One-Way ANOVA/Two-Way ANOVA

by Sophia Tutorial

WHAT'S COVERED

This tutorial will cover the difference between a one-way ANOVA test versus a test with a two-way ANOVA. Our discussion breaks down as follows:

1. Types of ANOVA Tests
   a. One-Way ANOVA
   b. Two-Way ANOVA

1. Types of ANOVA Tests

Recall that with ANOVA tests, you want to compare three or more population means and see if there's a significant difference between the means.

There are two types of ANOVA tests:

- One-Way ANOVA: Consider the population means based on one characteristic
- Two-Way ANOVA: Consider the population means based on multiple characteristics

1a. One-Way ANOVA

With **one-way ANOVA**, we are comparing three or more sample means for only one characteristic.

EXAMPLE Suppose that you had a 10-point cleanliness scale that you were ranking detergents on.

Detergent	$\bar{x}$
Tide	8.3
All	6.4
Era	5.5
Arm & Hammer	6.8

Based on this one factor, detergent, you are trying to see how clean the clothes get on average. You would need more information, such as sample size and standard deviation, but this is a situation which would lead you to an ANOVA test.

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Because we're only looking at the one factor of detergent affecting cleanliness, this case would be considerd a one-way ANOVA.

TERM TO KNOW

One-Way ANOVA
A hypothesis test that compares three or more population means with respect to a single characteristic or factor.

1b. Two-Way ANOVA

With **two-way ANOVA**, we are comparing three or more sample means for multiple characteristics.

EXAMPLE Consider the scenario from above that compared cleanliness of different types of detergents. Now, suppose that you included another factor: water temperature.

	Water Temperature		
Detergent	Hot	Warm	Cold
Tide	8.3	8.4	8.6
All	6.4	6.9	7.3
Era	5.5	5.9	6.5
Arm & Hammer	6.8	7.8	7.8

It's possible that some of these detergents do a better job of cleaning in different temperatures of water.

Now that you have all of this additional information, you're actually looking at 12 treatments, four detergents and three water temperatures for each detergent.

There are two factors that are factoring into the cleanliness score.

- Type of Detergent
- Water Temperature

Because there are two factors that are affecting the cleanliness score, we can still do an ANOVA test, but this time, it's called a two-way ANOVA.

TERM TO KNOW

Two-Way ANOVA
A hypothesis test that compares three or more population means with respect to multiple characteristics or factors.

SUMMARY

In one-way ANOVA, you can consider population means that are based on just one characteristic. In

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two-way ANOVA, you consider the comparisons based on multiple characteristics or factors.

Good luck!

Source: Adapted from Sophia tutorial by Jonathan Osters.

TERMS TO KNOW

One-Way ANOVA
A hypothesis test that compares three or more population means with respect to a single characteristic or factor.

Two-Way ANOVA
A hypothesis test that compares three or more population means with respect to multiple characteristics or factors.

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