Chapter 8 : One-sample hypothesis tests

Heart rate during laughter. Laughter is often called "the best medicine," since studies have shown that laughter can reduce muscle tension and increase oxygenation of the blood. In the *International Journal of Obesity* (Jan. 2007), researchers at Vanderbilt University investigated the physiological changes that accompany laughter. Ninety subjects (18–34 years old) watched film clips designed to evoke laughter. During the laughing period, the researchers measured the heart rate (beats per minute) of each subject, with the following summary results: $\bar{x} = 73.5$, $s = 6$. It is well known that the mean resting heart rate of adults is 71 beats per minute. → $n = 90$

a. Set up H_0 and H_a for testing whether the true mean heart rate during laughter exceeds 71 beats per minute.

b. If $\alpha = .05$, find the rejection region for the test.

c. Calculate the value of the test statistic.

d. Make the appropriate conclusion.

X = heart rate of a subject in the study during the laughing period

μ = true mean heart rate during laughter

a. $H_0: \mu \leq 71$

$H_1: \mu > 71$

b. $\alpha = 0.05$ → Rejection region $R = \{z > z_{0.05}\}$, where $n = 90 (> 20)$ → $z = \dfrac{\bar{x} - 71}{s/\sqrt{90}}$ is the test statistic.

c. $z = \dfrac{73.5 - 71}{6/\sqrt{90}} = 3.953$

d. Since $z_{0.05} = 1.645$, the condition in R is satisfied. We reject $H_0: \mu \leq 71$ for $\alpha = 0.05$. We conclude that, at the significance level $\alpha = 0.05$ there is enough sample evidence that laughter drives the mean heart rate above 71 beats per minute.