

## Paired Samples $t$ -Test Example in SPSS

A group of high school seniors ( $N = 160$ ) took the SATs twice: once before they took an SAT prep course, and again after they took an SAT prep course.

We want to know if taking the SAT prep course caused their scores to increase.

The datafile **SATcourse.sav** contains the data for all 160 participants.

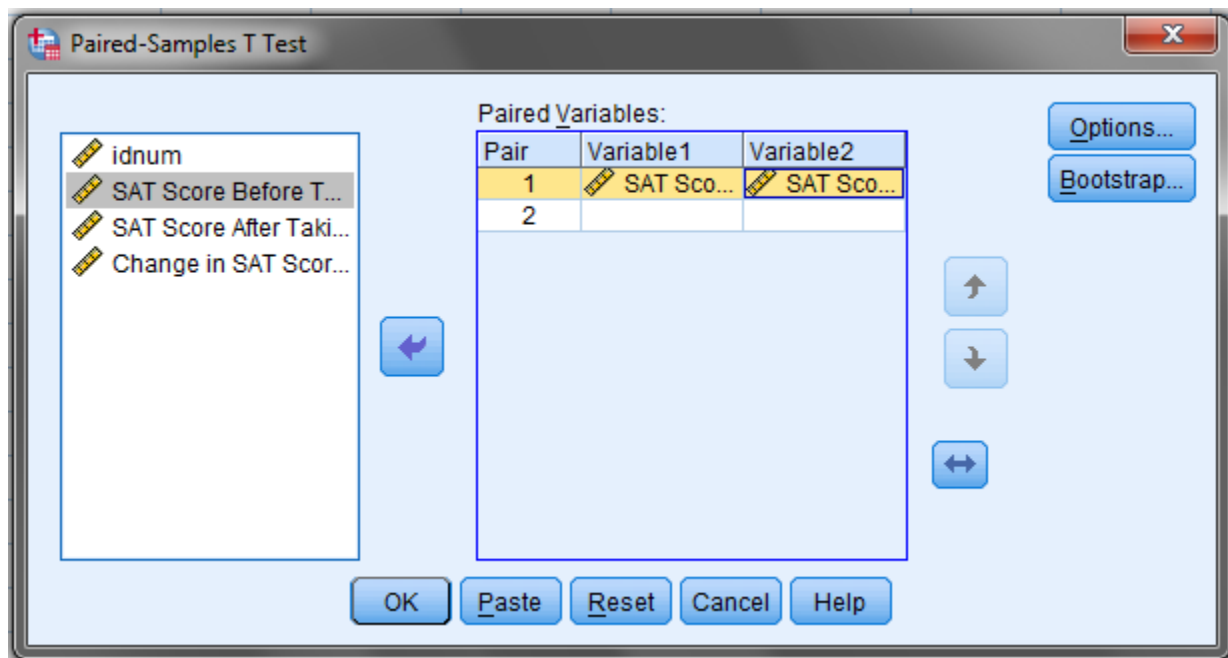
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### Step 1: What test should we use to test this hypothesis?

Because we measured the *same* group of people *TWICE*, in order to test whether their scores (i.e., SAT scores) changed over time, we use a paired samples  $t$  test

### Step 2: How do we run this test in SPSS?

- Go to “Analyze” → “Compare Means” → “Paired-Samples  $t$ -Test”



- Select the variables that we want to compare (i.e., SATpre and SATpost), and move them over to the box on the right. (It is generally better to list the “after” variable as Variable1 and the “before” variable as Variable2, but the order doesn’t really matter).

### Step 3: How do we read the output from SPSS?

Paired Samples Statistics

|        |                                     | Mean      | N   | Std. Deviation | Std. Error Mean |
|--------|-------------------------------------|-----------|-----|----------------|-----------------|
| Pair 1 | SAT Score After Taking Prep Course  | 1094.8125 | 160 | 214.50241      | 16.95790        |
|        | SAT Score Before Taking Prep Course | 1074.6250 | 160 | 149.91774      | 11.85204        |

**1:** Before they took the prep course, our sample had an average SAT score of 1074.63 ( $SD = 149.92$ ). After they took the prep course, they had an average score of 1094.81 ( $SD = 214.50$ ). So, their scores increased by about 20 points, on average, but we don't yet know whether or not this was a *significant* increase.

**2:** Our sample consisted of  $N = 160$  students, each of whom took the SATs both before and after they took the prep course.

Paired Samples Test

|        |                                                                          | Paired Differences |                |                 |       |     | Sig. (2-tailed) |
|--------|--------------------------------------------------------------------------|--------------------|----------------|-----------------|-------|-----|-----------------|
|        |                                                                          | Mean               | Std. Deviation | Std. Error Mean | t     | df  |                 |
| Pair 1 | SAT Score After Taking Prep Course - SAT Score Before Taking Prep Course | 20.18750           | 151.41875      | 11.97070        | 1.686 | 159 | .094            |

**3:** These are the  $t$  (1.69) and  $df$  (159) values for our  $t$ -test. We will need to include these in our write-up of the results, but they aren't terribly interesting on their own.

**4:** This is our  $p$ -value ( $p = .094$ ), which tells us if our hypothesis was supported (or not).

Because our  $p$ -value (.094) is greater than .05, we *RETAIN* the null hypothesis, and conclude that there was NOT a significant increase in students' SAT scores over time.

In other words, even though their scores increased by 20.19 points (on average) after taking the prep course, our dependent  $t$ -test tells us that this wasn't a *significant* increase, and therefore the course didn't actually cause their scores to increase.

#### **Step 4: How do we write up the results in APA format?**

We hypothesized that students' SAT scores would increase as a result of taking an SAT prep course. A dependent-samples  $t$ -test found no significant change in SAT scores over time,  $t(159) = 1.69$ ,  $p = .094$ . Contrary to our hypothesis, students' SAT scores were the same after they took the prep course ( $n = 160$ ;  $M = 1094.81$ ,  $SD = 214.50$ ) as they were before they took the prep course ( $n = 160$ ;  $M = 1074.63$ ,  $SD = 149.92$ ).

*A few things to notice about our write-up...*

- 1)** We always begin our write-up by explicitly stating our hypothesis.
- 2)** Then, we name which test we did, and explain what the test showed. Did we, or didn't we, find a significant difference/relationship? This is where we will provide our test statistic (in this case, our  $t$  value), degrees of freedom, and our  $p$ -value.
- 3)** Finally, we *describe* our group's scores at Time 1 and Time 2, by providing the sample size ( $n$ ), mean ( $M$ ), and standard deviation ( $SD$ ) for each Time.
- 4)** Notice that all non-Greek letters are italicized, every equals sign has a space both before and after it, and every number is rounded to two decimal places (except for  $p$  values, which are rounded to three decimal places).