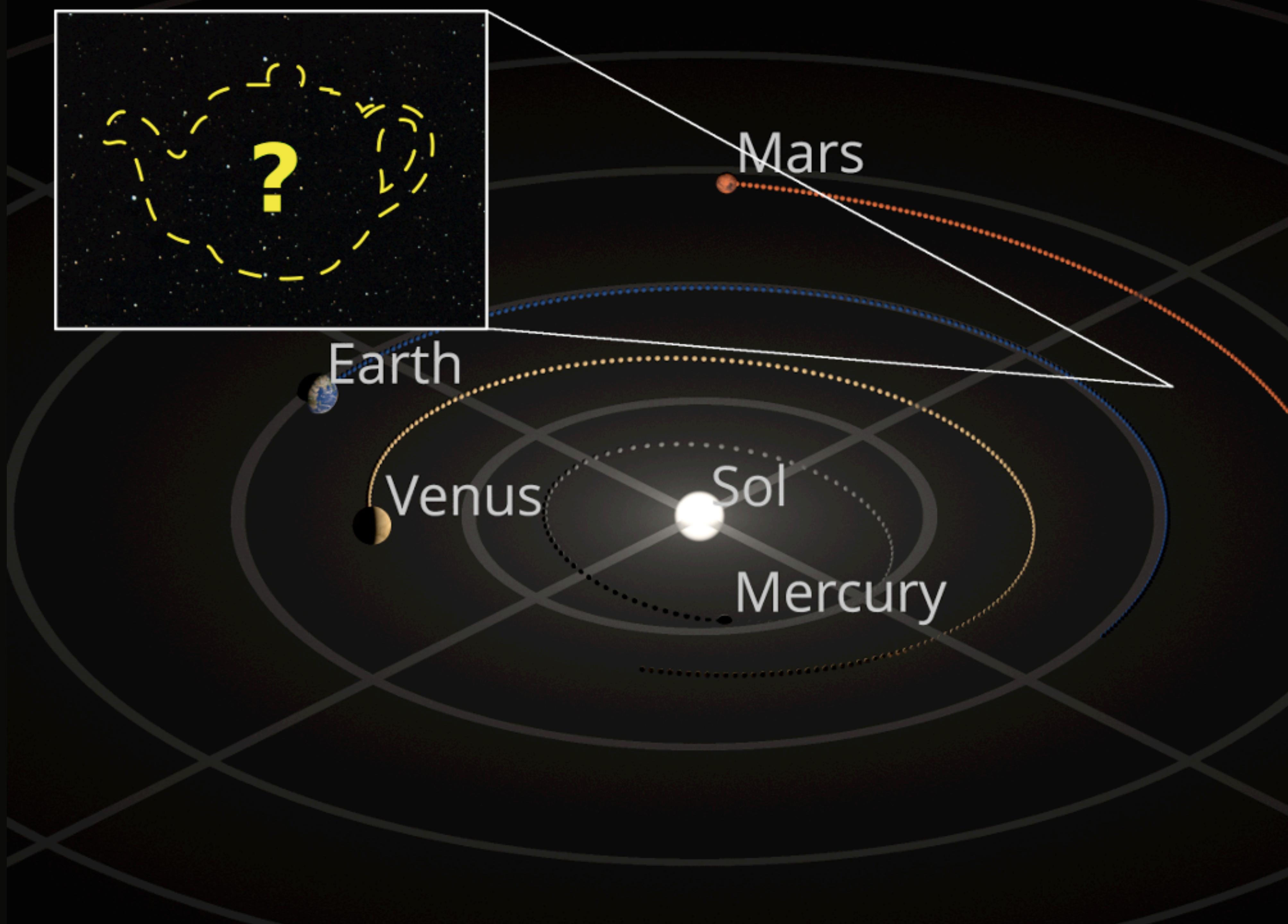


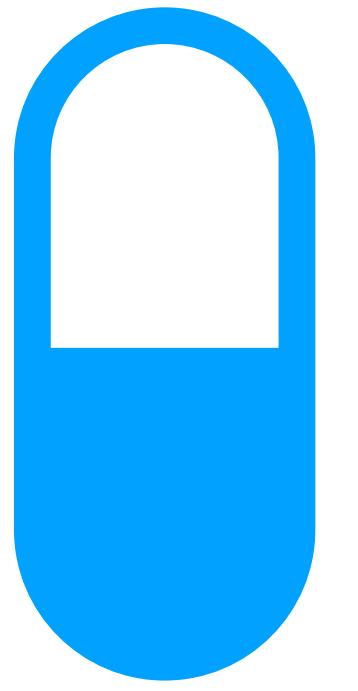
Testiranje hipoteza o populacionim prosečnim vrednostima i proporcijama

Nedelja 6 - Vežbe

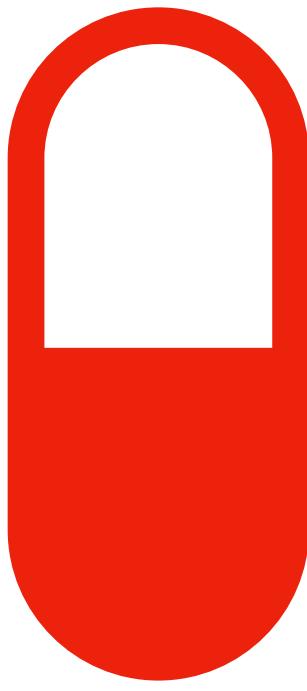


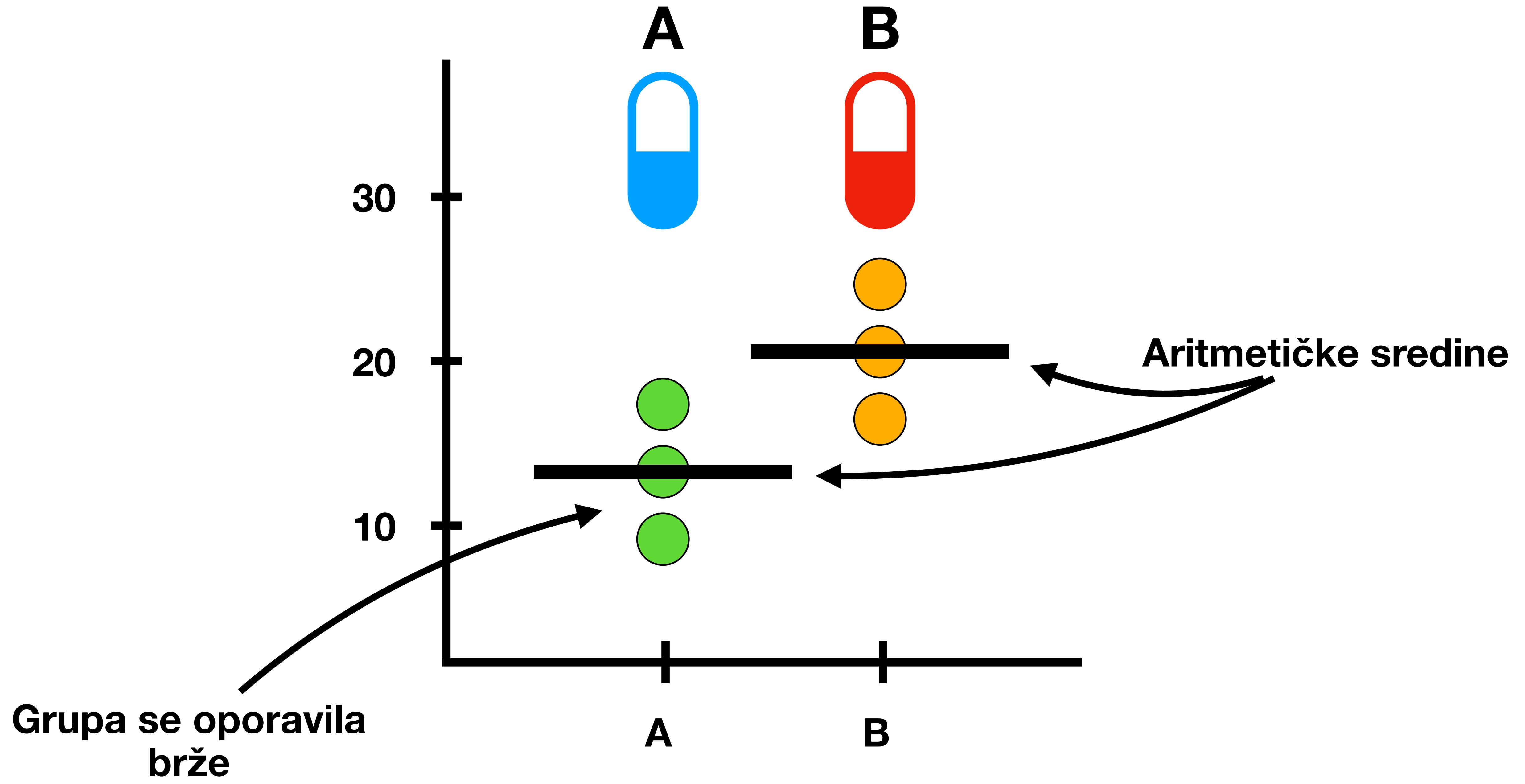


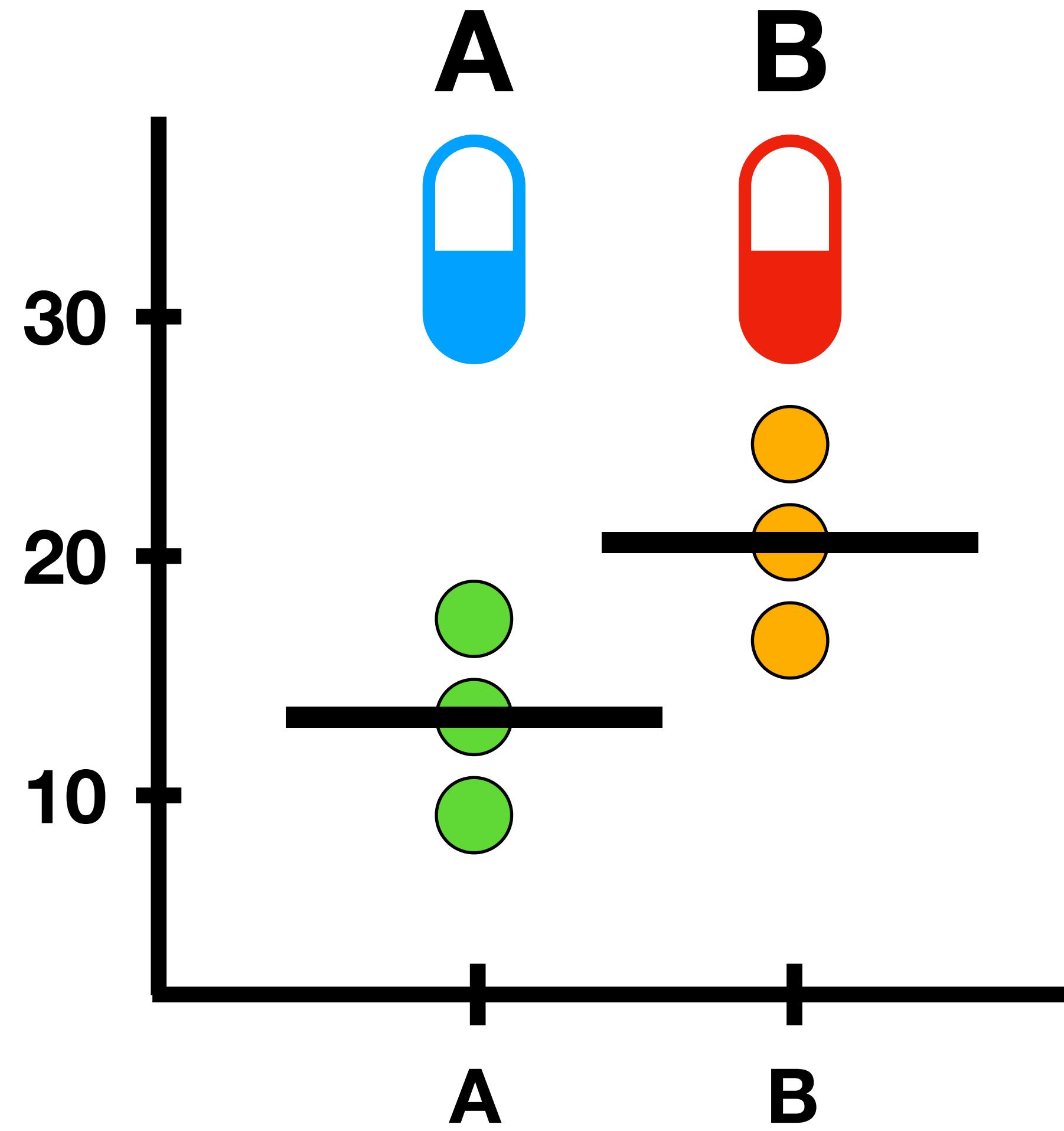
A



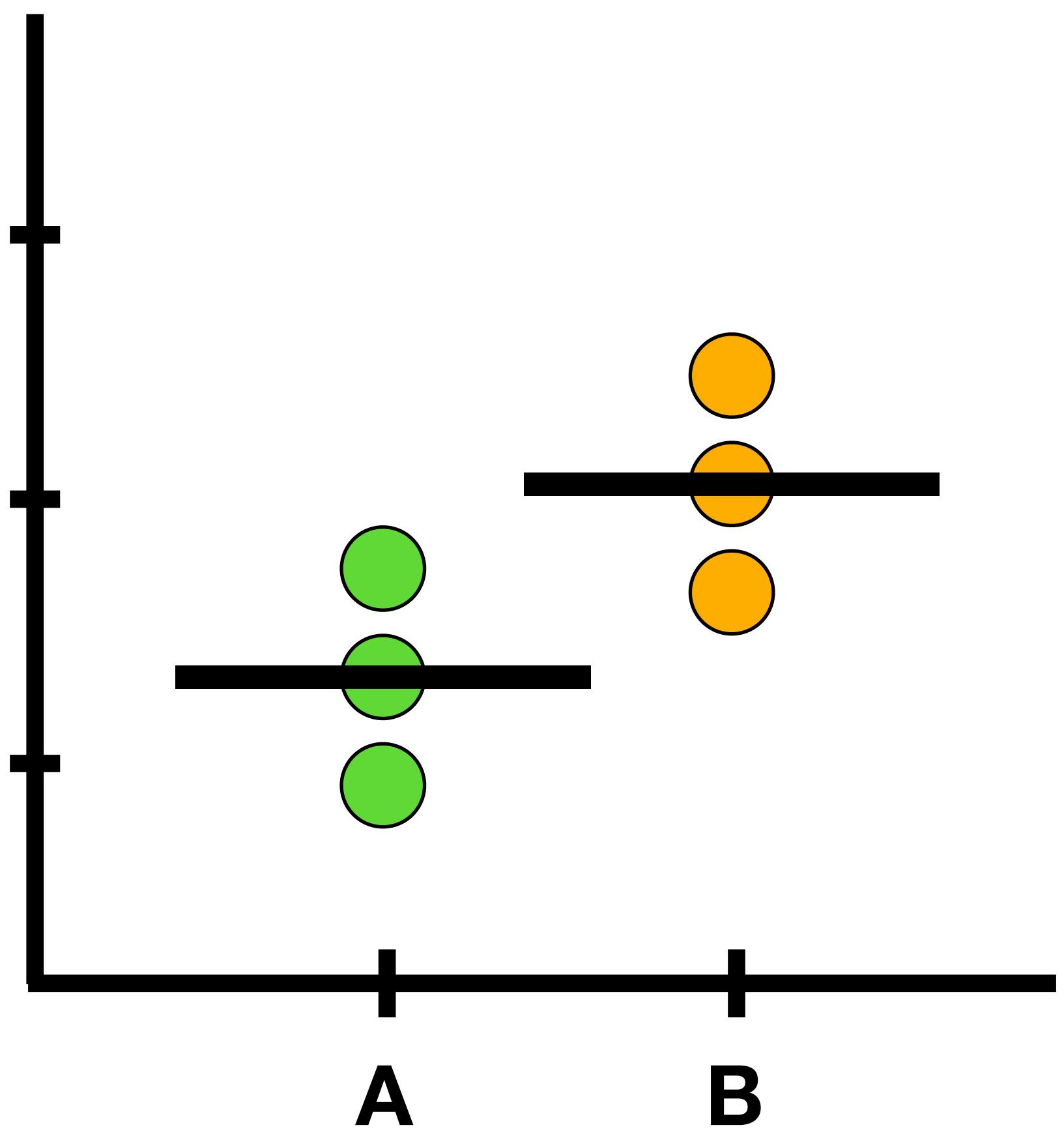
B

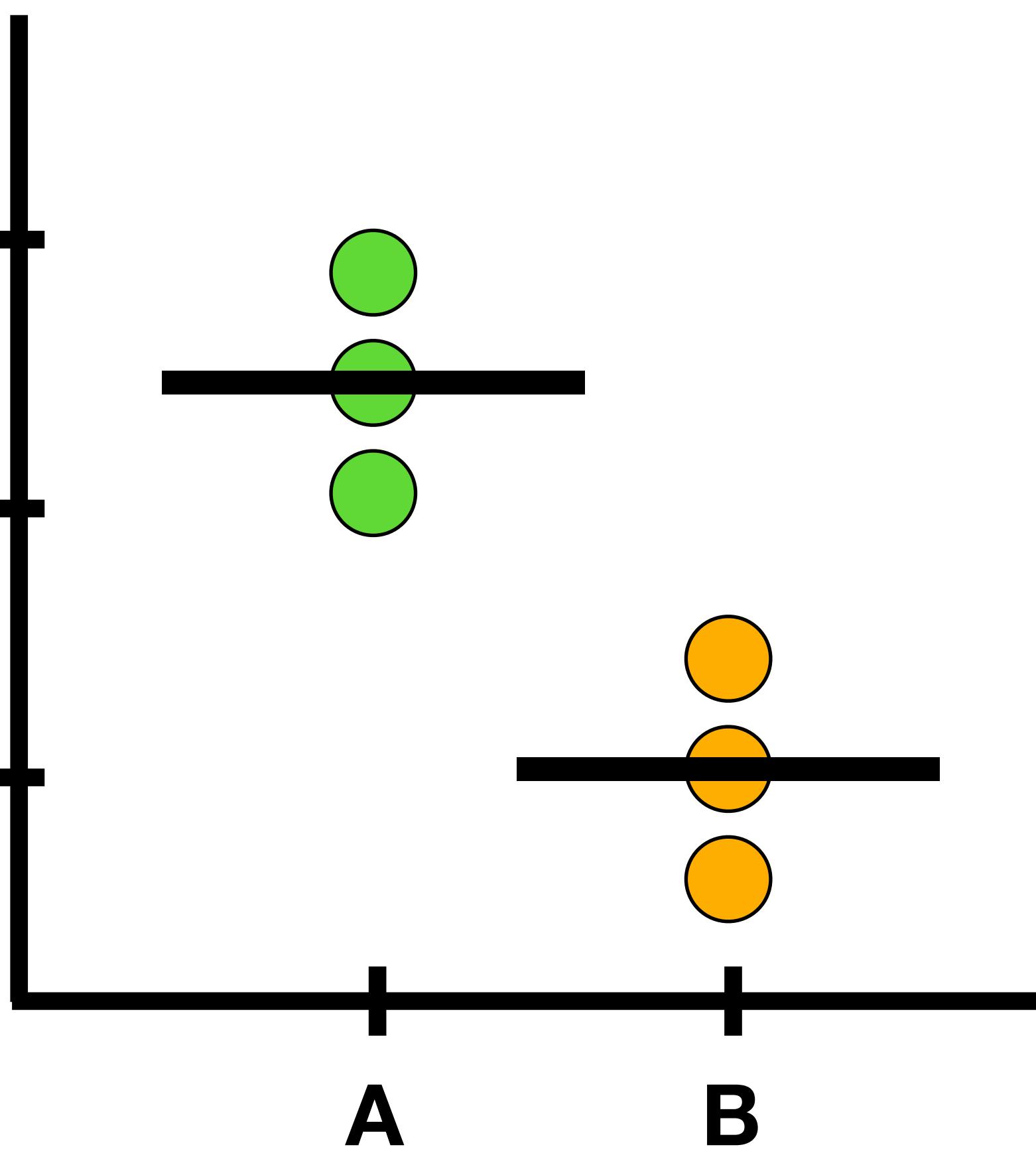
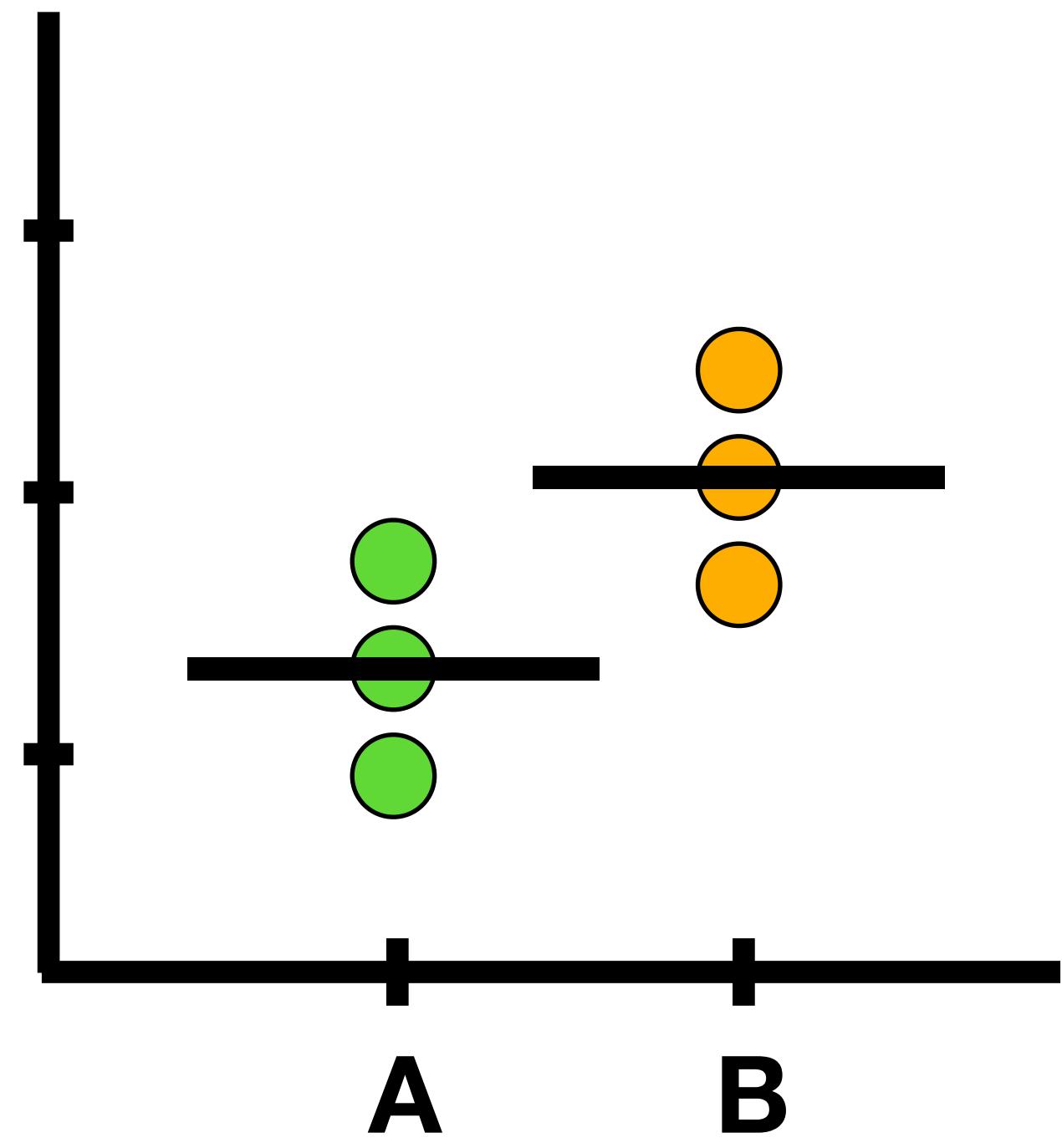


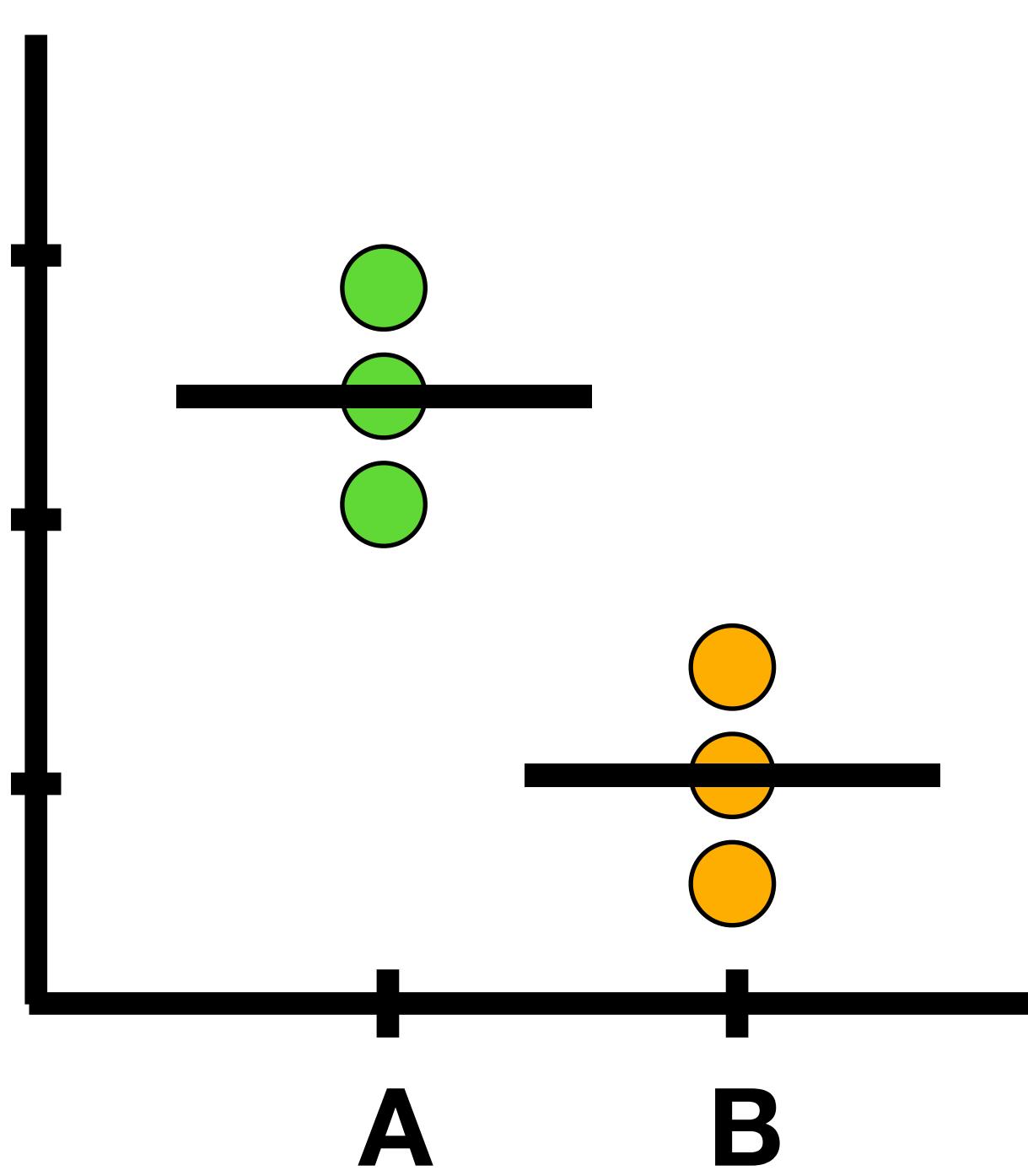
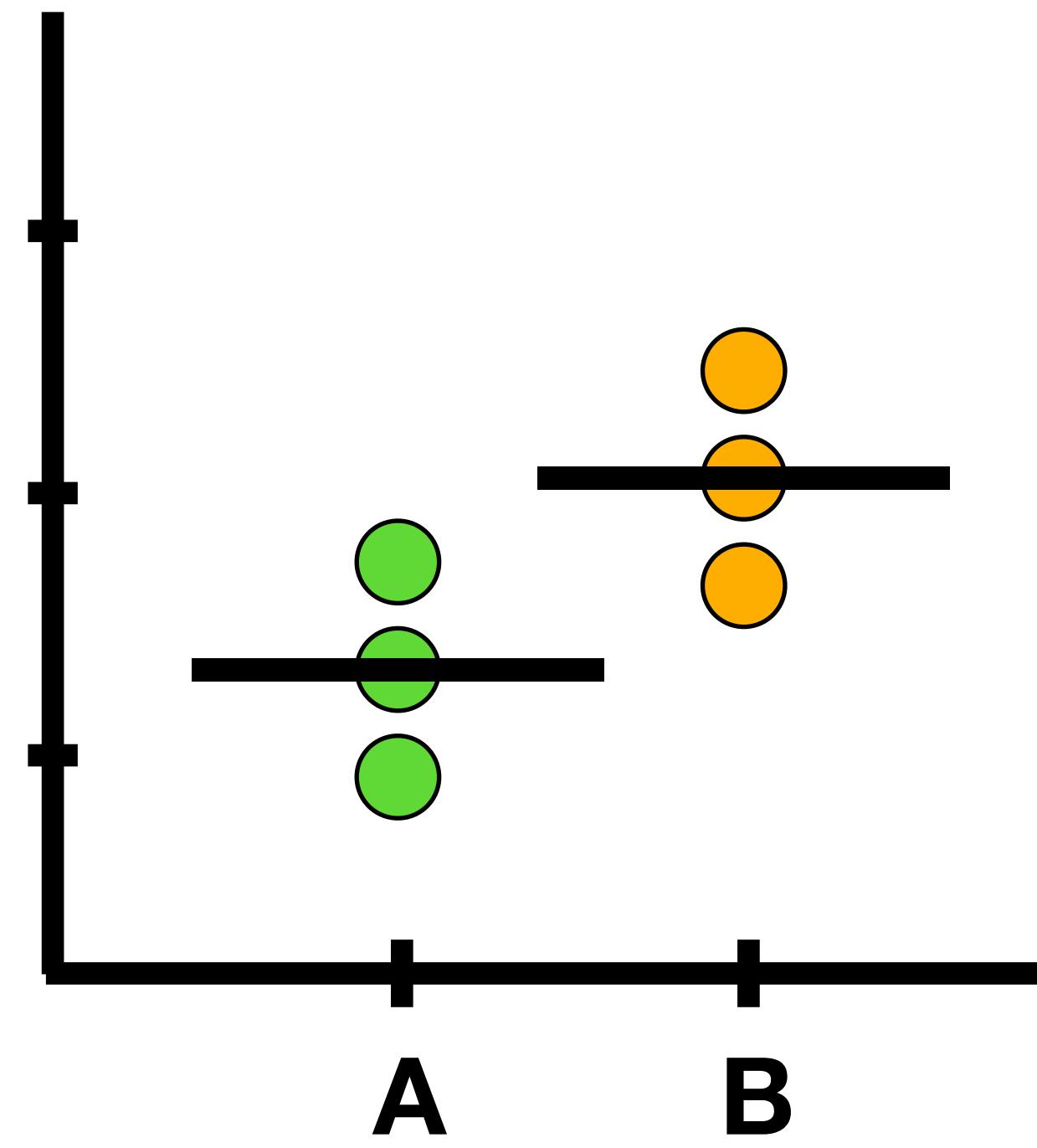


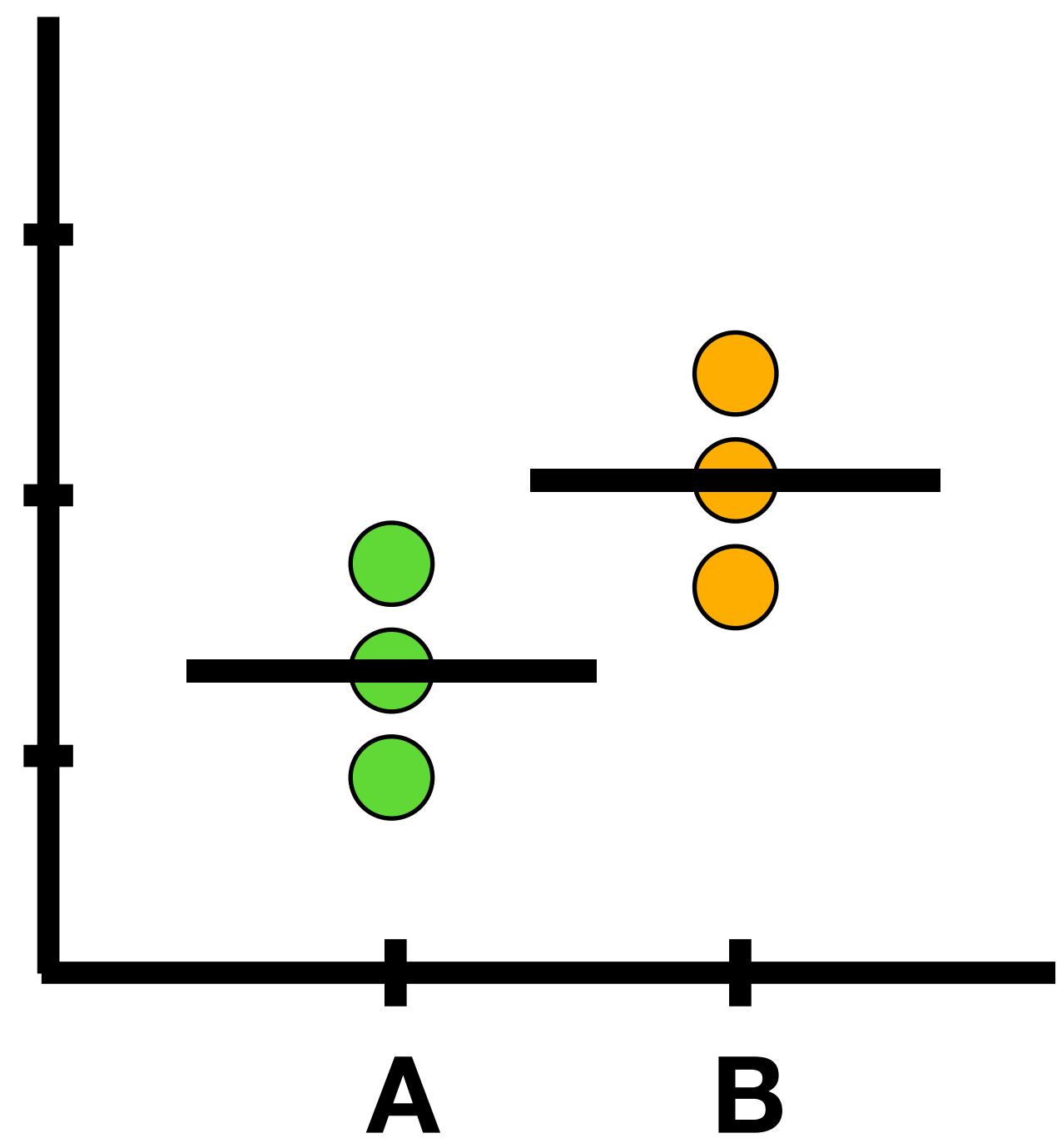


Ljudi koji su pili **Lek A** su se, u proseku, oporavili **8** dana brže od ljudi koji su pili **Lek B**.

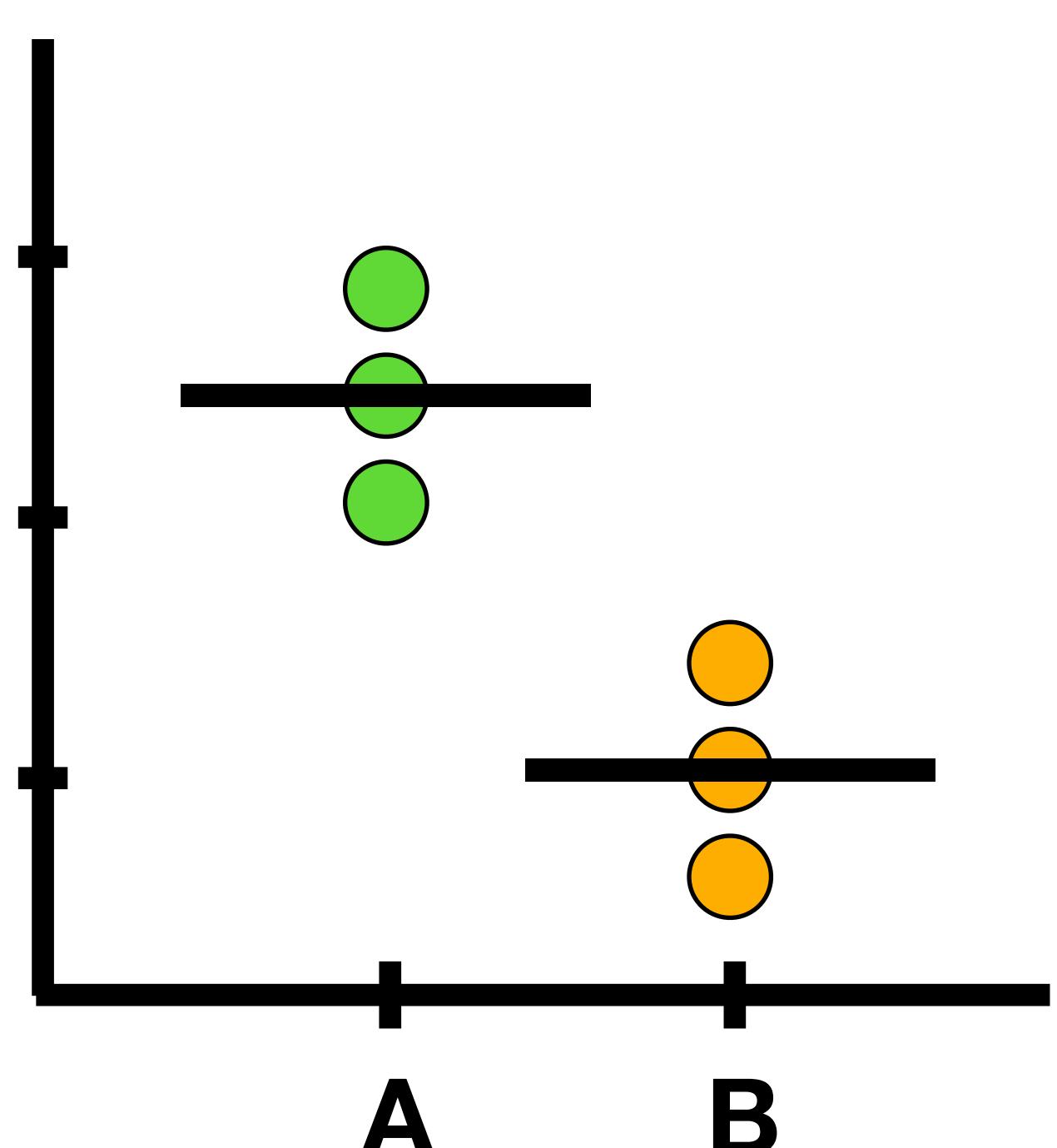




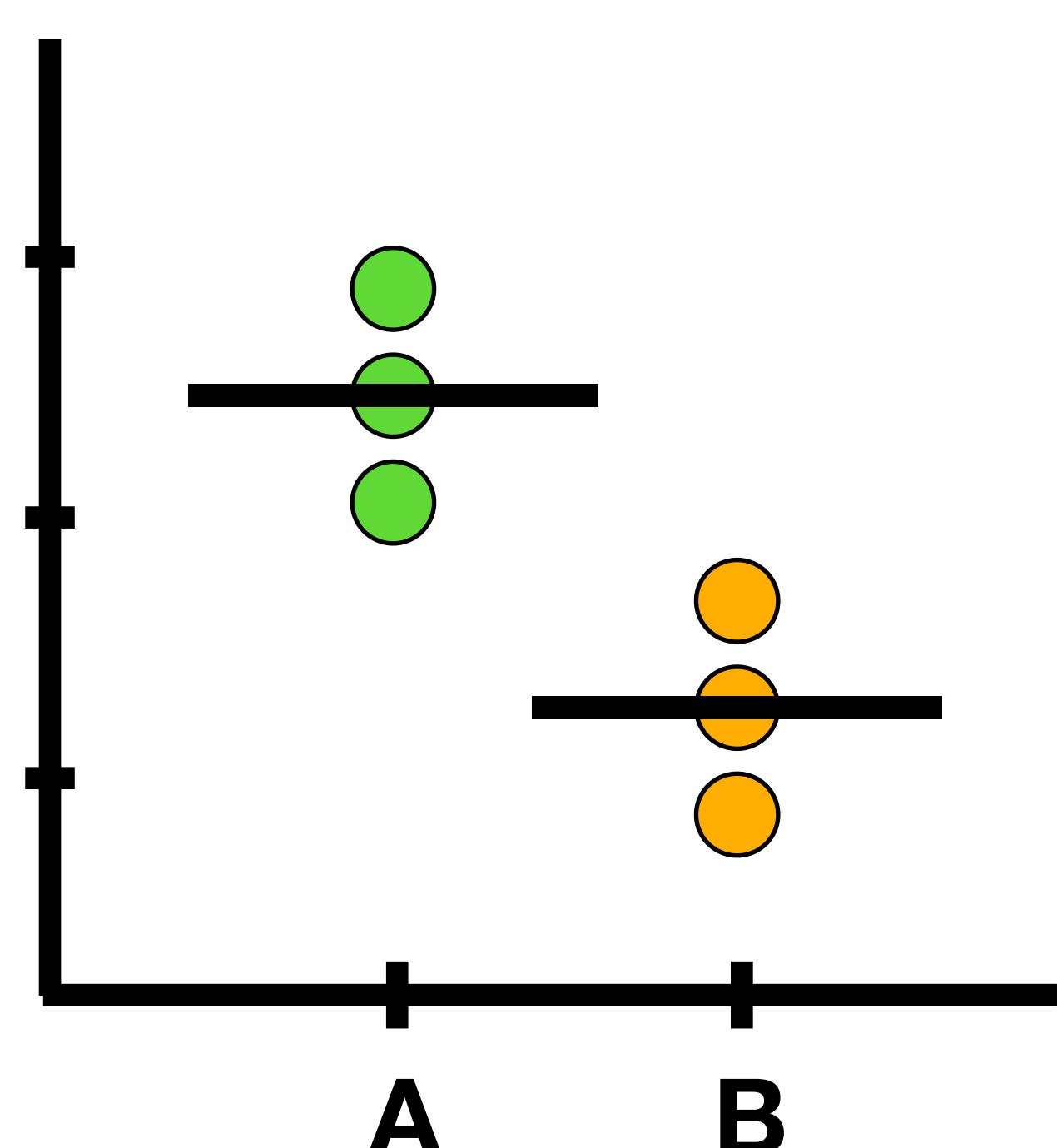




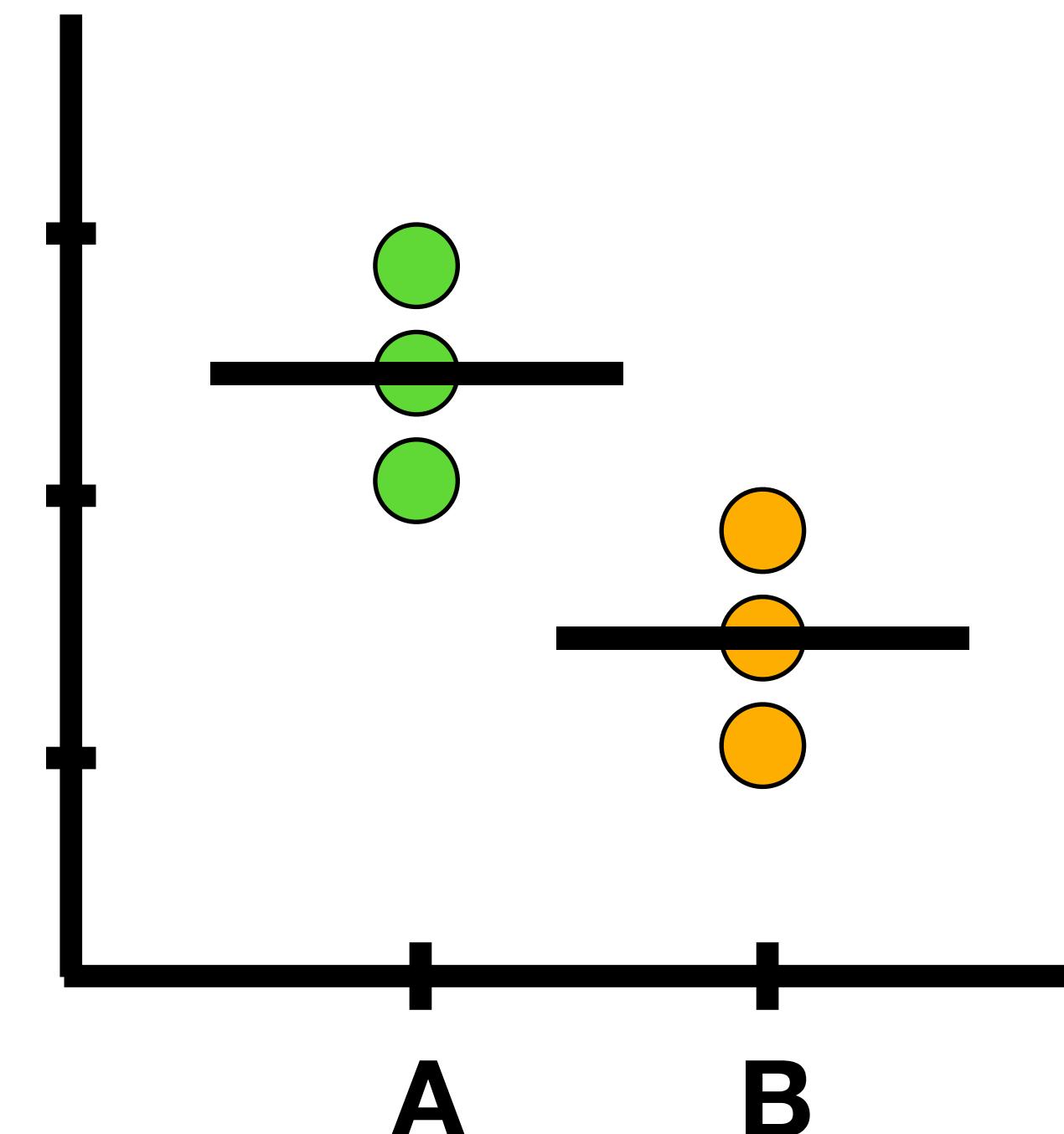
A **B**



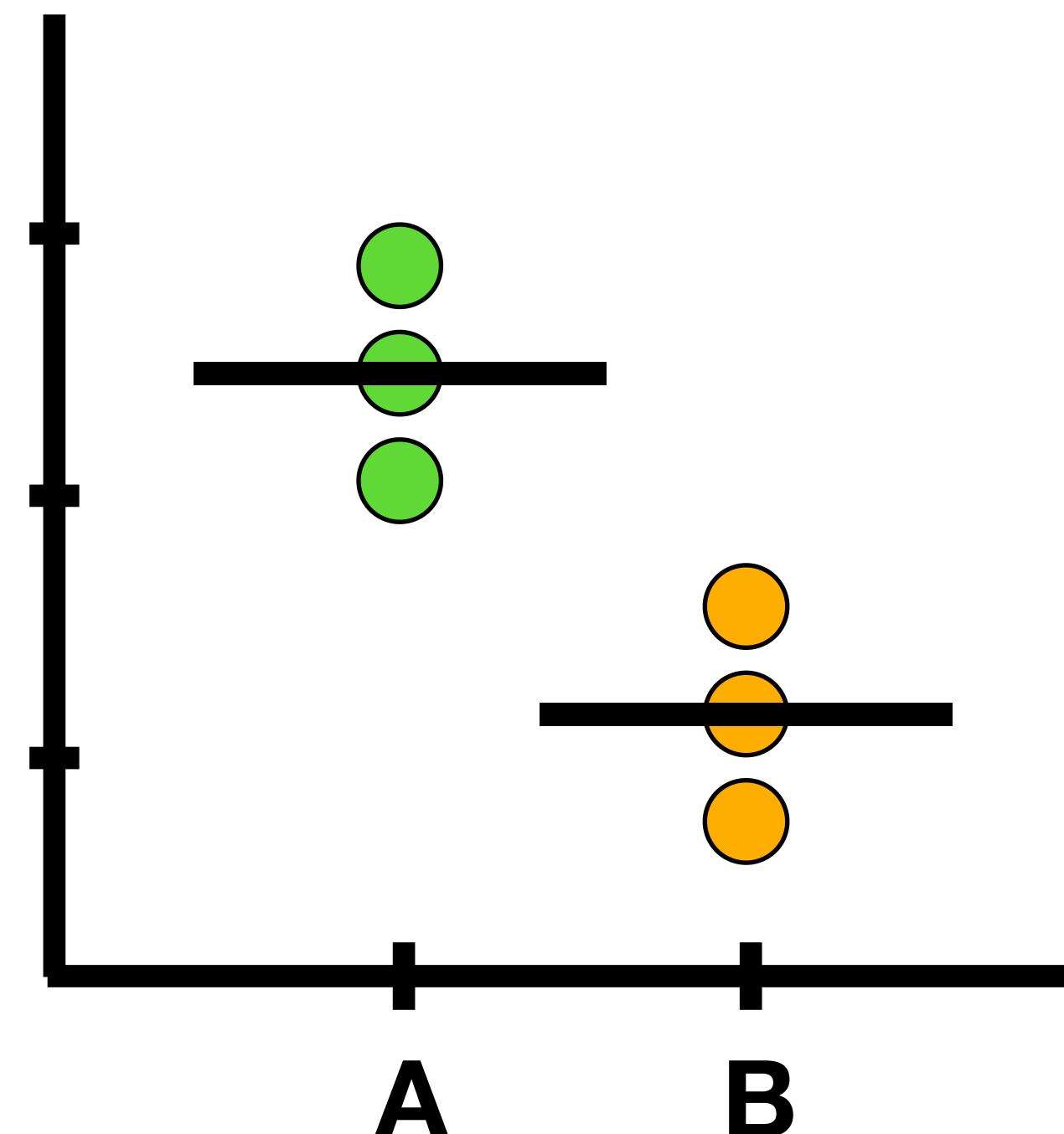
A **B**



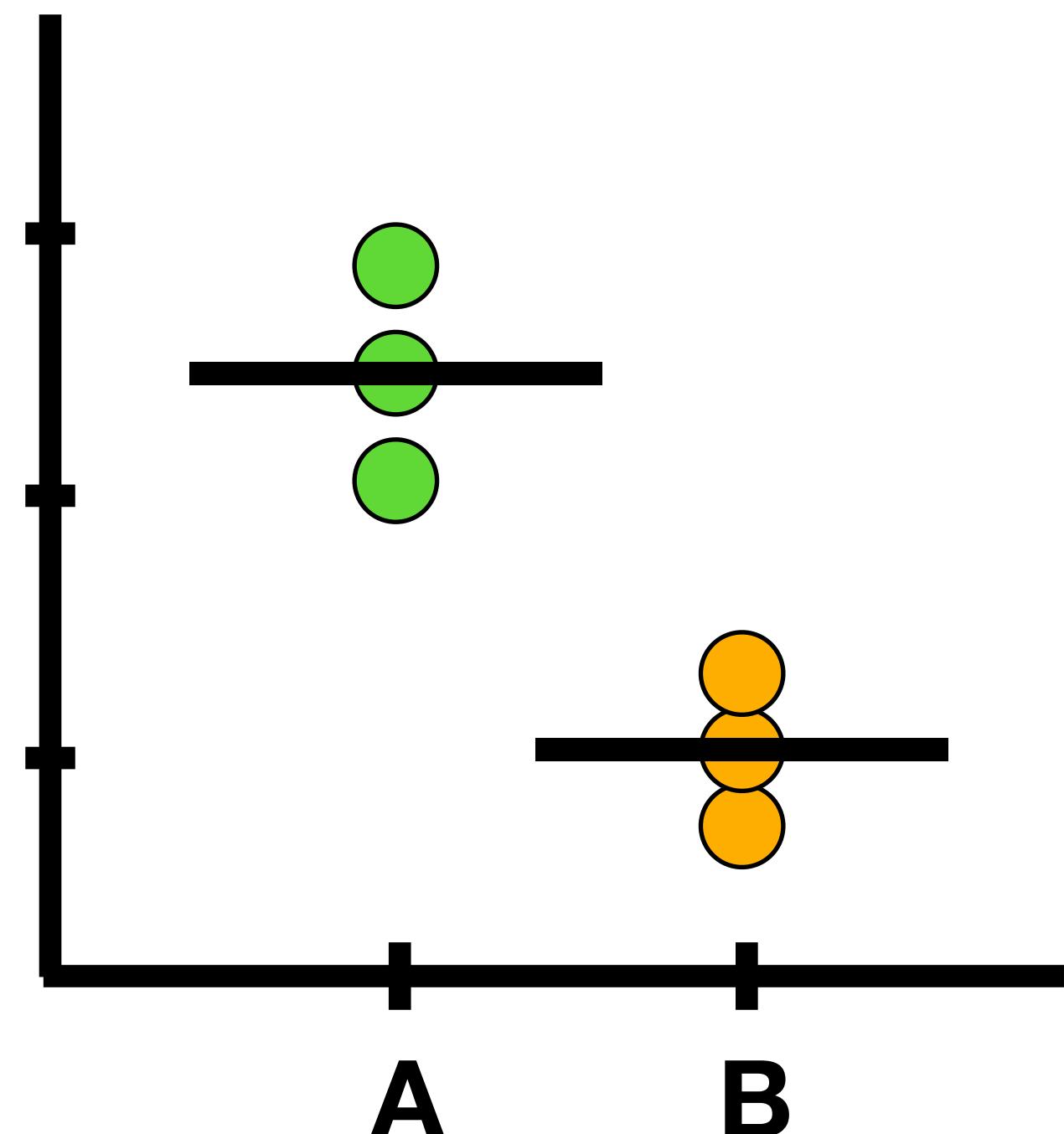
A **B**



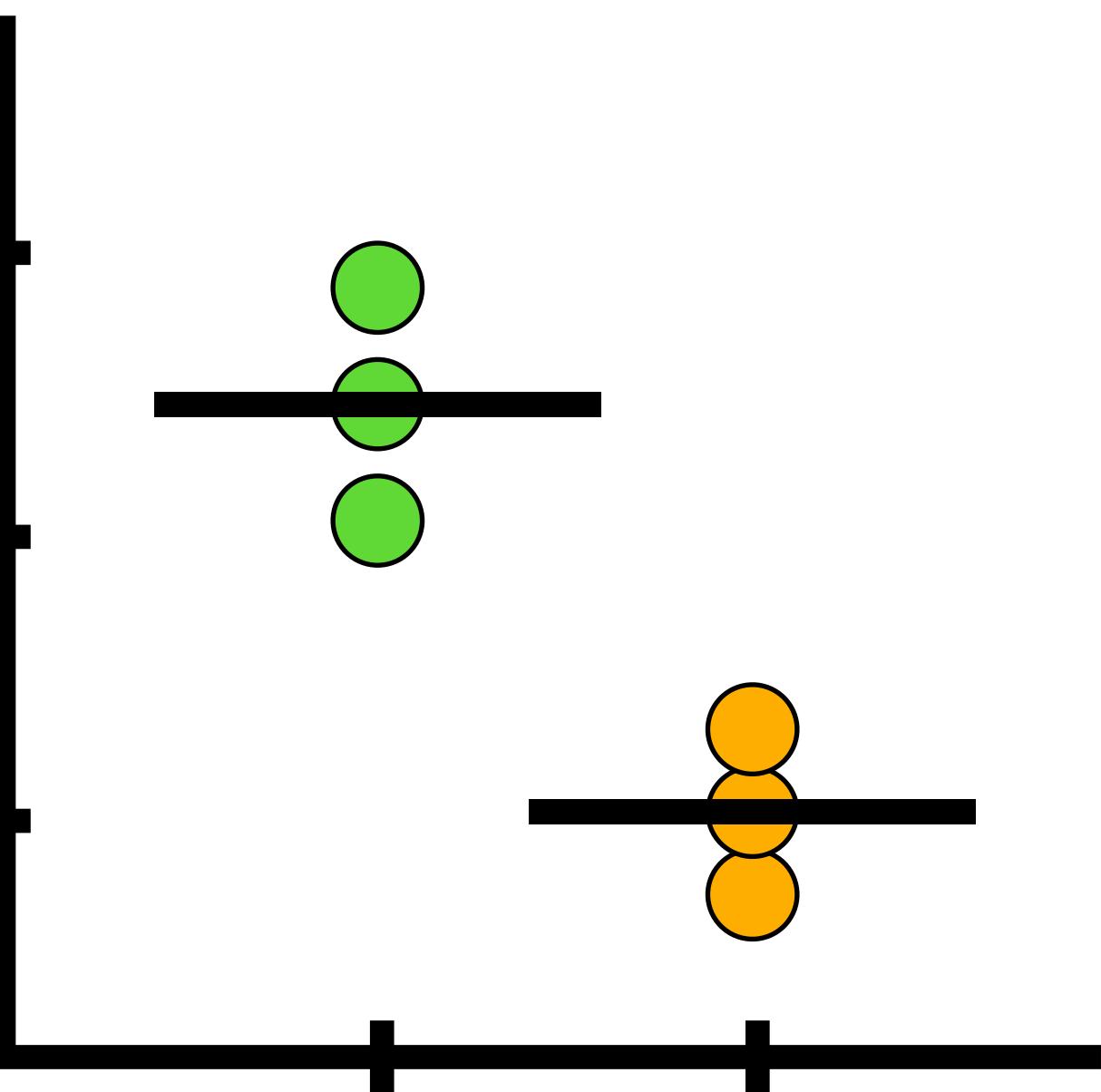
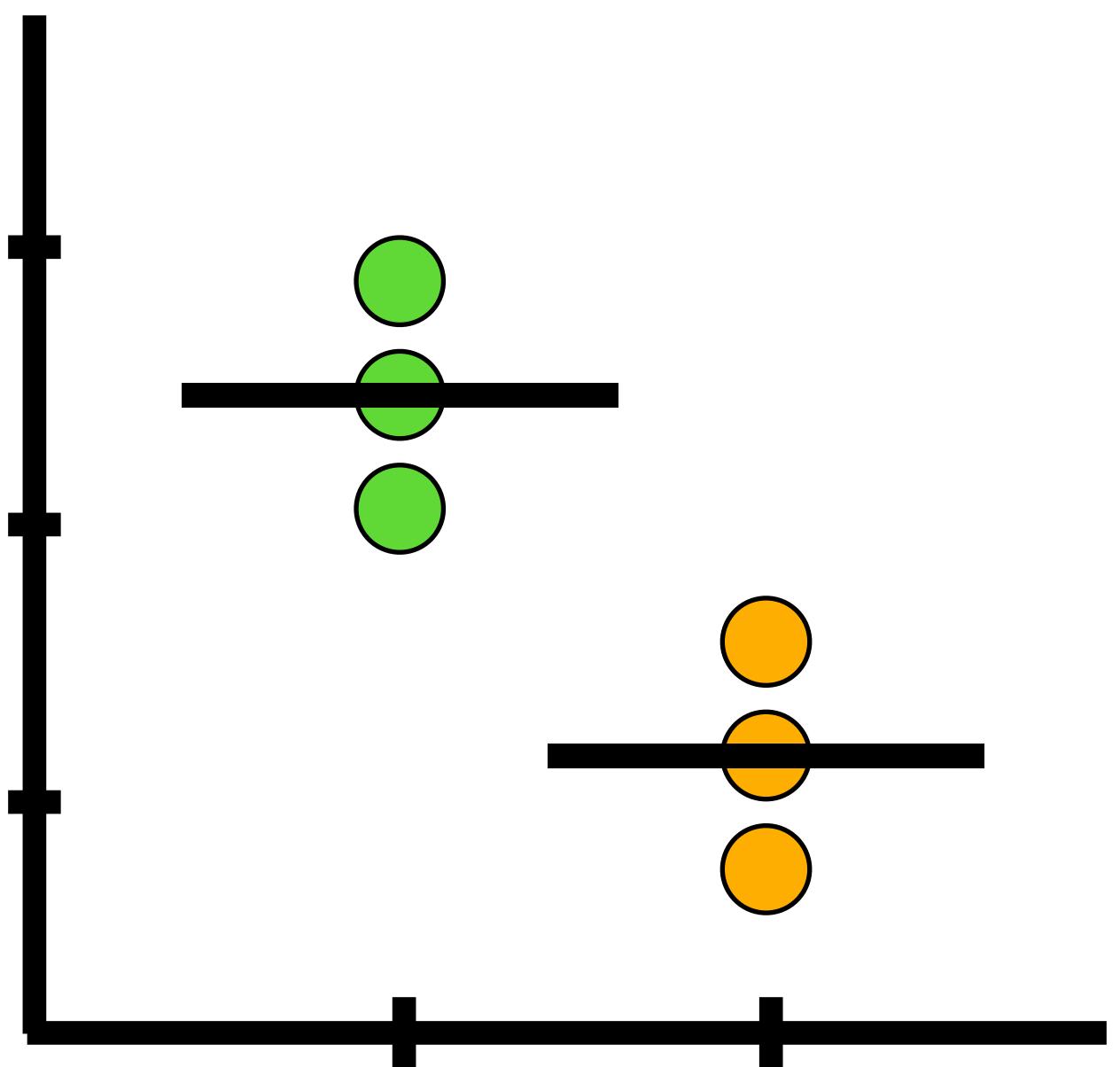
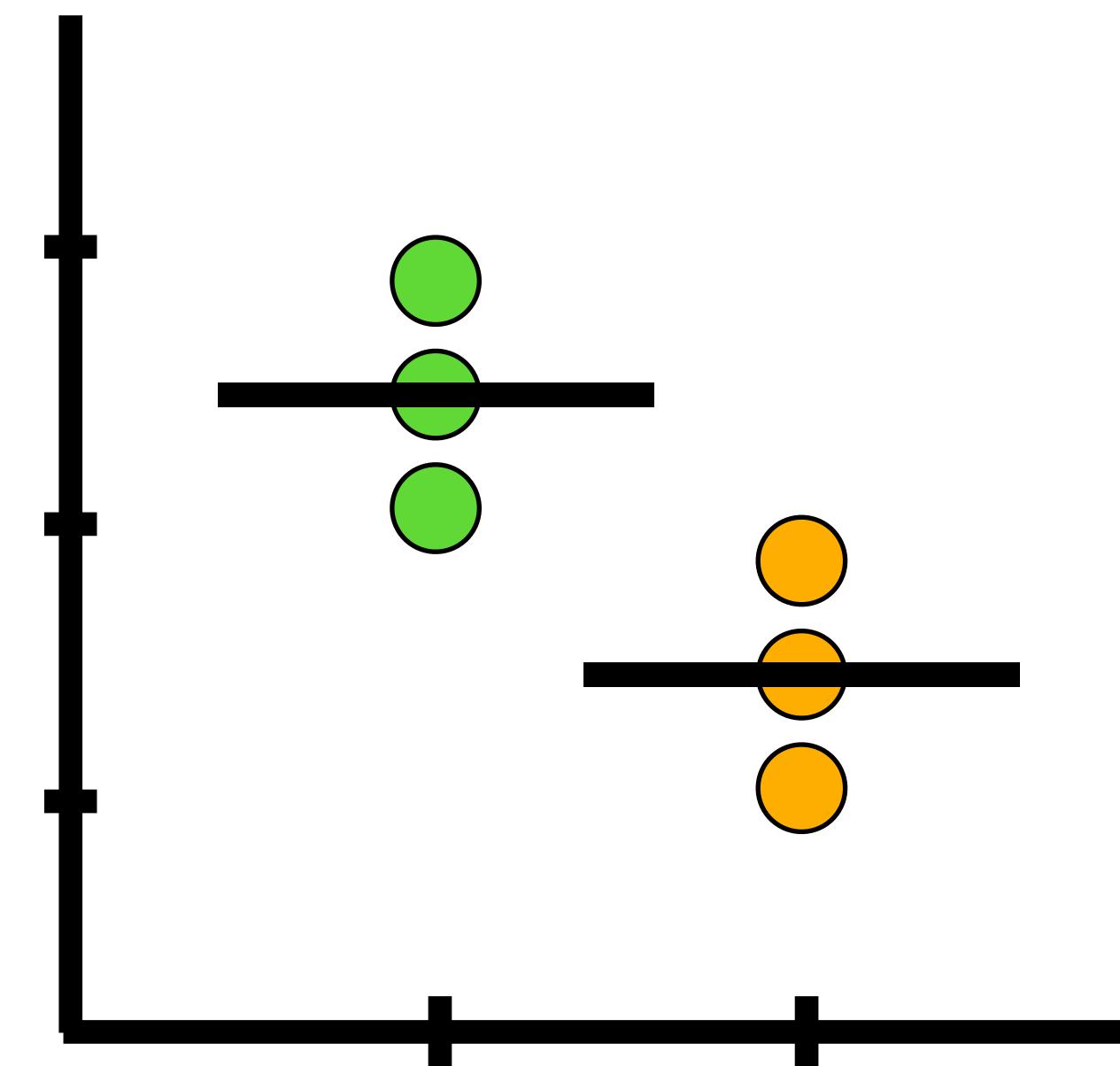
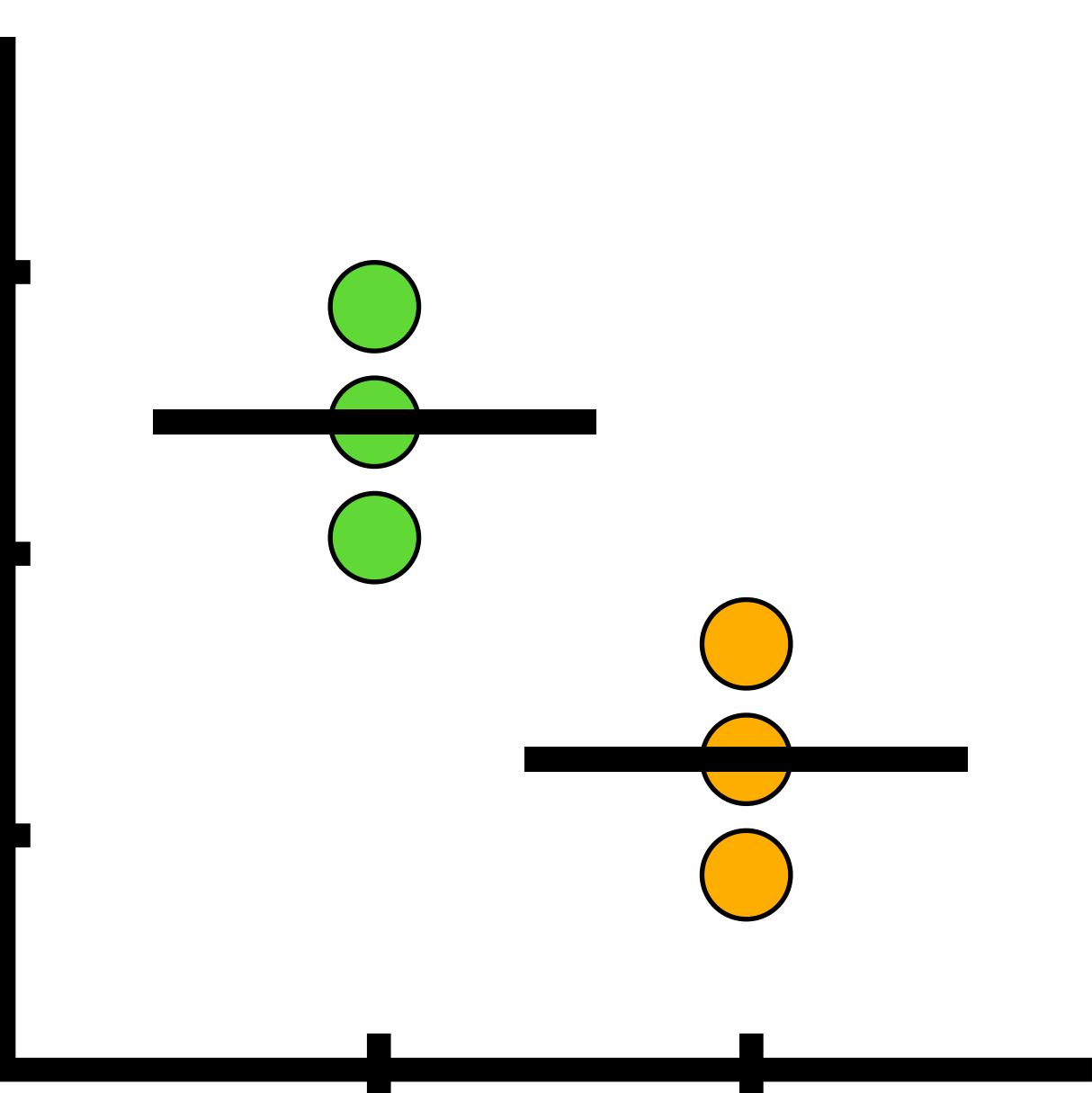
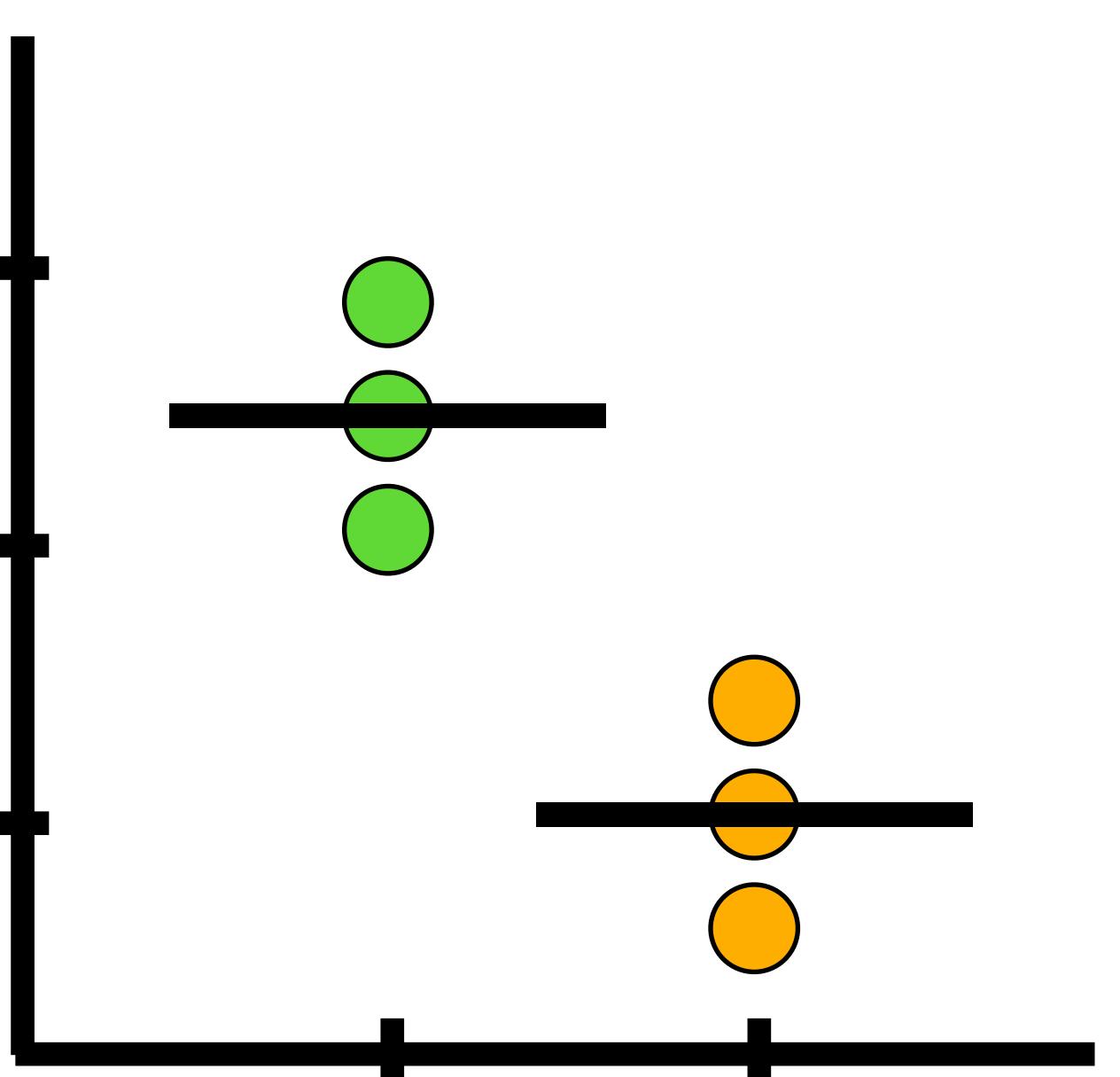
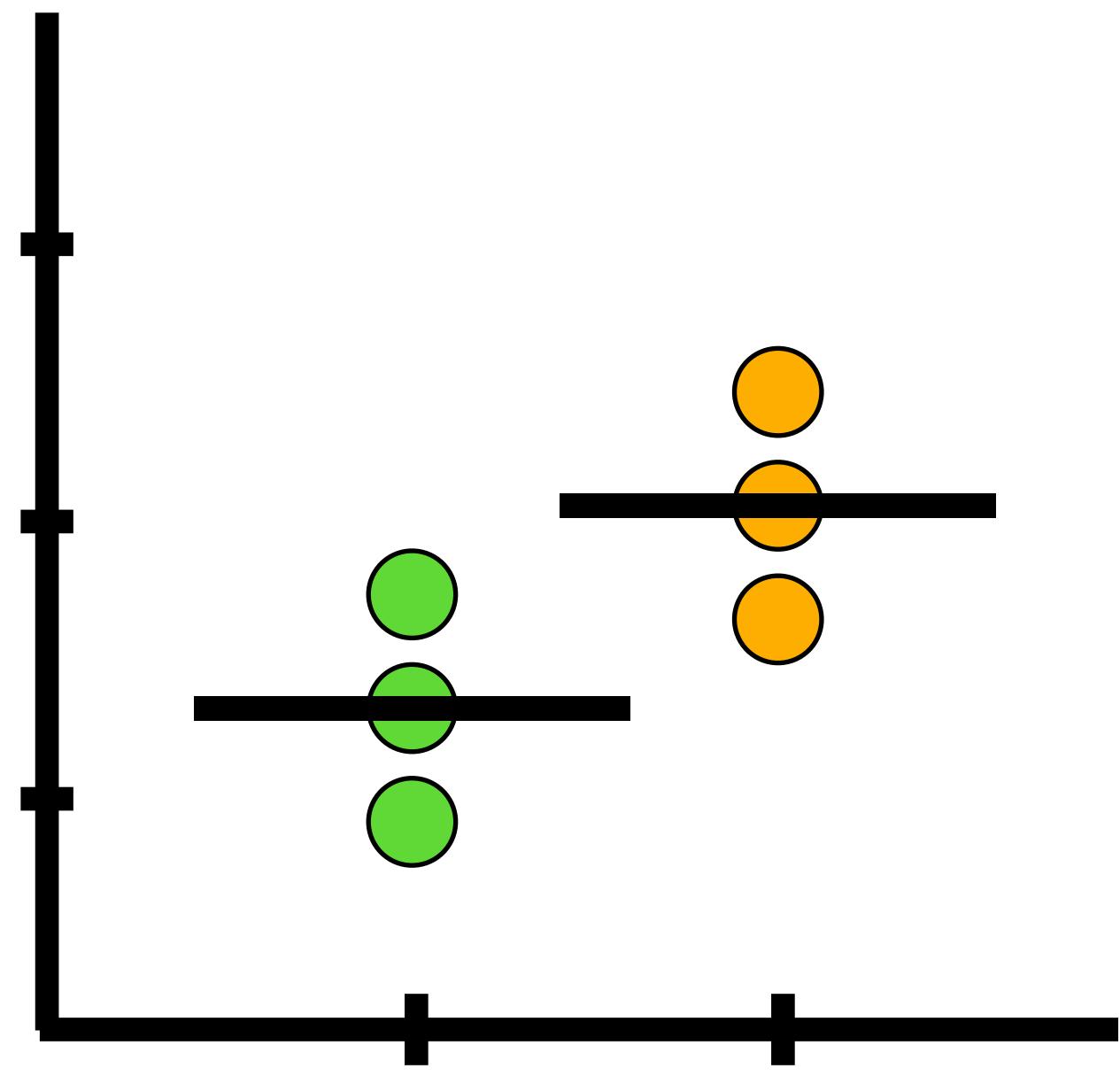
A **B**

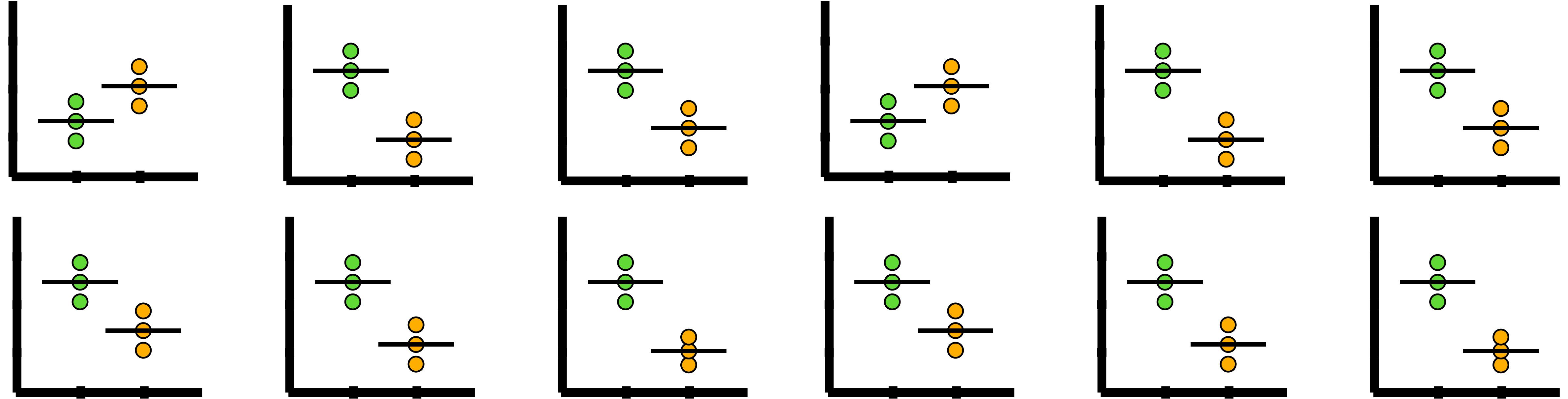


A **B**



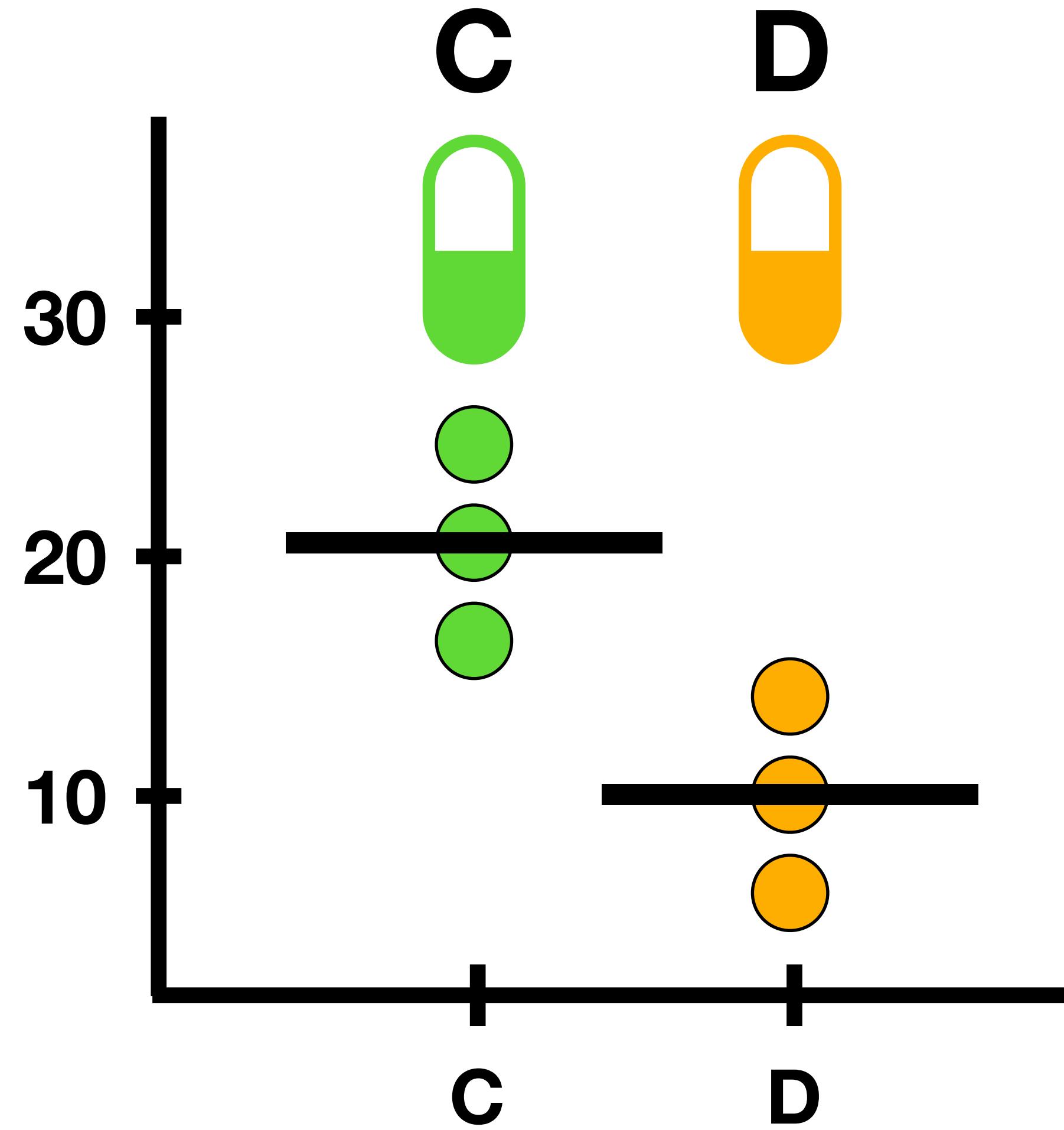
A **B**



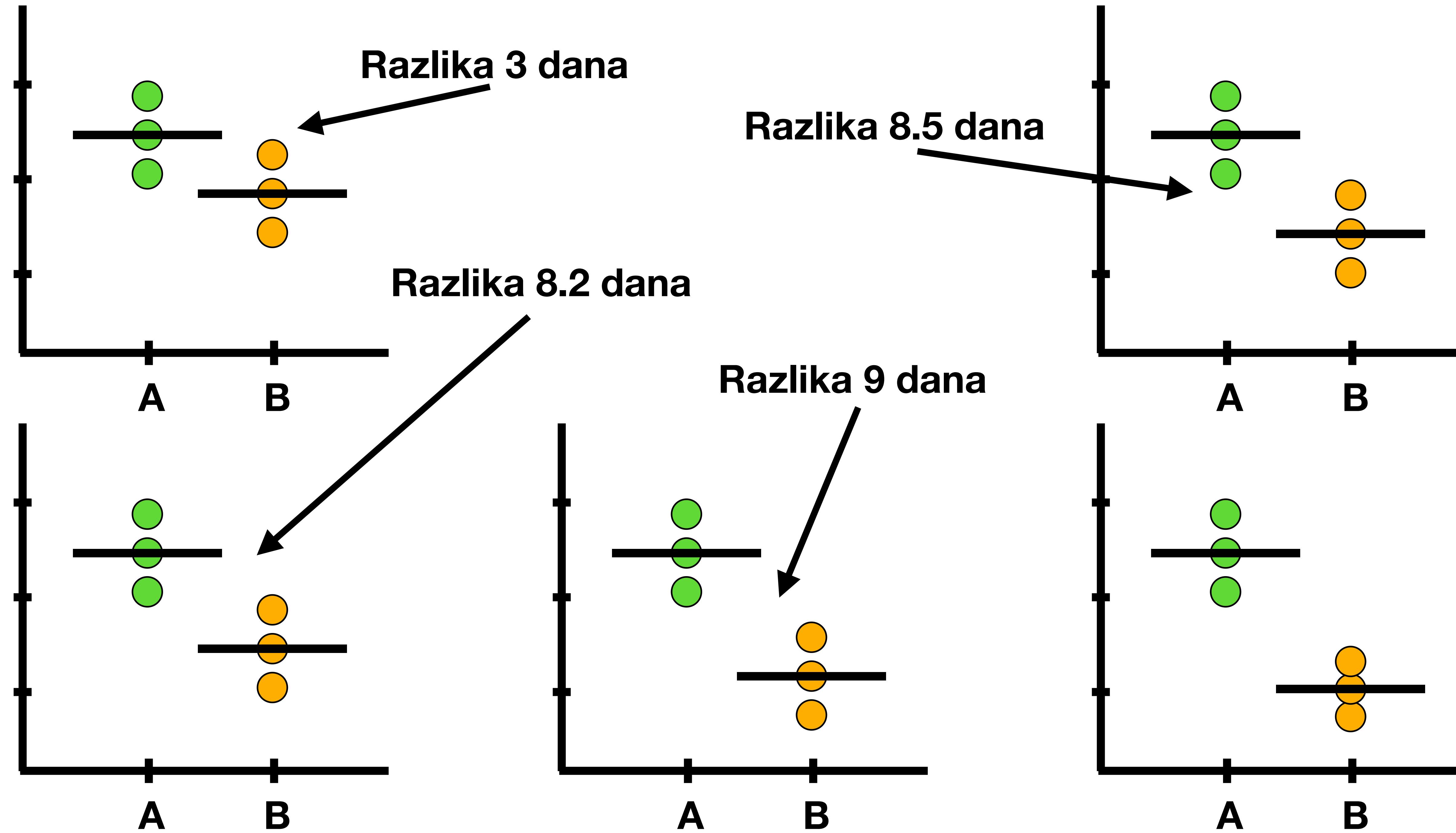


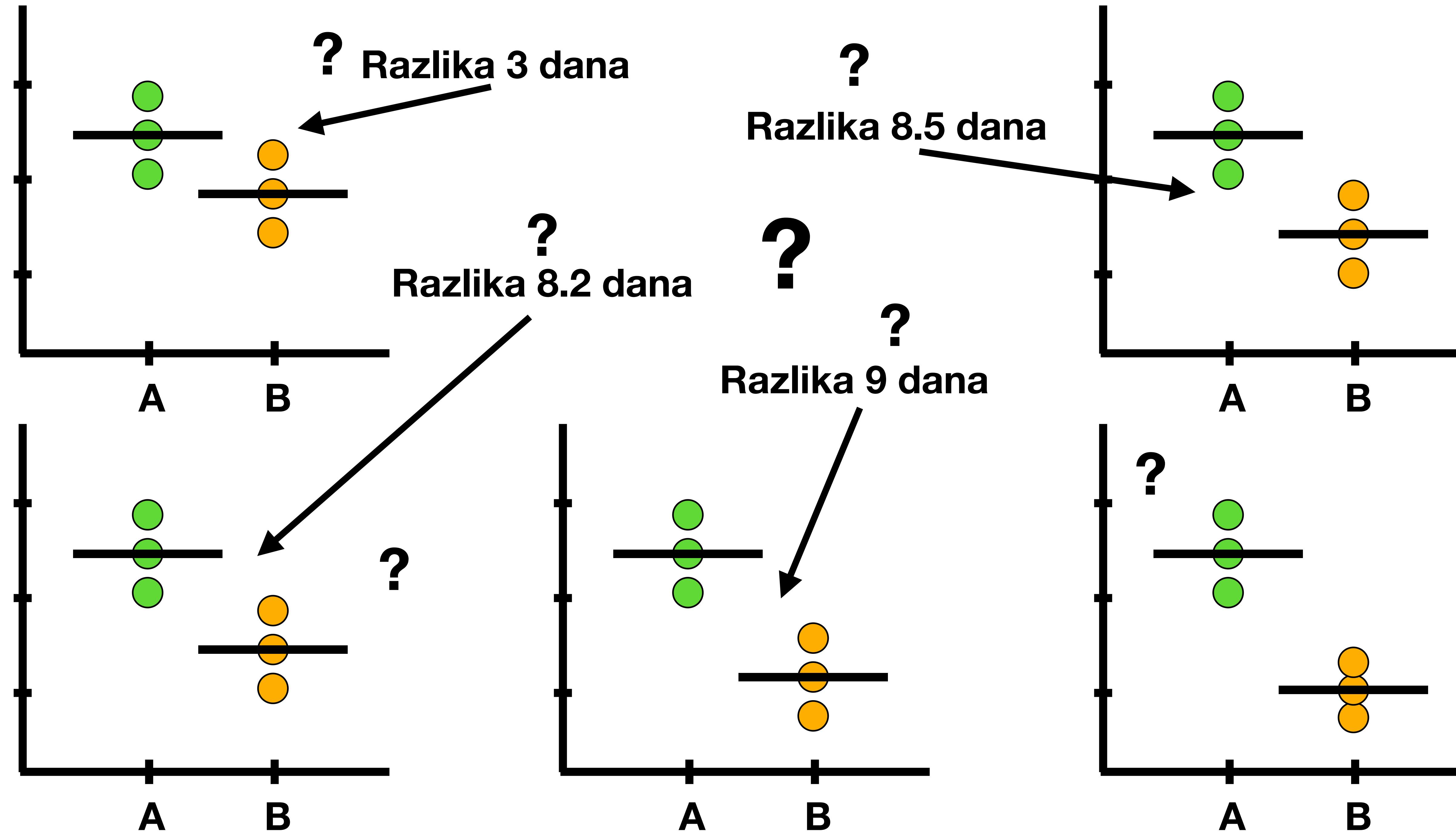
Možemo da odbacimo hipotezu!

Ljudi koji su pili **Lek A** su se, u proseku, oporavili 8 dana brže od ljudi koji su pili **Lek B**.



Ljudi koji su pili **Lek C** su se, u proseku, oporavili **8** dana brže od ljudi koji su pili **Lek D**.

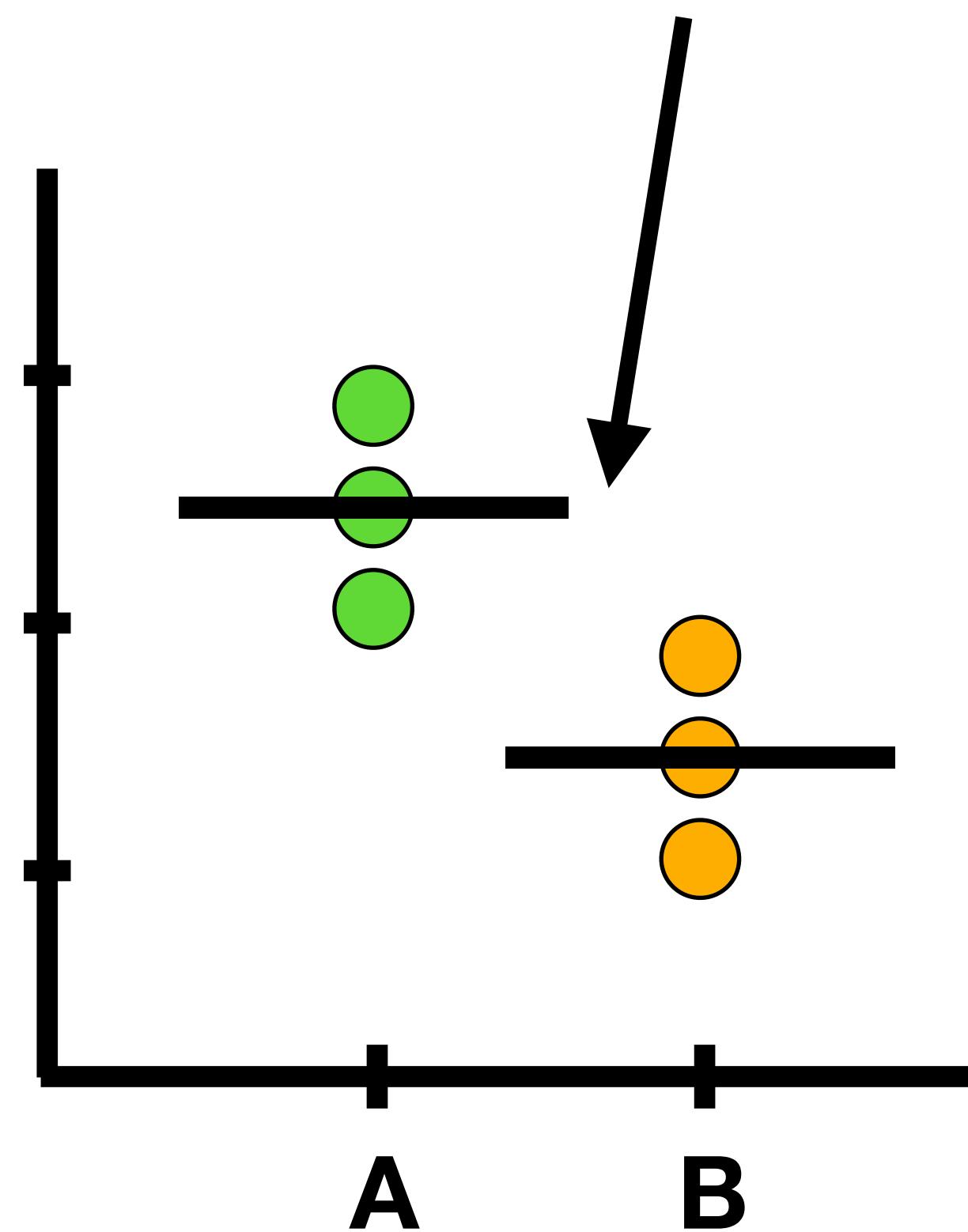




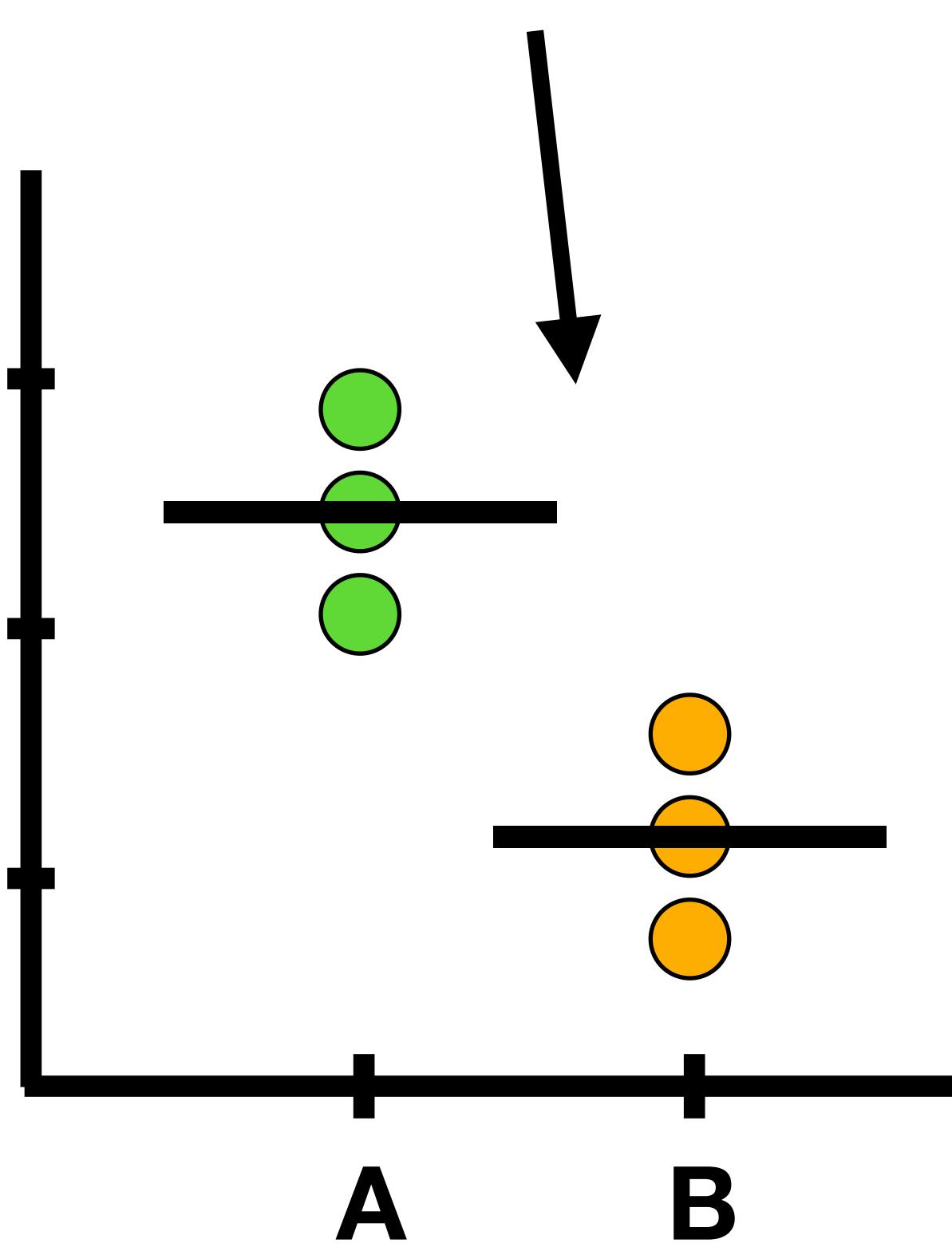
Koju hipotezu da prihvativ?

**Sada ne mogu da prihvatom hipotezu,
mogu samo da ne uspem da je odbacim.**

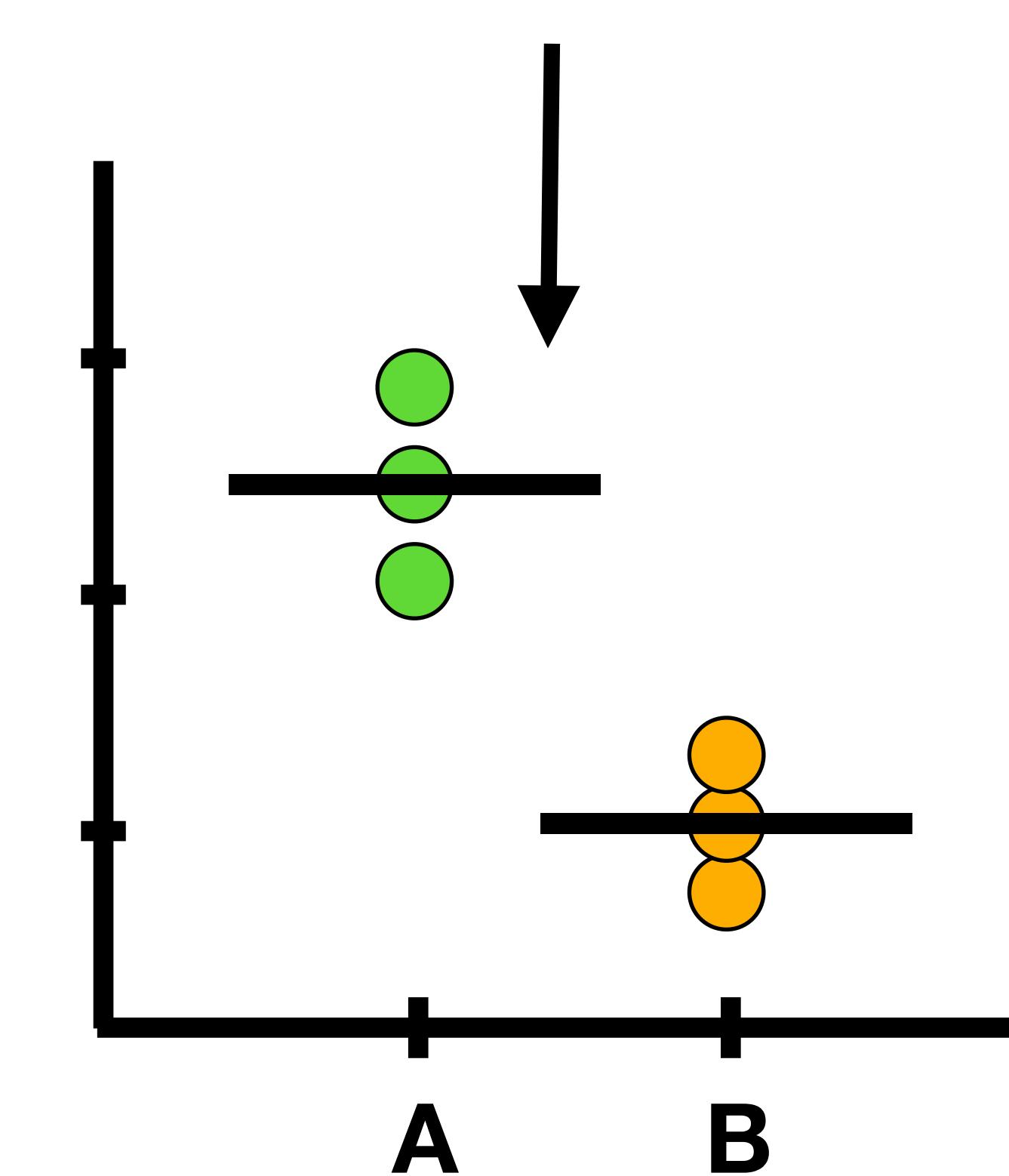
Razlika 8.2 dana?



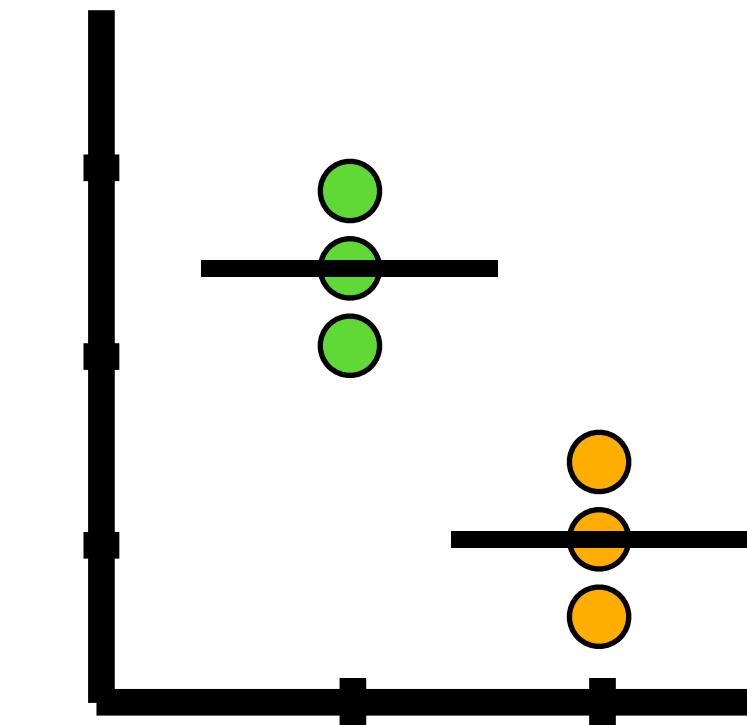
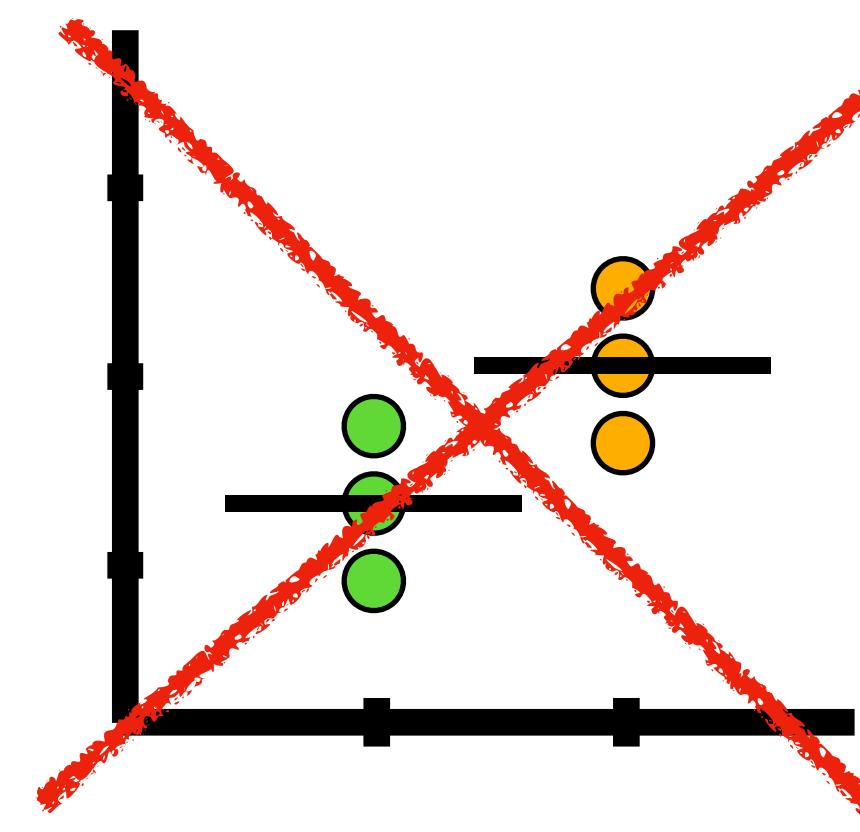
Razlika 9 dana?



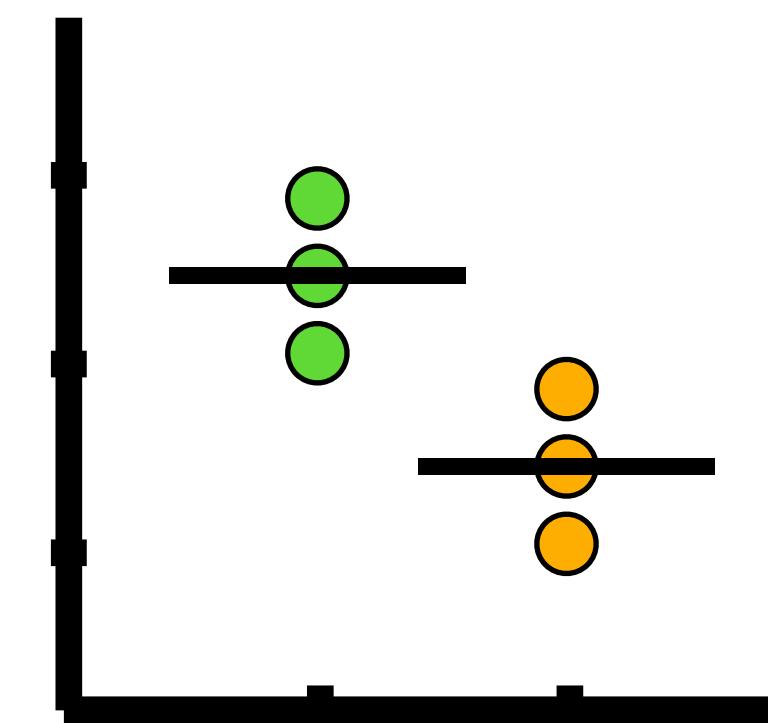
Razlika 9.2 dana?



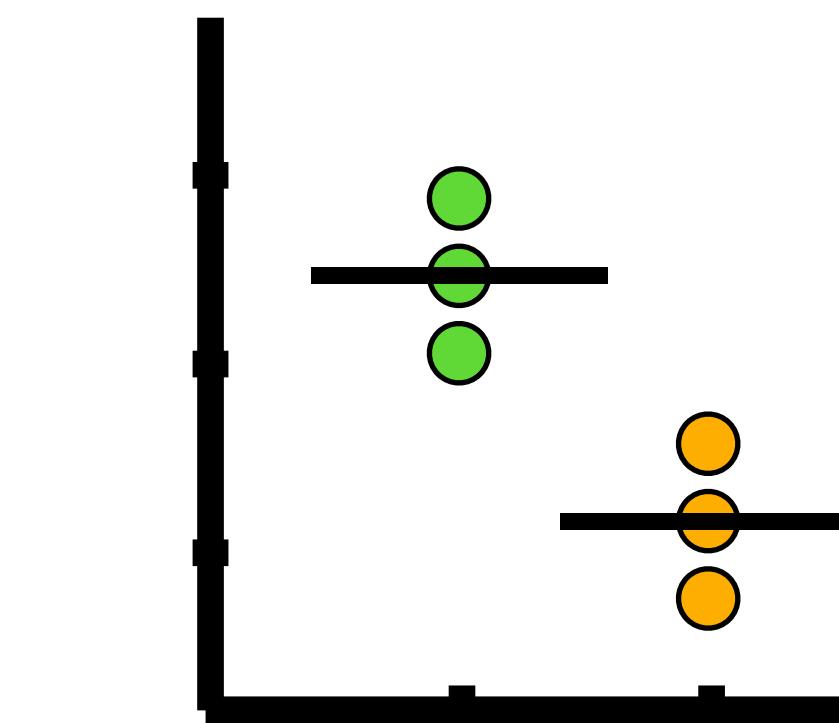
Dokazi osporavaju hipotezu = odbacim je.



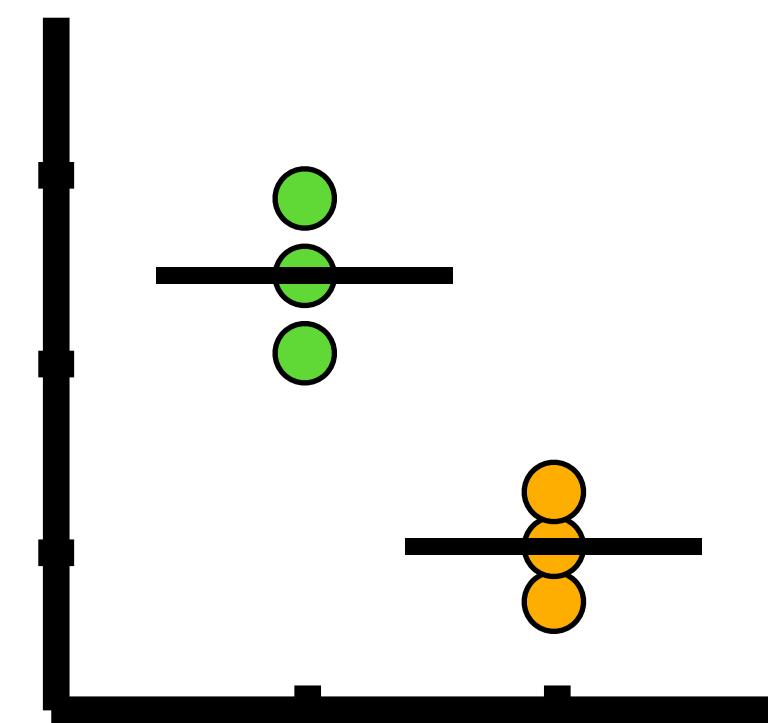
Dokazi potvrđuju hipotezu = ne uspem da je odbacim.



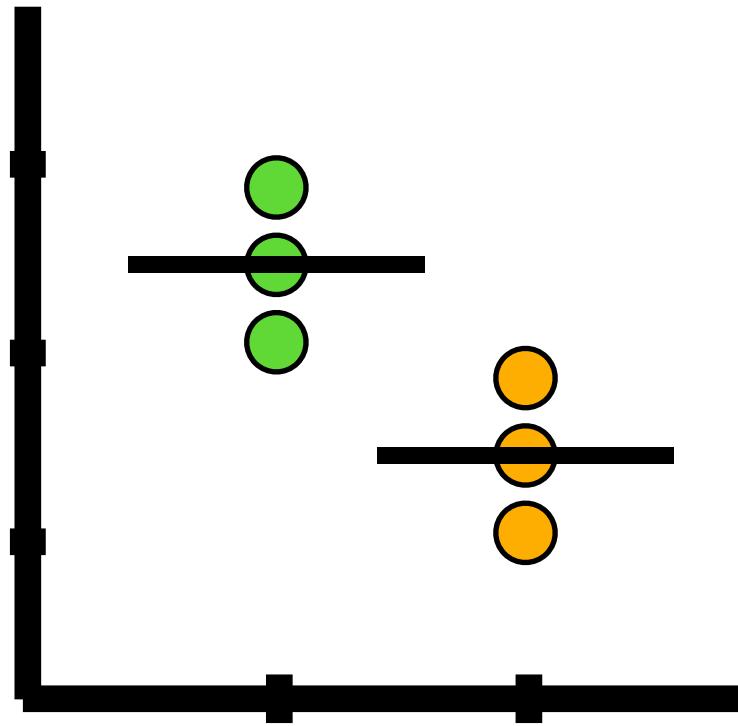
Razlika 9 dana?



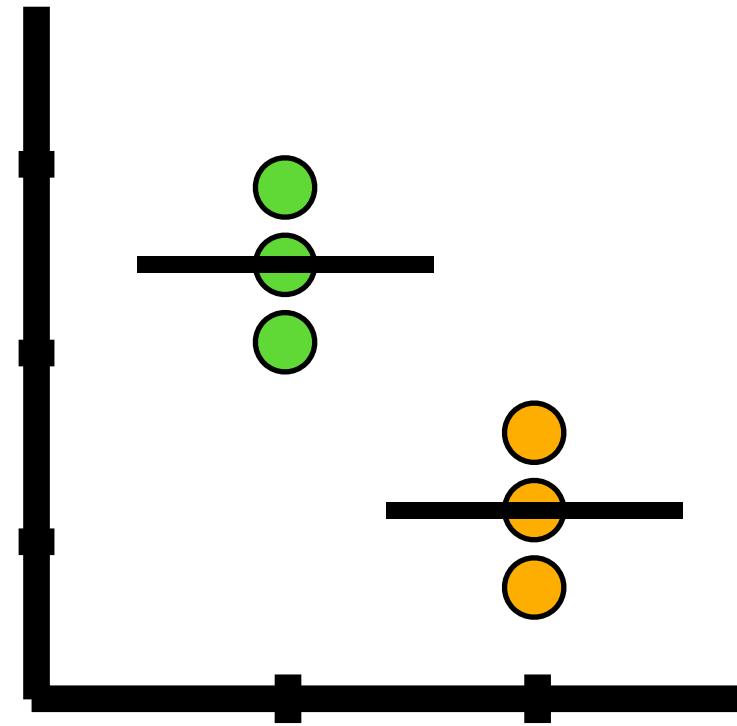
Razlika 9.2 dana?



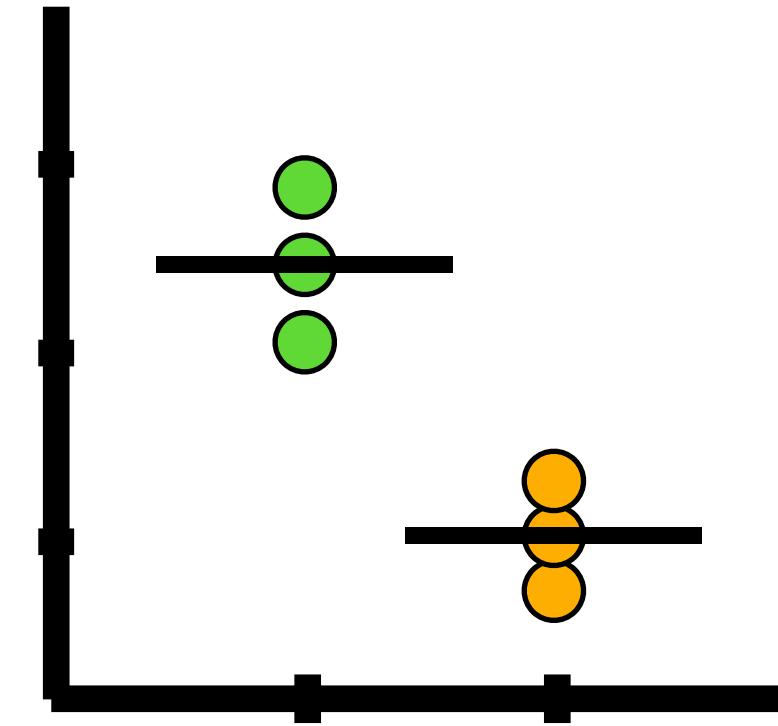
Razlika 8.2 dana?



Razlika 9 dana?

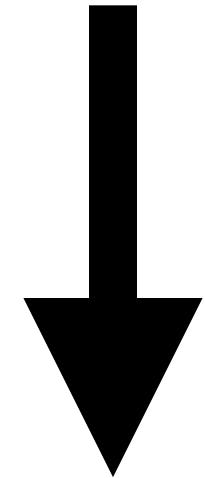


Razlika 9.2 dana?



Razlika 8.2 dana?

Jedini ~~Kako~~ ~~koj~~ ~~koji~~ ~~je~~ ~~rešaći~~ ~~davaće~~ ~~probazliko~~ je 0!



Nulta Hipoteza

$$H_0 : \mu_1 = \mu_2$$

Nulta Hipoteza

$$H_0 : \mu_1 = \mu_2$$

Alternativna Hipoteza

$$H_1 : \mu_1 \neq \mu_2$$

Nulta Hipoteza

$$H_0 : \mu_{brufen} = \mu_{paracetamol}$$

Alternativna Hipoteza

$$H_1 : \mu_{brufen} \neq \mu_{paracetamol}$$

Nulta Hipoteza

$H_0 : \pi_{vakcinisan} = \pi_{nevakcinisan}$

Alternativna Hipoteza

$H_1 : \pi_{vakcinisan} \neq \pi_{nevakcinisan}$

Žena koja piće čaj



- Šta je nulta hipoteza?
- Kako bi bili još sigurniji?

$$\binom{8}{4} = 70 \quad 1/70 \approx 1.4\% < 5\%$$



Greške u Zaključivanju

Type I Error



Type II Error



Greške u Zaključivanju

Tabela 1. Ishodi odlučivanja u testiranju hipoteza

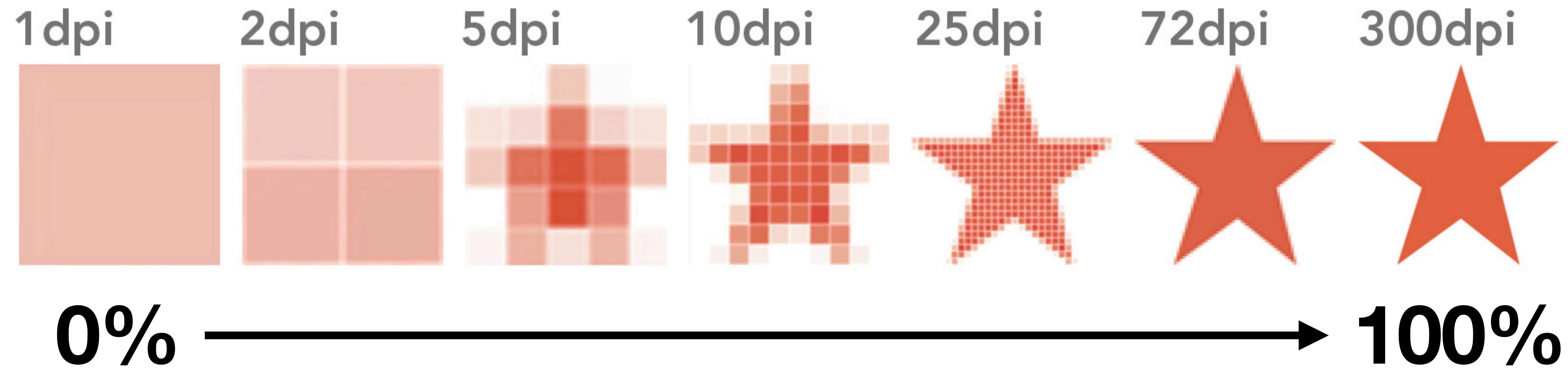
		Istina (populacija)
Odluka istraživača na osnovu analize uzoračkih podataka	H_0 istinita	H_0 neistinita
Odbacivanje H_0	Greška prvog tipa (α) Ispravan zaključak ($1-\beta = \text{snaga testa}$)	Ispravan zaključak ($1-\beta = \text{snaga testa}$)
Prihvatanje H_0	Ispravan zaključak ($1-\alpha = \text{nivo poverenja}$)	Greška drugog tipa (β)

Greške u Zaključivanju

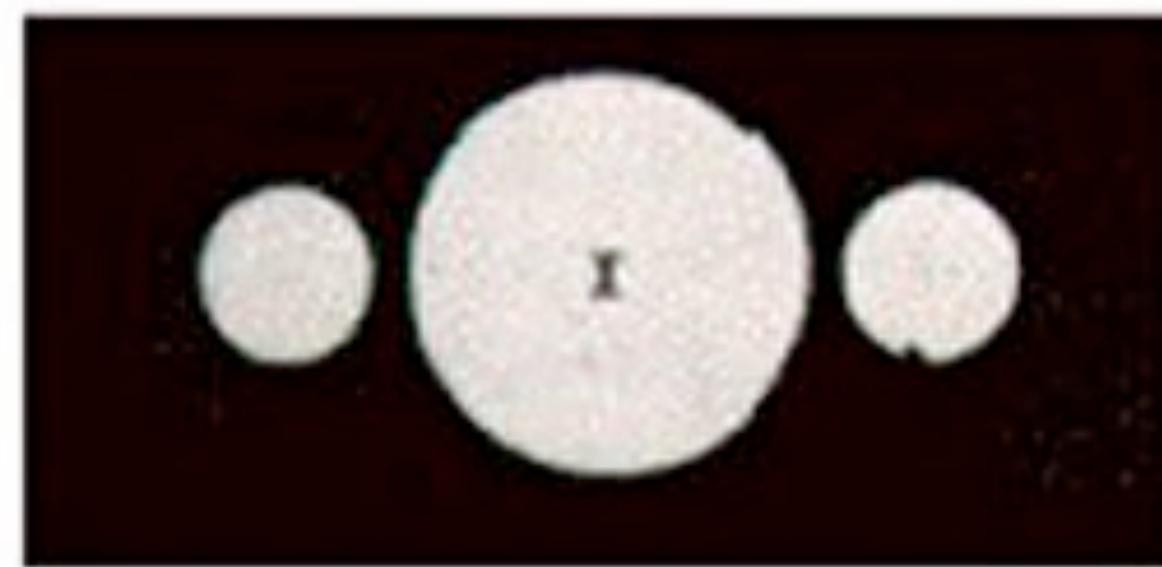
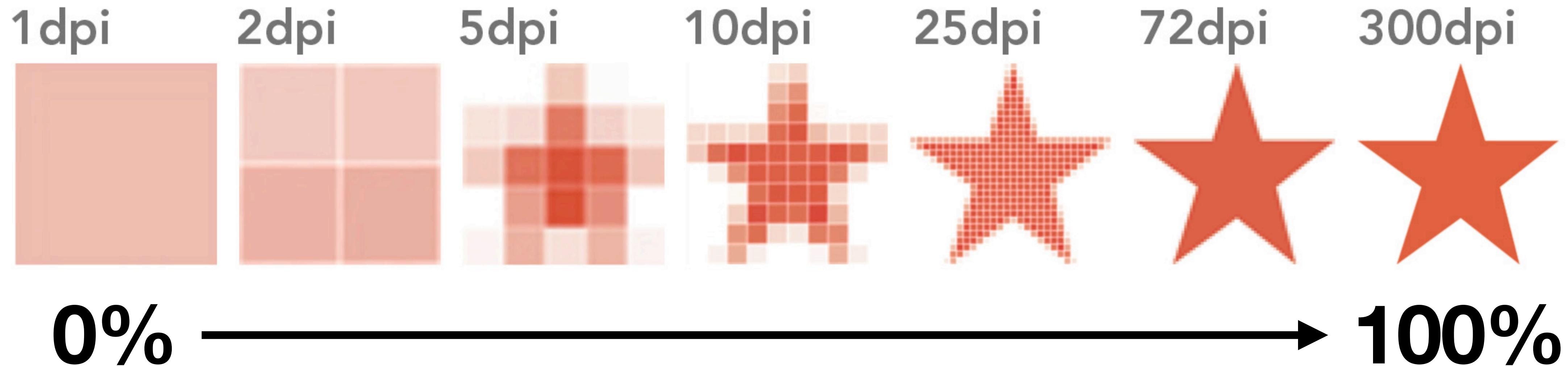
Tabela 1. Ishodi odlučivanja u testiranju hipoteza

		Istina (populacija)
Odluka istraživača na osnovu analize uzoračkih podataka	H_0 istinita	H_0 neistinita
Odbacivanje H_0	Greška prvog tipa (α)	Ispravan zaključak ($1-\beta = \text{snaga testa}$)
Prihvatanje H_0	Ispravan zaključak ($1-\alpha = \text{nivo poverenja}$)	Greška drugog tipa (β)

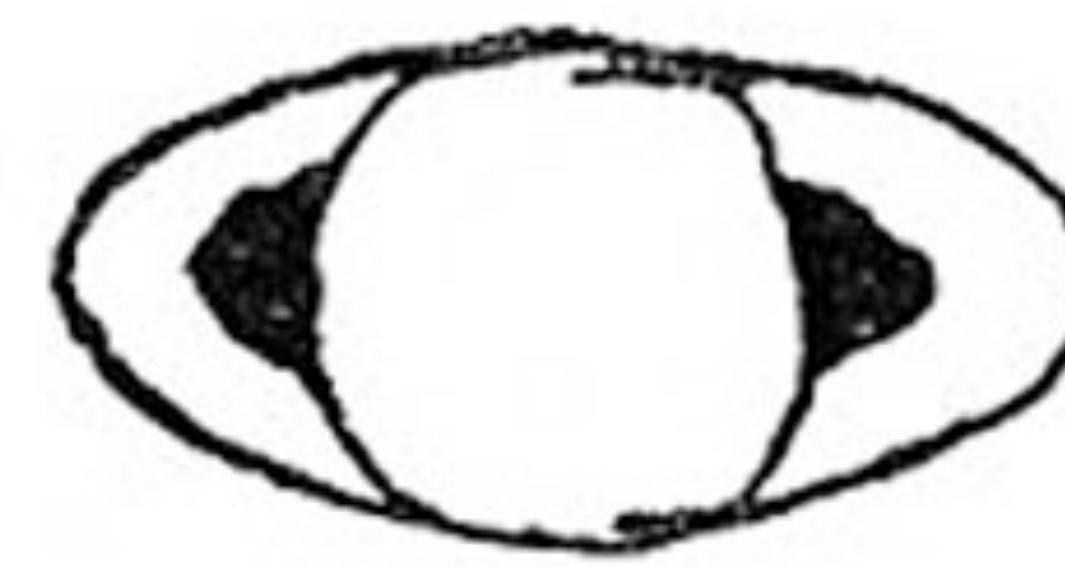
Snaga Testa



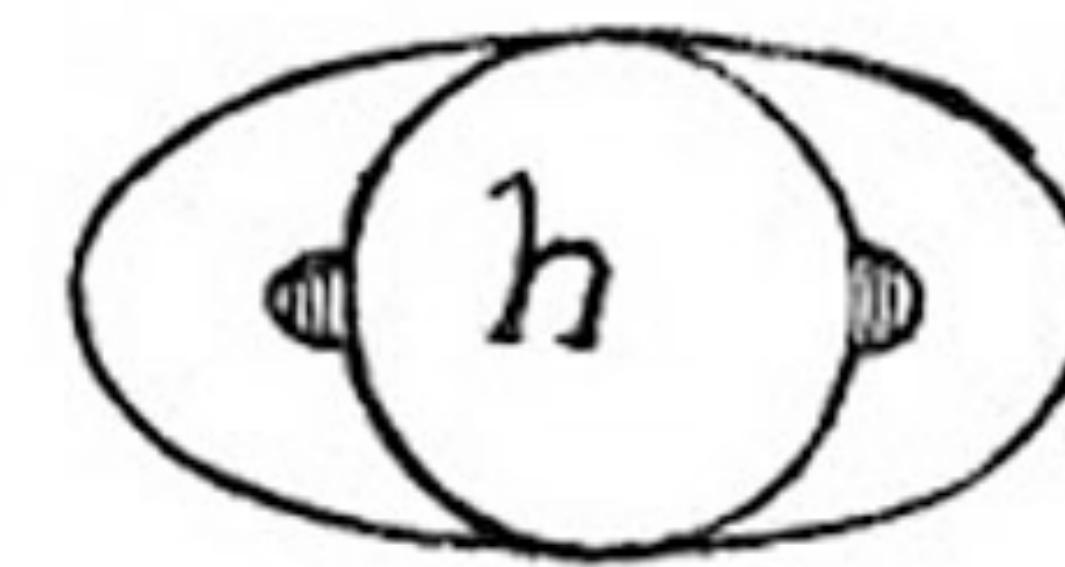
Snaga Testa



Galileo first sketch
1610

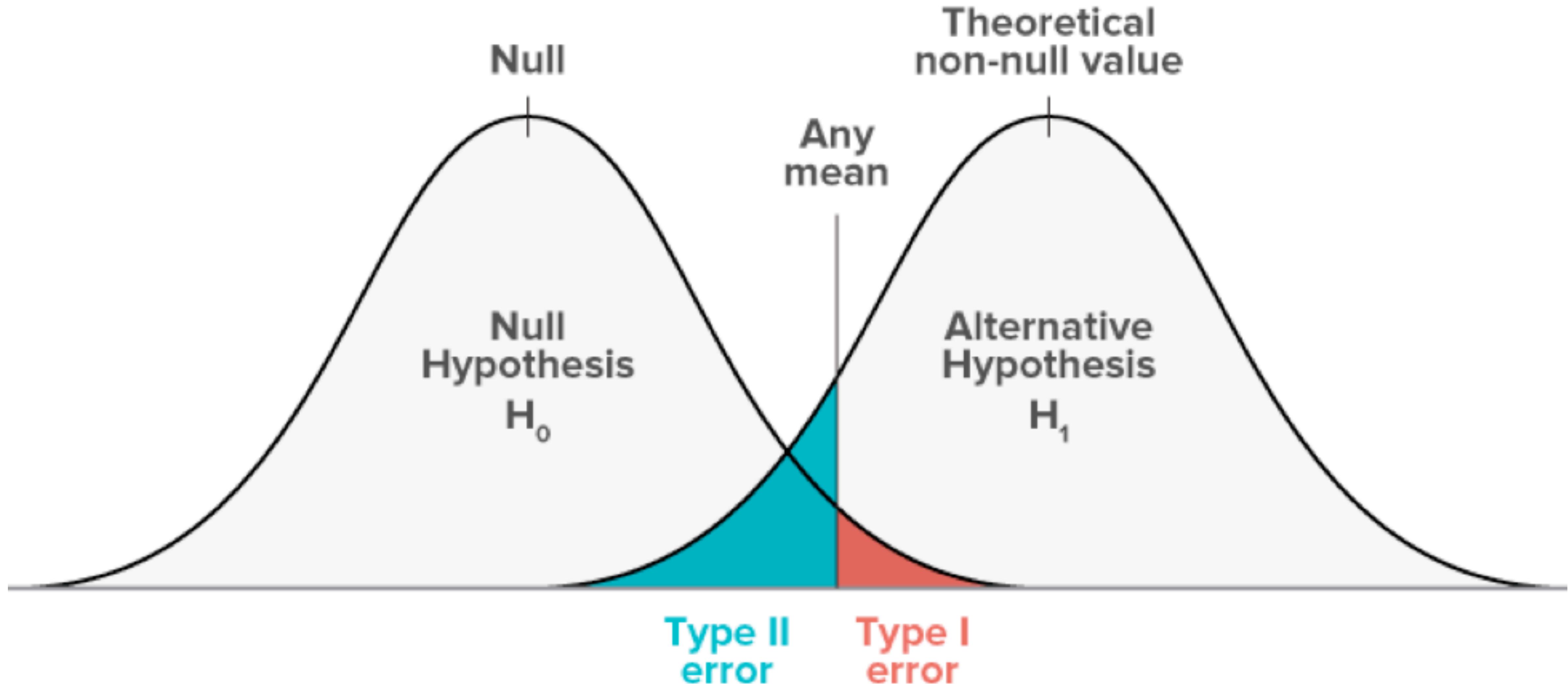


Better telescope
1616



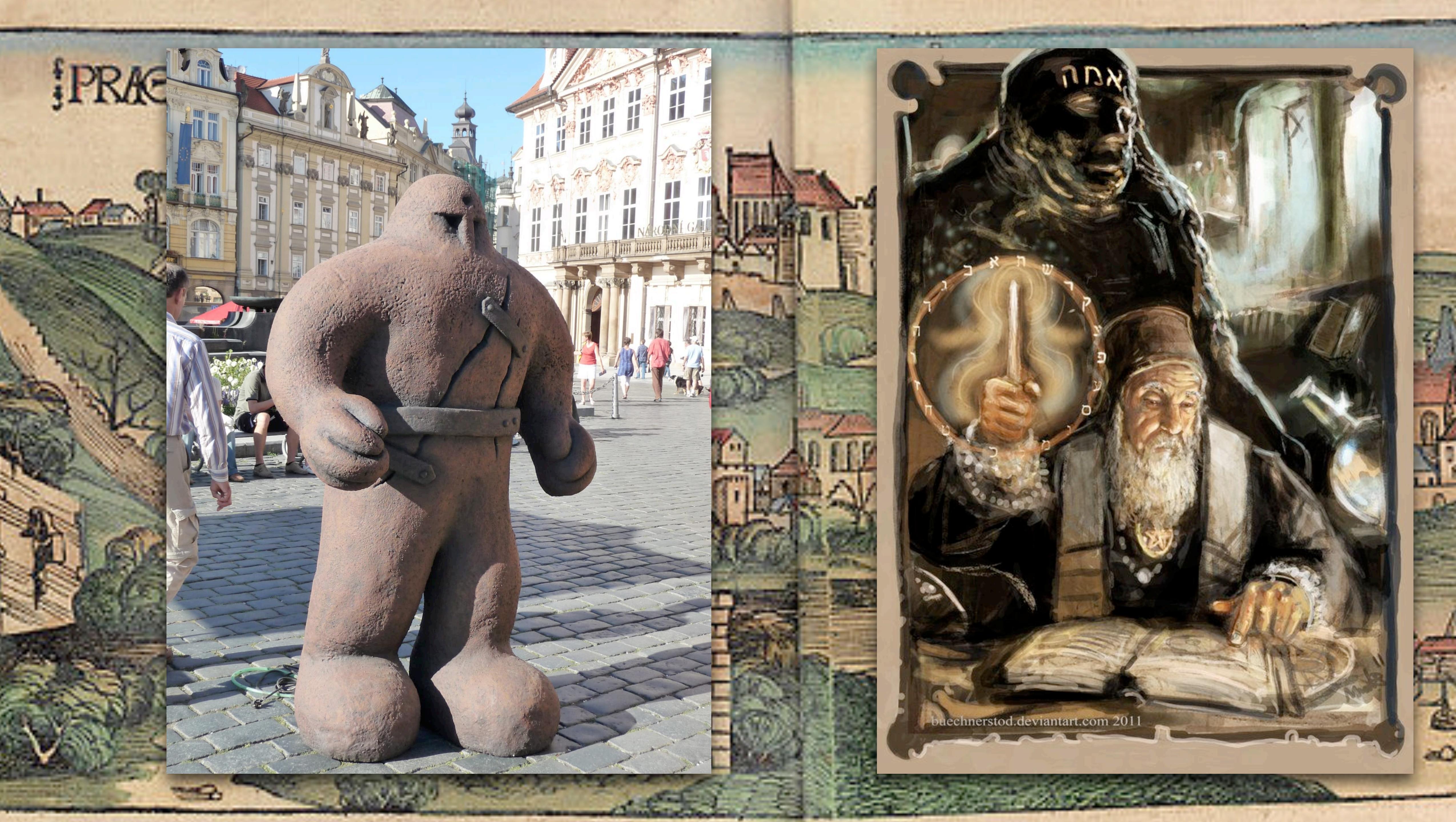
Published etch
1623

Greške u zaključivanju



Uticaj na Statističku Snagu

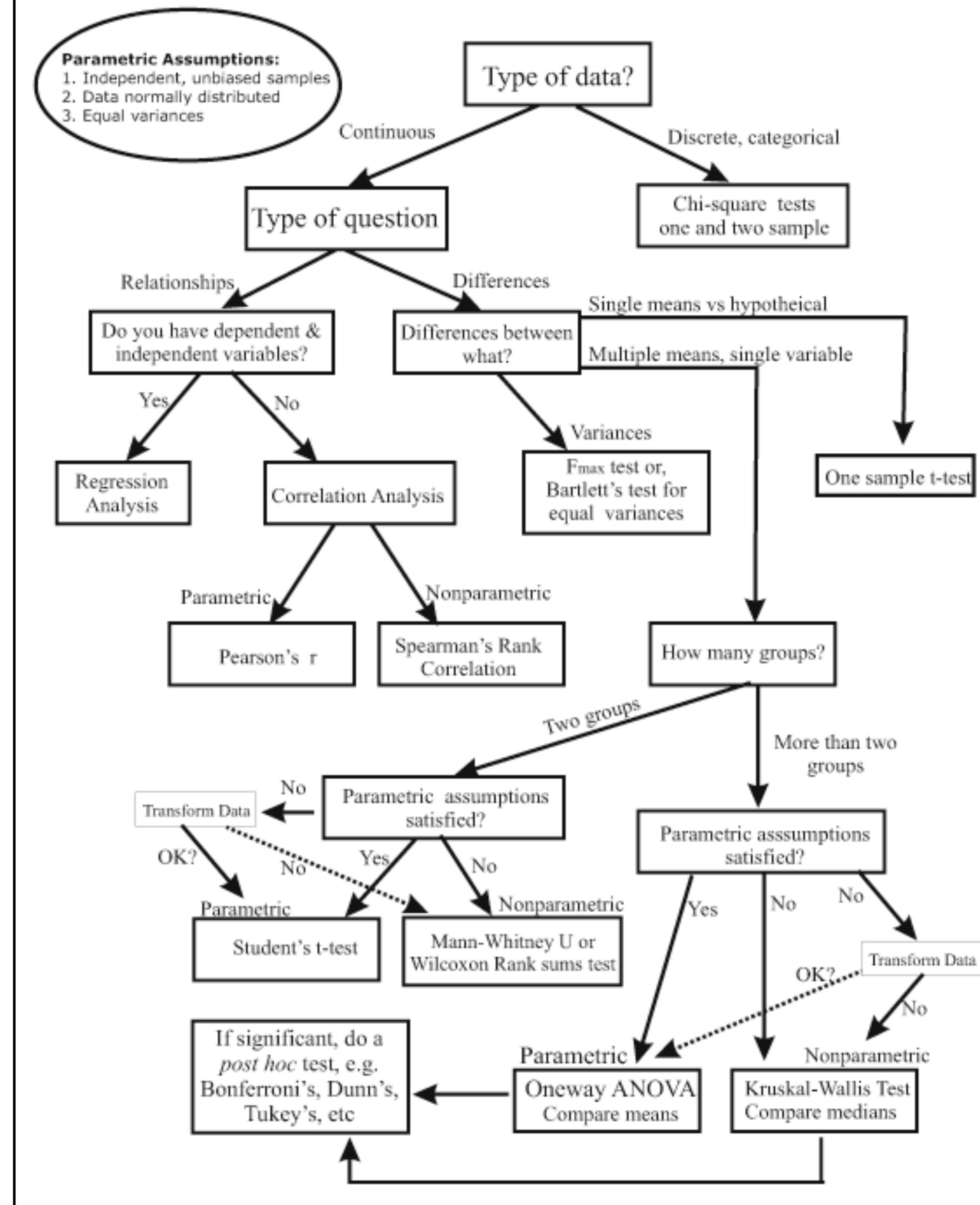
- Odabranog nivoa značajnosti (α nivo)
- Veličine uzorka
- Formulacije H_1 kao dvosmerne ili jednosmerne
- Stvarne razlike ispitivane pojave (effect size)



Izbor statističkog testa

- Kao roboti
- Moćni
- Nisu mudri
- Opasni su
- Uske upotrebe

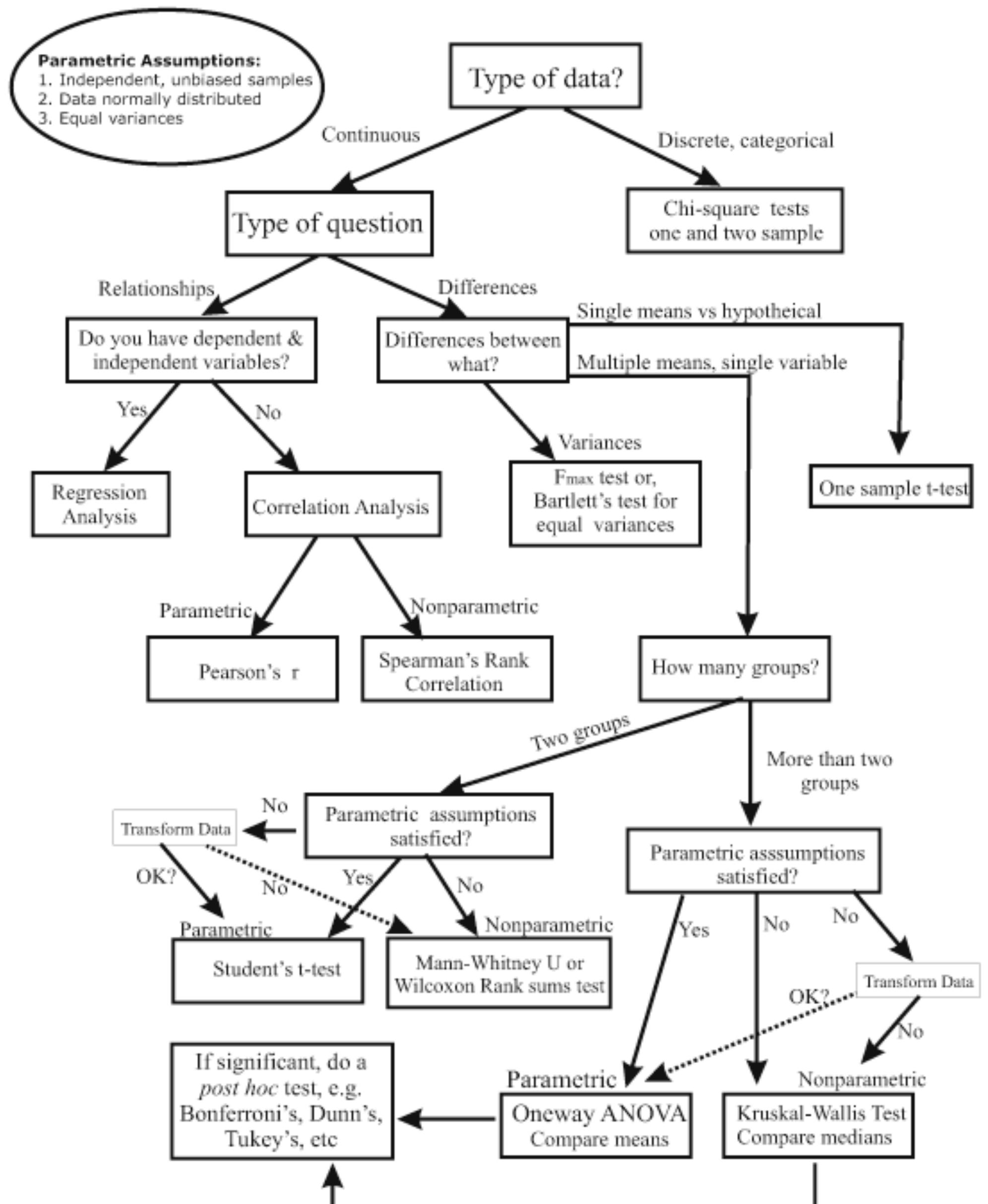
Flow Chart for Selecting Commonly Used Statistical Tests



Izbor statističkog testa

- Tip podataka
- Dizajn studije
 - Broj uzoraka
 - Nezavisni ili Zavisni
- Parametarski
 - Zahtevaju norm. raspodelu
- Neparametarski

Flow Chart for Selecting Commonly Used Statistical Tests

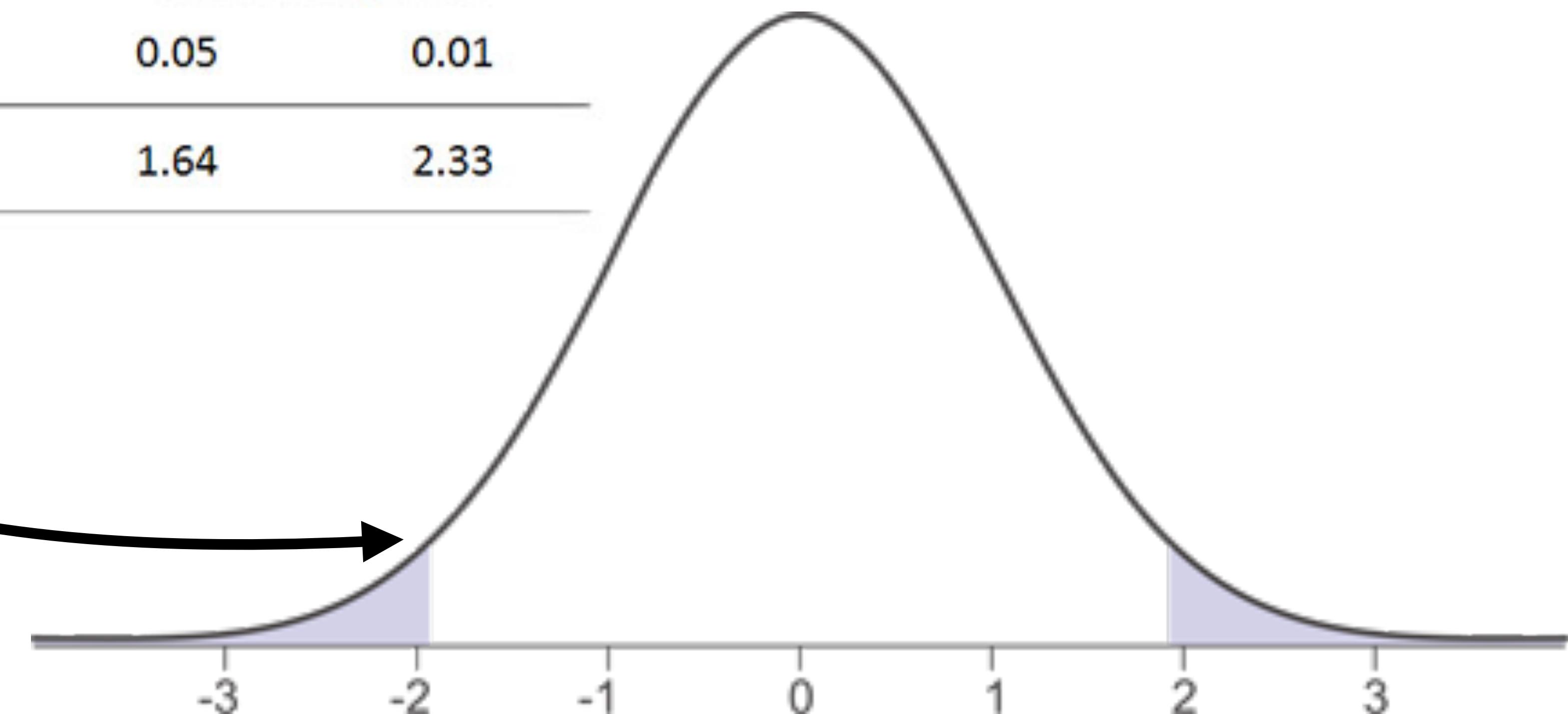


Statistički zaključak

Region odbacivanja odgovara nivou statističke značajnosti

Tabela 3. Granične vrednosti zed testa

	Dvosmerno testiranje		Jednosmerno testiranje	
Nivo značajnosti	0.05	0.01	Nivo značajnosti	0.05
z vrednost	1.96	2.58	1.64	2.33



William Sealy Gosset (1876 - 1937)



COOPERAGE YARD IN THE WORLD'S LARGEST BREWERY



t-statistika

p-vrednost

Output 

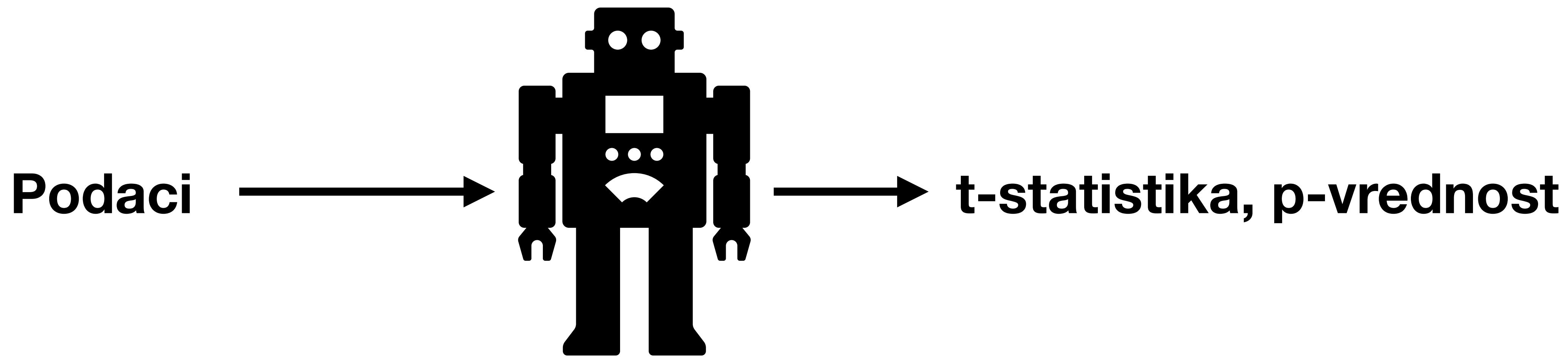
```
One Sample t-test
data: DatasetSTA
t = -1.5848, df = 9, p-value = 0.1475
alternative hypothesis: true mean is not equal to 145
95 percent confidence interval:
130.4356 147.5644
sample estimates:
mean of x
139
```

aritmetička sredina

95% interval poverenja

statistika testa i p-vrednost

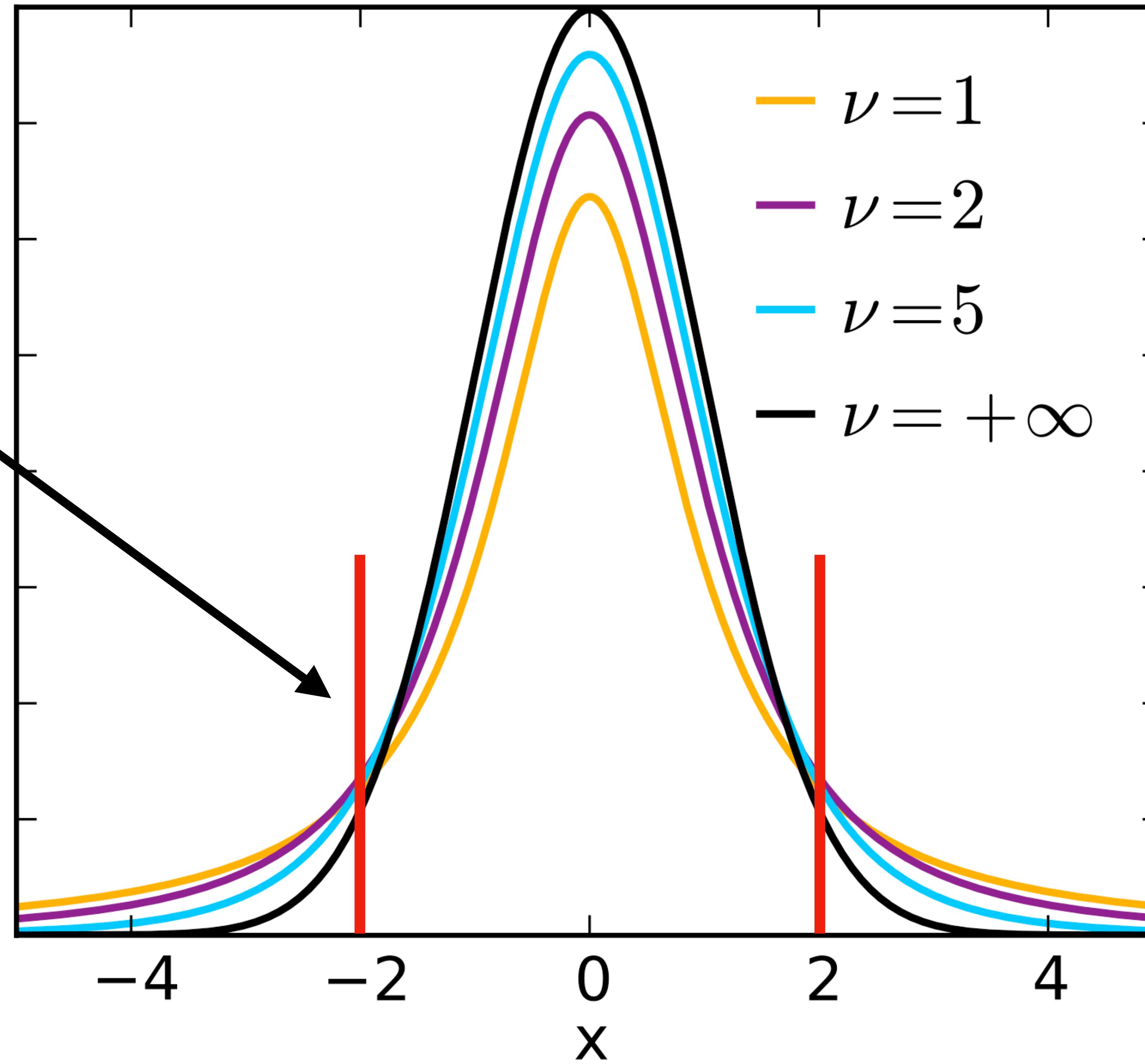
Studentov t-test



1. Slučajno biran uzorak
2. Numerički podaci
3. Normalna raspodela u populaciji

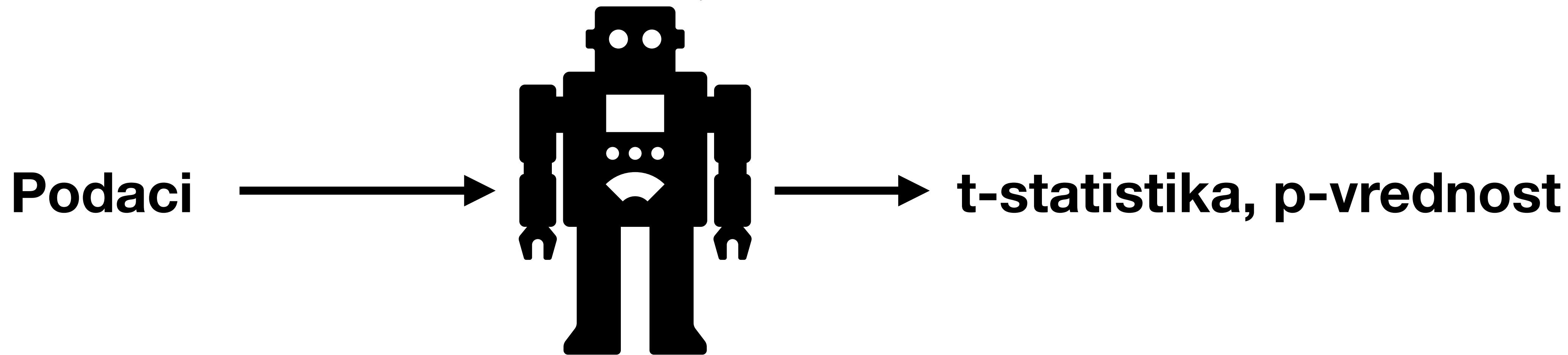
Kritična t-vrednost

Ona koja obezbeđuje
značajnost od
 $\alpha = 0.05 / 0.01$



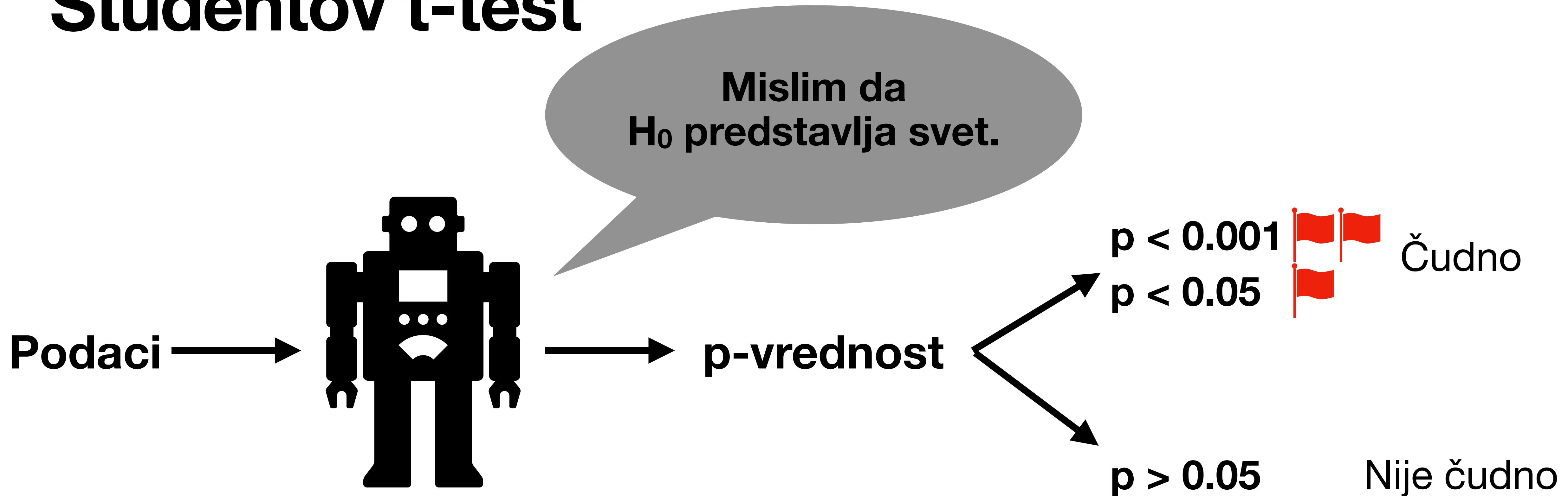
Studentov t-test

Mislim da
 H_0 predstavlja svet.



1. Slučajno biran uzorak
2. Numerički podaci
3. Normalna raspodela u populaciji

Studentov t-test



1. **Slučajno biran uzorak**
2. **Numerički podaci**
3. **Normalna raspodela u populaciji**

Primer 1. Da li se pritisak razlikuje kod pacijenata koji su preležali infarkt?

$$H_0 : \mu_{zdrav} = \mu_{infarkt} \quad p = 0.00242$$

120 mmHg 145 mmHg

Primer 1. Da li se pritisak razlikuje kod pacijenata koji su preležali infarkt?

$$H_0 : \mu_{zdrav} = \mu_{infarkt} \quad p = 0.82$$

120 mmHg 145 mmHg

Verzije Studentovog t-testa

$H_0 : \mu_{uzorak} = 145$ **jedan uzorak**

$H_0 : \mu_{zdrav} = \mu_{infarkt}$ **dva nezavisna uzorka**

$H_0 : \mu_{preop} = \mu_{postop}$ **dva zavisna**

Na osnovu prethodnih istraživanja
očekivana aritmetička sredina iznosi 145
mmHg. Da li populacija iz koje potiče
uzorak u bazi **Sistolna TA.xlsx** ima
aritmetičku sredinu jednaku očekivanoj?
Testirati na nivou značajnosti od **0.05**.

Discrete variables

Continuous variables

Nonparametric tests

Survival analysis

Accuracy of diagnostic test

Matched-pair analysis

No active model

Numerical summaries

Smirnov-Grubbs test for outliers

Kolmogorov-Smirnov test for normal distribution

Confidence interval for a mean

Single-sample t-test

Single-Sample t-Test

X

Variable (pick one)

rb
TA

odabratи variablu

Alternative Hypothesis

Population mean $\neq \mu_0$

Population mean $< \mu_0$

Population mean $> \mu_0$

ukucati vrednost očekivane
aritmetičke sredine

Null hypothesis: $\mu = 145$

Confidence Level: 0.95

Condition to limit samples for analysis. Ex1. age>50 & Sex==0 Ex2. age<50 | Sex==1

<all valid cases>

Help

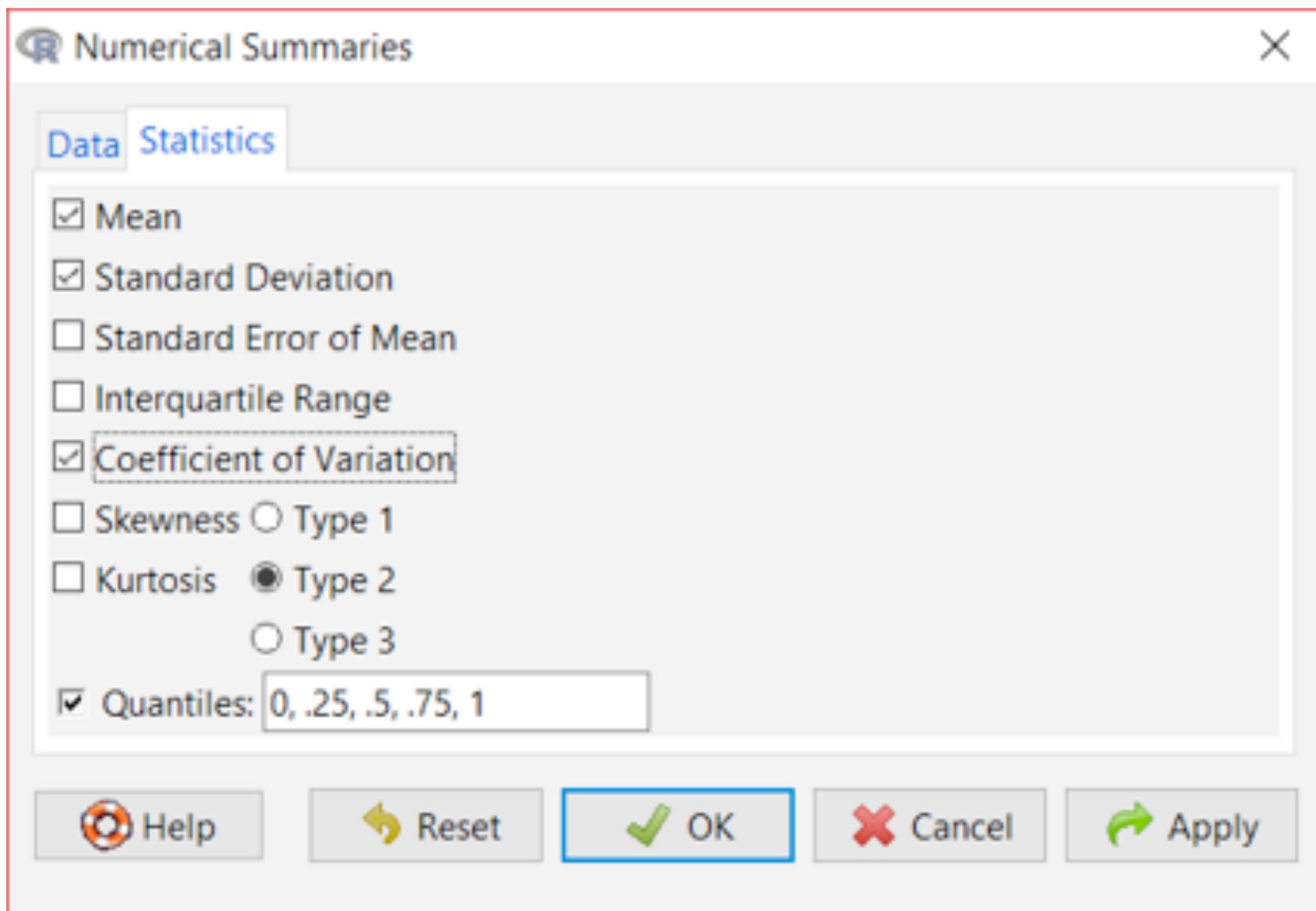
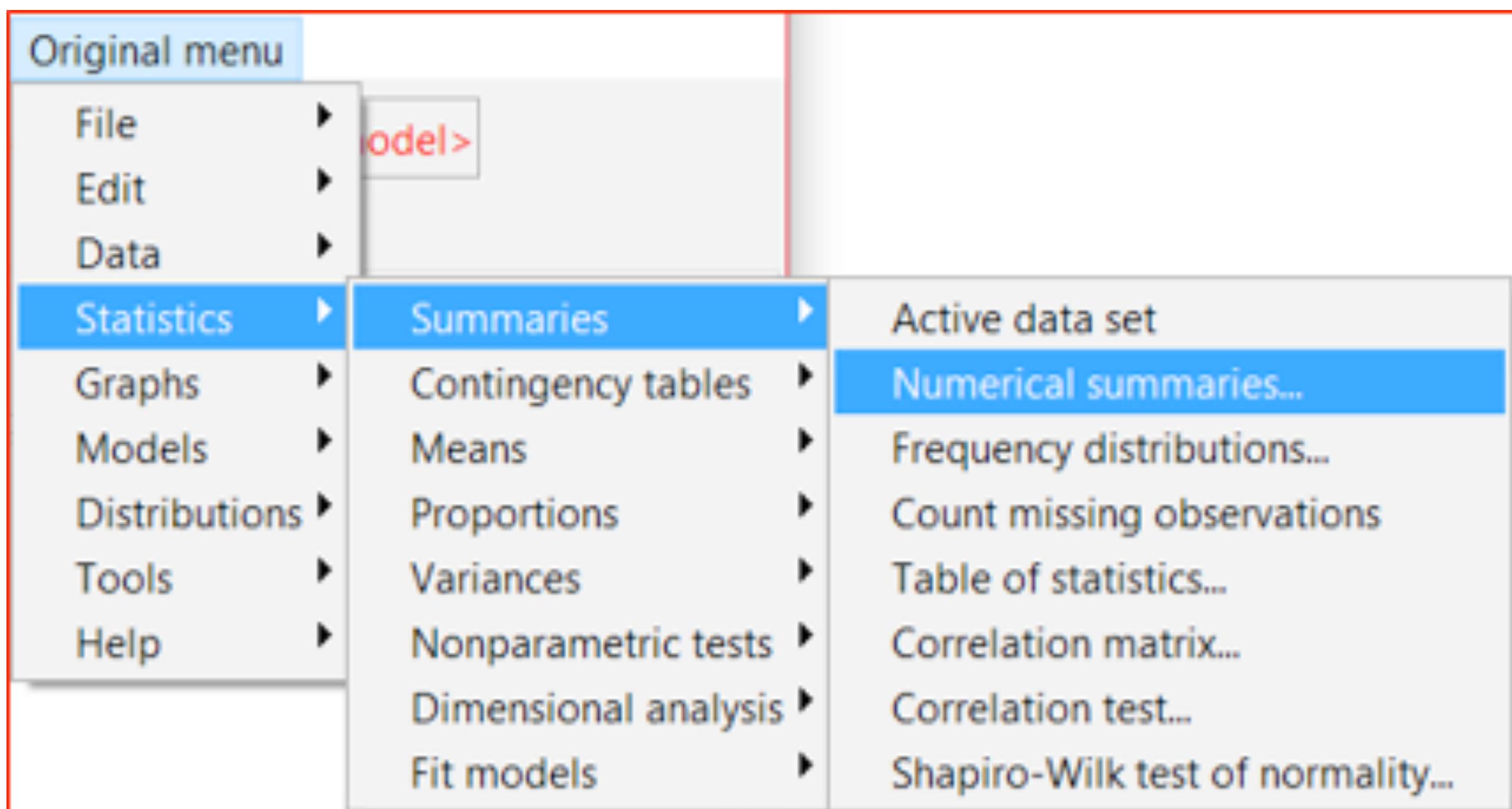
Reset

OK

Cancel

Apply

Da li se ukupan holesterol u bazi
DZ.xlsx razlikuje kod pušača i
nepušača? Testirati na nivou
značajnosti od **0.01**.



```
> numSummary(Dataset[, "Sedimentacija"], group=koeficijent varijacije, statistics=c("mean", "sd", "quantiles", "cv"), quantiles=.25, .5, .75, 1)
      mean        sd        cv 0% 25% 50% 75% 100% data:n
Tretman A 17.37500 2.065879 0.11889953 14 16.5 17.5 19 20     8
Tretman B 16.14286 1.345185 0.08333007 14 15.5 16.0 17 18     7
```

Discrete variables

Continuous variables

Nonparametric tests

Survival analysis

Accuracy of diagnostic test

Matched-pair analysis

Metaanalysis and metaregression

Calculate sample size

```
s=c(0,.25,.5,.75,1)
```

```
"drugo_merenje".
```

```
statisti
```

Model <No active model>

Numerical summaries

Smirnov-Grubbs test for outliers

Kolmogorov-Smirnov test for normal distribution

Confidence interval for a mean

Single-sample t-test

Two-variances F-test

Two-sample t-test

Paired t-test

Paired t-test

First variable (pick one)

drugo_merenje
prvo_merenje
rb

Second variable (pick one)

drugo_merenje
prvo_merenje
rb

Alternative Hypothesis

 Two-sided Difference < 0 Difference > 0

Confidence Level

0.95

Condition to limit samples for analysis. Ex1. age>50 & Sex==0 Ex2. age<50 | Sex==1

<all valid cases>

Help

Reset

OK

Cancel

Apply

Nameštanje p-vrednosti

Napredovanje uslovljeno radovima

Problem višestrukog testiranja

“Vidi da li ima značajne razlike...”

<u>P-VALUE</u>	<u>INTERPRETATION</u>
0.001	
0.01	
0.02	HIGHLY SIGNIFICANT
0.03	
0.04	
0.049	SIGNIFICANT
0.050	OH CRAP. REDO CALCULATIONS.
0.051	ON THE EDGE OF SIGNIFICANCE
0.06	
0.07	HIGHLY SUGGESTIVE,
0.08	SIGNIFICANT AT THE P<0.10 LEVEL
0.09	
0.099	HEY, LOOK AT THIS INTERESTING
≥0.1	SUBGROUP ANALYSIS

Oseltamivir treatment for influenza in adults: a meta-analysis of randomised controlled trials

Joanna Dobson, Richard J Whitley, Stuart Pocock, Arnold S Monto

Summary

Background Despite widespread use, questions remain about the efficacy of oseltamivir in the treatment of influenza. We aimed to do an individual patient data meta-analysis for all clinical trials comparing oseltamivir with placebo for treatment of seasonal influenza in adults regarding symptom alleviation, complications, and safety.

Methods We included all published and unpublished Roche-sponsored randomised placebo-controlled, double-blind trials of 75 mg twice a day oseltamivir in adults. Trials of oseltamivir for treatment of naturally occurring influenza-like illness in adults reporting at least one of the study outcomes were eligible. We also searched Medline, PubMed, Embase, the Cochrane Central Register of Controlled Trials, and the ClinicalTrials.gov trials register for other relevant trials published before Jan 1, 2014 (search last updated on Nov 27, 2014). We analysed intention-to-treat infected, intention-to-treat, and safety populations. The primary outcome was time to alleviation of all symptoms analysed with accelerated failure time methods. We used risk ratios and Mantel-Haenszel methods to work out complications, admittances to hospital, and safety outcomes.

Findings We included data from nine trials including 4328 patients. In the intention-to-treat infected population, we noted a 21% shorter time to alleviation of all symptoms for oseltamivir versus placebo recipients (time ratio 0·79, 95% CI 0·74–0·85; $p<0\cdot0001$). The median times to alleviation were 97·5 h for oseltamivir and 122·7 h for placebo groups (difference -25·2 h, 95% CI -36·2 to -16·0). For the intention-to-treat population, the estimated treatment effect was attenuated (time ratio 0·85) but remained highly significant (median difference -17·8 h). In the intention-to-treat infected population, we noted fewer lower respiratory tract complications requiring antibiotics more than 48 h after randomisation (risk ratio [RR] 0·56, 95% CI 0·42–0·75; $p=0\cdot0001$; 4·9% oseltamivir vs 8·7% placebo, risk difference -3·8%, 95% CI -5·0 to -2·2) and also fewer admittances to hospital for any cause (RR 0·37, 95% CI 0·17–0·81; $p=0\cdot013$; 0·6% oseltamivir, 1·7% placebo, risk difference -1·1%, 95% CI -1·4 to -0·3). Regarding safety, oseltamivir increased the risk of nausea (RR 1·60, 95% CI 1·29–1·99; $p<0\cdot0001$; 9·9% oseltamivir vs 6·2% placebo, risk difference 3·7%, 95% CI 1·8–6·1) and vomiting (RR 2·43, 95% CI 1·83–3·23; $p<0\cdot0001$; 8·0% oseltamivir vs 3·3% placebo, risk difference 4·7%, 95% CI 2·7–7·3). We recorded no effect on neurological or psychiatric disorders or serious adverse events.

Interpretation Our findings show that oseltamivir in adults with influenza accelerates time to clinical symptom alleviation, reduces risk of lower respiratory tract complications, and admittance to hospital, but increases the occurrence of nausea and vomiting.

Oseltamivir treatment for influenza in adults: a meta-analysis of randomised controlled trials

Joanna Dobson, Richard J Whitley, Stuart Pocock, Arnold S Monto

Summary

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