Section 9.2 — Comparing Two Population Means (σ unknown, dependent samples)

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Outline

Introduction

Example

A typing program claims to be able to improve your typing speed. To test the claim, you and three of your friends decide to try it and see what happens. (Assume typing speeds are normally distributed). Construct a 80% confidence interval to estimate the mean change for people who use the program

Before	42	50	37	22
After	54	52	41	30

Paired Difference

When two dependent samples consist of paired data, the paired difference for any pair is

$$d = x_2 - x_1$$

where x_2 is a data value from the second sample and x_1 is the data value from the first sample that is paired with x_2

Margin of Error

Mean and Standard Deviation

$$\overline{d} = \frac{\sum d_i}{n}$$

$$s_d = \sqrt{\frac{\sum (d_i - \overline{d})^2}{n-1}}$$

Margin of Error

$$E = t_{\alpha/2}\left(\frac{s_d}{\sqrt{n}}\right),\ df = n-1$$

Examples

Typing

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Temperature Prediction

The author recorded actual temperatures along with the temperatures predicted five days earlier. Construct a 99% confidence interval estimate of the mean of the population of all differences. What does this suggest about the accuracy of the program?

Actual High	80	73	78	73	82	81	74	62
Predicted	80	79	79	78	73	79	70	69