## Graphpad 分析教程 | 手把手教你玩转独立样本 t 检验

在统计学分析里,最重要的元素是数据,因为数据的属性决定了用什么样的方式 来比较数据,不同的数据比较方式就决定了统计分析方法以及对应的统计图。

今天给大家介绍一下 Graphpad 的统计分析功能之非配对 / 独立样本



(unpaired)t 检验。

今天的演示直接以 sample data 来进行。

1. 点击 creat, 生成一组系统示例数据。如下图

-12	Group A	Group B	Group C	Group D	Group E	Group F	Group G	Group H	Group I	Group J
	Male	Female	Title	Title	Title	Title	Title	Title	Title	Title
1	54	43								
2	23	34		How the	data are	organized	数据的组织	现代		
3	45	65		The two o	columns de	fine two gr	oups. Note	that, unlike	e many sta	tistics
4	54	77		programs	, Prism do	es not defin	e groups u	sing a grou	ping variab	le.
5	45	46		Instead, t	ne groups	are defined	by column	IS.		
6		65		The goal	st检验分析	的目的				
7				- To dete	rmine if the	difference	s between	the two gro	oup means	
8				is great	er than you	u'd expect	to see by c	hance.		
9				- To dete	rmine the 9	95% confid	ence interv	al for the d	fference	
10				betweer	i the two h	neans.				
11				How to p	perform ar	n unpaired	t test 如何	It检验的步骤	<b>W</b> ,是不是很	J 人性化啊
12				Click Ana	lyze, choo	se t test fro	om the list	of column a	nalyses th	nen
13				choose a	nunpaired	t test on th	ie dialog. C	lick the link	below for	detailed
14				Instruction	ns.			怕用户	还不会,提	供了傻瓜
15				Step-by-	step instruction	ns for performir	ng an unpaired	t test 式教学	step by ste	ep

 点击 Analyze,也可以点击左侧的 Results 的 New Analysis,则会 creat a new analysis,选定 Column analyses 里的 t test (and nonparametric test),再勾选右侧的 A:male 和 B:female



abler	There is a treat data	-		_
able:	Unpaired t test data			
ype of	analysis			
Which a	analysis?		Analyze which data sets?	
±Τ	ransform, Normalize	*	A:Male	
ΞX	Y analyses		B:Female	
	olumn analyses			
-	t tests (and nonparametric tests)			
/	One-way ANOVA (and nonparametric or			
/	One sample t and Wilcoxon test			
	Descriptive statistics			
	Normality and Lognormality Tests			
	Frequency distribution			
	ROC Curve	Ξ		
	Bland-Altman method comparison			
	Identity outliers			
0.5	Analyze a stack of P values			
E G	roupeu analyses			
	uningency table analyses			
	arts of whole analyses			
	ultiple variable analyses			
E N	ested analyses			
E G	enerate curve			
E S	imulate data	-		
1	4 11			

- 3. 点击 OK , 得到下图 , 按照图示选择双尾 (two-tailed ) 的 P value 和 95%
- CI 后 , 点击 OK

P value: One-	tailed (recommended)
Report differences a	s: Female - Male
Confidence level:	95% ▼ 置信区间
Definition of statis	tical significance: P < 0.05
Graphing options	
Graph difference:	s (paired)
Graph ranks (non	parametric)
Graph correlation	(paired)
CI of differ	ence between means
Additional results	
Descriptive statis	tics for each data set
🔲 t test: Also compa	are models using AICc
Mann-Whitney: A	lso compute the CI of difference between medians
Assumes both di	stributions have the same shape,
Wilcoxon: When I	both values on a row are identical, use method of Pratt
If this option is u match prior vers	inchecked, those rows are ignored and the results will ion of Prism
Output	
Show this many signi	ficant digits (for everything except P values): 4 🚔
Ryalue style: CD. C	1224 (ma) 0.0222 (#) 0.0021 (##) 0 - N- 6



21	F test to compare variances	
22	F, DFn, Dfd	1.680, 5, 4
23	P value	0.6354
24	P value summary	ns
25	Significantly different (P < 0.05)?	No

Unpaired t test	
P value	0.2613
P value summary	ns
Significantly different (P < 0.05)?	No
One- or two-tailed P value?	Two-tailed
t, df	t=1.199, df=9

①一般来说在双样本非配对 t 检验之前应先进行 F 检验,如上图 F 检验的 P 值为 0.6354 > 0.05,说明无明显差异,说明 male 和 female 两组样本是方差齐。

②再来看 t 检验的 p 值为 0.2613 > 0.05, 同样无明显差异。

这里我们用 sample data 得到的两组数据的 F 检验 p > 0.05(方差齐),若 实际操作过程中遇到 F 检验 p < 0.05 怎么办呢?

别急,听我说。若两组数据方差不齐,则需要校正。How?

点击 unpaired t test,选择 Experimental design 里的 choose test,按图 示选择 welch 校正,得到校正后的新 P 值。

Unpaired t test		
1		
1	Table Analyzed	Unpaired t test data
2		
3	Column B	Female
4	VS.	VS.
5	Column A	Male
6		



Welch's t test			
Table Analyzed	Unpaired t test data		
Column B	Female		
vs.	VS.		
Column A	Male		
Unpaired t test with Welch's correction			
P value	0.2501		
P value summary	ns		
Significantly different (P < 0.05)?	No		
One- or two-tailed P value?	Two-tailed		
Welch-corrected t, df	t=1.230, df=8.972		

5. 我们先假设数据符合正态分布,按下图勾选,点击 OK 后出现对应 4 个 P

值,均>0.05,则符合正态分布(Gaussian distribution)。



QQ plot



Normality of Residuals				
Test name	Statistics	P value	Passed norn	P value sum
Anderson-Darling (A2*)	0.4421	0.2330	Yes	ns
D'Agostino-Pearson omnibus (K2)	0.7701	0.6804	Yes	ns
Shapiro-Wilk (W)	0.9177	0.2997	Yes	ns
Kolmogorov-Smirnov (distance)	0.2108	0.1000	Yes	ns

## 若实际数据不服从正态分布,多采用非参数检验。主要有两种非参数检验方法:

①「曼 - 惠特尼秩和检验」(Mann-Whitney test),它假设两个样本分别来自除了总体 均值以外完全相同的两个总体,目的是检验两个总体均值是否有显著的差别。

② 正态性的 Kolmogorov-Smirnov 检验,这是一种基于 ECDF 的检验。

Experimental Desig	n Residuals	Options	
Experimental de	esign		
() Unpaired			
O Paired			
	A	В	
	Control	Treated	3
4	Y	Y	
1		0	
2			1
3			3
4			3
5	inte	in	1
Assume Gaussia	an distributic ametric test.	n? <sup>是否服)</sup> 星,使用参	从正态分布 数检验
No. Use non	parametric tes	否,使用	非参数检验
Choose test Mann-Whitne Kolmogorov-	ey test. Compa Smirnov test. (	ire ranks <mark>M</mark> - Compare cumul	W检验 ative distributions K-S检验
. 完成了两组非配	对 t 检验 , 得	到了想要的 p	o值,其实统计分析过程到这里
忧结束了,如果把林	目对应的统计图	图一起做出来旨	這不是更完美。点击下图示

Graphs---Unpaired t test data 按下图示选择,生成想要的图片。



lot selected data sets only	Select	
iso plot associated curves reate a new graph for each data	set (don't put them all on one graph)	
axis title:	set (aon tipat alem al on one graph)	
graph		
[= ]		
Column		
Individual values	Box and violin	Mean/median & erro

