



Analiza variance

Iztok Grabnar

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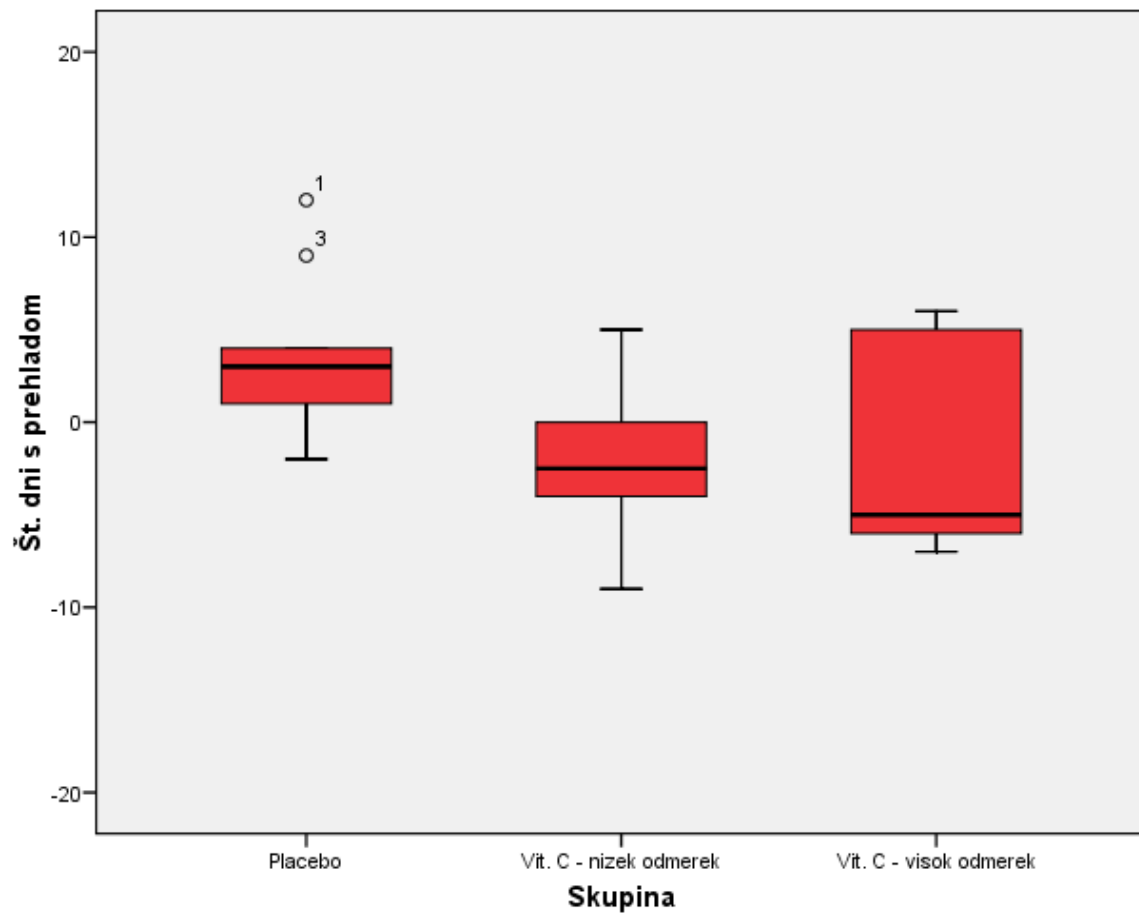
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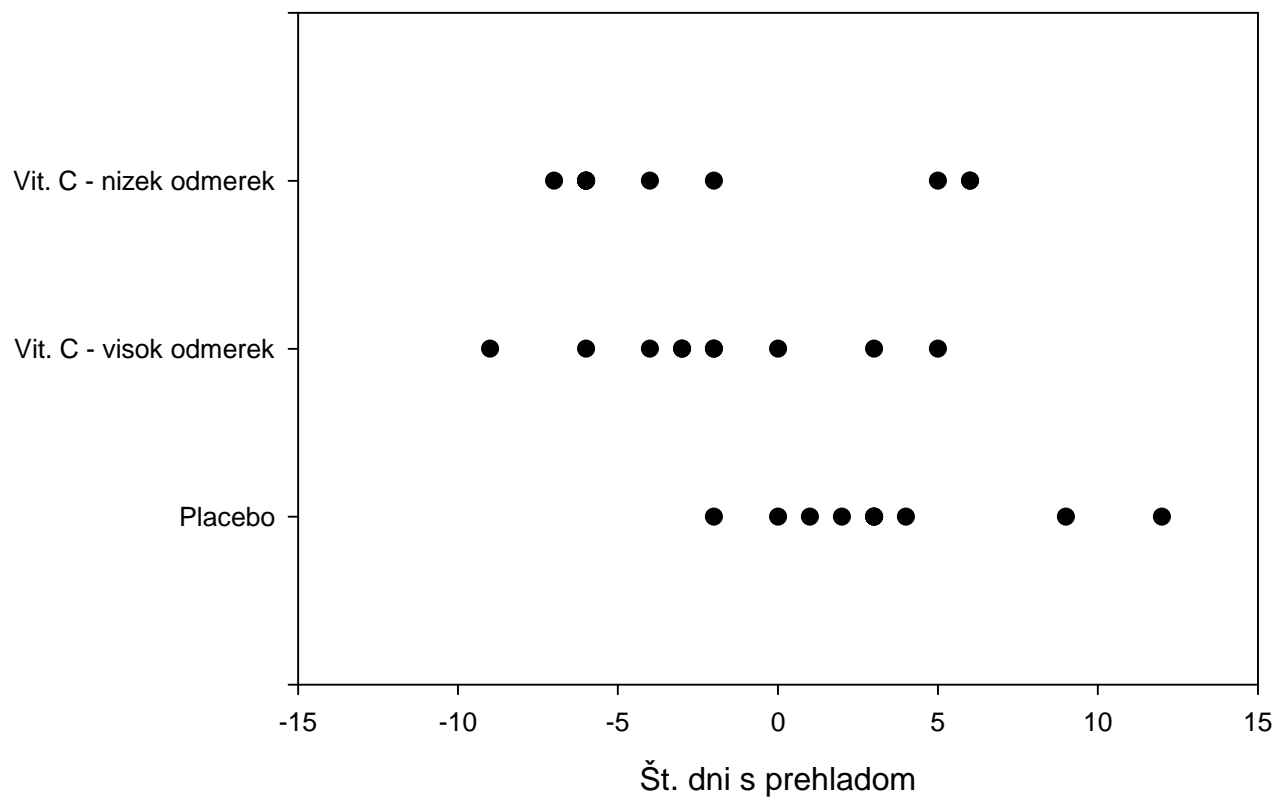
Da bi ugotovili vpliv vitamina C na pogostnost prehladnih obolenj so izvedli naslednjo raziskavo.

Trideset prostovoljcev so naključno razvrstili v 3 enako velike skupine. Prva skupina je dnevno dobivala placebo, druga nizek odmerek vitamina C in tretja visok odmerek vitamina C. Vse tri skupine prostovoljcev so spremljali v obdobju dveh let in beležili število dni s simptomi prehlada. Rezultati so zbrani v tabeli.

Razlika v številu dni s prehladom med 2. in 1. letom poskusa

Placebo	Vit. C - nizek odmerek	Vit. C - visok odmerek
12	-2	6
-2	-3	-7
9	3	-6
3	-2	-6
3	0	-6
0	-4	-4
3	-3	-2
2	5	-6
4	-9	6
1	-6	5





ANOVA enega faktorja

$$Y_{ij} = \mu + G_i + \varepsilon_i$$

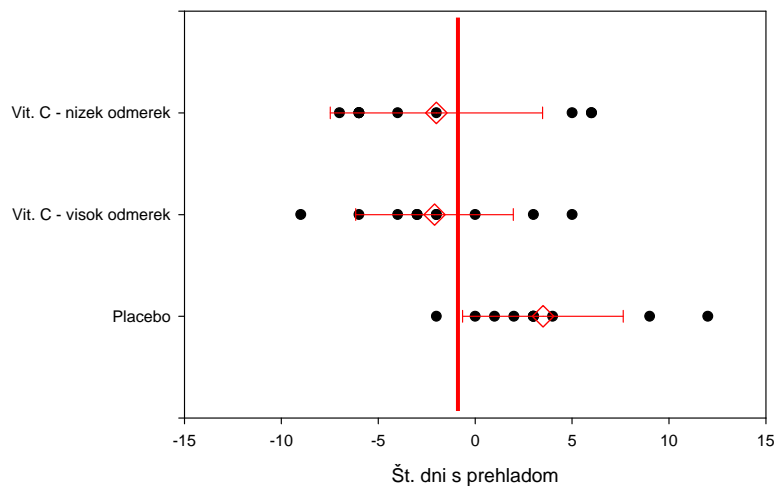
Napaka je porazdeljena normalno

Napake (ali meritve) so neodvisne

$$H_0: \mu_1 = \mu_2 = \mu_3 = \dots$$

$$H_a: \mu_a \neq \mu_b$$

ANOVA

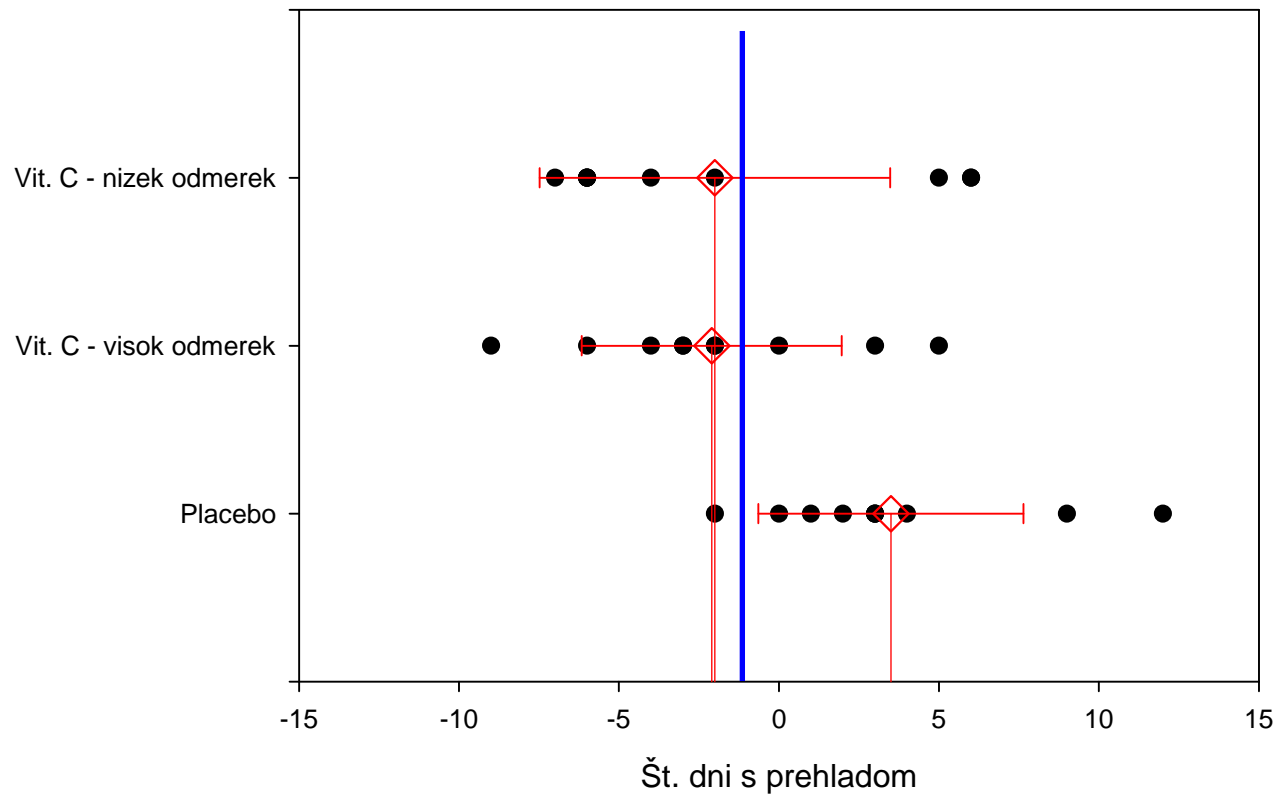


$$TSS = \sum (Y_{ij} - \bar{Y})^2$$

$$WSS = \sum (Y_{ij} - \bar{Y}_i)^2$$

$$BSS = \sum N_i (\bar{Y}_i - \bar{Y})^2$$

$$TSS = BSS + WSS$$



ANOVA

			Mean	Std Deviation
Skupina	Placebo	Št. dni s prehladom	3.50	4.14
	Vit. C - nizek odmerek	Št. dni s prehladom	-2.10	4.07
	Vit. C - visok odmerek	Št. dni s prehladom	-2.00	5.48

Število stopinj prostosti (df)

ANOVA

Št. dni s prehladom

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	205.400	2	102.700	4.836	.016
Within Groups	573.400	27	21.237		
Total	778.800	29			

Vsota kvadratov odklonov
od aritmetične sredine (SS)

Varianca $MS = SS/df$

$F_{exp} = BMS/WMS$

$BMS \geq WMS$

Načrtovane in nenačrtovane (*apriori/posteriori*) mnogotere primerjave

- Kontrola napake 1. vrste
 - Bonferroni (stopnja značilnosti α/k)
 - Post hoc testi
 - Test najmanjše pomembne razlike (LSD)
 - Tukey
 - Scheffe
 - Newman-Keuls
 - Dunnett (kontrolna skupina)
-

Post hoc

Multiple Comparisons

Dependent Variable: Št. dni s prehladom
LSD

(I) Skupina	(J) Skupina	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Placebo	Vit. C - nizek odmerek	5.600*	2.061	.011	1.37	9.83
	Vit. C - visok odmerek	5.500*	2.061	.013	1.27	9.73
Vit. C - nizek odmerek	Placebo	-5.600*	2.061	.011	-9.83	-1.37
	Vit. C - visok odmerek	-.100	2.061	.962	-4.33	4.13
Vit. C - visok odmerek	Placebo	-5.500*	2.061	.013	-9.73	-1.27
	Vit. C - nizek odmerek	.100	2.061	.962	-4.13	4.33

*. The mean difference is significant at the .05 level.

$$\sqrt{WMS(1/N_1 + 1/N_2)}$$

Ni korekcije napake 1. vrste

Post hoc

Multiple Comparisons

Dependent Variable: Št. dni s prehladom

Bonferroni

(I) Skupina	(J) Skupina	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Placebo	Vit. C - nizek odmerek	5.600*	2.061	.034	.34	10.86
	Vit. C - visok odmerek	5.500*	2.061	.038	.24	10.76
Vit. C - nizek odmerek	Placebo	-5.600*	2.061	.034	-10.86	-.34
	Vit. C - visok odmerek	-.100	2.061	1.000	-5.36	5.16
Vit. C - visok odmerek	Placebo	-5.500*	2.061	.038	-10.76	-.24
	Vit. C - nizek odmerek	.100	2.061	1.000	-5.16	5.36

*. The mean difference is significant at the .05 level.

Post hoc

Multiple Comparisons

Dependent Variable: Št. dni s prehladom
Tukey HSD

(I) Skupina	(J) Skupina	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Placebo	Vit. C - nizek odmerek	5.600*	2.061	.030	.49	10.71
	Vit. C - visok odmerek	5.500*	2.061	.033	.39	10.61
Vit. C - nizek odmerek	Placebo	-5.600*	2.061	.030	-10.71	-.49
	Vit. C - visok odmerek	-.100	2.061	.999	-5.21	5.01
Vit. C - visok odmerek	Placebo	-5.500*	2.061	.033	-10.61	-.39
	Vit. C - nizek odmerek	.100	2.061	.999	-5.01	5.21

*. The mean difference is significant at the .05 level.

Post hoc

Multiple Comparisons

Dependent Variable: Št. dni s prehladom
Scheffe

(I) Skupina	(J) Skupina	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Placebo	Vit. C - nizek odmerek	5.600*	2.061	.038	.26	10.94
	Vit. C - visok odmerek	5.500*	2.061	.042	.16	10.84
Vit. C - nizek odmerek	Placebo	-5.600*	2.061	.038	-10.94	-.26
	Vit. C - visok odmerek	-.100	2.061	.999	-5.44	5.24
Vit. C - visok odmerek	Placebo	-5.500*	2.061	.042	-10.84	-.16
	Vit. C - nizek odmerek	.100	2.061	.999	-5.24	5.44

*. The mean difference is significant at the .05 level.

Post hoc

Multiple Comparisons

Dependent Variable: Št. dni s prehladom

Dunnett t (2-sided)^a

(I) Skupina	(J) Skupina	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Vit. C - nizek odmerek	Placebo	-5.600*	2.061	.021	-10.41	-.79
Vit. C - visok odmerek	Placebo	-5.500*	2.061	.024	-10.31	-.69

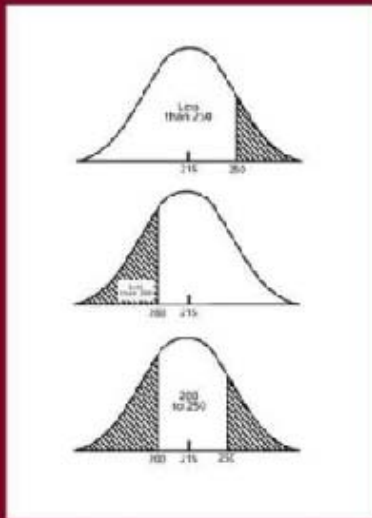
*. The mean difference is significant at the .05 level.

a. Dunnett t-tests treat one group as a control, and compare all other groups against it.

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Poglavje 8!