

T-Test

The Independent Sample T-Test compares the mean scores of two groups on a given variable. In this example, we compare “frequency of sex” for males versus females.

Null Hypothesis: The means of the two groups (males and females) are not significantly different.
 Alternate Hypothesis: The means of the two groups (males and females) are significantly different.

```
PROC TTEST;
CLASS sex;
VAR sexfreq;
RUN;
```

The TTEST Procedure

Statistics											
Variable	SEX	N	Lower CL Mean	Mean	Upper CL Mean	Lower CL Std Dev	Std Dev	Upper CL Std Dev	Std Err	Minimum	Maximum
SEXFREQ	1	976	2.9793	3.0994	3.2195	1.831	1.9123	2.0011	0.0612	0	6
SEXFREQ	2	1175	2.4792	2.5974	2.7157	1.9864	2.0667	2.1539	0.0603	0	6
SEXFREQ	Diff (1-2)		0.3322	0.5019	0.6716	1.9401	1.9981	2.0597	0.0865		

This column lists the dependent variable. In this example, it is “frequency of sex.”

We can see here that males report higher frequencies of sex than females. However, we cannot tell from here whether or not this difference is significant.

T-Tests					
Variable	Method	Variances	DF	t Value	Pr > t
SEXFREQ	Pooled	Equal	2149	5.80	<.0001
SEXFREQ	Satterthwaite	Unequal	2124	5.84	<.0001

This column specifies the method for computing standard error of the mean of the difference based on if the assumption of equal variance is used. If we assume equal variance, then we used the “pooled” method. If we do not assume equal variances, then we use the “Satterthwaite” method. When we talk about accounting for both variances, the difference between the two methods is really about how we treat the standard deviations: in the pooled method, we are taking the arithmetic average of the standard deviations and converting this value into a standard error, whereas in the Satterthwaite approximation we are calculating the standard error from the weighted average of the two variances, a subtle, but important difference. The main difference is that the Satterthwaite approximation does not assume equal variances, whereas the pooled method does. In other words, you can *always* use the Satterthwaite method and be correct, but you can only use the pooled method in very specific (and rare) circumstances.

Equality of Variances					
Variable	Method	Num DF	Den DF	F Value	Pr > F
SEXFREQ	Folded F	1174	975	1.17	0.0116

SAS uses an F test for the assumption of equal variance first—this means that the null hypothesis of equal variances is rejected. In other words, variances are unequal, and we use Satterthwaite.