KEY

More One-Sample t Tests

1. The Survey of Study Habits and Attitudes (SSHA) is a psychological test that measures students' attitudes toward school and study habits. Scores range from 0 to 200. Higher scores indicate more positive attitudes. The mean score for U.S. college students is about 115. A teacher suspects that older students have better attitudes toward school. She gives the SSHA to an SRS of 45 of the over 1000 students at her college who are at least 30 years of age. The sample mean SSHA score was 125.7 and the sample standard deviation was 29.8.

(a) Calculate the test statistic.

$t = \frac{125.7 - 115}{29.8/\sqrt{45}} = 2.41$ $\quad df = 44$

(b) Find the *P*-value using Table B. Then obtain a more precise *P*-value from your calculator.

Using df = 40 on table $\quad$ P-value = between .01 and .02

Using df = 44 on calc $\quad$ P-value = .0101

2. The one-sample *t* statistic from a sample of $n = 25$ observations for the two-sided test of

$H_0 : \mu = 64.$

$H_a : \mu \neq 64.$ $\quad df = 24$

has the value $t = -2.02$.

(a) Find the *P*-value for this test using Table B or technology. What conclusion would you draw at the 5% significance level?

P-value = between .05 and .10 (table) $\quad$ The P-value is not significant at the 5% level, so we fail to reject H_0.

P-value = .0547 (calc)

(b) Redo part (a) using an alternative hypothesis of $H_a : \mu < 64$.

P-value = between .025 and .05 (table) $\quad$ The P-value is significant at the 5% level, so we reject H_0.

P-value = .0273 (calc)

3. The makers of Aspro brand aspirin want to be sure that their tablets contain the right amount of active ingredient (acetylsalicylic acid). So they inspect a random sample of 36 tablets from a large batch in production. When the production process is working properly, Aspro tablets have an average of $\mu = 320$ milligrams (mg) of active ingredient. The amount of active ingredient in the 36 randomly selected tablets has mean 319 mg and standard deviation 3 mg.

(a) Is there significant evidence at the 5% level that the production process is not working properly for this batch?

$H_0: \mu = 320$

$H_a: \mu \neq 320$

T: $t = \frac{319-320}{3/\sqrt{36}} = -2$ $\quad df = 35$

O: P-value = between .05 and .10 (table) with df = 30

P-value = .0533 (calc)

M: Because the P-value is not significant at the 5% level, we fail to reject H_0.

S: There is not strong evidence that the production process is not working properly.

(b) Given your conclusion in part (a), which kind of mistake – a Type I error or a Type II error – could you have made? Explain what this mistake would mean in context.

Type II error since we failed to reject H_0.

It would mean that the production is not working properly but we have no reason to believe that it's not.