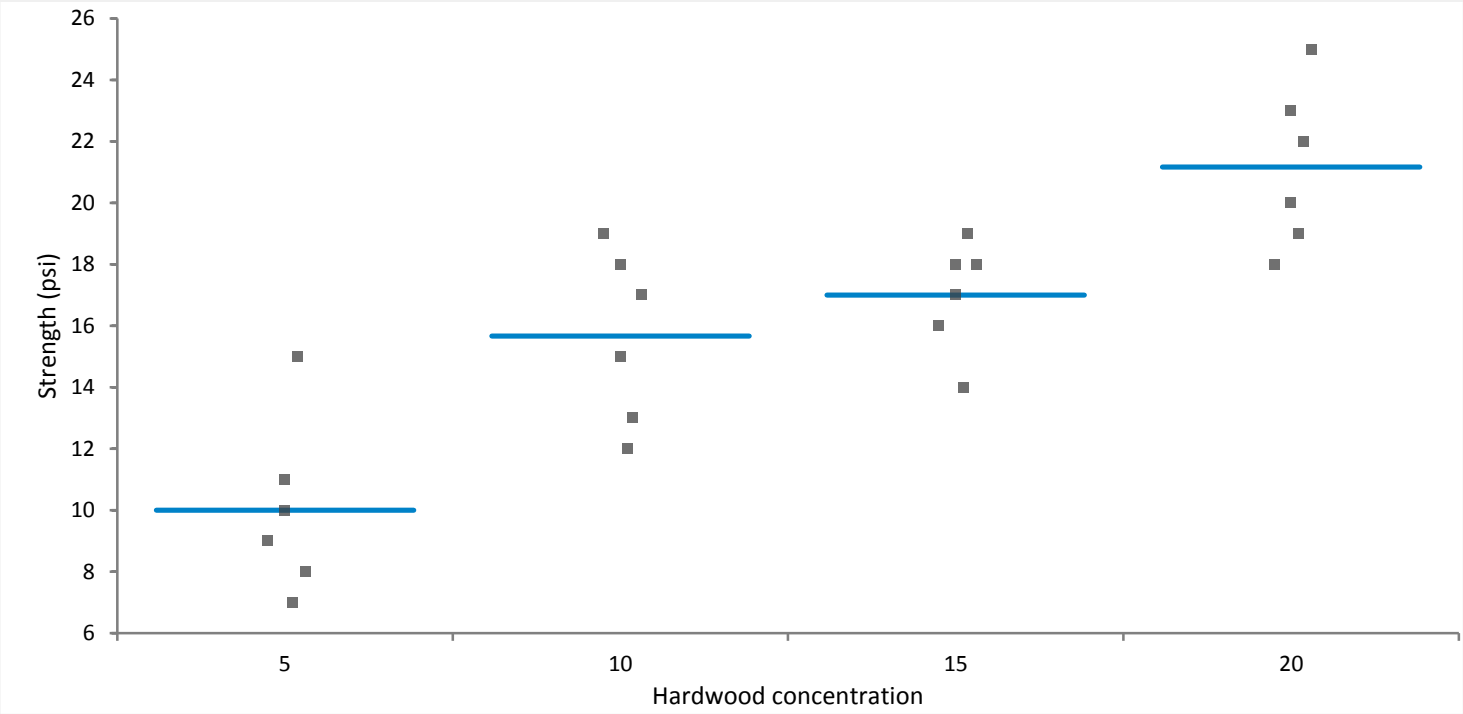
Compare Groups: Strength by Hardwood concentration

Analyse-it v4.80.1

Tensile strength of paper (Montgomery 2001)

Last updated 8 February 2017 at 10:26 by Analyse-it Software, Ltd.

Descriptives



N	24

Strength (psi) by Hardwood concentration	N	Mean	95% CI*	Mean SE*	SD
5	6	10.0	7.8 to 12.2	1.04	2.8
10	6	15.7	13.5 to 17.8	1.04	2.8
15	6	17.0	14.8 to 19.2	1.04	1.8
20	6	21.2	19.0 to 23.3	1.04	2.6
Pooled	24				2.6

* Standard error of the mean based on the pooled sample variance.

Location

ANOVA

Source	SS	DF	MS	F	p-value
Hardwood concentration	382.8	3	127.6	19.61	<0.0001 [1]
Error	130.2	20	6.5		
Total	513.0	23	22.3		

H0: $\mu_1 = \mu_2 = \mu...$

The mean of the populations are all equal.

H1: $\mu_i \neq \mu_j$ for at least one i,j

The mean of the populations are not all equal.

[1] Reject the null hypothesis in favour of the alternative hypothesis at the 5% significance level.

Compare Groups: Strength by Hardwood concentration

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Tensile strength of paper (Montgomery 2001)

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Multiple Comparisions

Tukey-Kramer all pairs comparisons

Contrast	Mean difference	Simultaneous 95% CI	SE	0	p-value
5 - 10	-5.7	-9.8 to -1.5	1.47		0.0051 [1]
5 - 15	-7.0	-11.1 to -2.9	1.47		0.0007 [1]
5 - 20	-11.2	-15.3 to -7.0	1.47		<0.0001 [1]
10 - 15	-1.3	-5.5 to 2.8	1.47		0.8022 [2]
10 - 20	-5.5	-9.6 to -1.4	1.47		0.0066 [1]
15 - 20	-4.2	-8.3 to -0.0	1.47		0.0470 [1]

H0: θ = 0

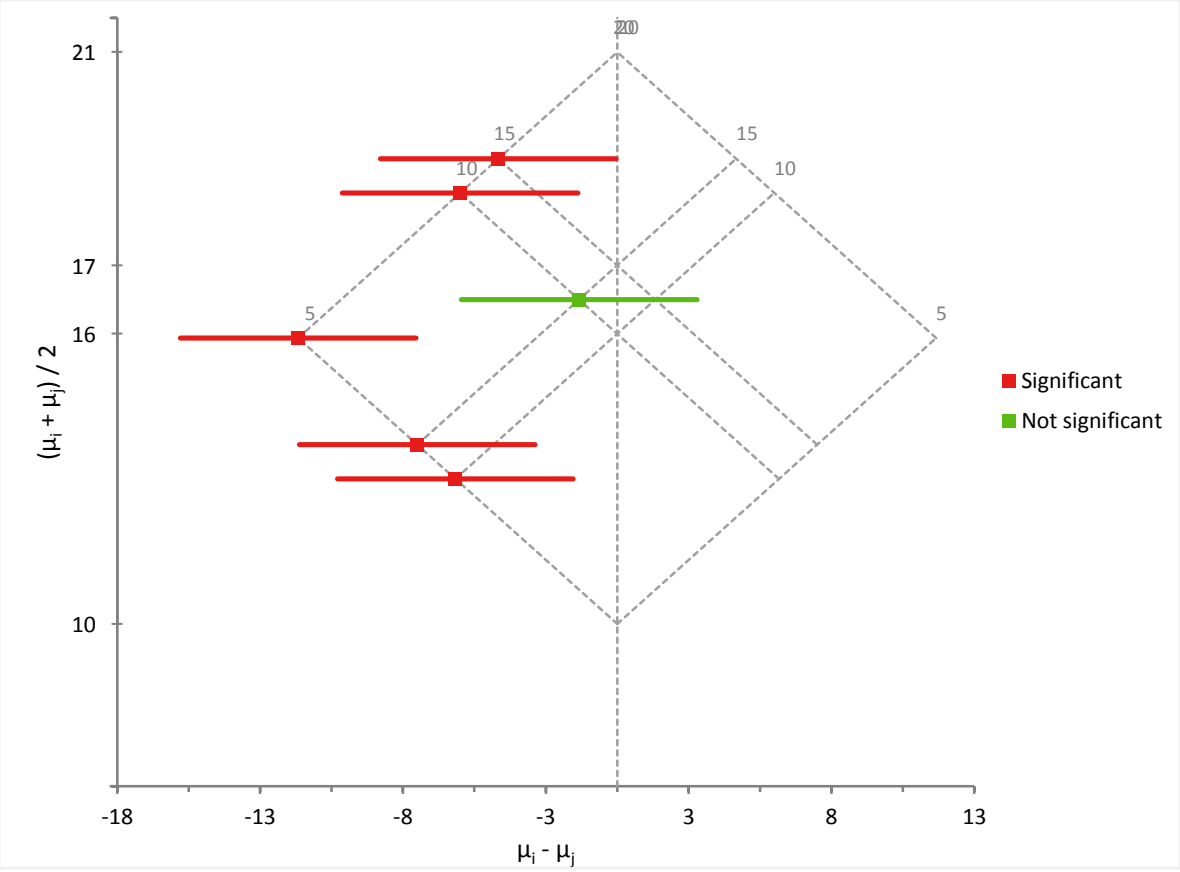
The difference between the means of the populations is equal to 0.

H1: θ ≠ 0

The difference between the means of the populations is not equal to 0.

[1] Reject the null hypothesis in favour of the alternative hypothesis at the 5% significance level.

[2] Do not reject the null hypothesis at the 5% significance level.



Fit: Adhesion force

Aircraft primer paint (Montgomer 2001, page 572)

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Fit

N	18
R^2	0.908
R^2 adjusted	0.870
RMSE	0.287

Effect of Model

Source	SS	DF	MS	F	p-value
Difference	9.73	5	1.95	23.67	<0.0001
Error	0.99	12	0.08		
Null model	10.72	17	0.63		

H0: $E(Y|X=x) = \mu$

The model is no better than a null model $Y=\mu$.

H1: $E(Y|X=x) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots$

The model is better than the null model.

Effect of Terms

Term	SS	DF	MS	F	p-value
Primer type	4.58	2	2.29	27.86	<0.0001 [1]
Application method	4.91	1	4.91	59.70	<0.0001 [1]
Primer x Application	0.24	2	0.12	1.47	0.2693 [2]

H0: $\beta_{Term} = 0$

The term does not contribute to the model.

H1: $\beta_{Term} \neq 0$

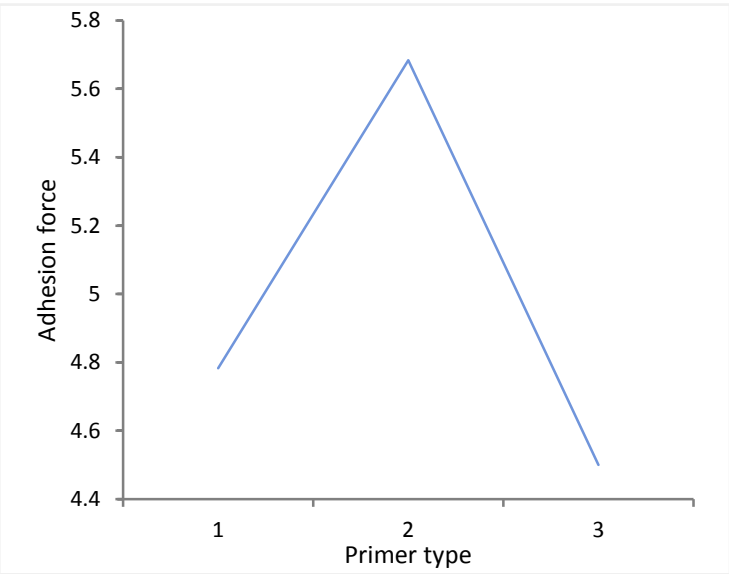
The term contributes to the model.

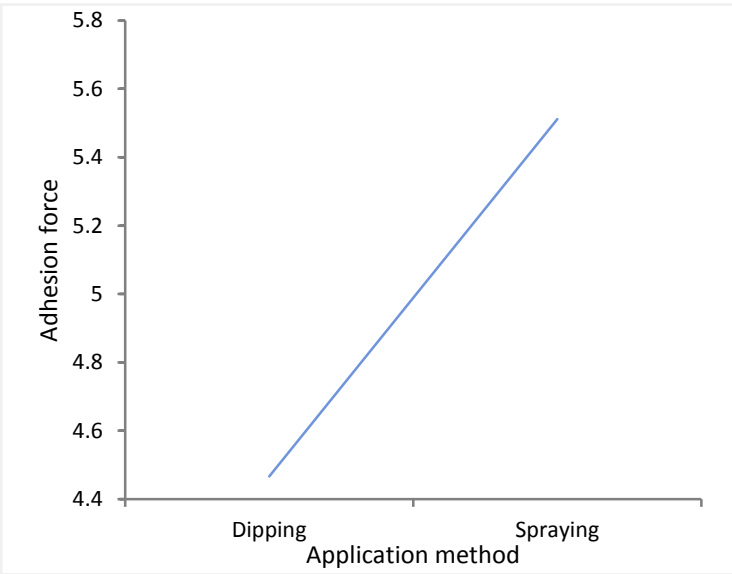
[1] Reject the null hypothesis in favour of the alternative hypothesis at the 5% significance level.

[2] Do not reject the null hypothesis at the 5% significance level.

Effect Means

Main Effects





Fit: Adhesion force

Analyse-it v4.80.1

Aircraft primer paint (Montgomer 2001, page 572)

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Mean of Y	4.99

Primer type Effect

Level	LS mean	SE
1	4.78	0.117
2	5.68	0.117
3	4.50	0.117

Tukey-Kramer all pairs Contrast	Mean difference	Simultaneous 95% CI	SE	0	p-value
2 - 3	1.18	0.74 to 1.63	0.166		<0.0001 [1]
2 - 1	0.90	0.46 to 1.34	0.166		0.0004 [1]
1 - 3	0.28	-0.16 to 0.73	0.166		0.2410 [2]

[1] Reject the null hypothesis in favour of the alternative hypothesis at the 5% significance level.

[2] Do not reject the null hypothesis at the 5% significance level.

Application method Effect

Level	LS mean	SE
Dipping	4.47	0.096
Spraying	5.51	0.096

Tukey-Kramer all pairs Contrast	Mean difference	Simultaneous 95% CI	SE	0	p-value
Spraying - Dipping	1.04	0.75 to 1.34	0.135		<0.0001 [1]

H0: $\mu = 0$

The difference between the means of the populations is equal to 0.

H1: $\mu \neq 0$

The difference between the means of the populations is not equal to 0.

[1] Reject the null hypothesis in favour of the alternative hypothesis at the 5% significance level.

Fit: Y

Analyse-it v4.80.1

Surface finish (Montgomery 2001, page 587)

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Fit

N	16
R^2	0.790
R^2 adjusted	0.607
RMSE	1.56

Effect of Model

Source	SS	DF	MS	F	p-value
Difference	73.4	7	10.5	4.30	0.0288
Error	19.5	8	2.4		
Null model	92.9	15	6.2		

H0: $E(Y|X=x) = \mu$

The model is no better than a null model $Y=\mu$.

H1: $E(Y|X=x) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots$

The model is better than the null model.

Effect of Terms

Term	SS	DF	MS	F	p-value
A	45.6	1	45.6	18.69	0.0025 [1]
B	10.6	1	10.6	4.33	0.0709 [2]
A x B	7.6	1	7.6	3.10	0.1162 [2]
C	3.1	1	3.1	1.26	0.2948 [2]
A x C	0.1	1	0.1	0.03	0.8767 [2]
B x C	1.6	1	1.6	0.64	0.4465 [2]
A x B x C	5.1	1	5.1	2.08	0.1875 [2]

H0: $\beta_{Term} = 0$

The term does not contribute to the model.

H1: $\beta_{Term} \neq 0$

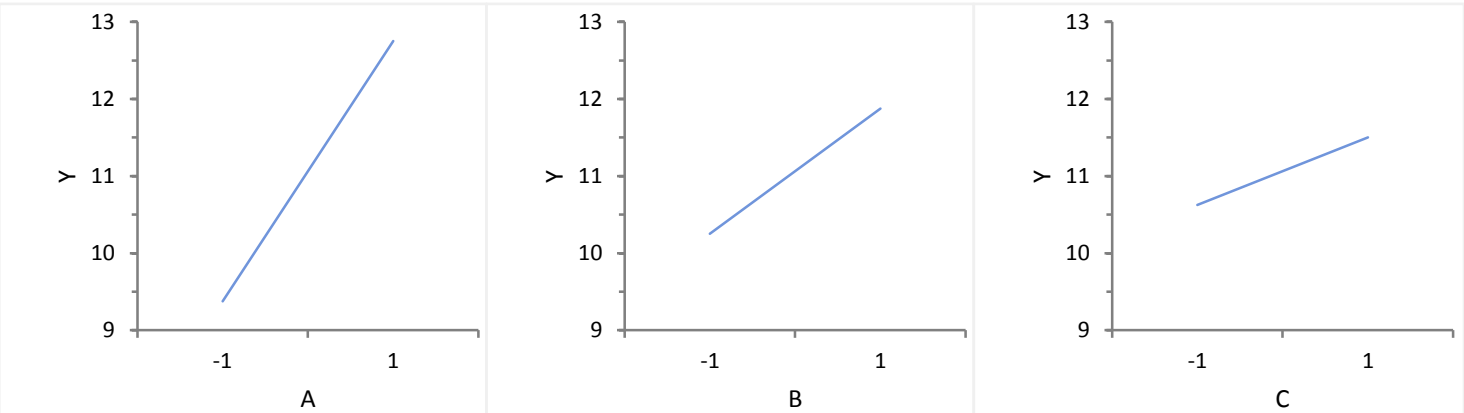
The term contributes to the model.

[1] Reject the null hypothesis in favour of the alternative hypothesis at the 5% significance level.

[2] Do not reject the null hypothesis at the 5% significance level.

Effect Means

Main Effects



Surface finish (Montgomery 2001, page 587)

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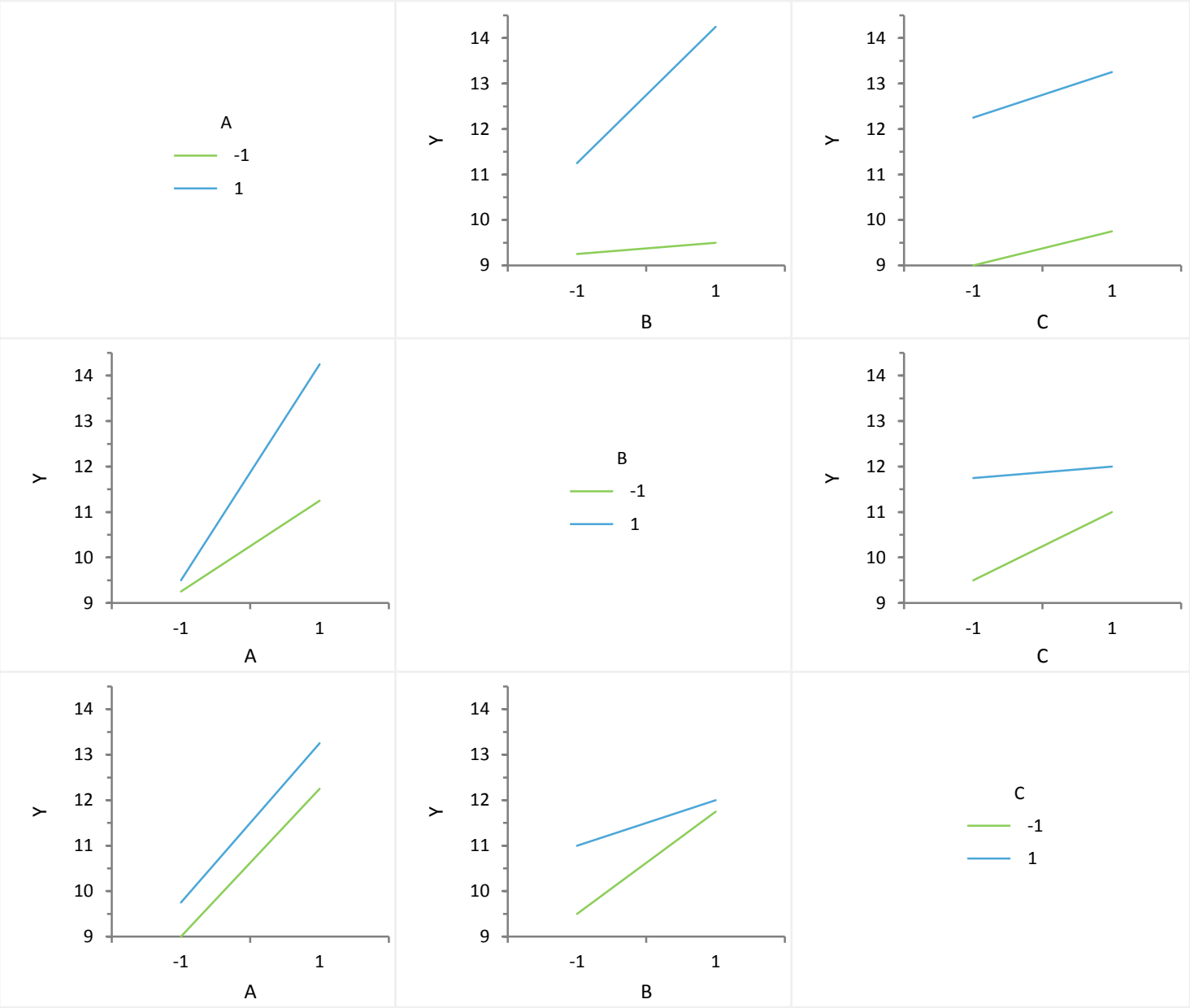
2-way Interaction Effects



Fit: Participant Libido

Viagra study (Field 2003)

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Fit

N	30
R^2	0.288
R^2 adjusted	0.205
RMSE	1.74

Effect of Model

Source	SS	DF	MS	F	p-value
Difference	31.9	3	10.6	3.50	0.0295
Error	79.0	26	3.0		
Null model	111.0	29	3.8		

H0: $E(Y|X=x) = \mu$

The model is no better than a null model $Y=\mu$.

H1: $E(Y|X=x) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots$

The model is better than the null model.

Effect of Terms

Term	SS	DF	MS	F	p-value
Dose	25.2	2	12.6	4.14	0.0274 [1]
Partner's Libido	15.1	1	15.1	4.96	0.0348 [1]

H0: $\beta_{Term} = 0$

The term does not contribute to the model.

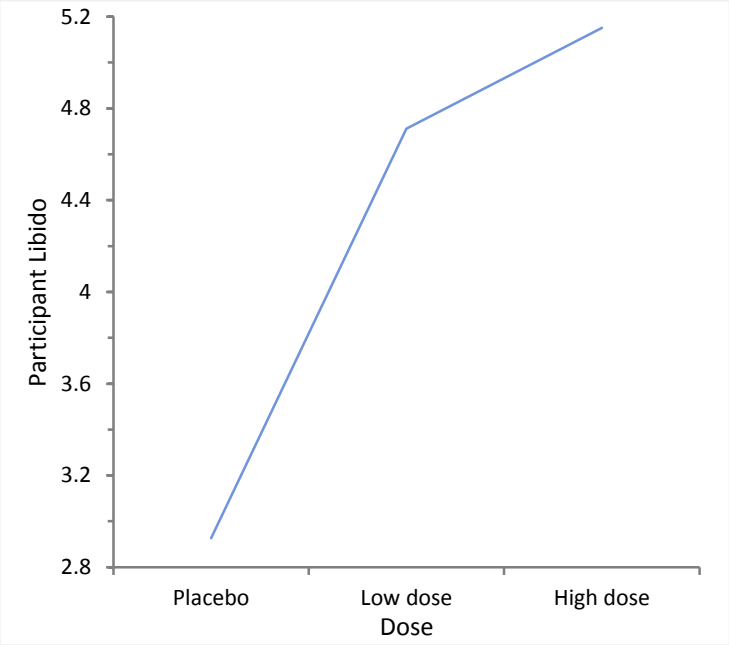
H1: $\beta_{Term} \neq 0$

The term contributes to the model.

[1] Reject the null hypothesis in favour of the alternative hypothesis at the 5% significance level.

Effect Means

Main Effects



Fit: Participant Libido

Viagra study (Field 2003)

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Mean of Y	4.4

Dose Effect

Level	LS mean	SE
Placebo	2.9	0.60
Low dose	4.7	0.62
High dose	5.2	0.50

Dunnett against control Contrast	Mean difference	Simultaneous 95% CI	SE	0	p-value
Low dose - Placebo	1.8	-0.2 to 3.8	0.86		0.0858 [2]
High dose - Placebo	2.2	0.4 to 4.0	0.78		0.0157 [1]

H0: $\mu = 0$

The difference between the means of the populations is equal to 0.

H1: $\mu \neq 0$

The difference between the means of the populations is not equal to 0.

[1] Reject the null hypothesis in favour of the alternative hypothesis at the 5% significance level.

[2] Do not reject the null hypothesis at the 5% significance level.