如何使用 Graphpad 做单因素方差分析

方差分析就是对试验数据进行分析,检验方差相等的多个正态总体均值是否相等,进而判断各因素对试验 指标的影响是否显著,根据影响试验指标条件的个数可以区分为单因素方差分析、双因素方差分析和多因 素方差分析。试验中要考察的指标称为试验指标,影响试验指标的条件称为因素,因素所处的状态称为水 平,若试验中只有一个因素改变则称为单因素试验,若有两个因素改变则称为双因素试验,若有多个因素 改变则称为多因素试验。——《百度百科》今天,我们就以动物行为学数据进行一下示范,因为影响因素 只有药物,所以我们应该使用单因素方差进行分析的方法。

我们回顾一下进行单因素方差的基本步骤: a. 对各个组数据进行正态性检验 b. 对各个组数据进行方差齐 性检验 c. 进行各个组之间均值的比较(单因素方差分析)1. 下面是我们的数据,我们首先进行数据的统 计描述

Control	Model	Positive drug	Experimental drug
68.8	34.9	98.9	51.2
70.6	37.6	67.4	54.3
87.7	26.5	63.9	57.4
70	15.3	31.1	77.1
74.3	16.9	47	54.9
85.1	26.3	46.7	47.5
87.5	37.5	44.9	44.5
90.4	41.5	31.1	59.8 公グ Paper錠图

2. 首先打开 Graphpad 软件,输入数据,更改组名,更改 Data1 为 Total distance

Welcome to GraphPad Prism GraphPad Prism Version 8.0.1 (244)	Column tables have one grouping variable, with each group defined by a column A B Column A B Control Treated Y Y Y Control Treated Control Treated Contro
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Project2:Total distance - GraphPad Prism 8.0.1 (244)

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进行数据正态性检验:选中数据 – Analyze - Column analyses - Normality and Log normality Tests -选中组
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4. 进行正态性检验软件参数设置

hich distribution(s)	to test?
Normal (<u>G</u> aussian)	distribution
<u>L</u> ognormal distribut	ion
Compute the <u>r</u> elative lognormal distribution	ve likelihood of sampling from a Gaussian (normal) vs. a on (assuming no other possibilities)
ethods to test distr	ibution(s)
Anderson-Darling t	est
✓ D'Agostino-Pearsor	n omnibus normality test
Shapiro-Wilk norma	lity test
Kolmogorov-Smirna	ov normality test with Dallal-Wilkinson-Lilliefor P value
raphing options	
Create a QQ plot	
ubcolumns	
Average the replication of th	ates in each row, and then perform the calculation
Perform calculation	s on each subcolumn separatel <u>y</u>
<u>Treat all the values</u>	in all subcolumns as single set of data
alculations	
Significance le <u>v</u> el (alph	na) 0.05
utput	
Show this many signific	ant digits (for everything except P values): 4 🖨
	1224 () 0 0222 (*) 0 0021 (**)
	1254 (IIS), 0.0552 (*), 0.0021 (**), V M = 0
Make these choices t	ne default for <u>f</u> uture analyses.

 5. 查看结果,因为选中了四种统计方法,所以出现了四种统计结果来进行高斯分布的描述,我们只看一种

 就可以了。四种方法均显示, Passed normality test (alpha=0.05), P value summary 为 ns。因此,可以进行单因

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Layouts »	12	P value summary	ns	ns	ns								
New Layout	13		1.540										
	14	Shapiro-Wilk test											
Family »	15	W	0.8352	0.9039	0.8843	0.8828							
distance	16	P value	0.0672	0.3132	0.2067	0.2003							
ormality and Lognormality Tests	17	Passed normality test (alpha=0.05)?	Yes	Yes	Yes	Yes							
al QQ plot: Normality and Lognorn	18	P value summary	ns	ns	ns	ns							
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	20	Kolmogorov-Smirnov test				1				10	2	E) currie	44.17
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	22	P value	>0.1000	>0.1000	>0.1000	>0.1000					~		

6. 选中数据,进行单因素方差分析

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Normality and Lognormality	7	87.5	37.5	44.9	44.5	Transpose X and Y	
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7. 这里呢,我们首先假设方差相等

Parameters: (One-Way ANC	VA (and Nonp	parametric or N	Mixed)	×
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No. Use	Brown-Forsythe	and Welch ANOV	/A tests.		
0.00					
Based on y - Ordina	our choices (on a ry one-way ANO\	ıll tabs), Prism will /A.	perform:		
		Le	arn	Cancel	🕐 Papar绘图

8. 设定需要比较的组,或者两两比较也行

Parameters: One-Way ANOVA (and Nonparametric or Mixed)	\times
Experimental Design Repeated Measures Multiple Comparisons Options Residuals	
Followup tests 两两比较	
Compare the mean of each column with the mean of every other column.	
Control column: Column B : Model	
Compare the means of preselected pairs of columns.	
Selected pairs: Select 与特定的组比较	
○ Test for linear trend between column mean and left-to-right column order.	
Which test?	
future ANOVAs.	
Learn Cancel Cancel	2

9. 方差如果相等的话就可以直接看结果了,但是方差不等,如下所示,那么我们应该假设方差不等。

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	17	Bartlett's test																				
	18	Bartlett's statistic (corrected)	8.47	3																		
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	21	Are SDs significantly different (P < 0.05)?	Yes														50	•)	121	Det	15	1

10. 我们应该选择方差不等,使用 Brown-Forsythe and Welch ANOVA tests。

🚢 Project2:Ordinary one-way ANOVA of Total distance - GraphPad Prism 8.0.1 (244)

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Normality and Lognormality	6	E.	10.04			_	
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New Analysis	-	P value summary					
✓ Graphs »	0	Significant diff. among means (P < 0.05)?	Yes				
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Normal QQ plot: Normality	10						
New Graph	11	Brown-Forsythe test					
✓ Layouts »	12	F (DFn, DFd)	1.368 (3, 28)				
New Layout	13	P value	0.2730				
Family »	14	P value summary	ns				
Total distance	15	Are SDs significantly different (P < 0.05)?	No				
Ordinary one-way ANOVA	16						
	17	Bartlett's test					
	18	Bartlett's statistic (corrected)	8.473				
	19	P value	0.0372				
	20	P value summary				Ca. D	anarlea
	21	Are SDs significantly different (P < 0.05)?	Yes			2 J	abaiszel '

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11. 然后查看结果,看看之间的比较是否具有显著性差异。这里显示出了 Significant,星号,P值等。

Prism File Sheet Undo ●●● ▲ ★ ★ ● ● ▲ ●●● ▲ ★ ★ ● ● ▲ ●●● ▲ ★ ★ ●		ard Analysis Interpret Change	Draw Va	Tα A A B I U	Text X ² X ₂ m ² m ² ≡ ·	Export F	rint Send LA Help	Prish	ñ8	
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 Project info 1 	2	Number of comparisons per family	3							
New Info	3	Alpha	0.05							
✓ Results »	4					-		-		
Normality and Lognormality	2	Dunnett's T3 multiple comparisons test	Mean Diff.	95.00% CI of diff.	Significant?	Summary	Adjusted P Value	B-?		
Brown-Forsythe and Welc	6	Model vs. Control	-49.74	-62.30 to -37.18	Yes	****	<0.0001	A	Control	
① New Analysis	1	Model vs. Positive drug	-24.31	-48.40 to -0.2257	Yes	1	0.0479	C	Positive drug	
✓ Graphs »	8	Model vs. Experimental drug	-26.28	-39.31 to -13.24	Yes		0.0003	D	Experimental drug	
Normal 00 plot: Normality	10	Test details	Mean 1	Mean 2	Mean Diff.	SE of diff.	n1	n2	t	
• New Graph	11	Model vs. Control	29.56	79 30	-49 74	4.771	8	8	10.43	
Lavouts »	12	Model vs. Positive drug	29.56	53.88	-24.31	8.670	8	8	2.804	
New Layout	13	Model vs. Experimental drug	29.56	55.84	-26.28	4.956	8	8	5.302	
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12. 作图,选择图形, Column, Mean/meadian&error, 我们来做个基本的柱状图



13. 调色,改变标签。(不会的请看 Graphpad 做小提琴图和箱线图等)。



进行显著性标记,模型组和空白组我们使用#表示,模型组和给药组我们用*表示,进行标记。

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15. 保存 Graphpad 文件,保存 TIFF 图片, 300dpi。

File format	TTE T-	aged Image File					
	Bitmap. Can	be high resolution. Cross	-platform.				
Exporting options			-				
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