

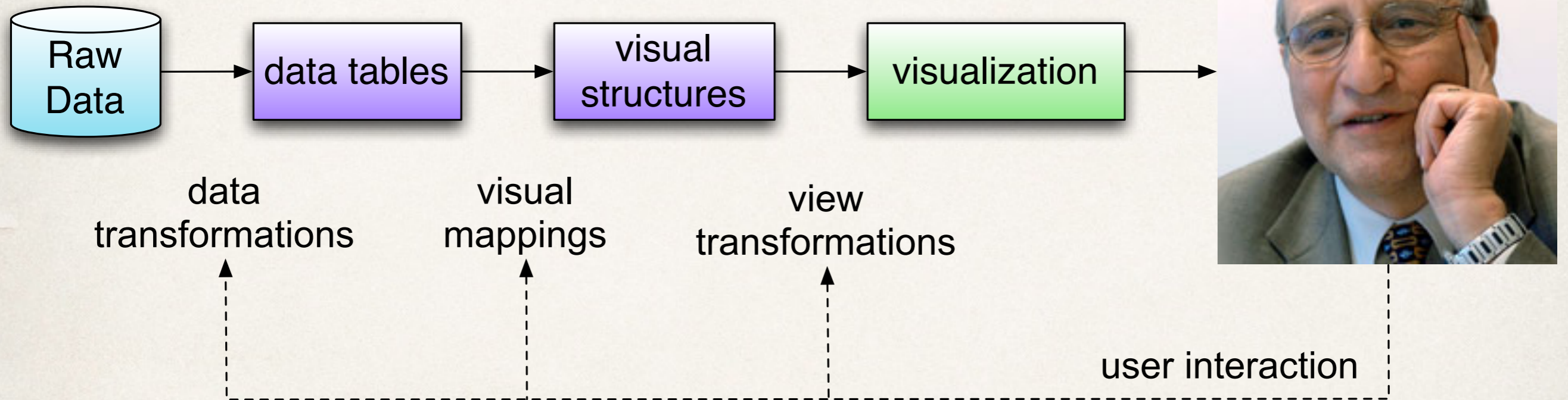
Perception to visualization I

C. Andrews

2016-02-24

Visualization Pipeline

Insight!

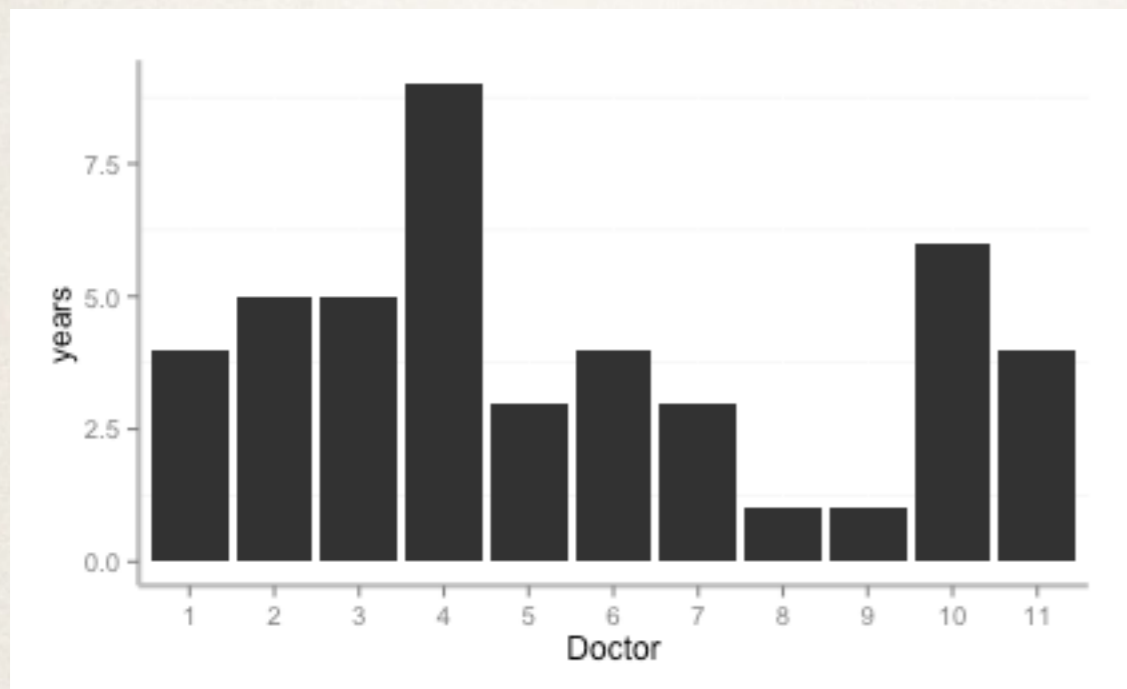


Visual mapping

doctor name	companions	start	end	episodes	duration
1 William Hartnell	10	1963	1966	135	3288
2 Patrick Troughton	5	1966	1970	127	3183
3 Jon Pertwee	3	1970	1974	129	3206
4 Tom Baker	8	1974	1982	174	4248
5 Peter Davidson	6	1982	1984	69	1800
6 Colin Baker	2	1984	1987	31	1029
7 Sylvester McCoy	2	1987	1989	42	1025
8 Paul McGann	1	1996	1996	1	84
9 Christopher Eccleston	3	2005	2005	13	568
10 David Tennant	5	2005	2010	48	2368
11 Matt Smith	4	2010	2013	44	2083



visual mapping



Computable (math)

$$\text{visual} = f(\text{data})$$

Comprehensible (invertible)

$$\text{data} = f^{-1}(\text{visual})$$

Creative

Eight Visual Variables

Position

Mark or Glyph or Shape

Size (length, area, volume)

Brightness or Luminance

Color

Orientation

Texture

Motion

Characteristics of visual variables

Selective

is a change in just this variable enough to make a mark distinct?

Associative

can marks sharing this attribute be grouped despite other variables?

Quantitative

if two marks differ in this variable, can we extract a numerical relationship?

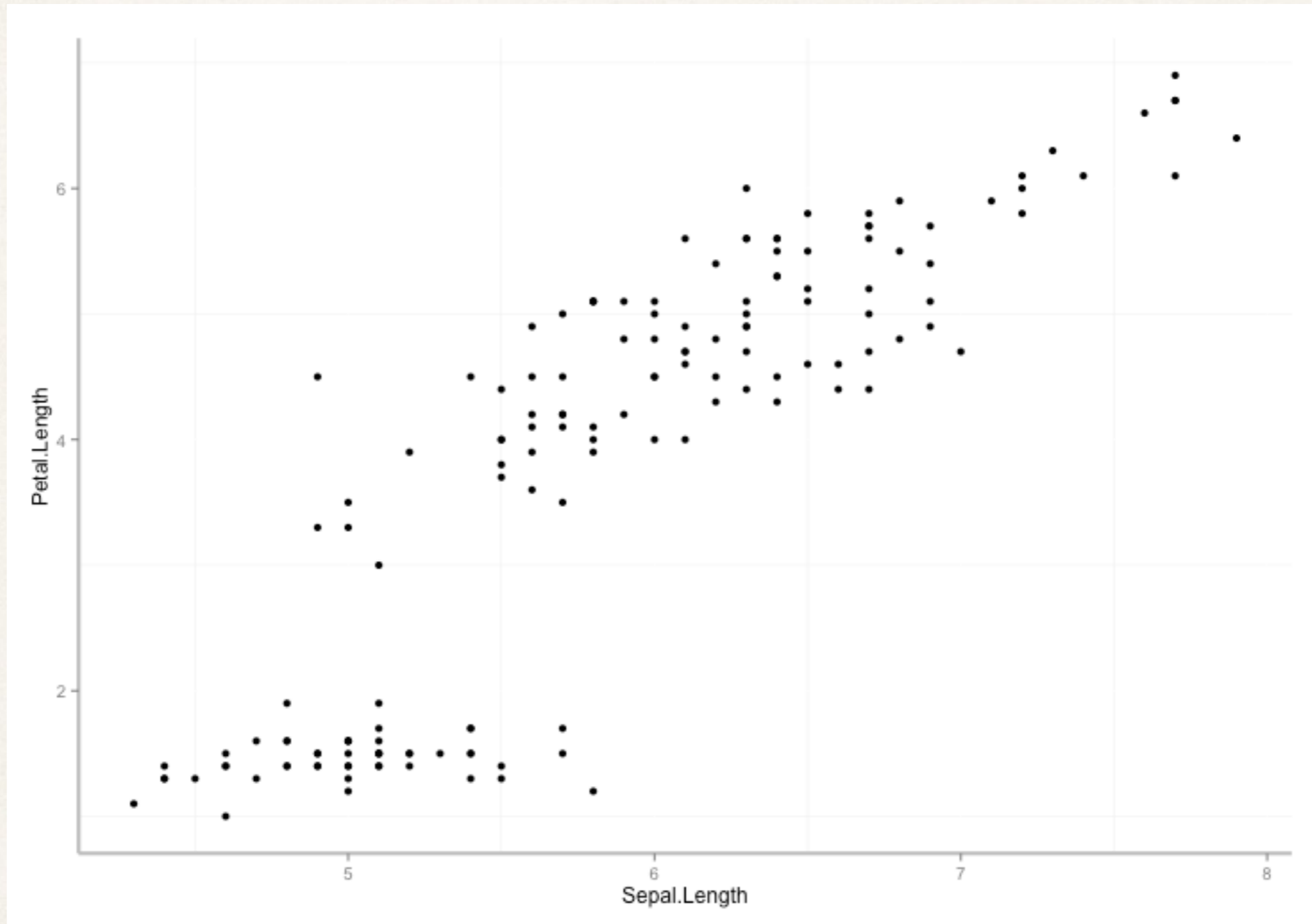
Order

can we order marks based on the values of this variable

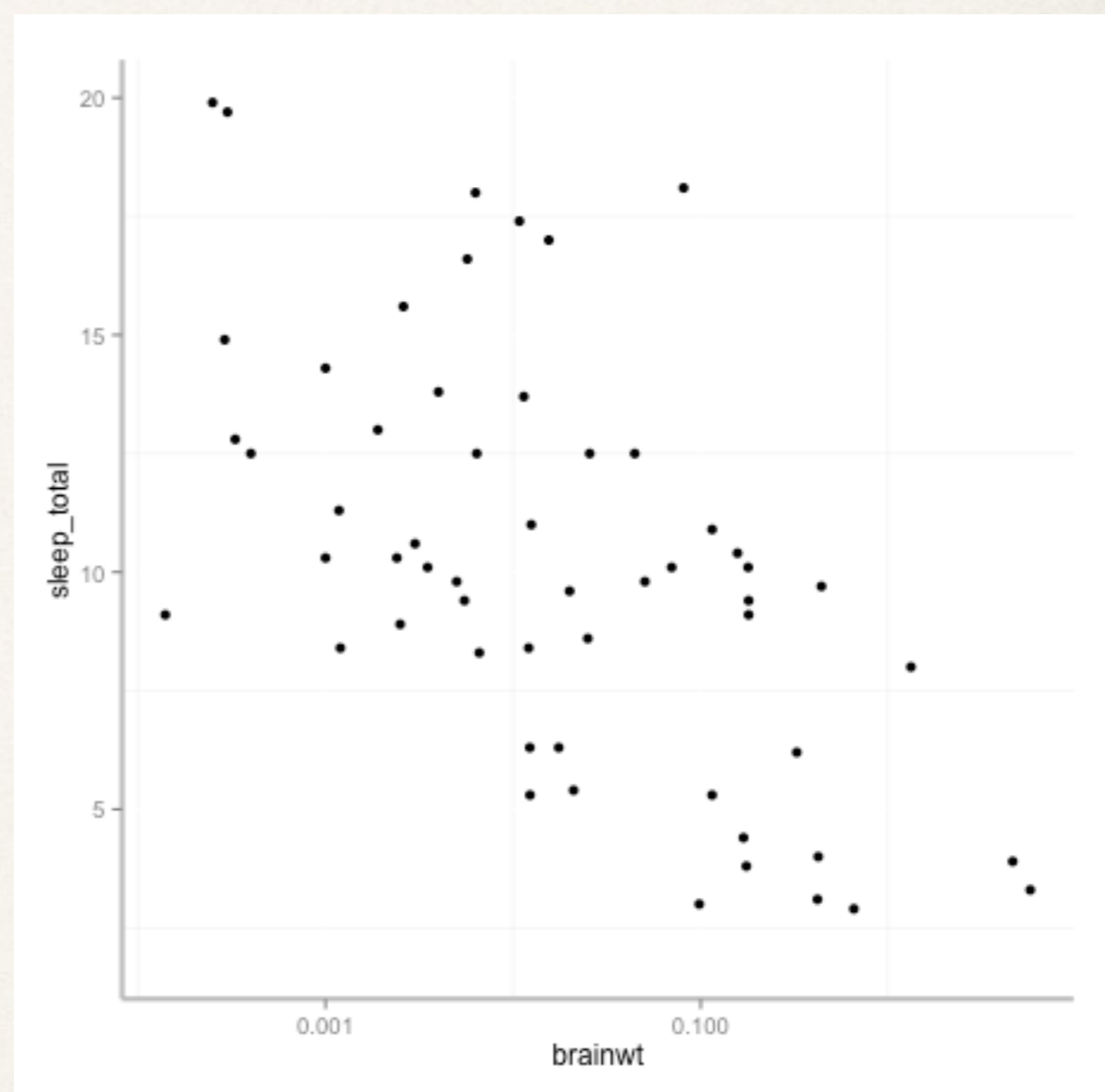
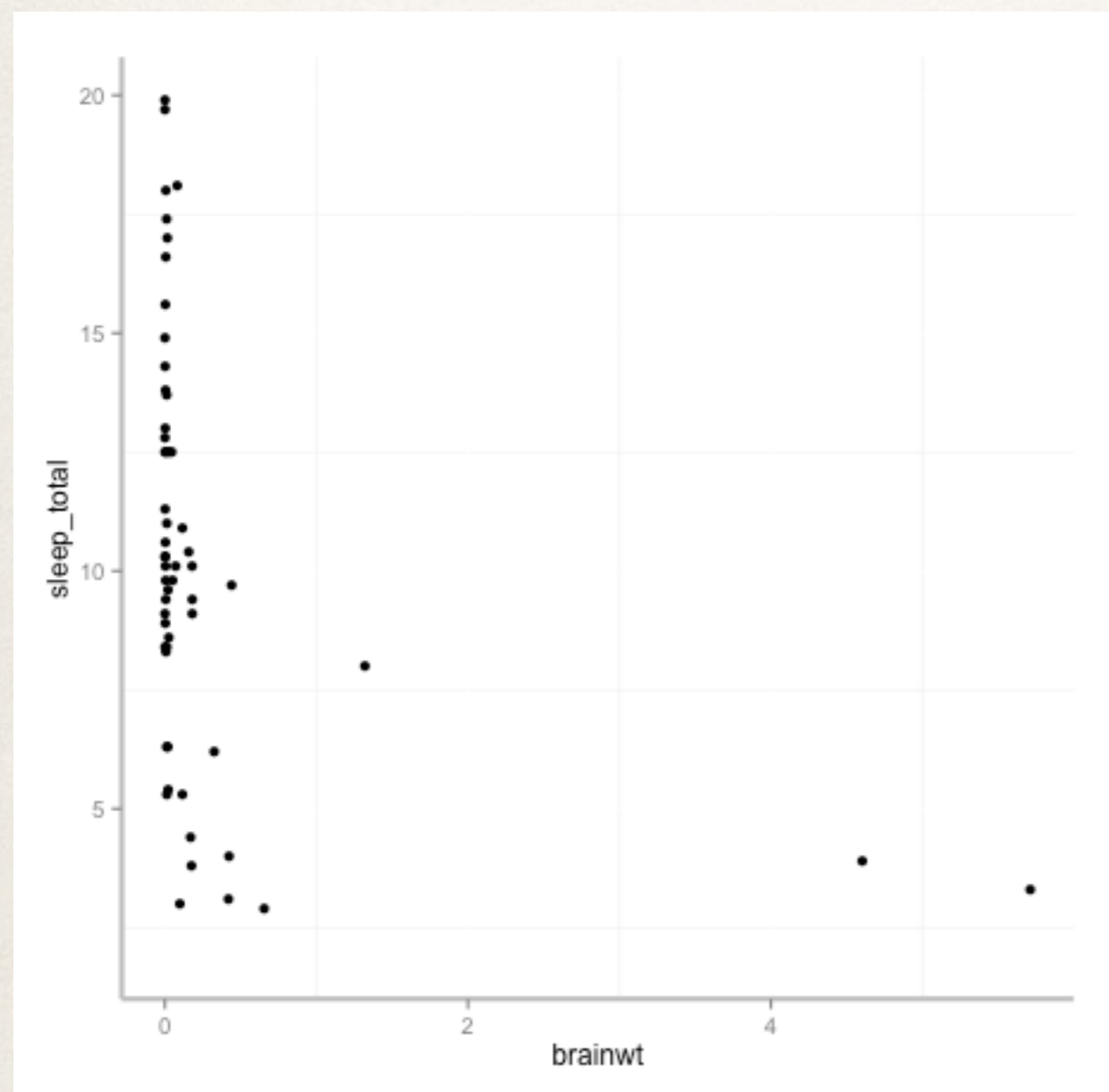
Length

across how many changes in this variable are distinctions recognizable?

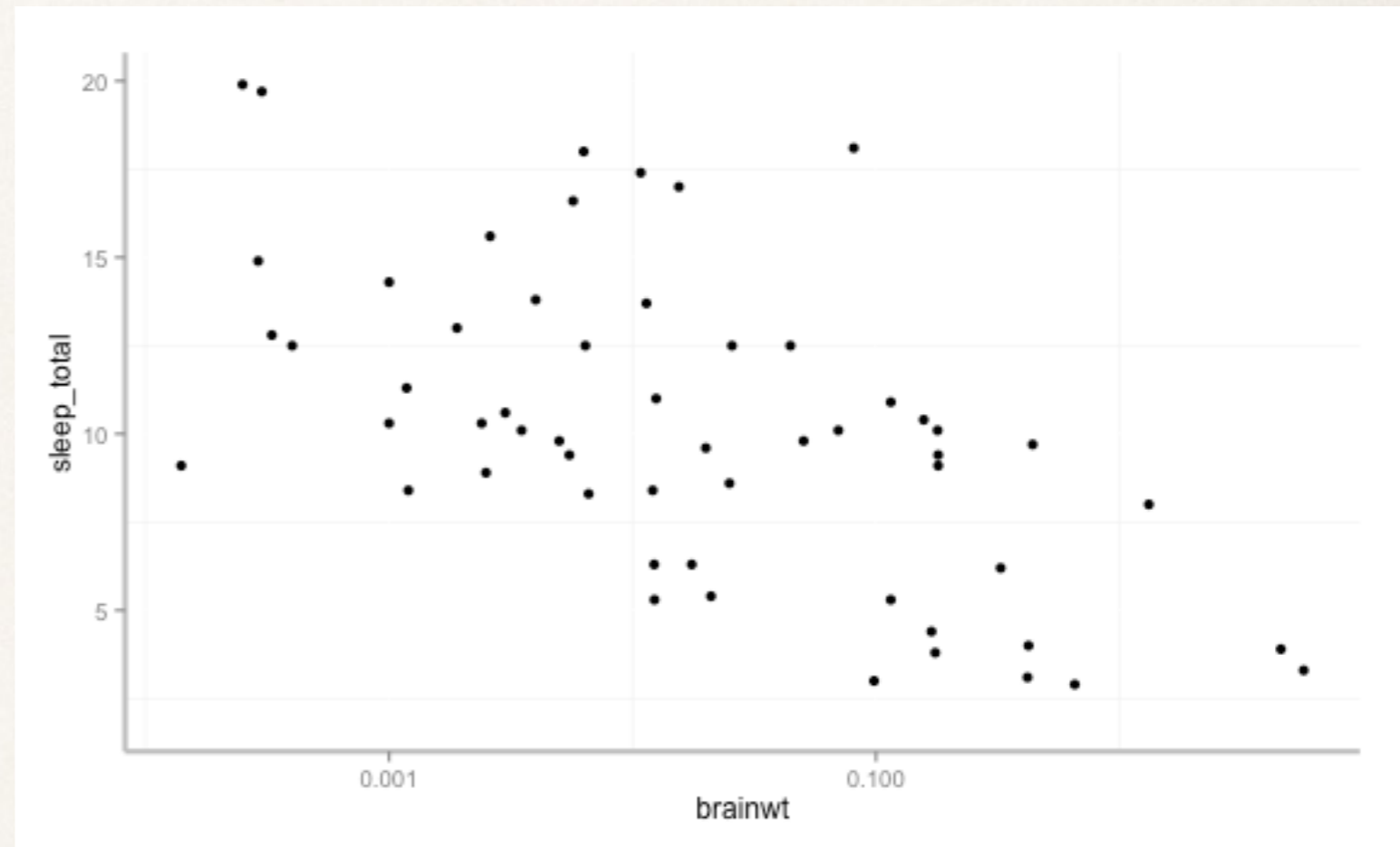
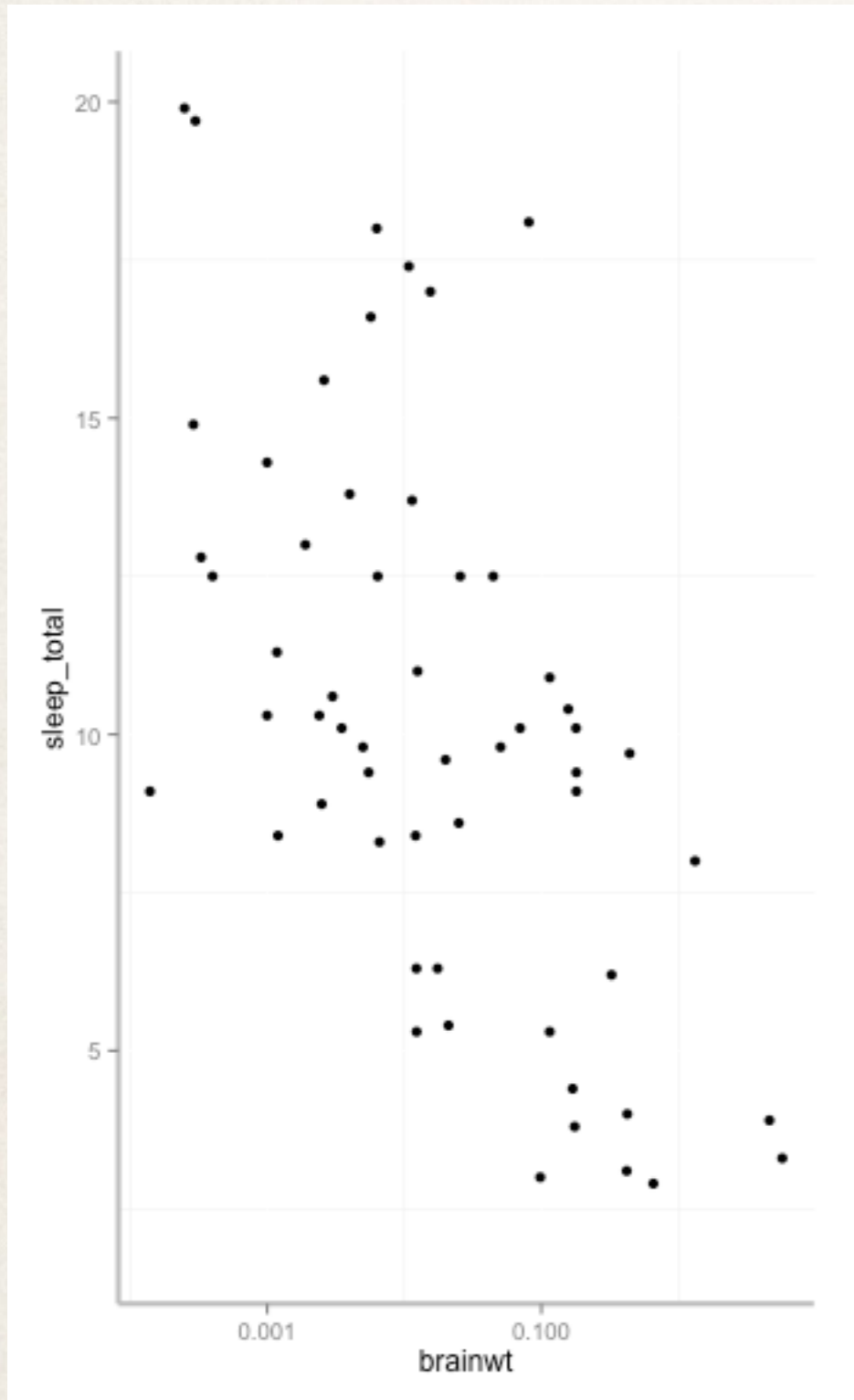
Position



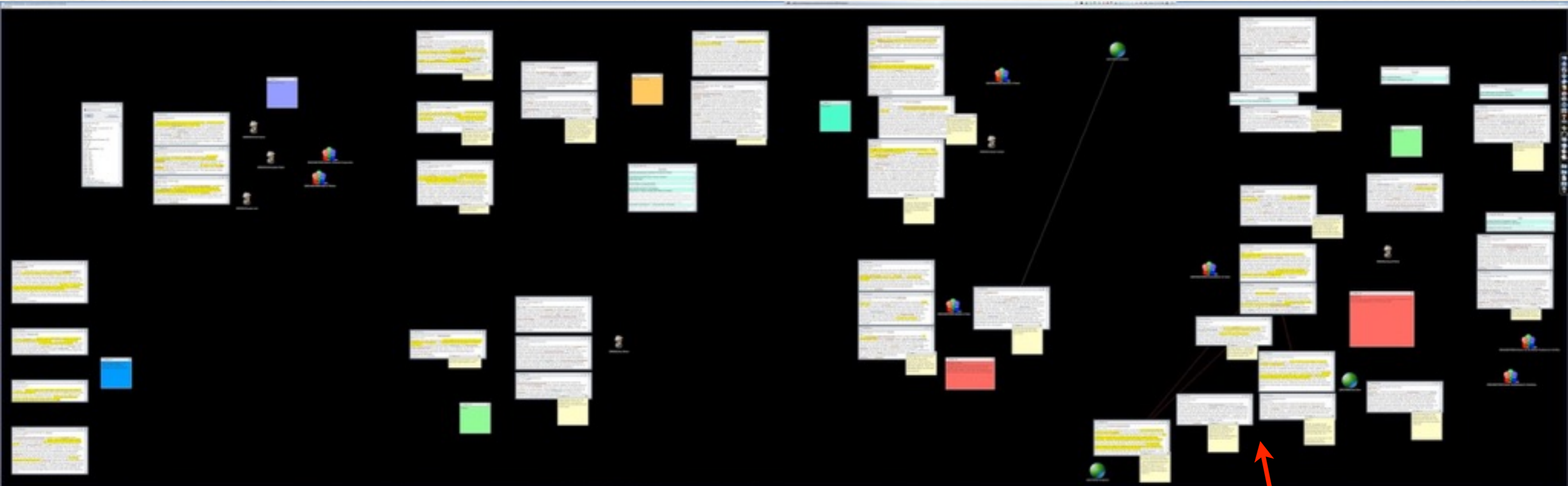
Position: Changing the range



Position: Changing the aspect ratio




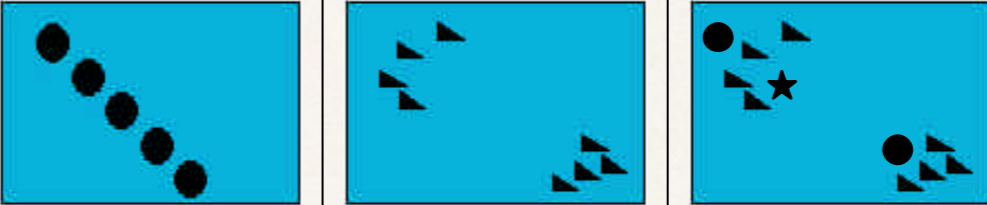
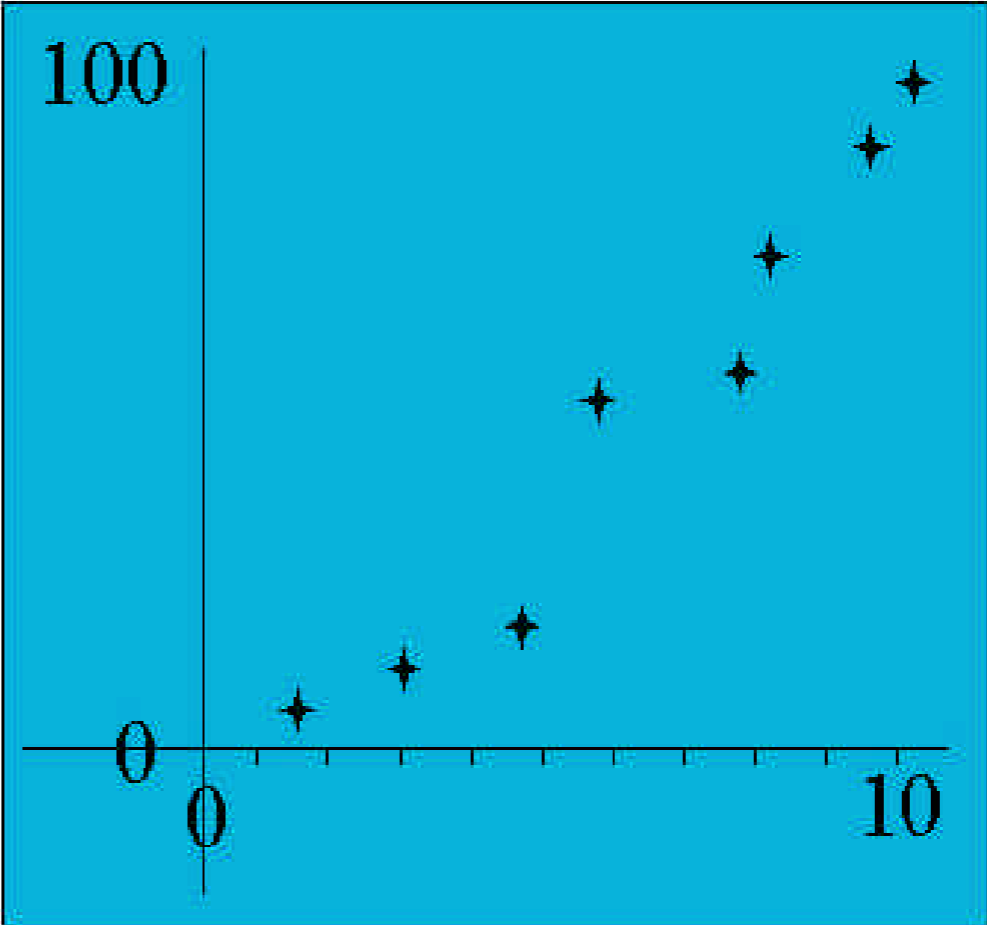
Position without scales



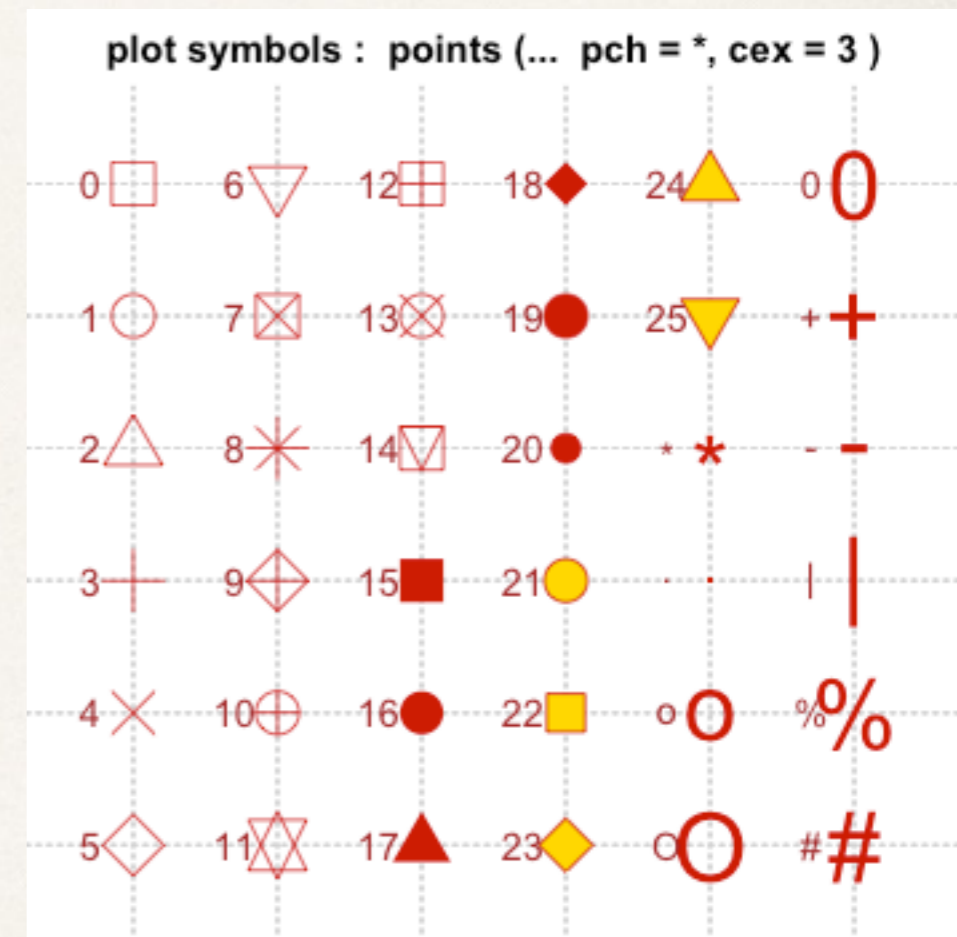
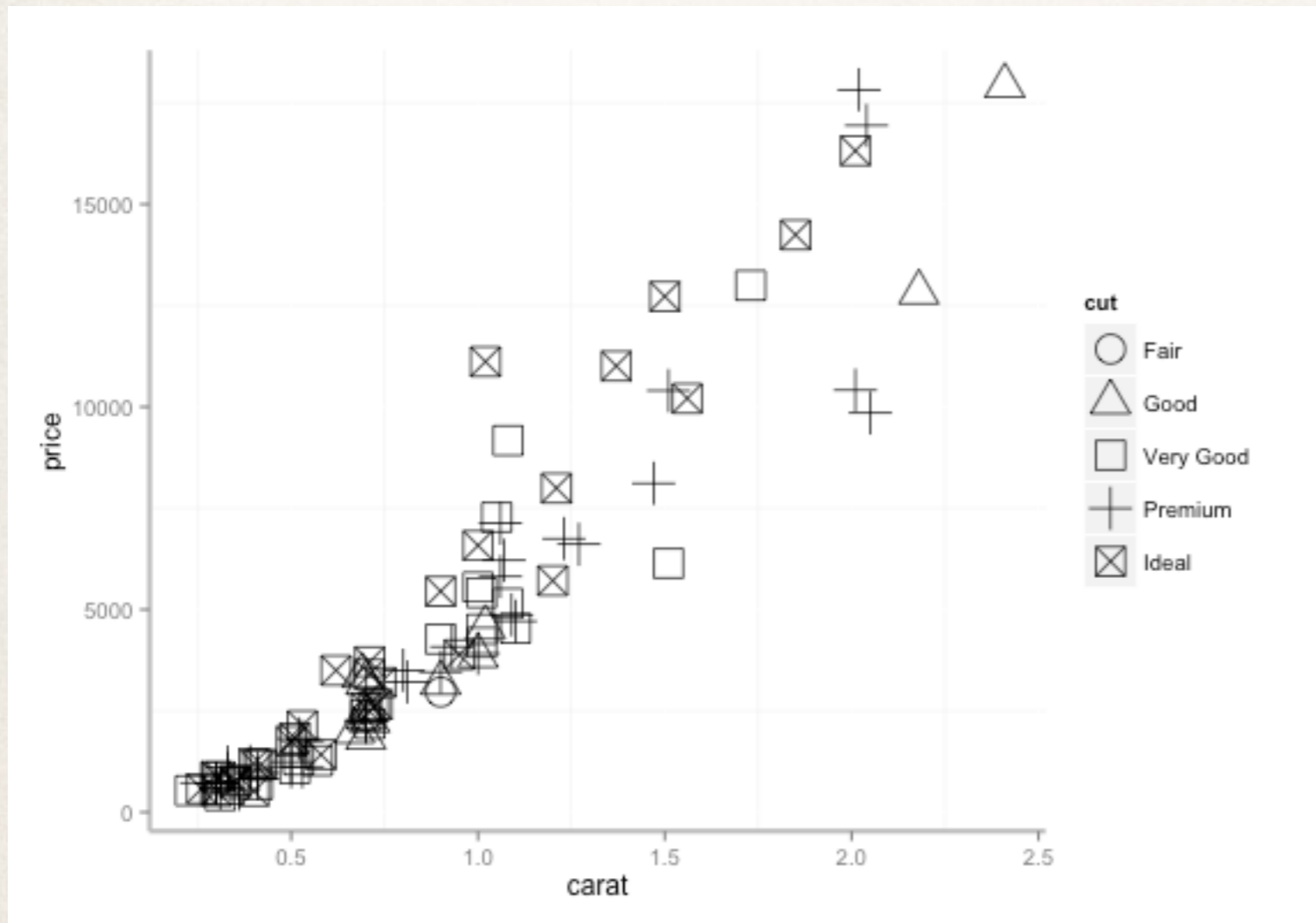
← decreasing threat level

↑ main threat

Position characteristics

Visual Variable: Position		
✓	selective	
✓	associative	
✓	quantitative	
✓	order	
✓	length	

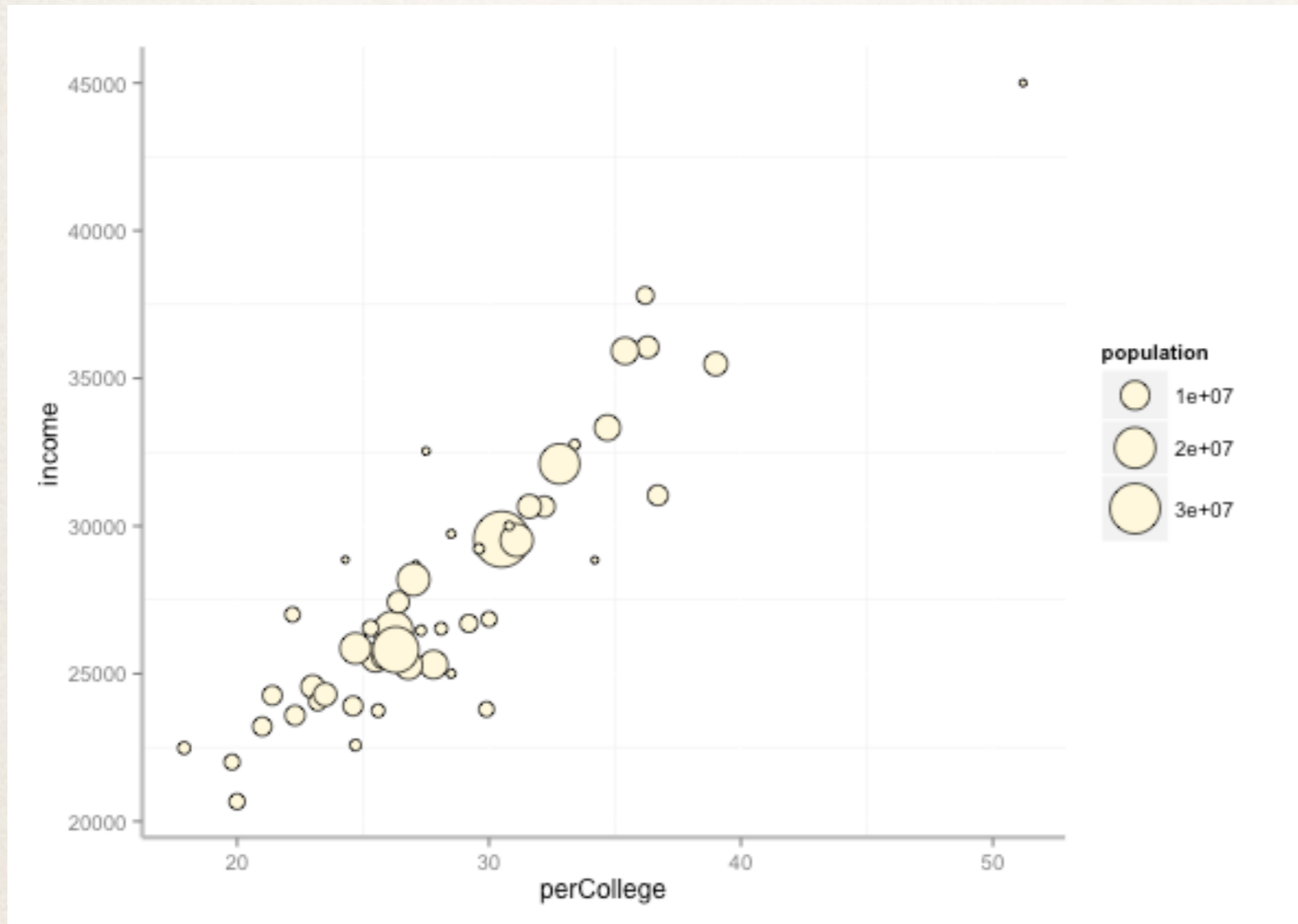
Marks or Glyphs



Shape characteristics

Visual Variable: Shape			
	selective		
	associative		
	quantitative		
	order		
	length		theoretically infinite

Size



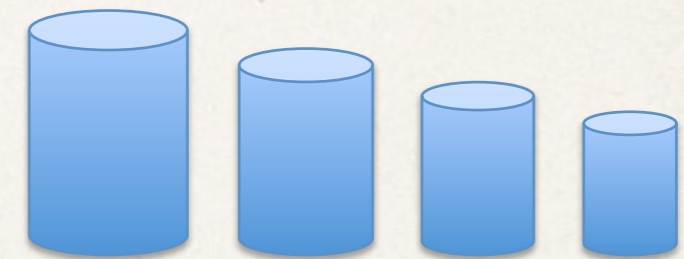
Length





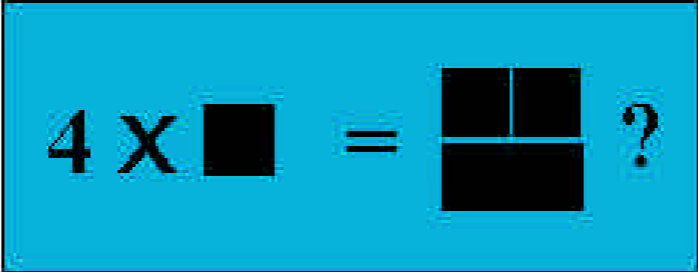
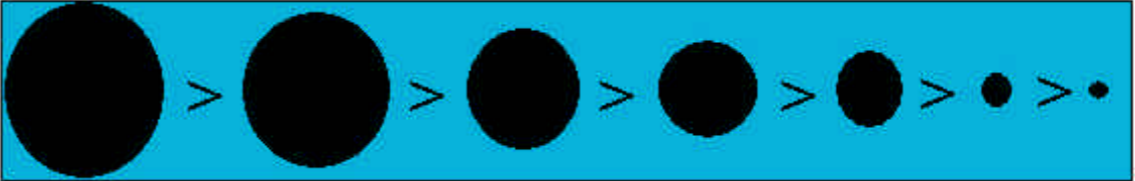
Area



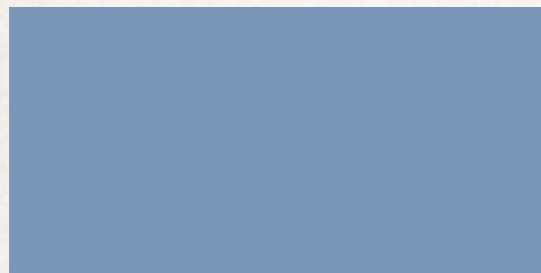
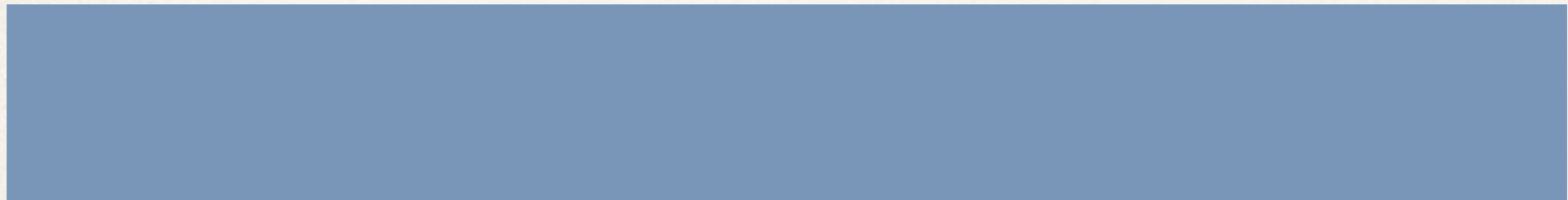
Volume



Size characteristics

Visual Variable: Size		
✓	selective	
✓	associative	
≈ =	quantitative	
✓	order	
✓	Length	<ul style="list-style-type: none"> • theoretically infinite but practically limited • association and selection ~ 5 and distinction ~ 20

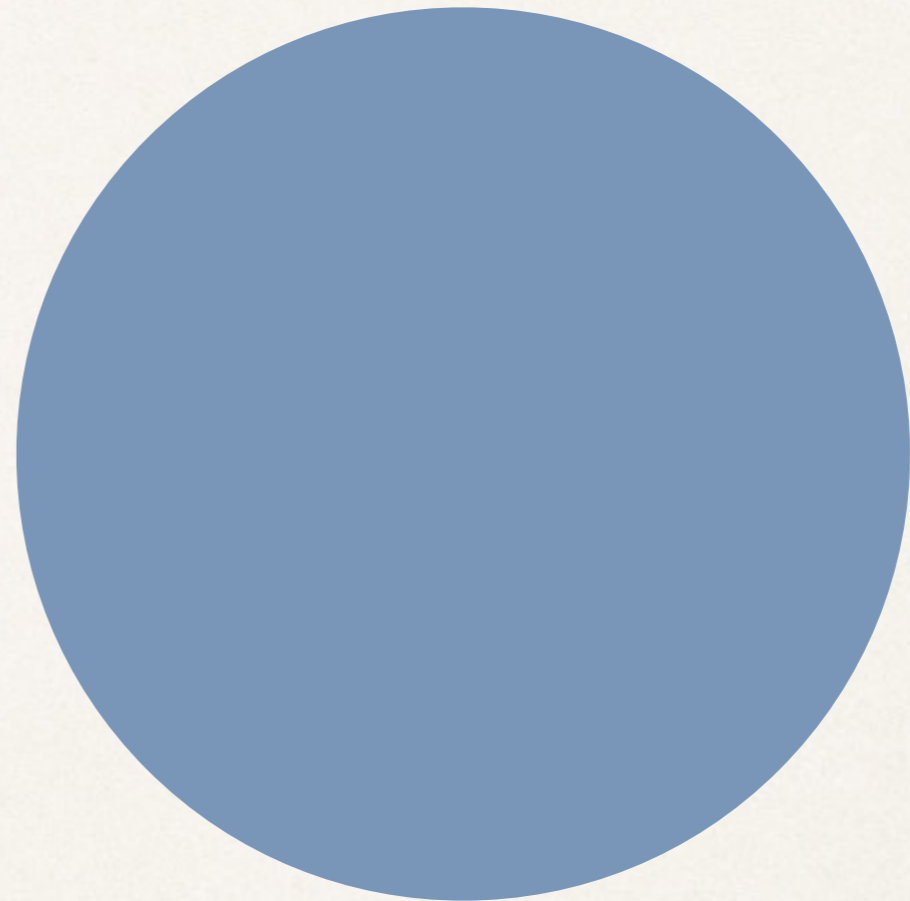
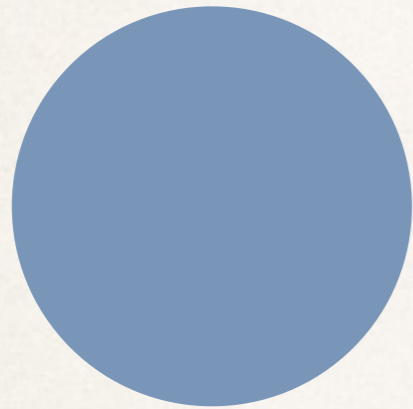
Quantitative values



compare the length of the bars

4 x longer

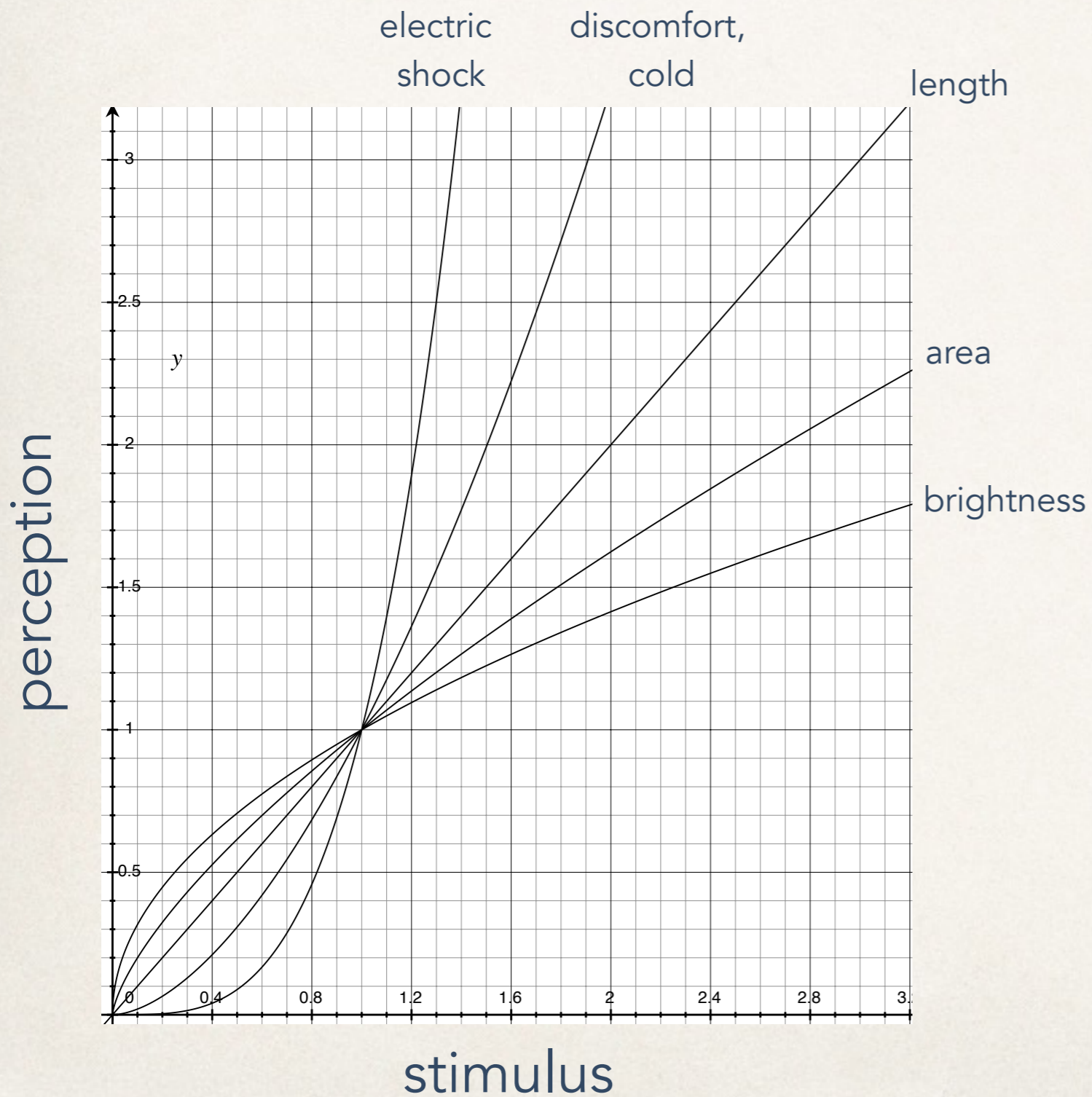
Quantitative values



compare the area of the circles

5 x bigger

Steven's power law



$$\psi(I) = kI^a$$

sensation	exponent
shock	3.5
discomfort, cold	1.7
length	1
area	0.7
brightness	0.5

Weber's Law

JNB - Just Noticeable Difference

$$dp = k \frac{dS}{S}$$

The perceptible difference proportional to the ratio of the difference in stimulus and the current stimulus

