

Inference and Experiments

AP Statistics | Collecting Data | what you are allowed to conclude

1. Two jobs of randomness

- **Random selection** (sampling): choosing *who is in the study* at random from the population. It lets you **generalize** to that population.
- **Random assignment**: deciding by chance *who gets which treatment*. It creates roughly equivalent groups, so it lets you conclude **cause and effect**.

A study can have both, one, or neither.

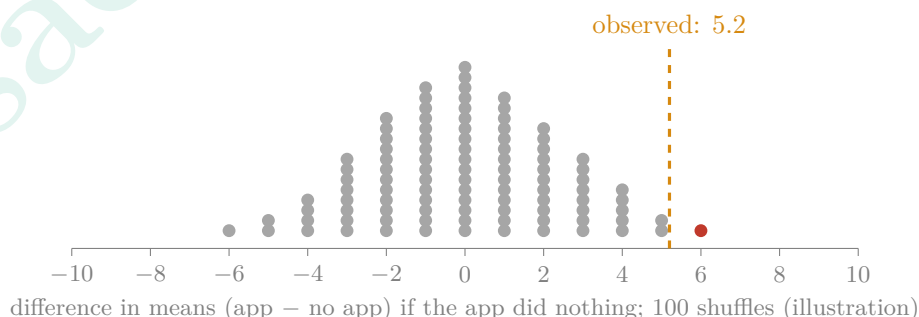
2. The scope of inference

	Random assignment	No random assignment
Random selection	cause and effect, for the <i>population</i>	association only, for the <i>population</i>
No random selection	cause and effect, only for units <i>like those in the study</i>	association only, only for the units in the study

Example. 40 student volunteers are randomly assigned to use a study app or not. Random assignment: yes. Random selection: no (volunteers). If the difference is real, the app *causes* higher scores, but only for students similar to those volunteers.

3. Statistically significant

Even if the treatment did nothing, the two groups would not have exactly equal means: the random assignment alone creates some difference. To see how much, pretend the treatment has no effect, shuffle the 40 scores into two new groups many times, and record the difference each time.



The app group averaged 75.95, the other group 70.75: a difference of 5.2 points. Only 1 of 100 shuffles gave a difference that large.

Statistically significant

An observed difference is **statistically significant** if it is too large to be plausibly explained by chance alone (the chance involved in the random assignment). It is then convincing evidence that the treatment caused the difference.

Significant does *not* mean large, and it does not mean important.

4. Writing the conclusion

A conclusion answers two questions, each with its reason.

- **Cause?** Look for random assignment. *“Because the treatments were randomly assigned and the difference is statistically significant, we can conclude that the app causes higher scores. . . .”*
- **For whom?** Look for random selection. *“...but because the students were volunteers, not a random sample, this applies only to students similar to those in the study.”*

Where students lose points

1. Generalizing because of random *assignment* (assignment gives cause, not generalization).
2. Claiming cause because of a random *sample* (selection gives generalization, not cause).
3. Reading “significant” as “large” or “important”.
4. Stating a conclusion with no justification.
5. Generalizing from volunteers to everyone.

Now practise it

Theory sticks once you use it. On **sad-academy.com** you'll find practice questions for this exact subtopic in the AP format, and an AI that grades your free-response answers against the scoring guidelines, the way an AP reader would.

sad-academy.com