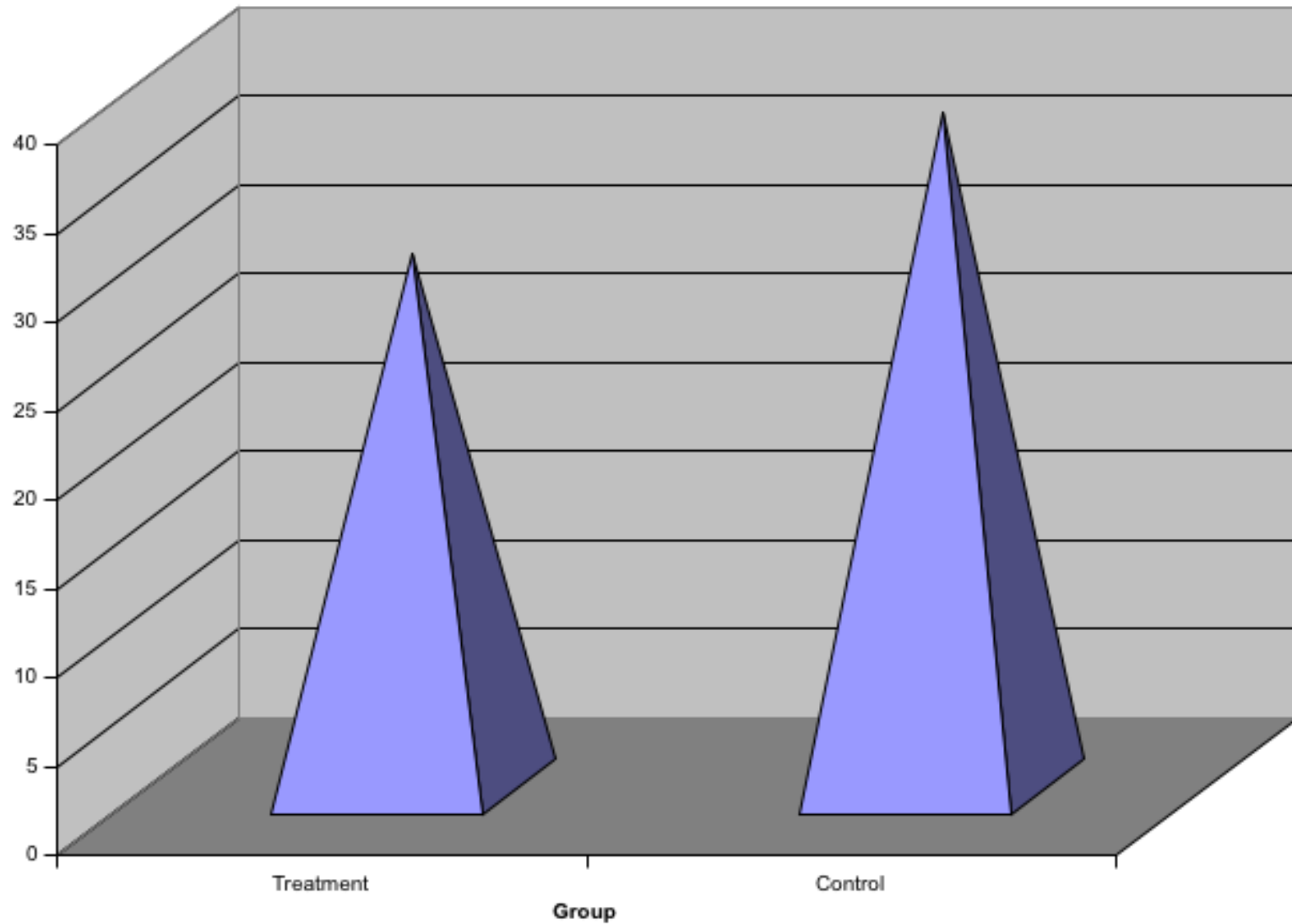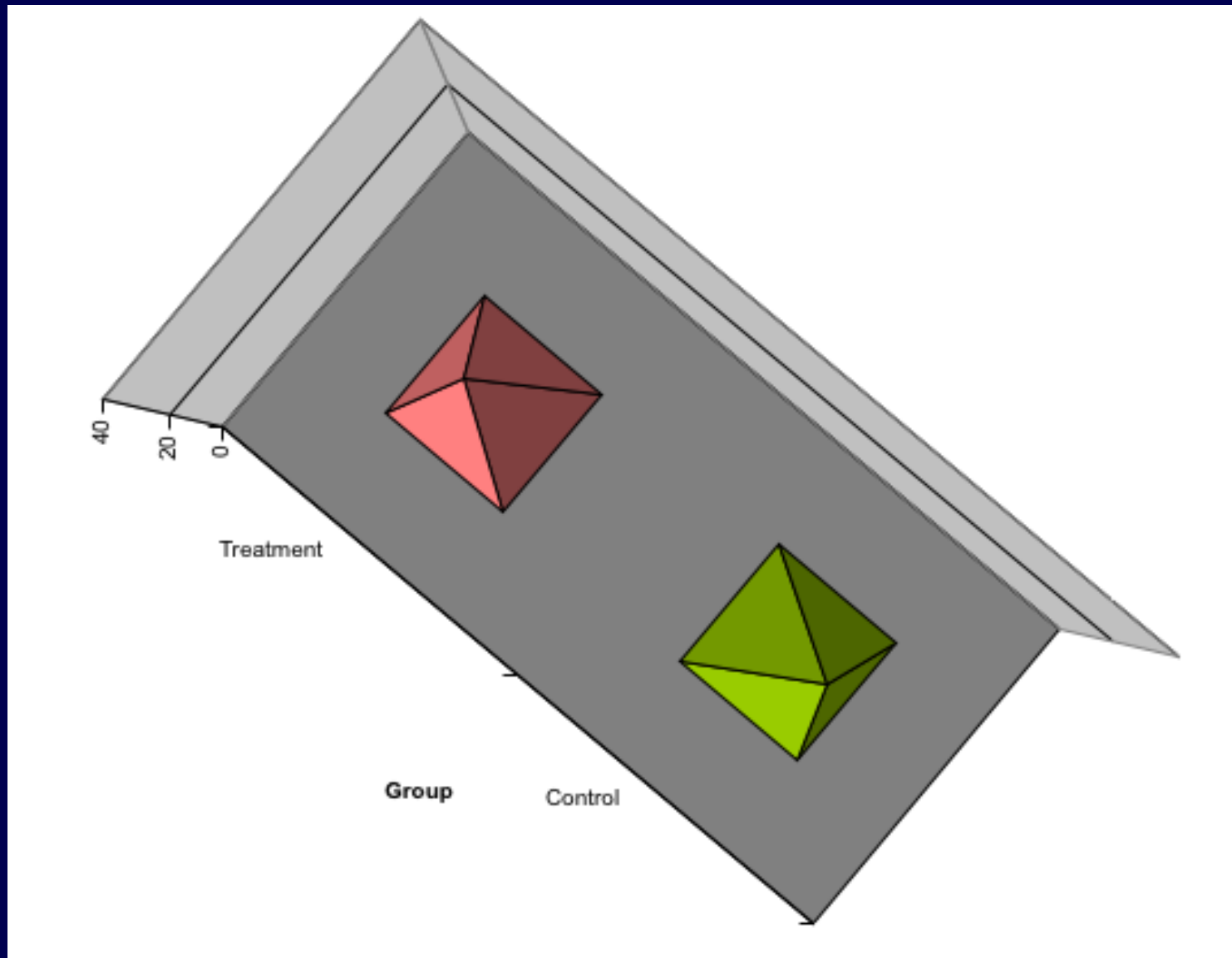
Example 1

Example 1
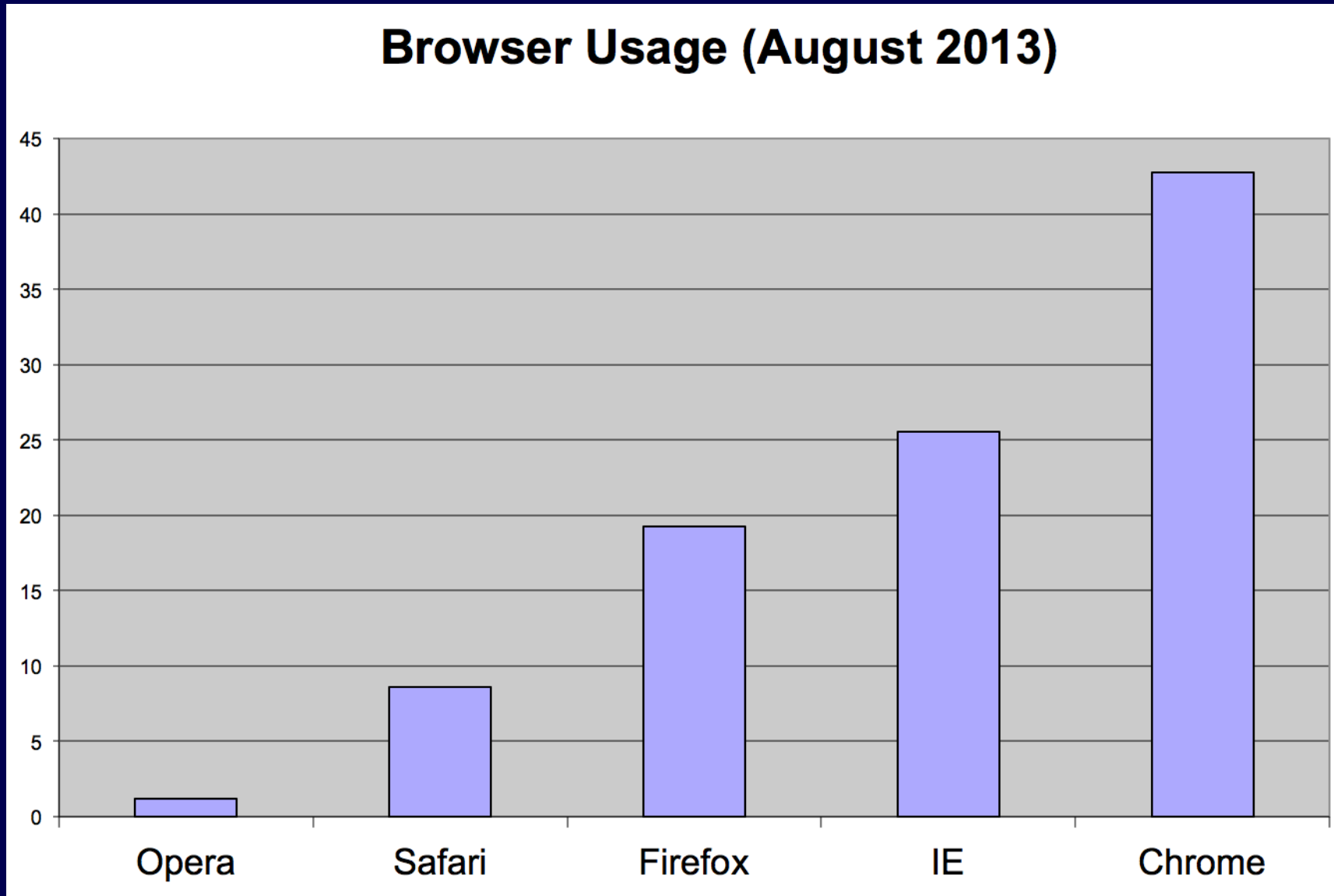
Example 1

Example 1

Example 1
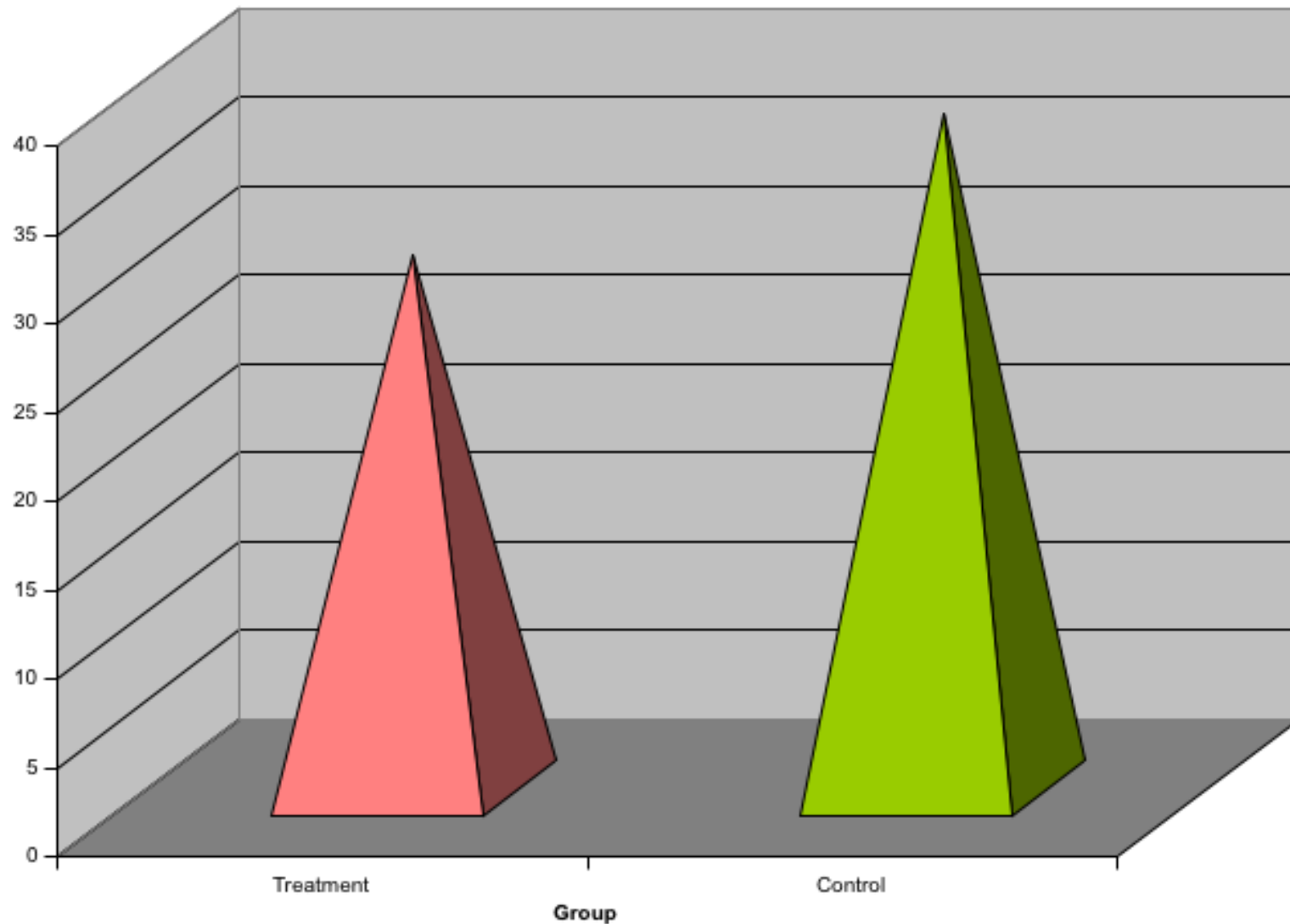
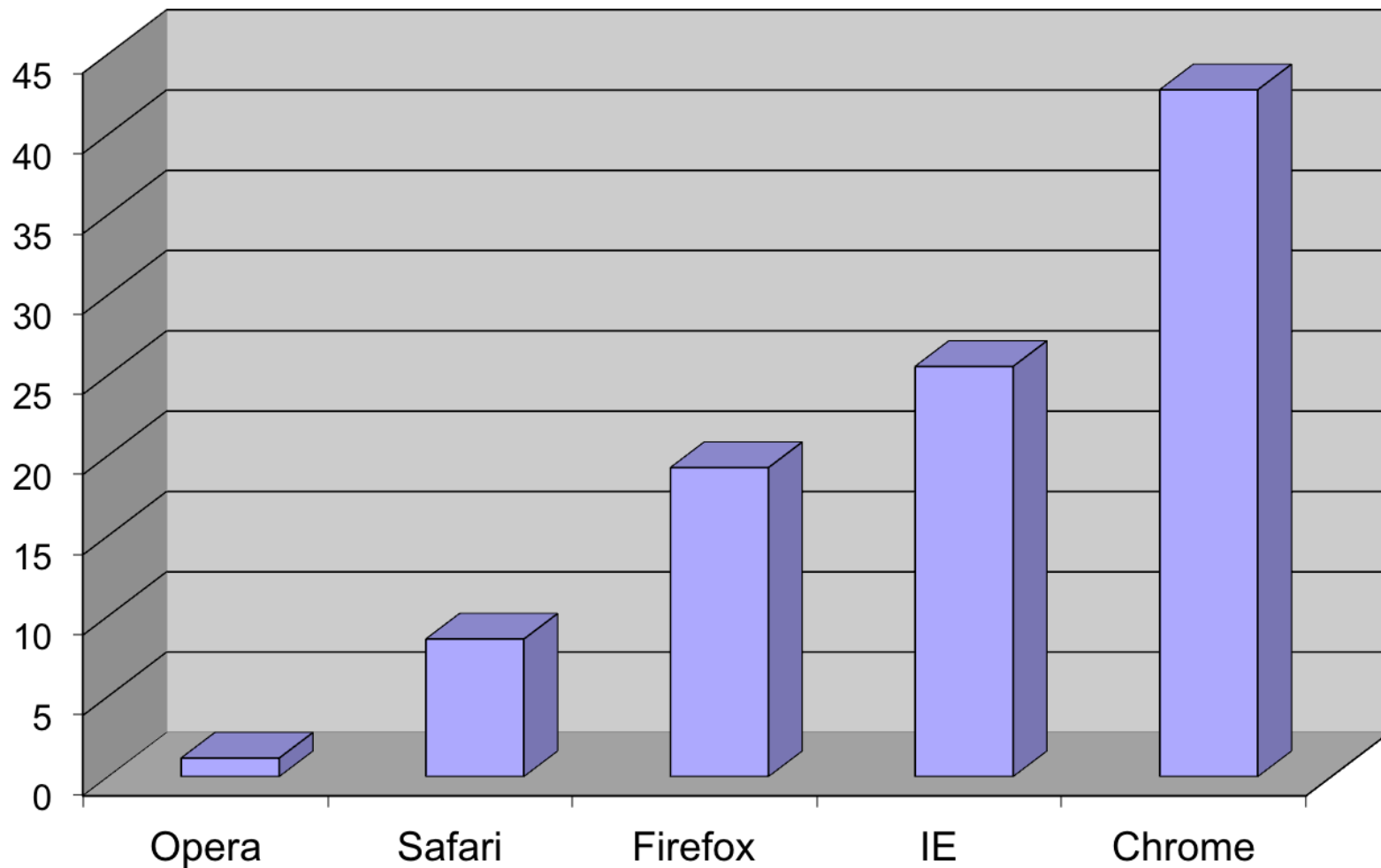# Example 1

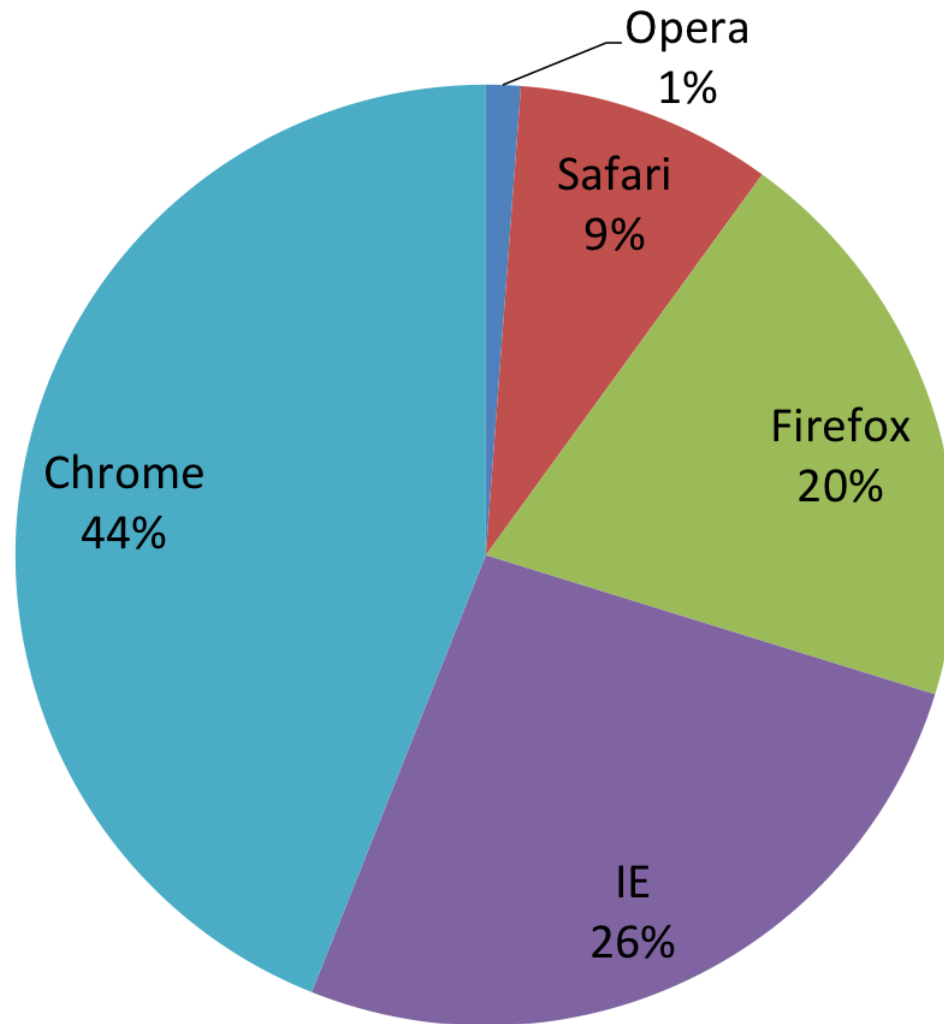# Example 1

Example 1

Example 2
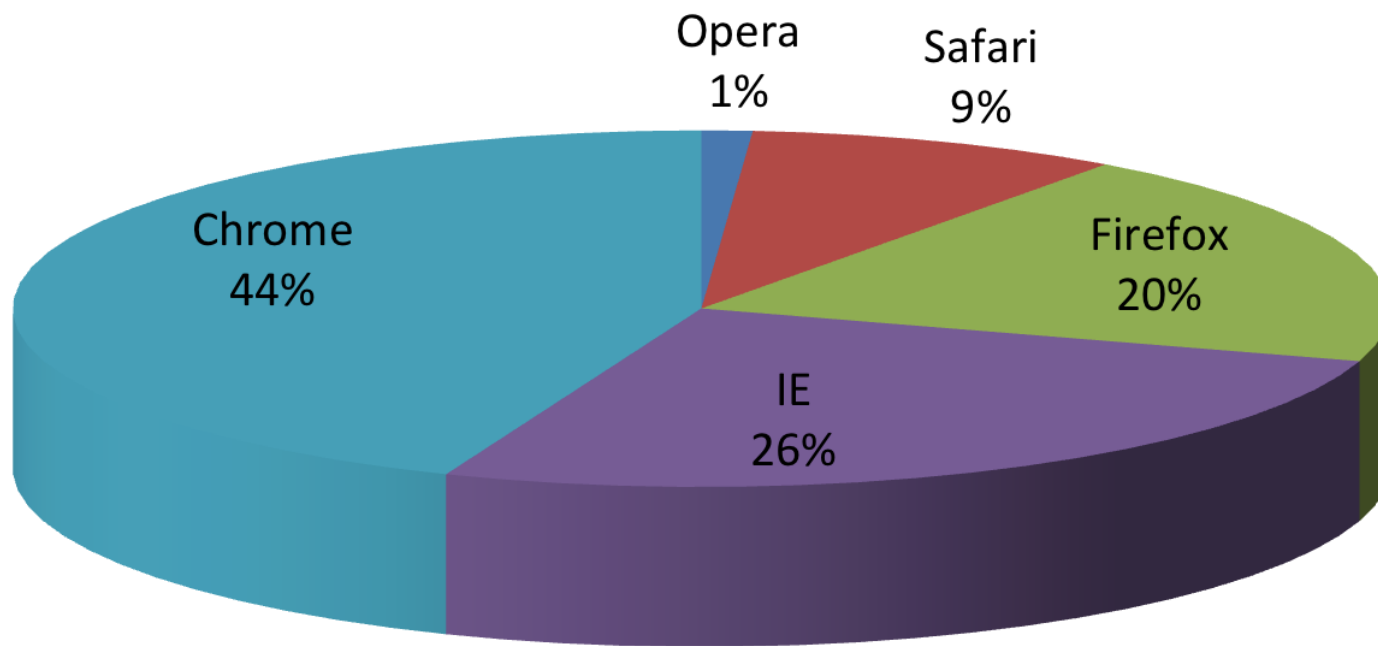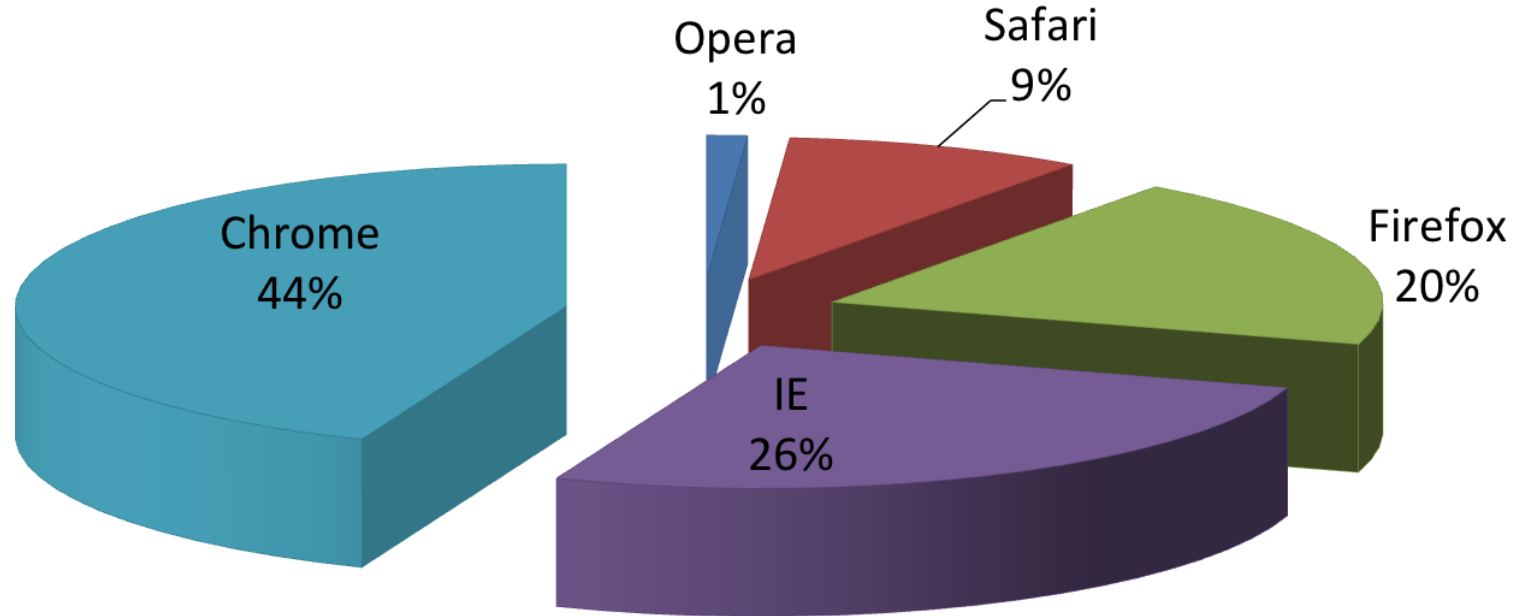

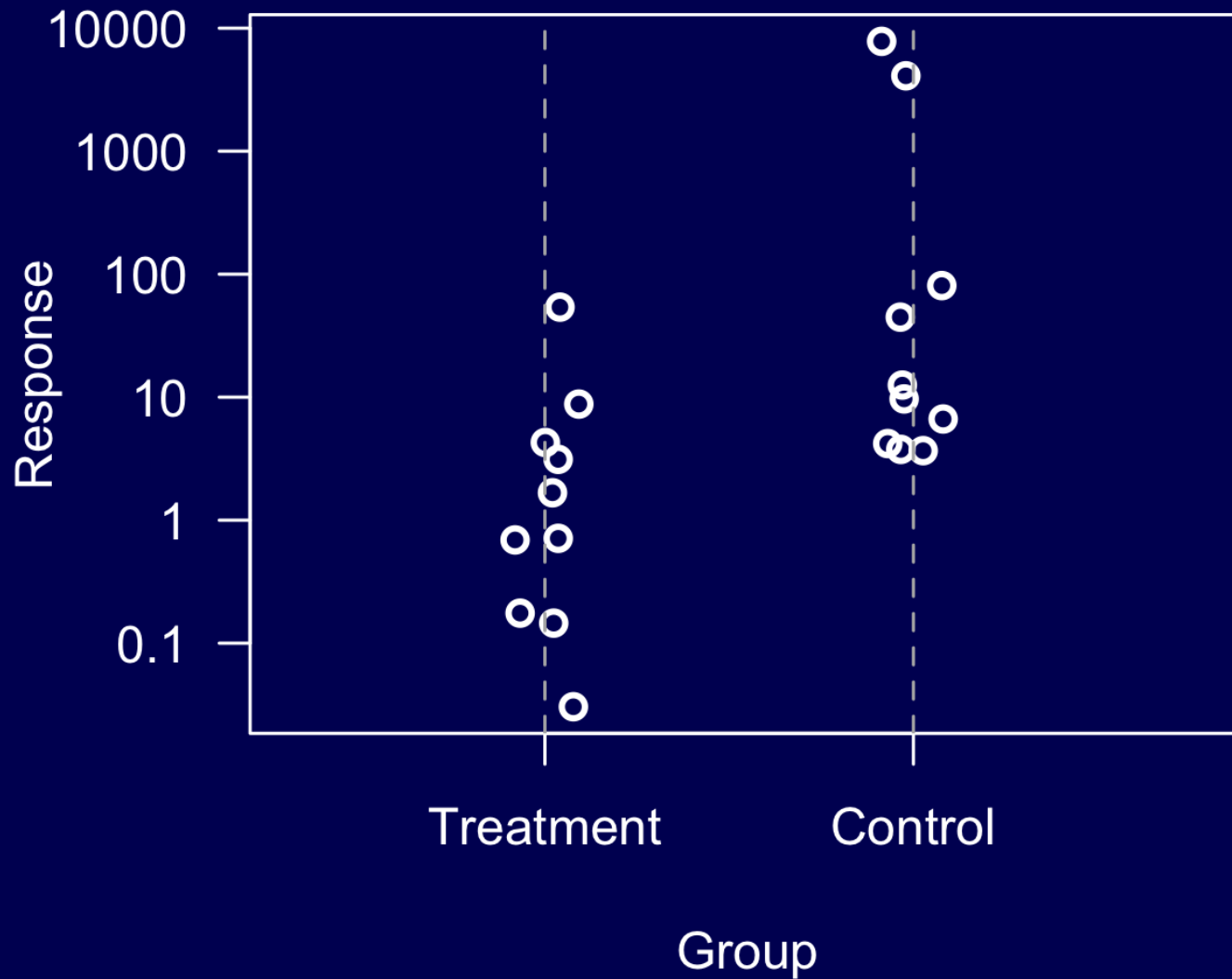**Browser Usage (August 2013)**

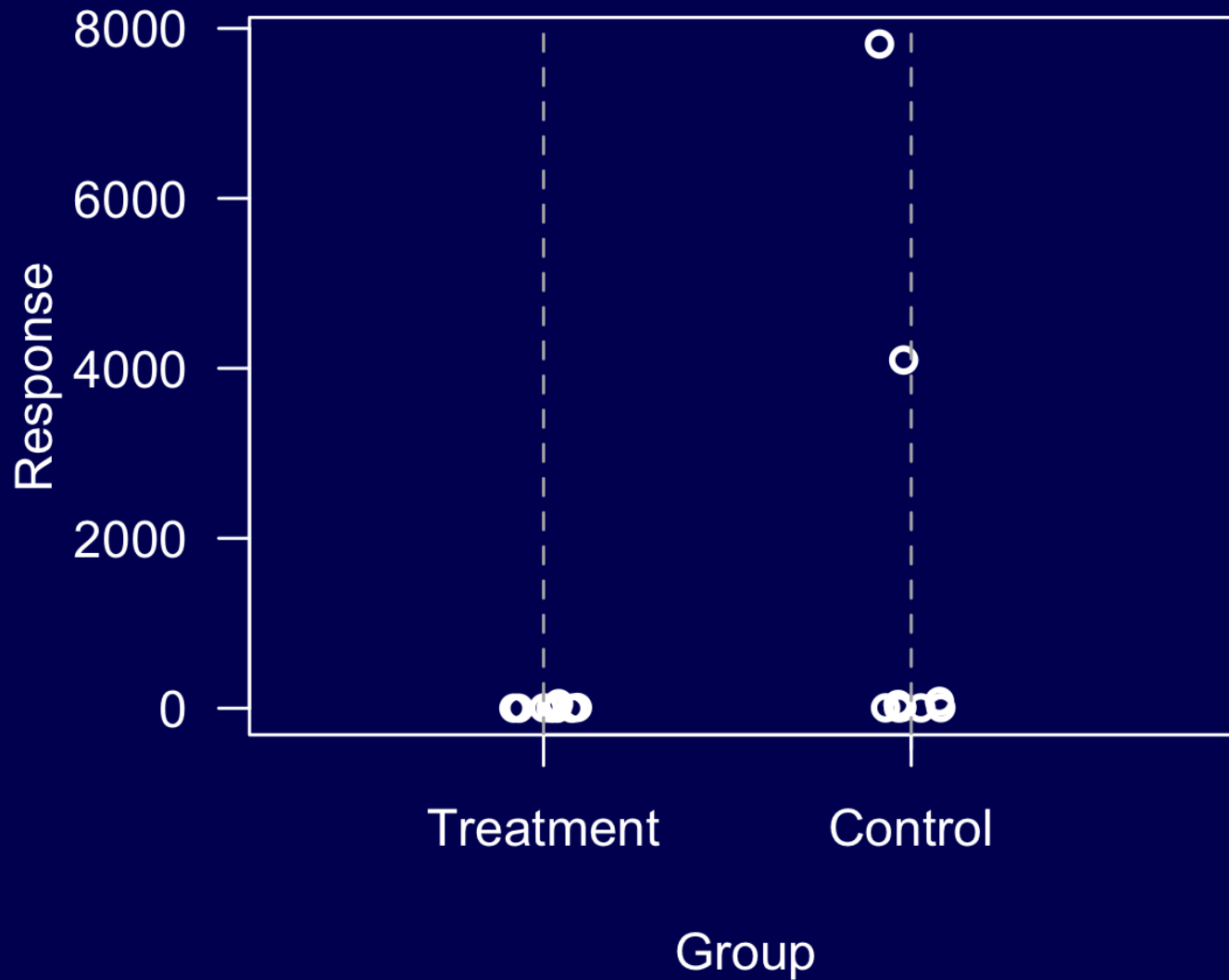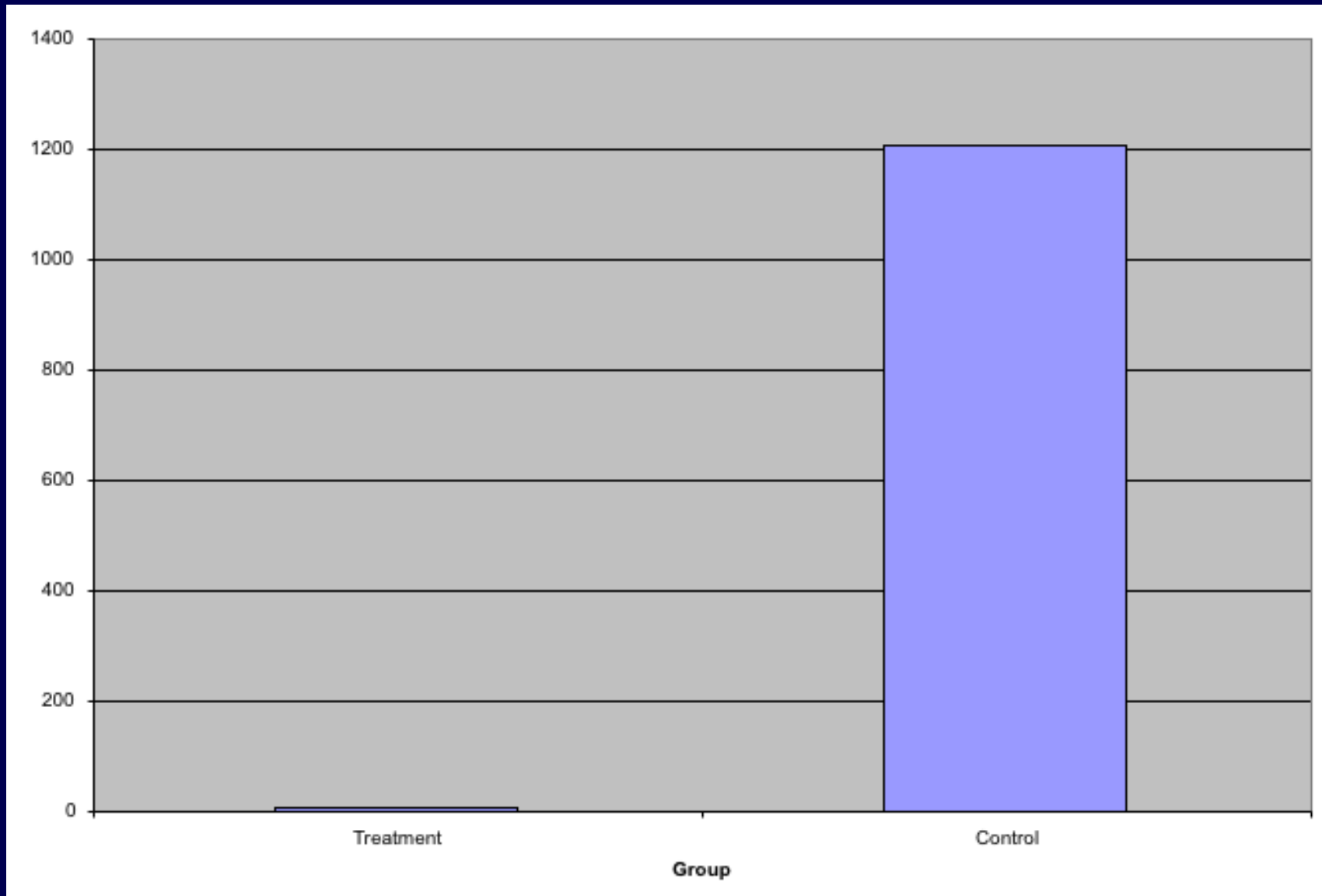# Example 2

Browser Usage (August 2013)

Example 2

Example 2

Example 2

Example 3

Example 3
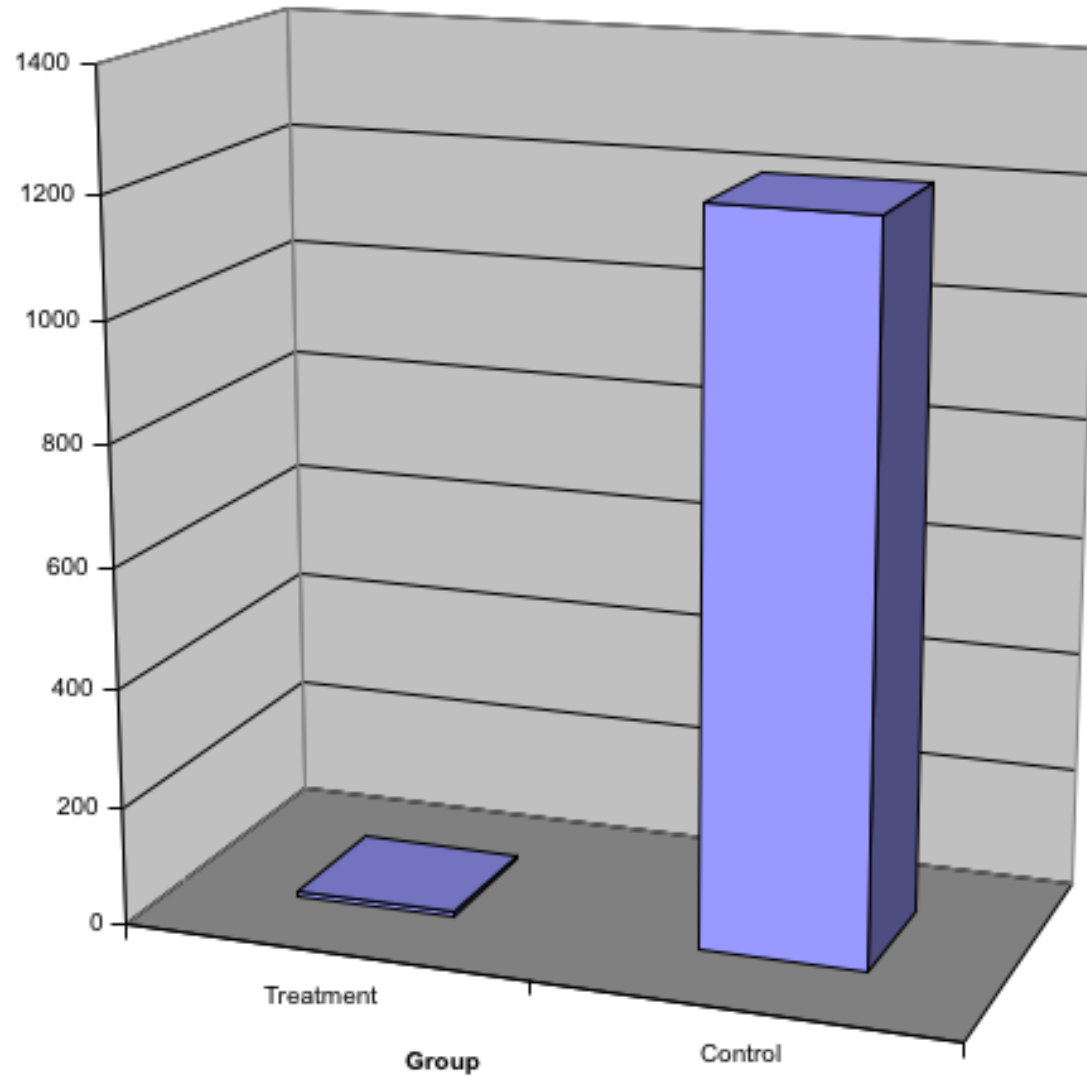
Example 3

Example 3
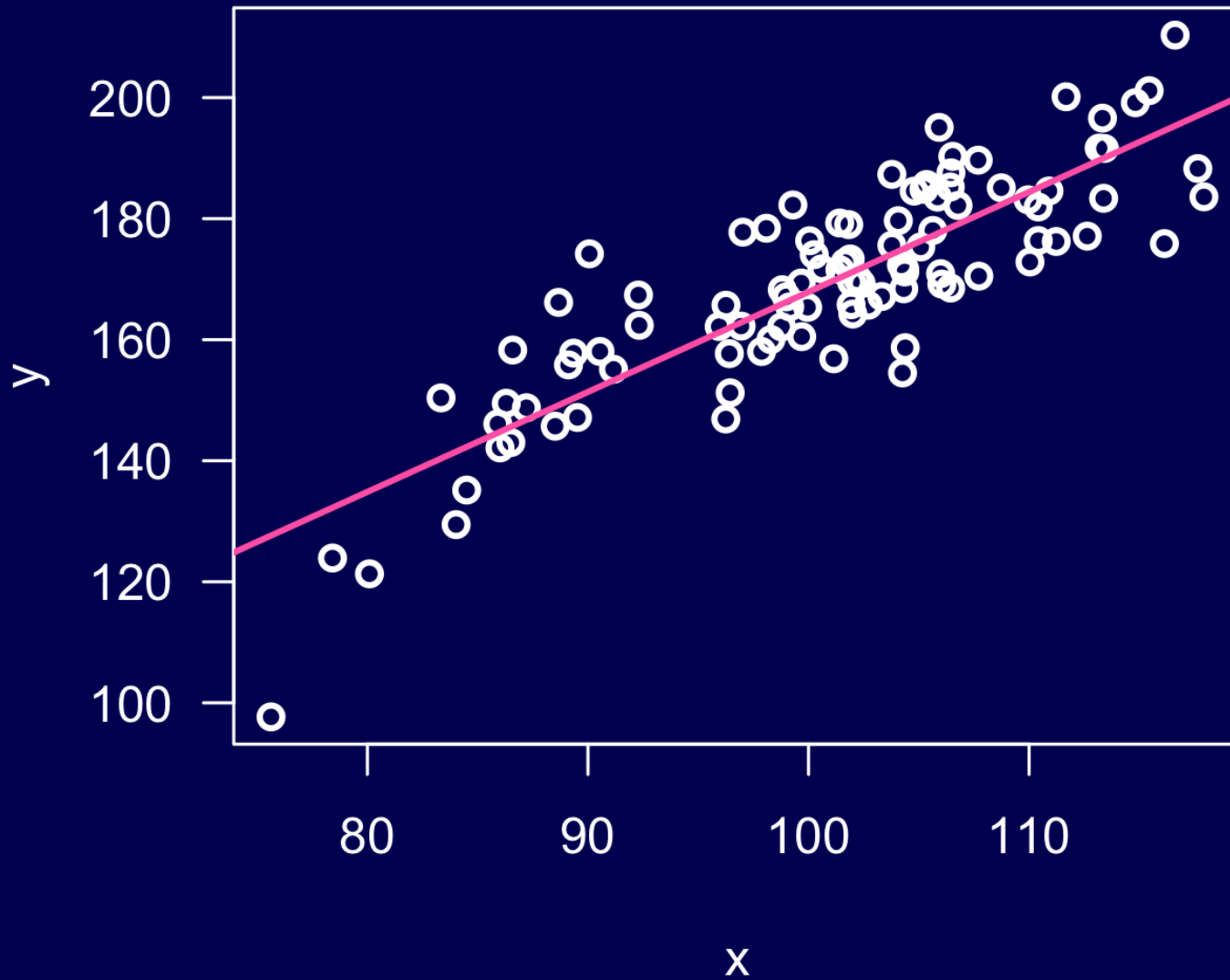
Example 4

Example 4

Example 4

$$y = 2.6981 + 1.652\, x$$
$$\rho = 0.8567$$
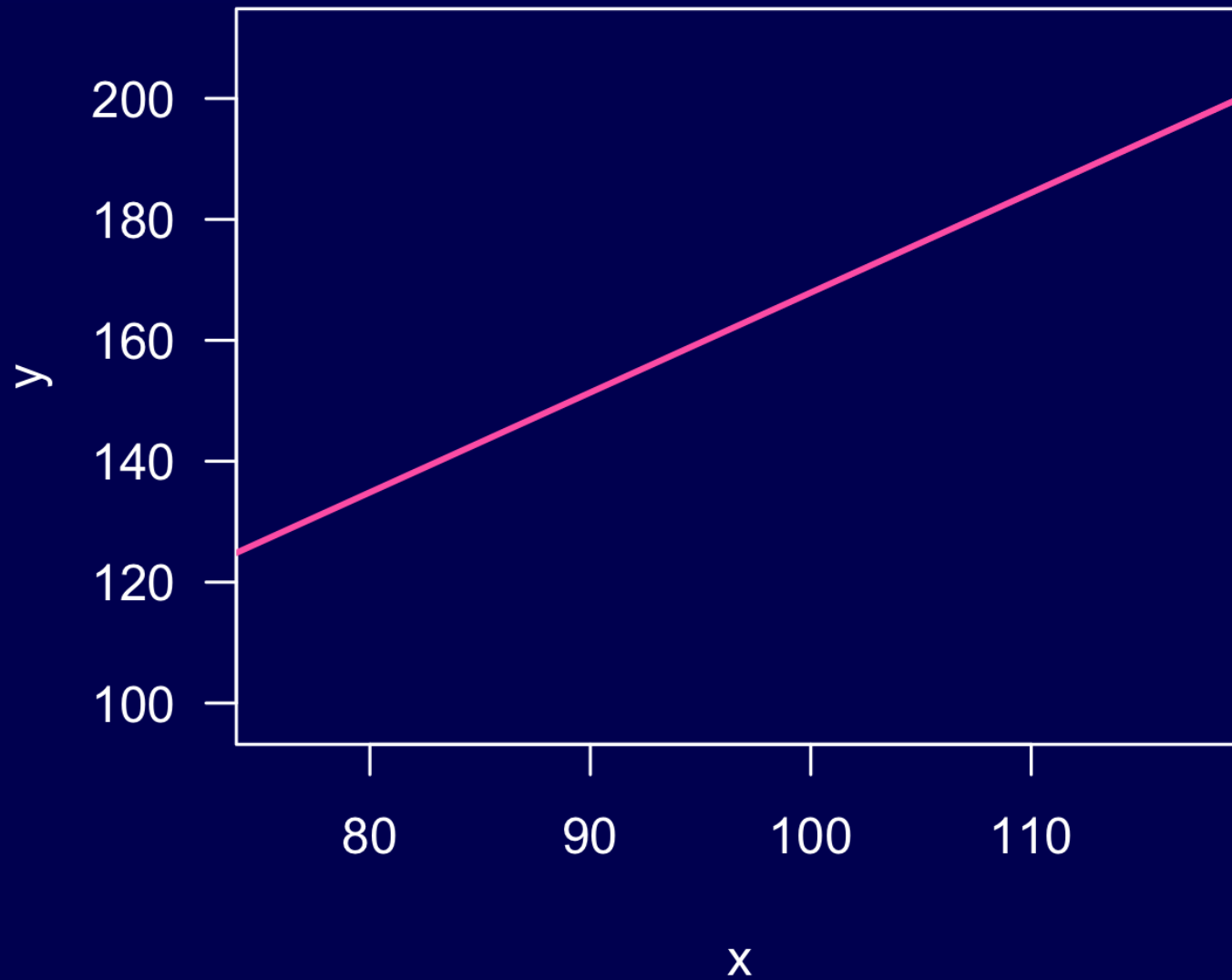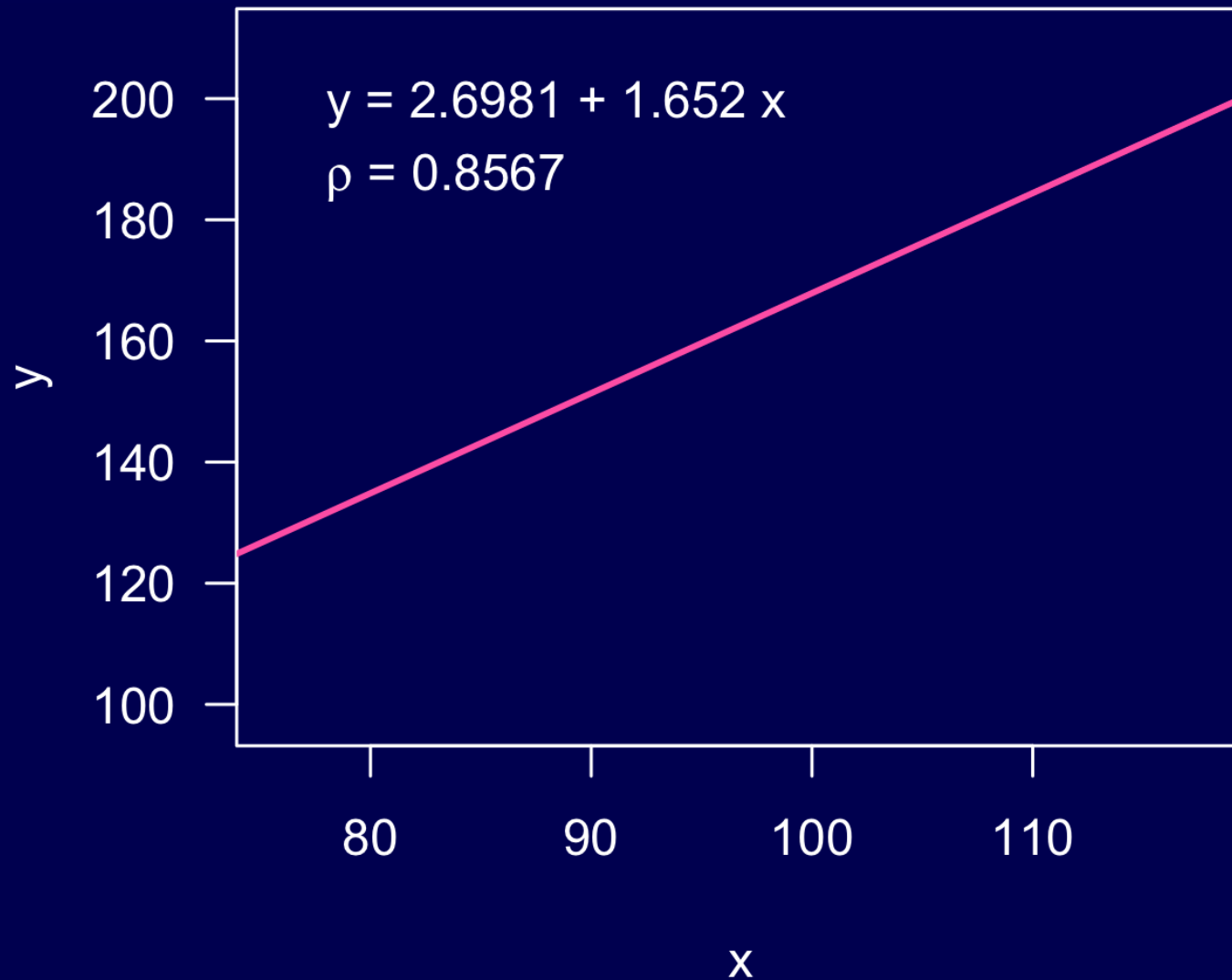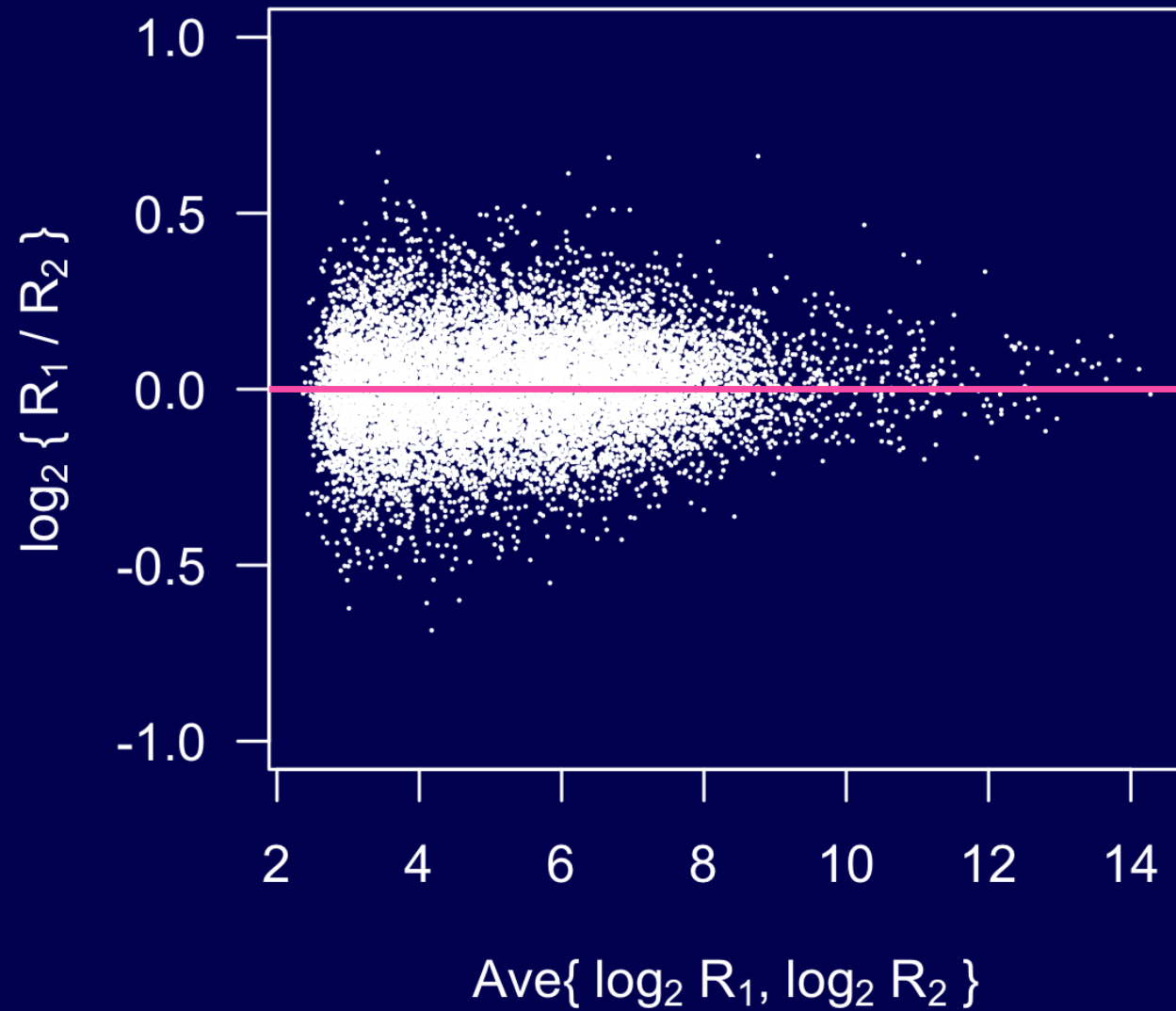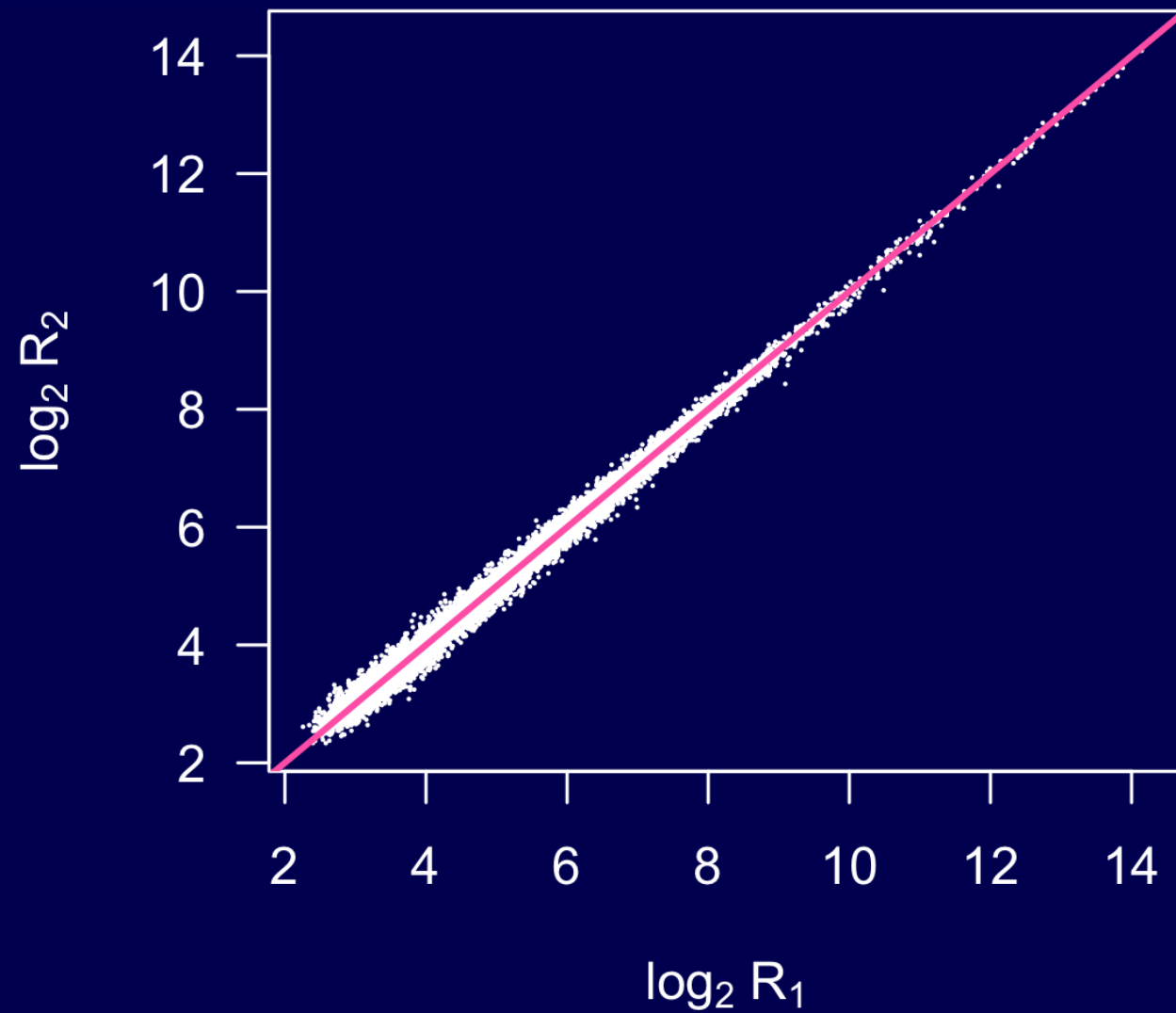
Example 5
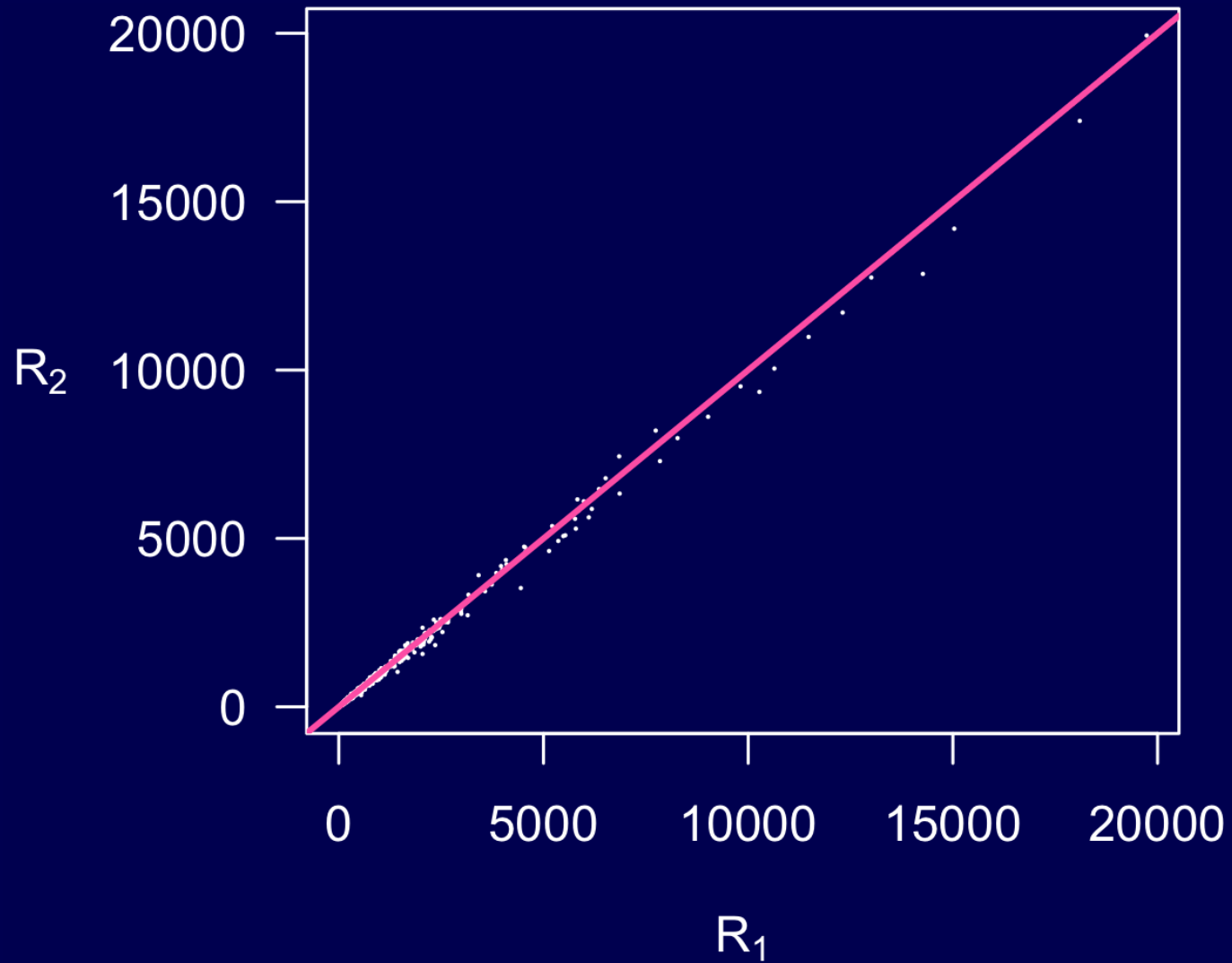
Example 5
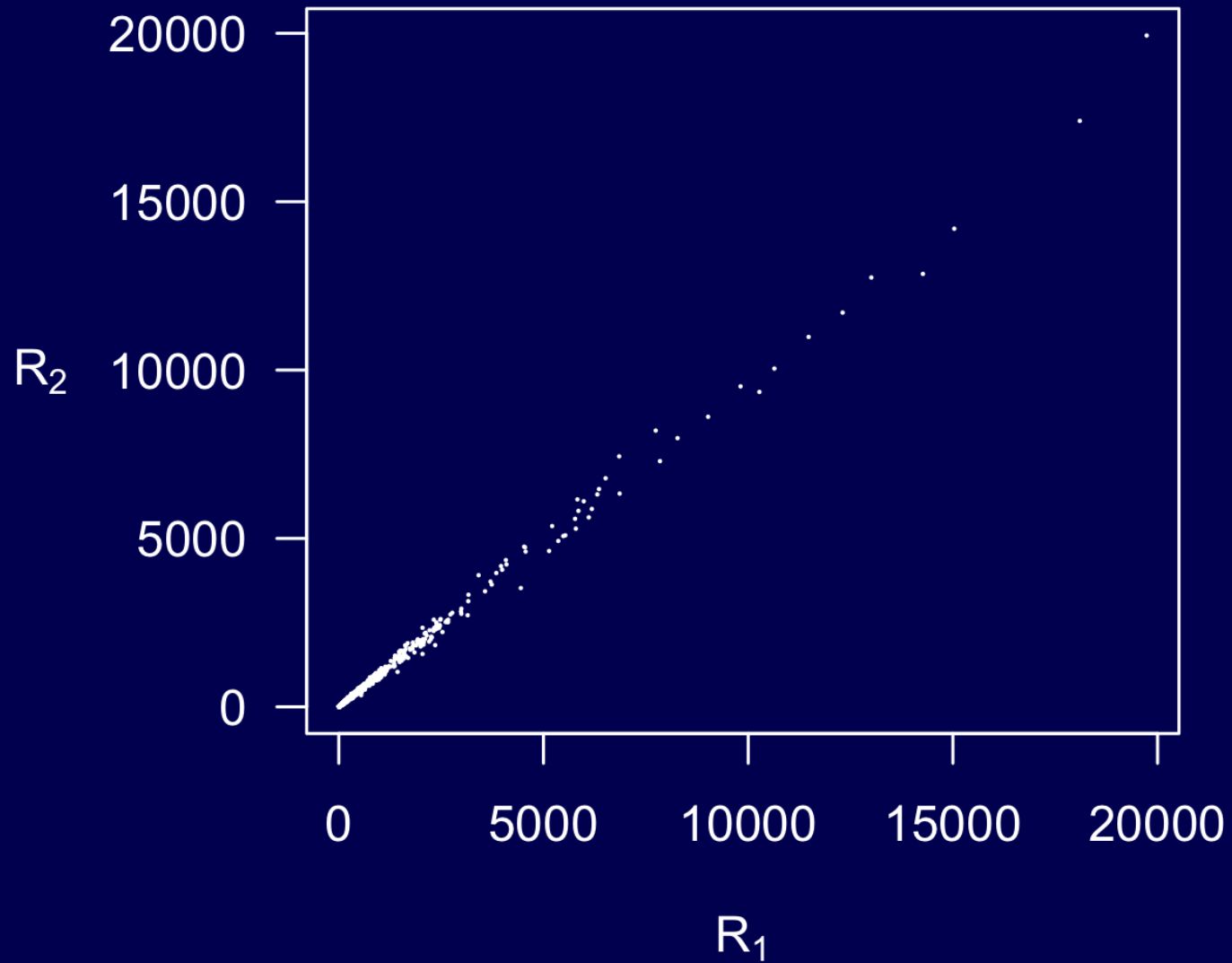
Example 5
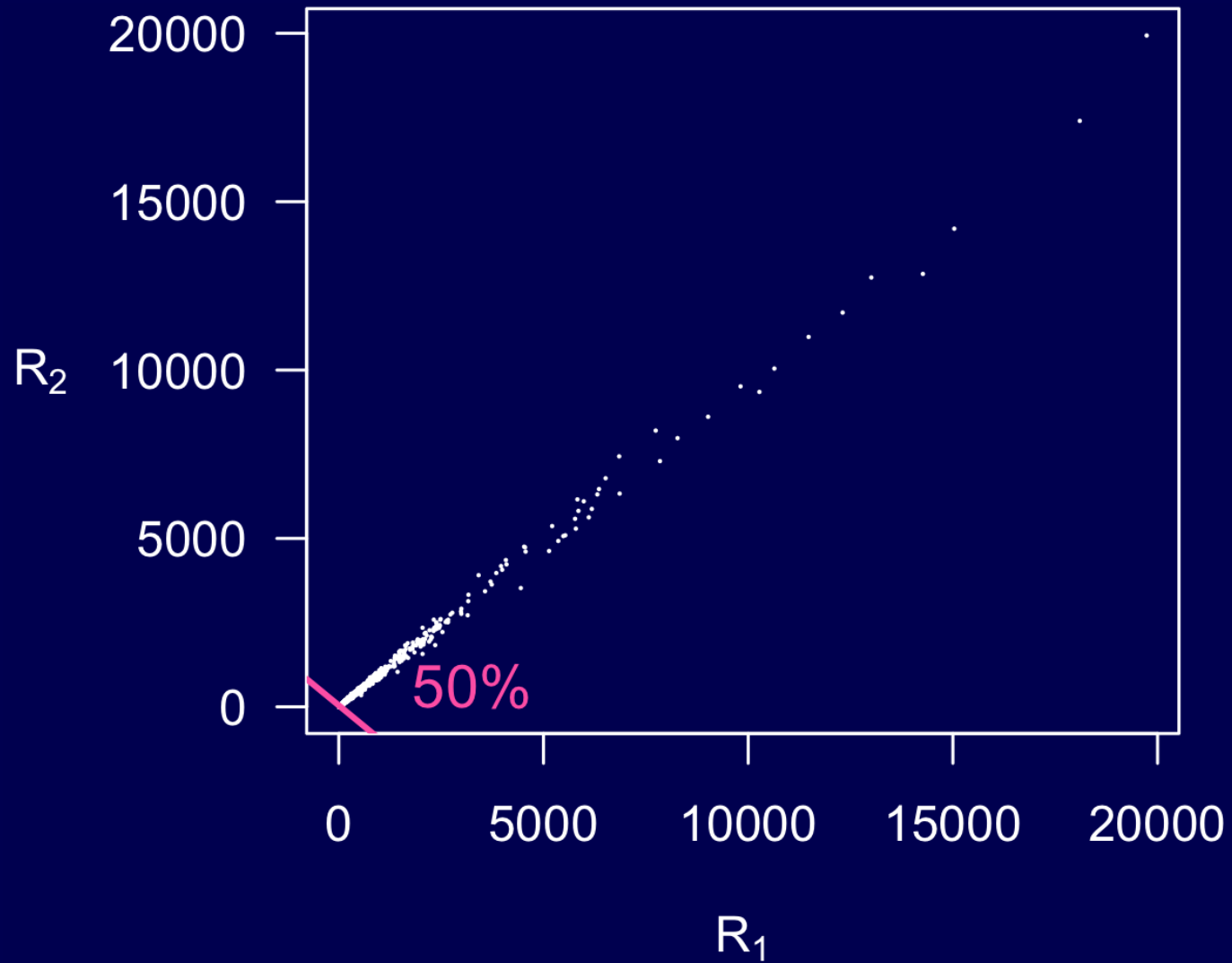
Example 5

Example 5

Example 5

Example 6
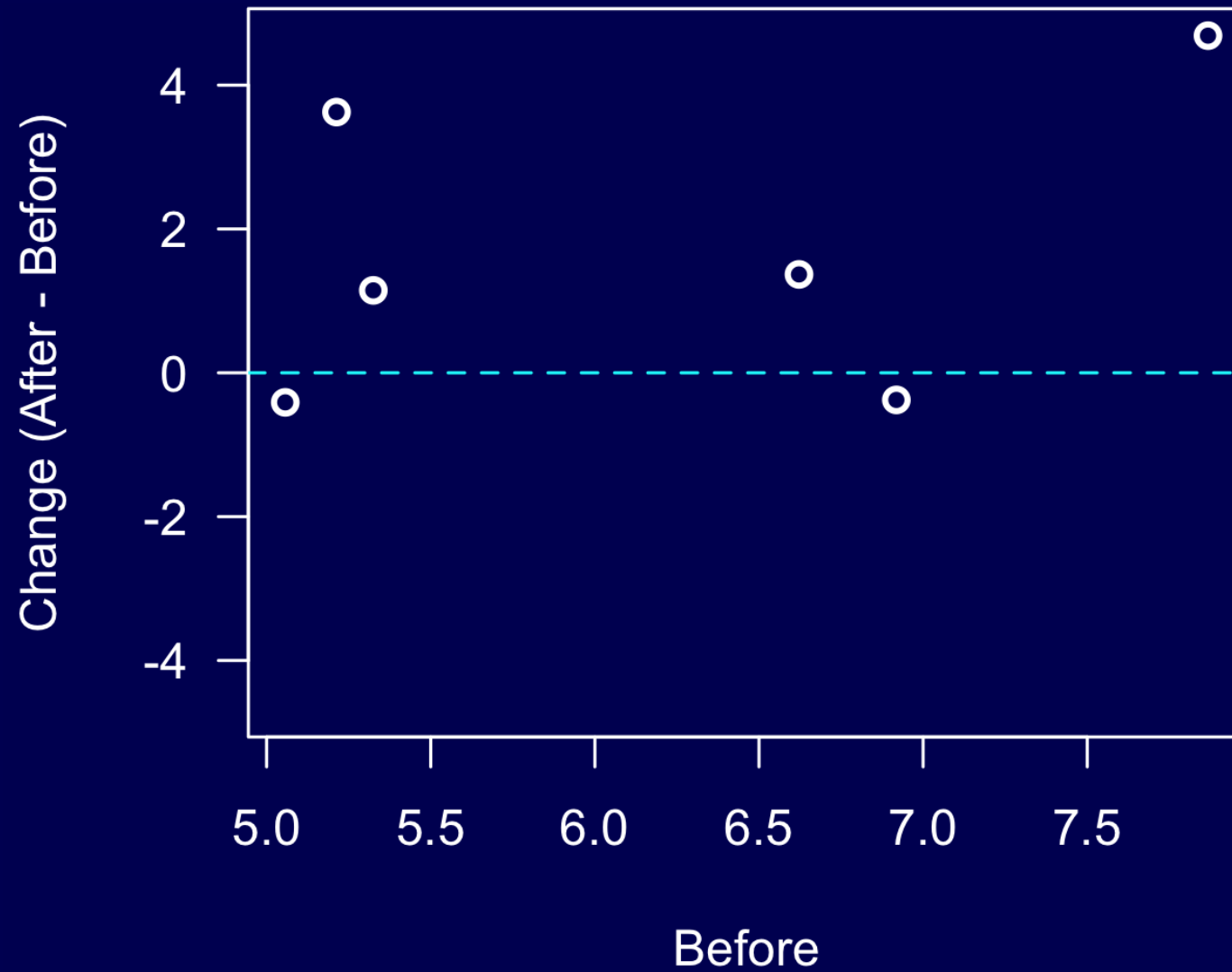
Example 6
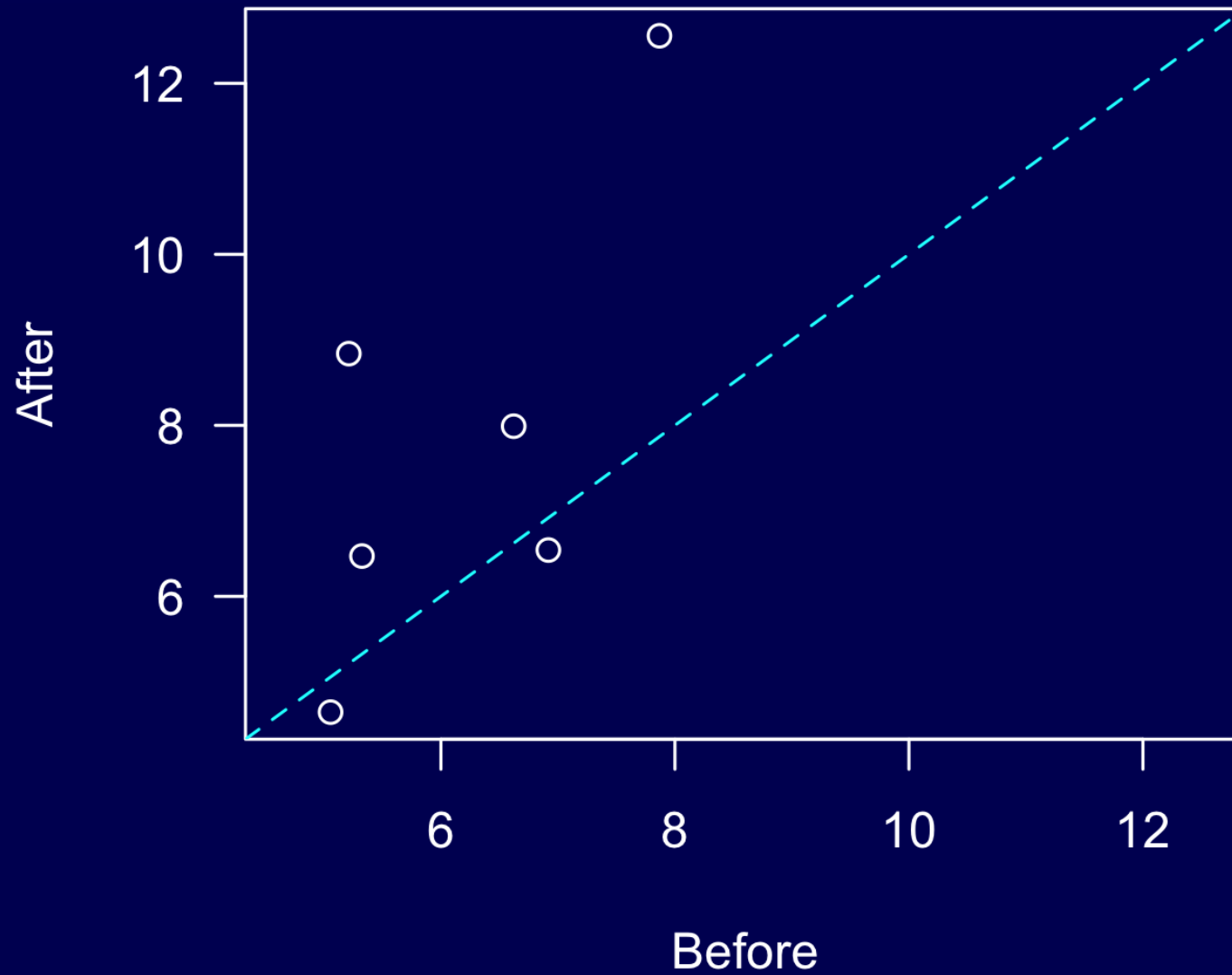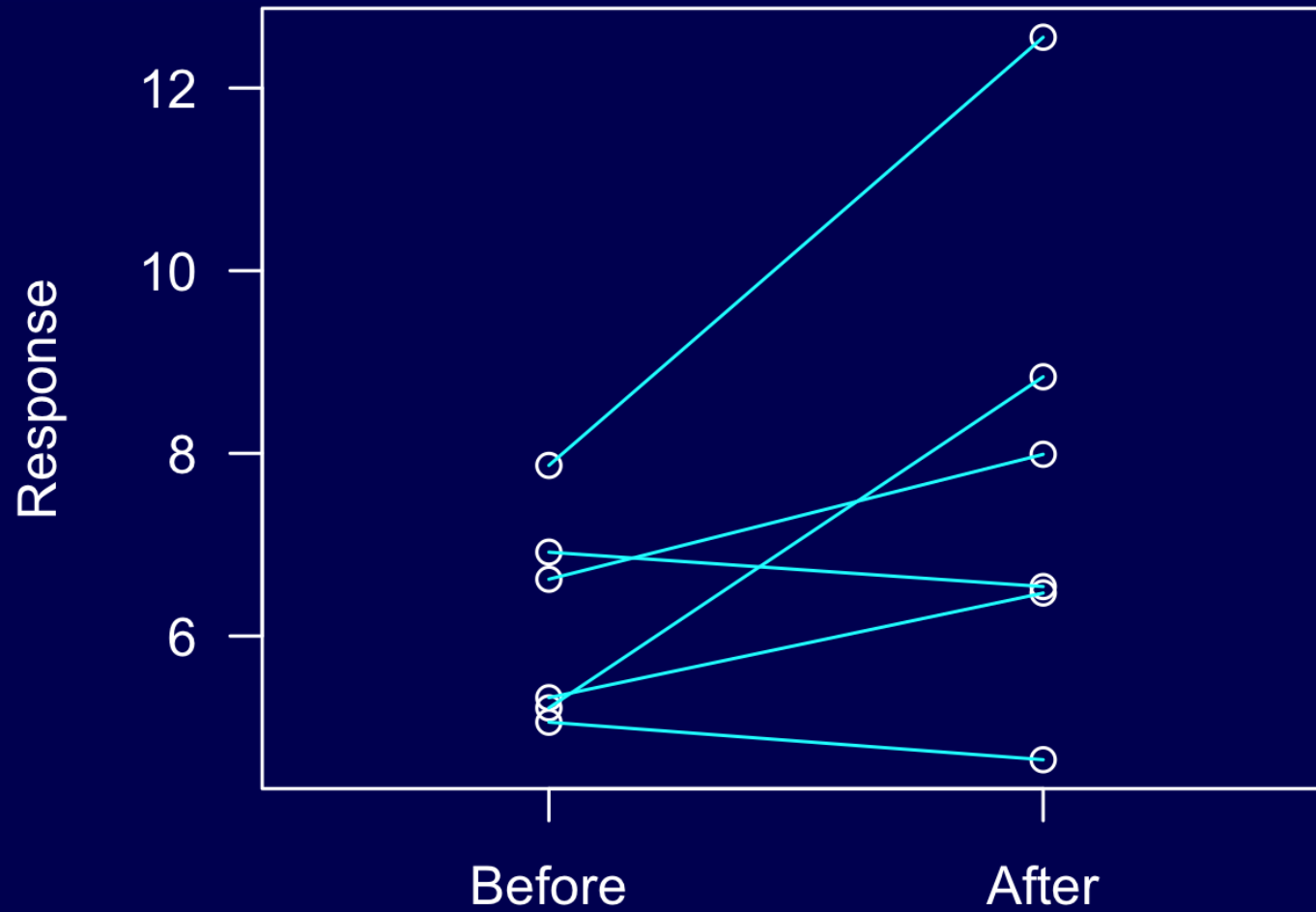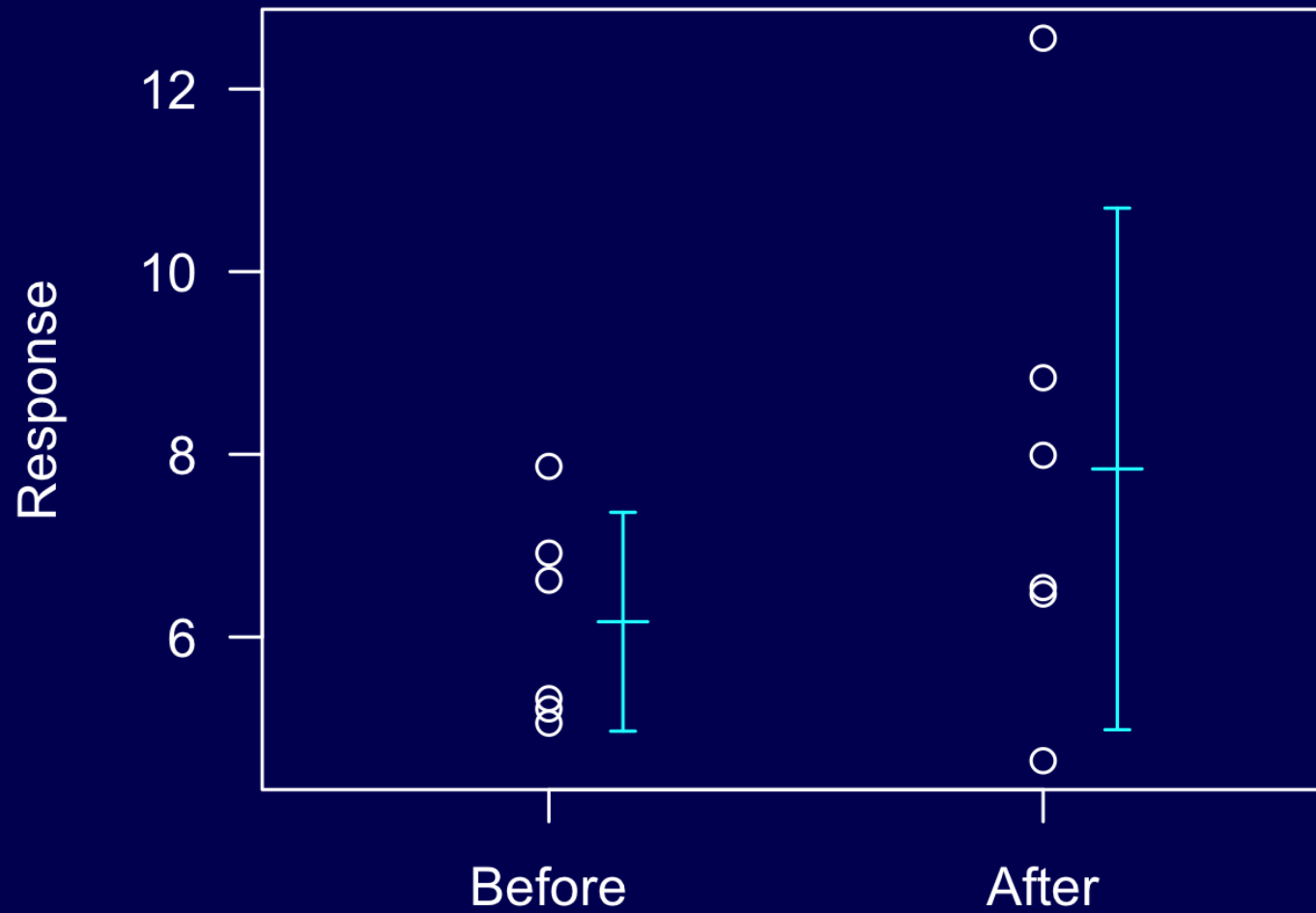
Example 6
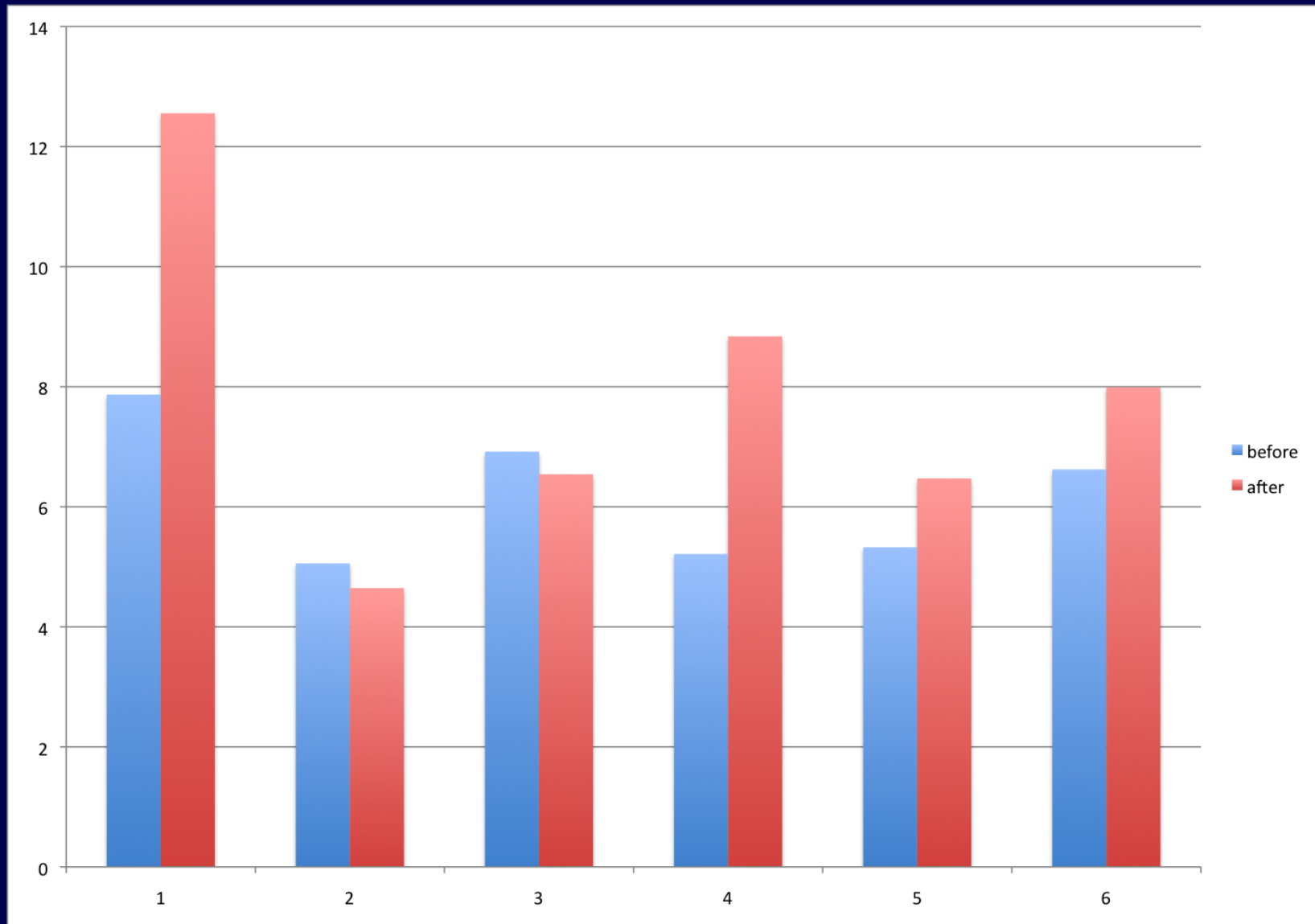
Example 6
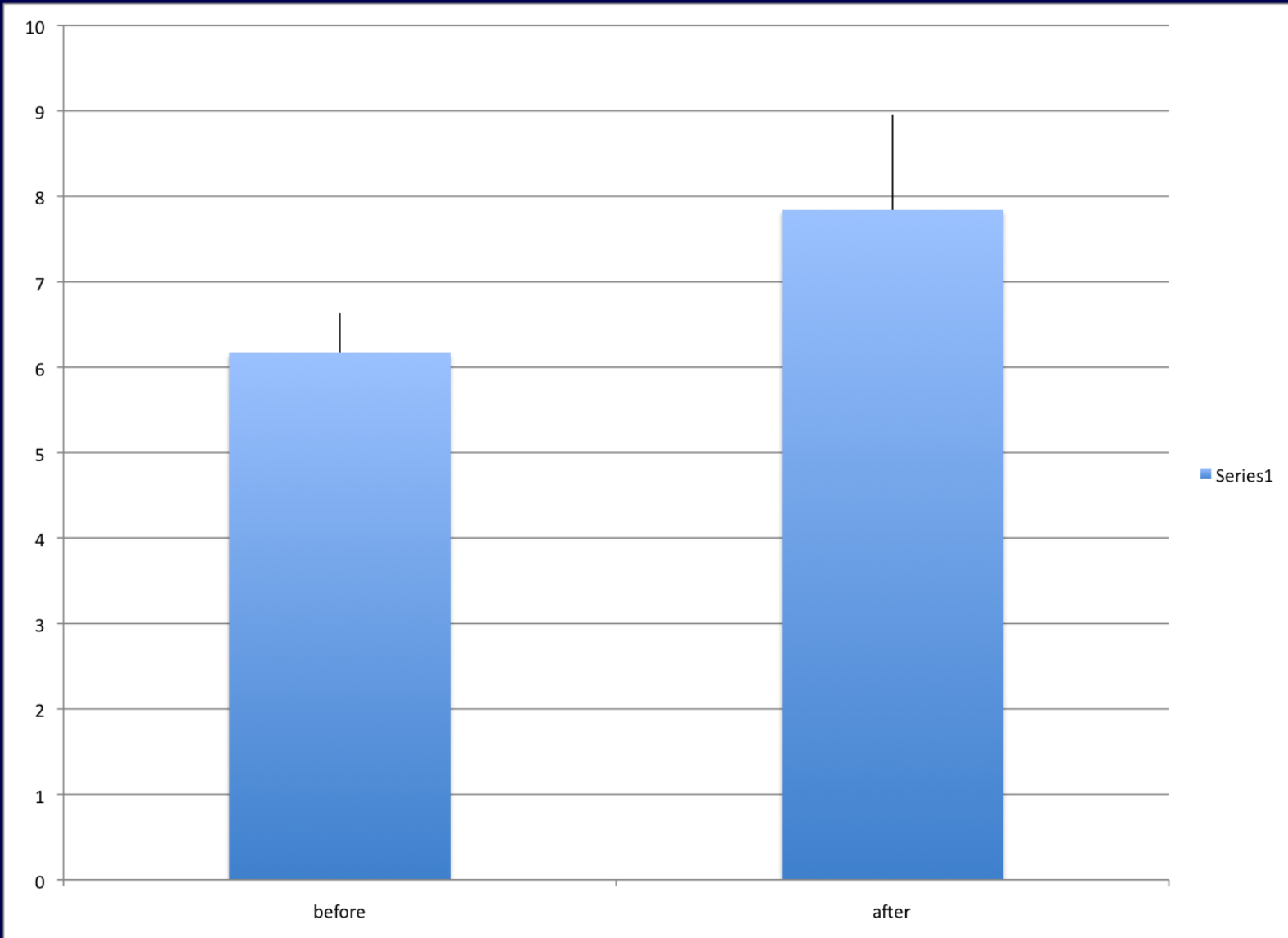
Example 6
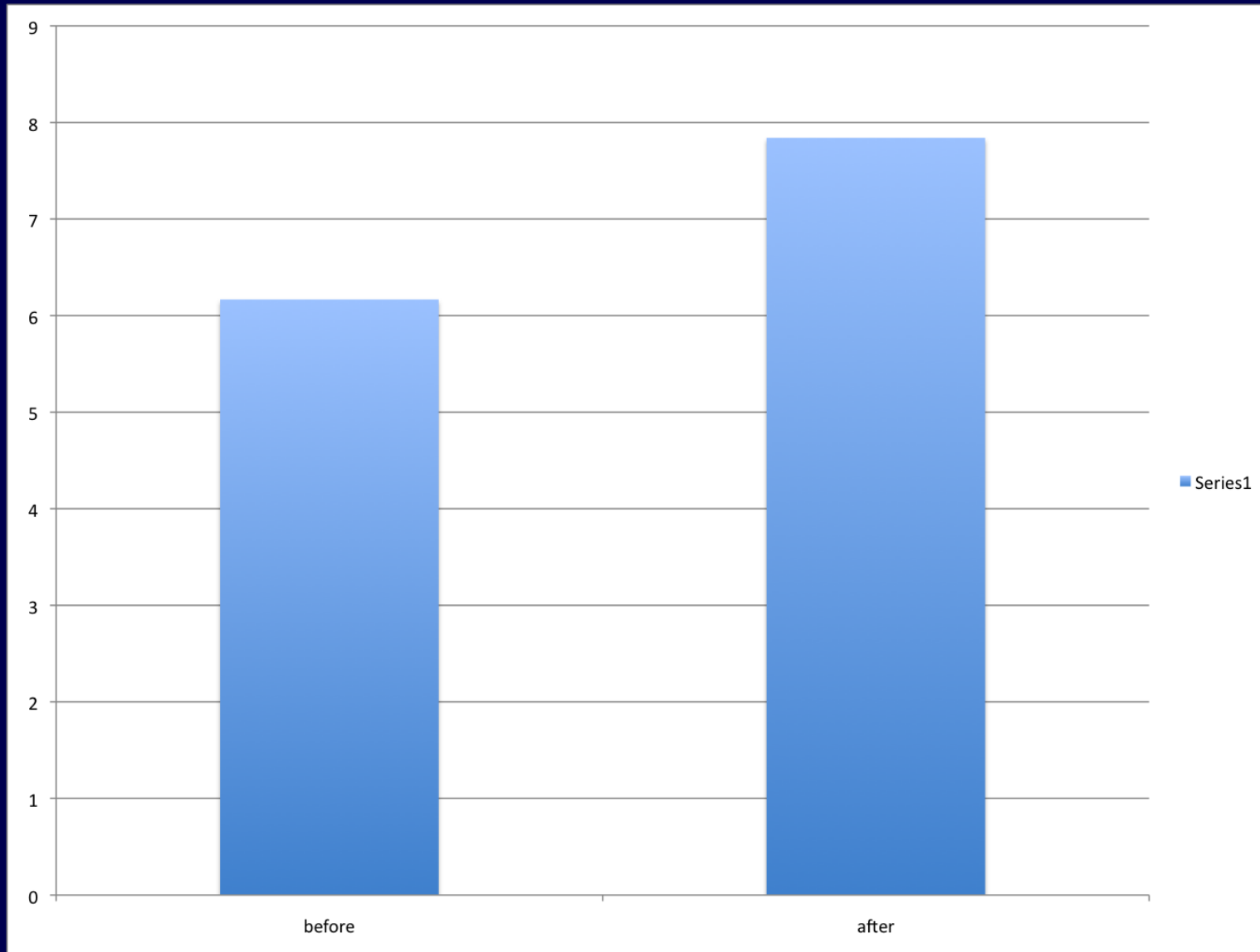
Example 6
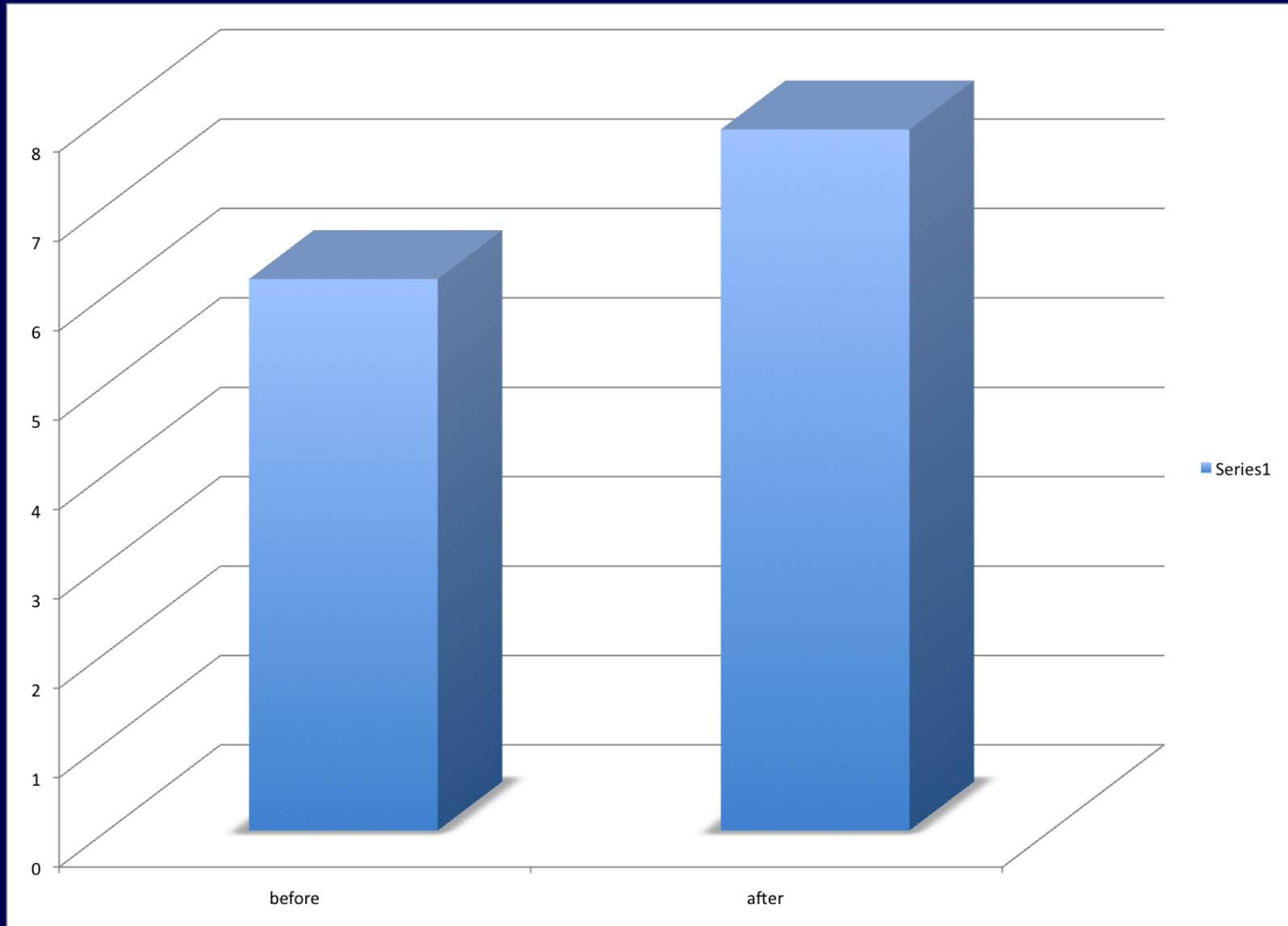
Example 6
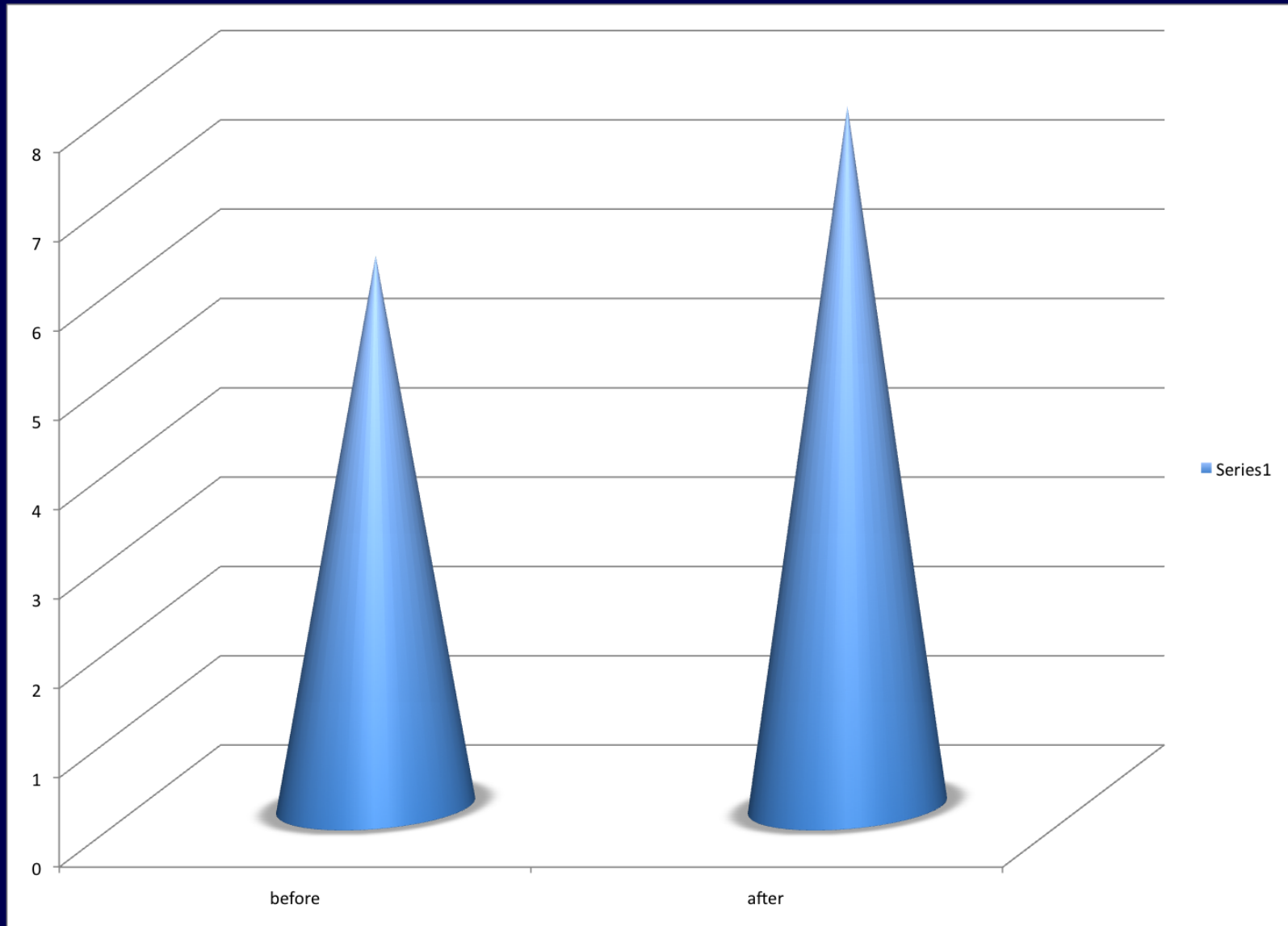
Example 6

Example 6

Example 7

N	$b/c = 10.0$		$b/c = 10.0$		$b/c = 100.0$	
	$r^\star$	G	$r^\star$	G	$r^\star$	G
3	2	0.20	2	2.2	2	22
4	2	0.26	2	2.9	2	29
5	2	0.32	3	3.5	3	36
6	3	0.38	3	4.2	3	43
7	3	0.45	3	4.9	3	49
8	3	0.51	4	5.6	4	56
9	3	0.57	4	6.3	4	63
10	4	0.63	4	6.9	4	70

Example 7

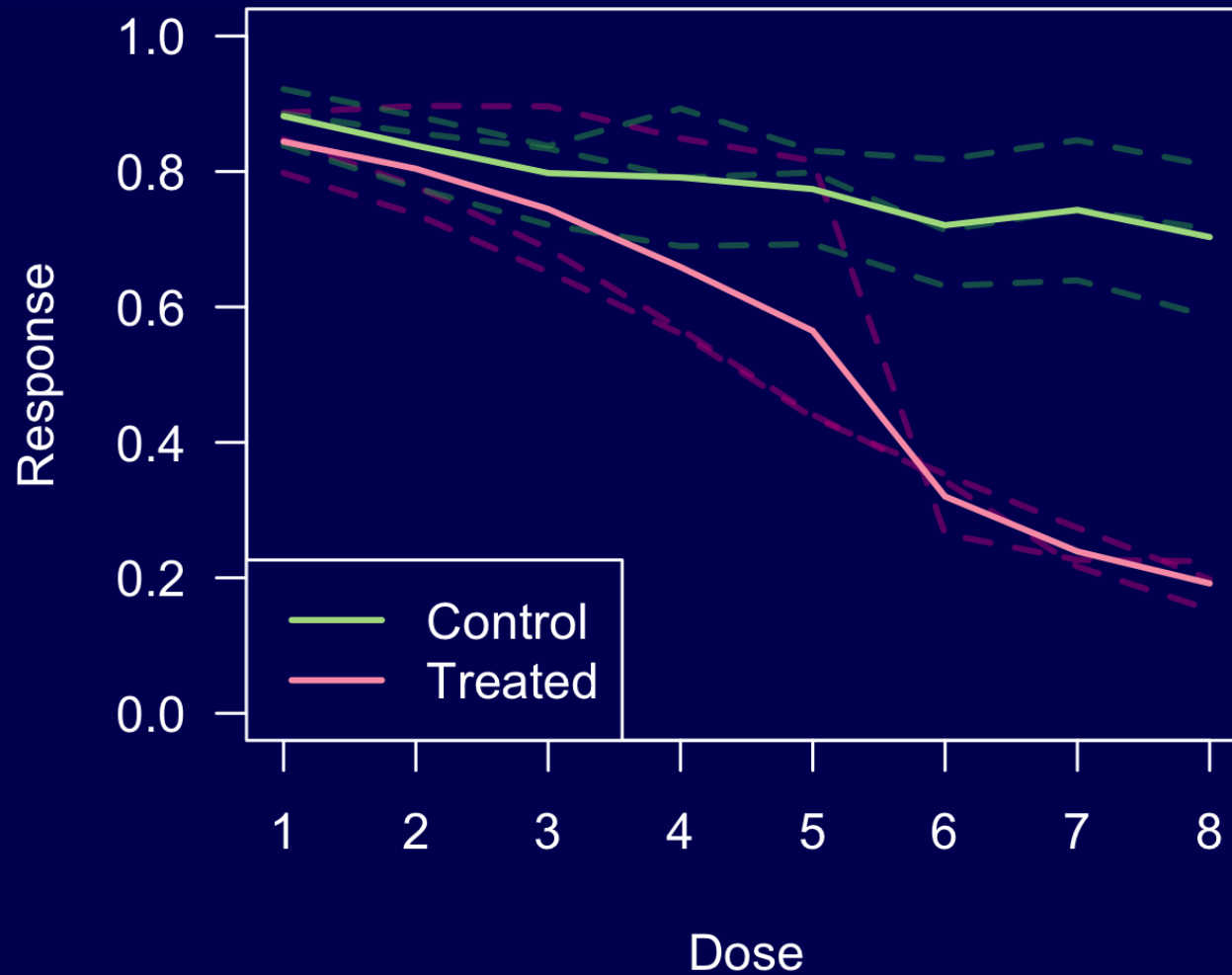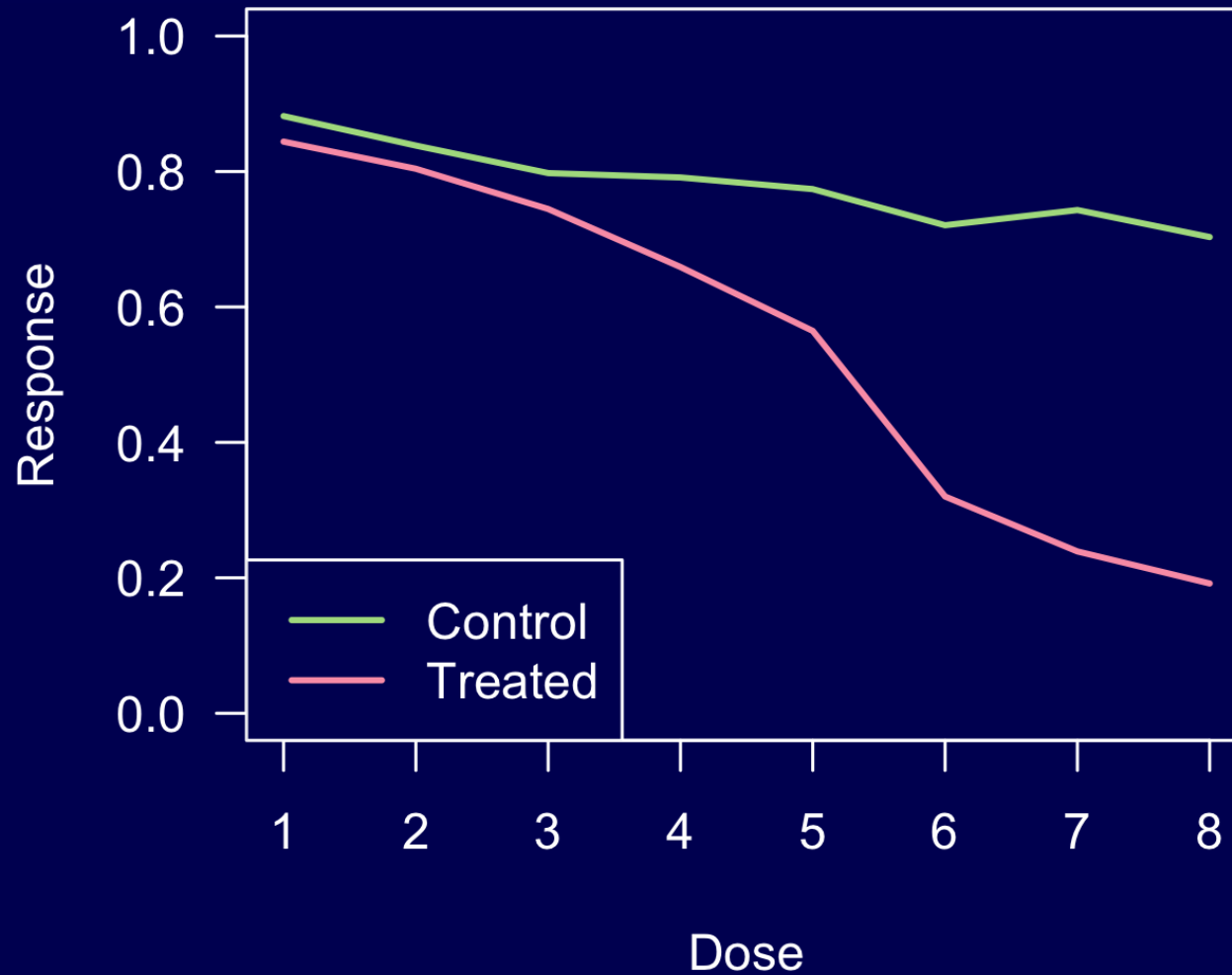| N	$b/c = 10.0$		$b/c = 10.0$		$b/c = 100.0$	
	$r^\star$	G	$r^\star$	G	$r^\star$	G
3	2	0.2	2	2.225	2	22.47499
4	2	0.26333	2	2.88833	2	29.13832
5	2	0.32333	3	3.54167	3	35.79166
6	3	0.38267	3	4.23767	3	42.78764
7	3	0.446	3	4.901	3	49.45097
8	3	0.50743	4	5.5765	4	56.33005
9	3	0.56743	4	6.26025	4	63.20129
10	4	0.62948	4	6.92358	4	69.86462

Example 8
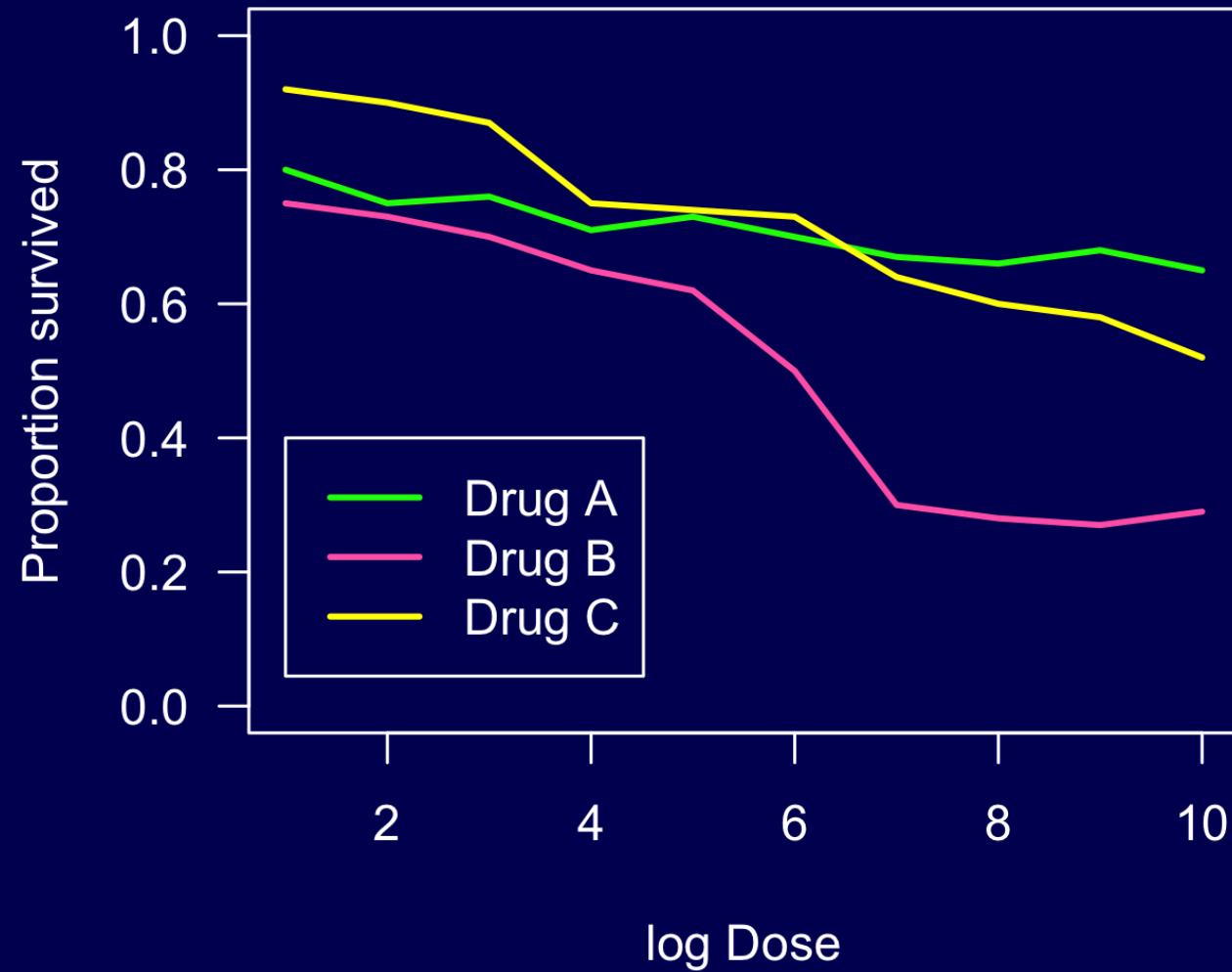
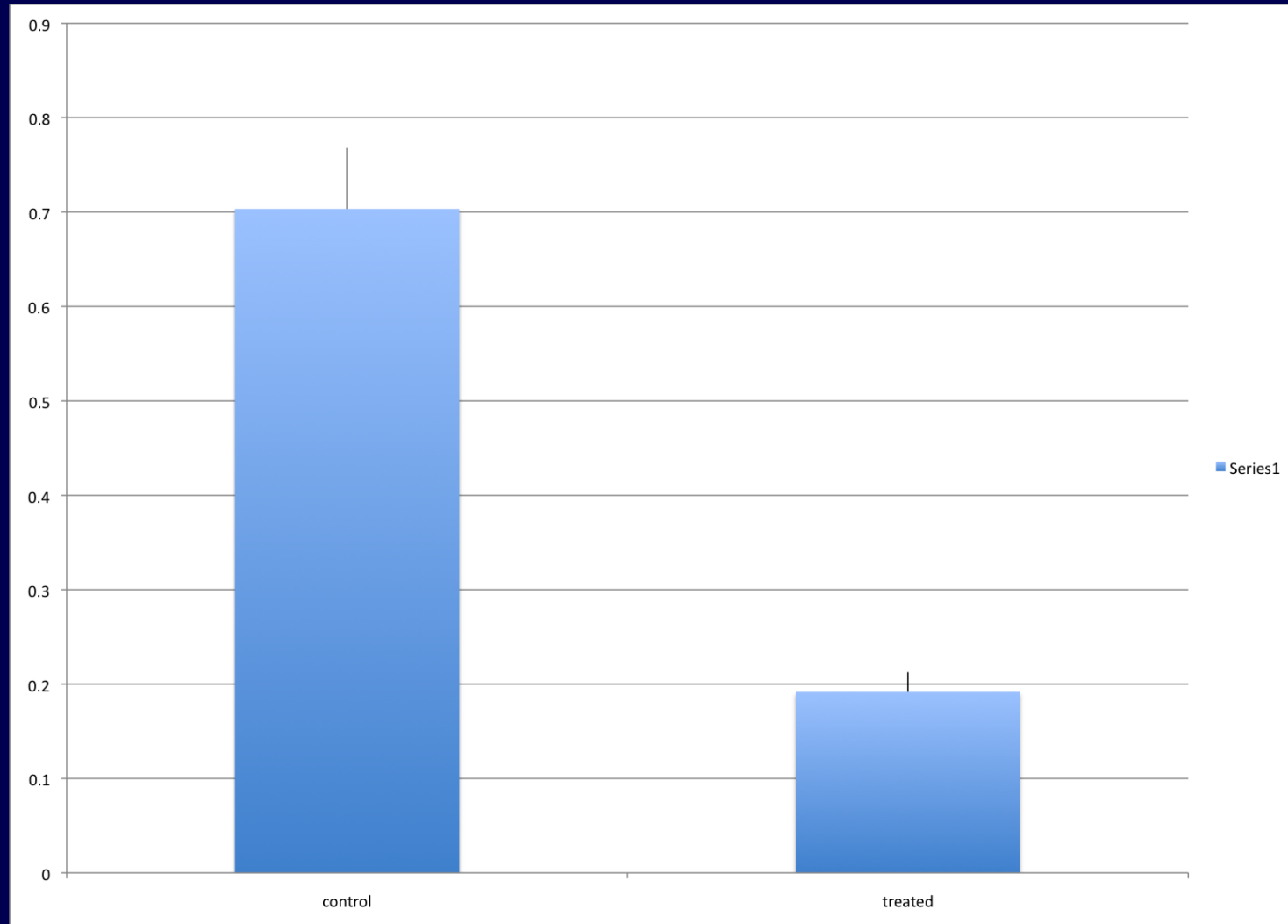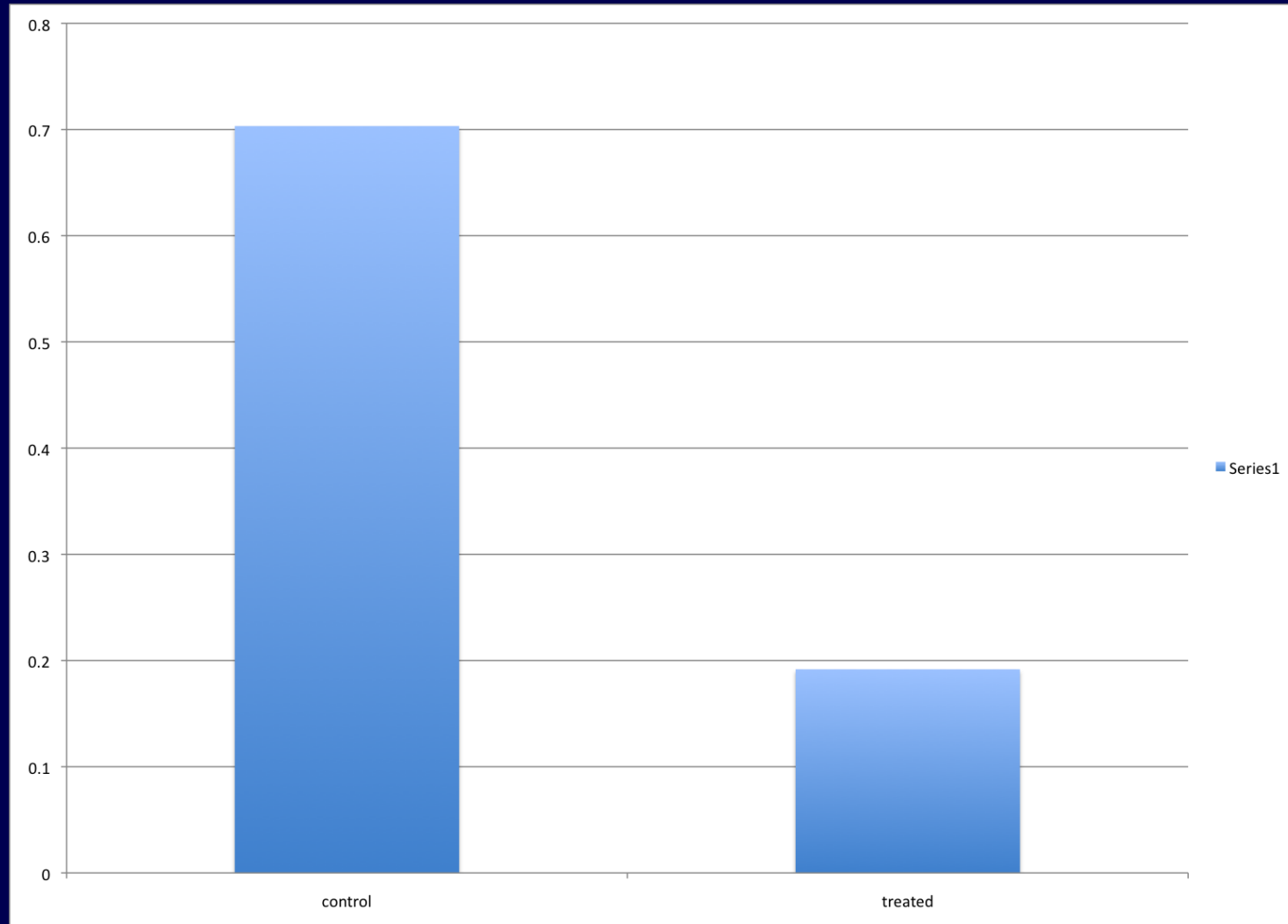# Example 8
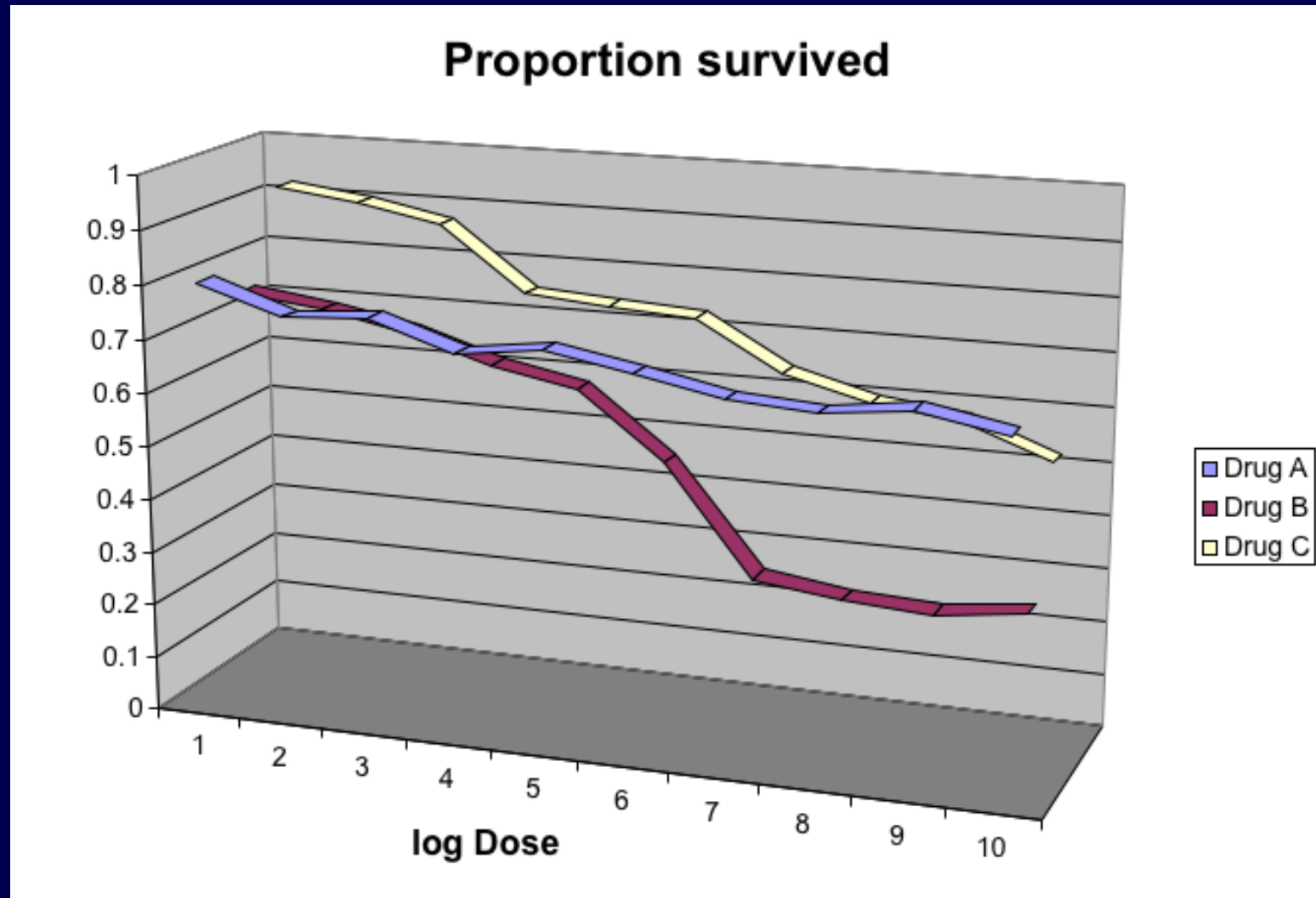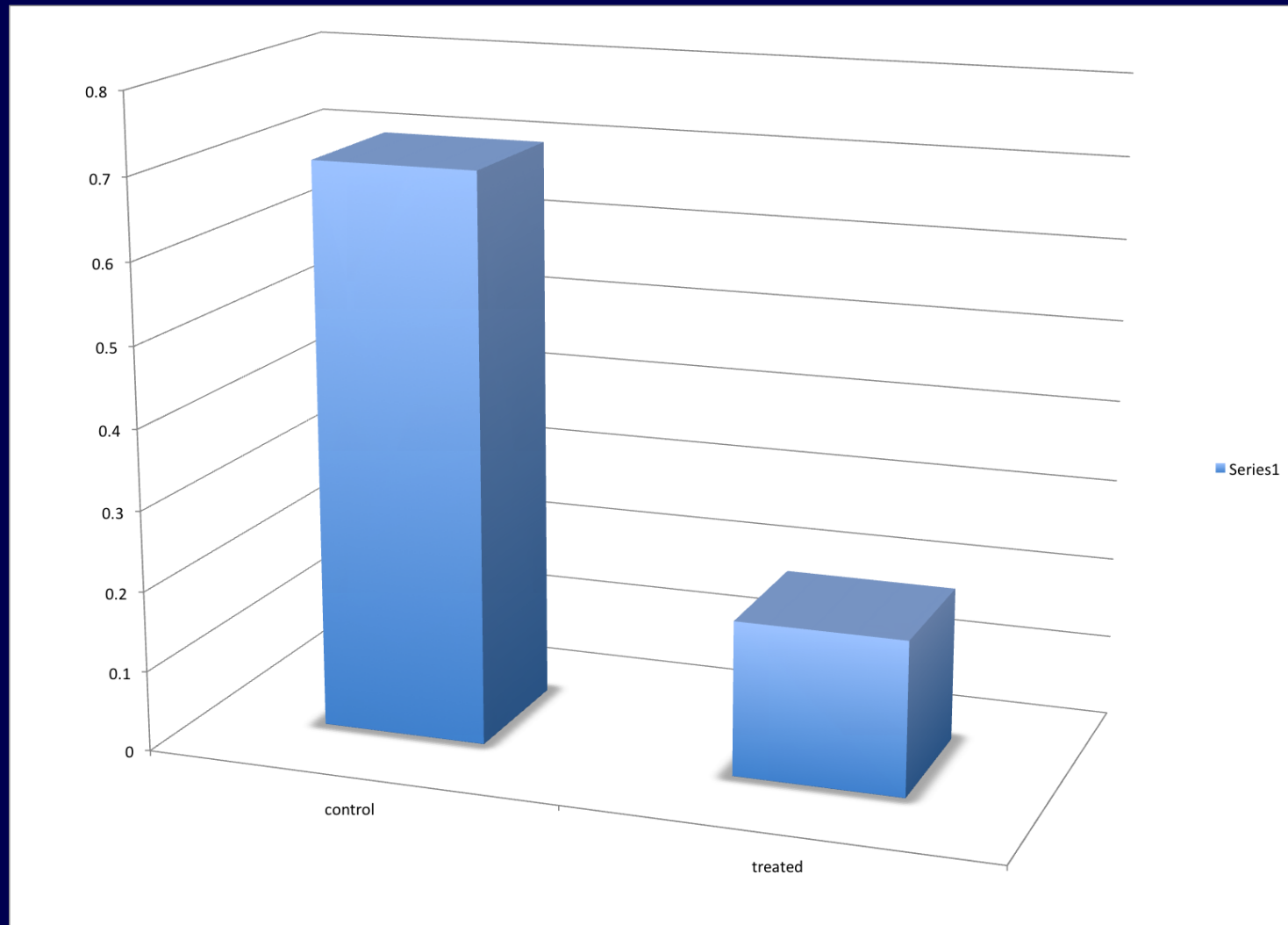
Example 9

Example 9
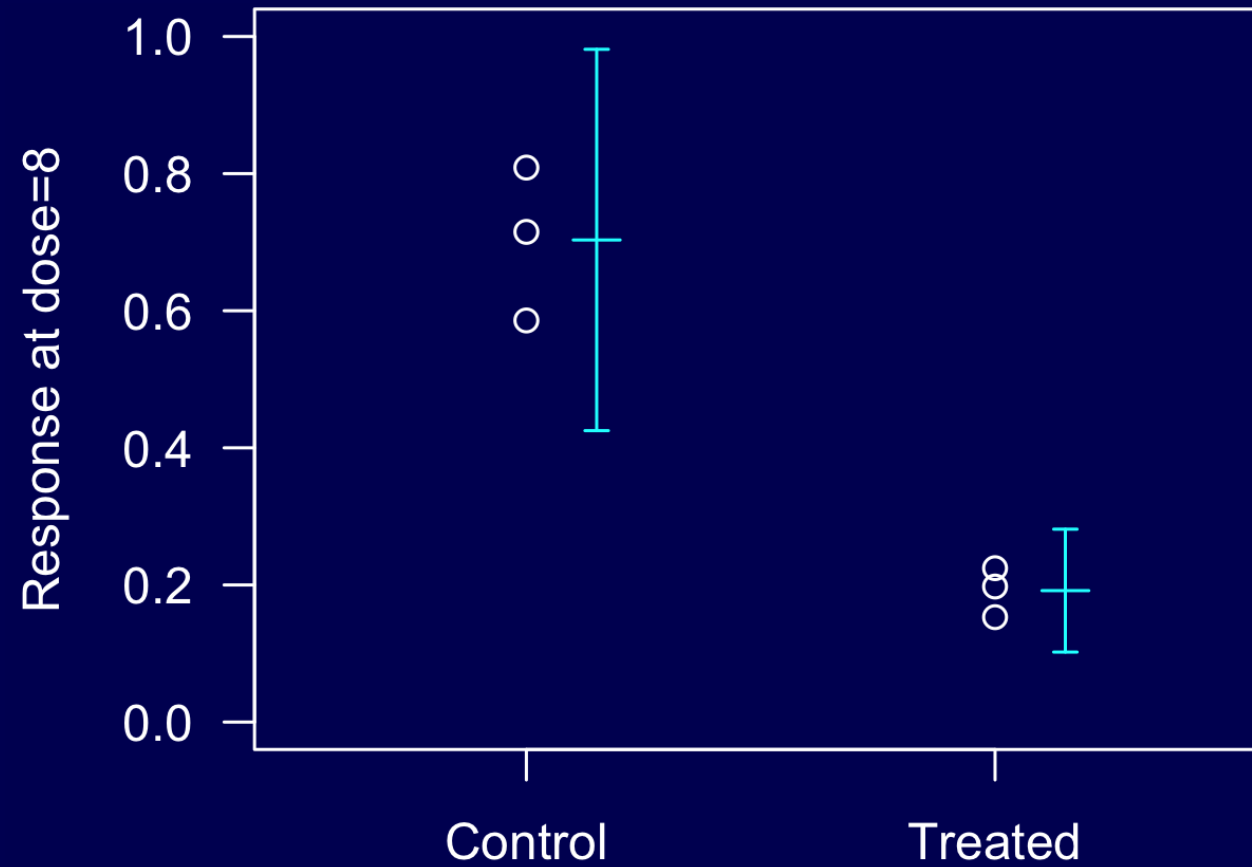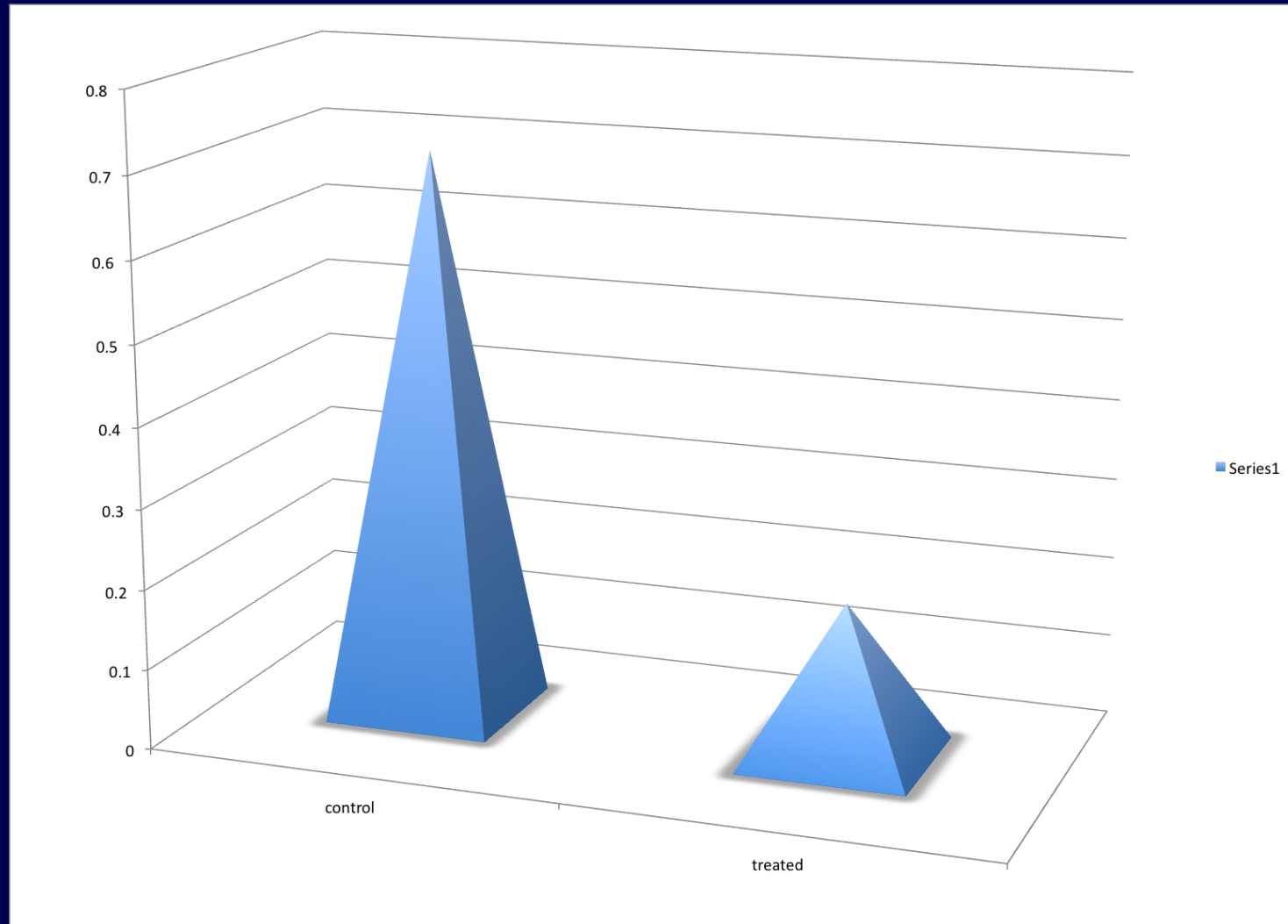
Example 9

Example 9

Example 9

Example 9

Example 9

Displaying data well

- Be accurate and clear.

- Let the data speak.
  - Show as much information as possible, taking care not to obscure the message.

- Science not sales.
  - Avoid unnecessary frills (esp. gratuitous 3d).

- In tables, every digit should be meaningful. Don't drop ending 0's.

Further reading

- ER Tufte (1983) The visual display of quantitative information. Graphics Press.

- ER Tufte (1990) Envisioning information. Graphics Press.

- ER Tufte (1997) Visual explanations. Graphics Press.

- WS Cleveland (1993) Visualizing data. Hobart Press.

- WS Cleveland (1994) The elements of graphing data. CRC Press.

- A Gelman, C Pasarica, R Dodhia (2002) Let's practice what we preach: Turning tables into graphs. The American Statistician 56:121-130

- NB Robbins (2004) Creating more effective graphs. Wiley

- Nature Methods columns: `http://bang.clearscience.info/?p=546`