Chapter Summary

- To estimate an athlete's *ABILITY* with a numerical variable, we can use the mean or median. If the athlete could keep playing indefinitely in the same conditions, his or her mean or median *PERFORMANCE* would be equal to his or her true *ABILITY*. However, because of *RANDOM CHANCE*, an athlete's observed *PERFORMANCE* is unlikely to equal his or her true *ABILITY*.
- In this chapter, the **null hypothesis** states that the athlete has the same *ABILITY* in two different contexts, and the **alternative hypothesis** states that the athlete has a greater *ABILITY* in one of the contexts.
- When using a numerical variable, the two possible test statistics we use to measure the difference in *ABILITY* are the **difference in means** and the **difference in medians**.
- To **simulate** the distribution of either test statistic, write the observed values on note cards, shuffle the cards, and divide them into two piles, making sure that the number of cards in each pile matches the original group sizes. Then, calculate the difference in means or medians and repeat many times.
- The ***p*-value** measures the chances of getting a test statistic at least as extreme as the observed test statistic when the null hypothesis is true.
- If the *p*-value is small, we **reject the null hypothesis** and have convincing evidence to support the alternative hypothesis. However, if the *p*-value is large, we **fail to reject the null hypothesis** and do not have convincing evidence to support the alternative hypothesis.
- Two or more variables are **confounded** if we do not know which one is causing a change in a response variable.
- To help avoid confounding, conduct an **experiment** where all variables are **controlled**. That is, make sure all variables are exactly the same except for the explanatory variable. Also, make sure to use **randomization** to avoid favoring one treatment.
- Subjects in an experiment are **blind** if they do not know which treatment they are receiving. If the subjects are not blind, they may consciously or subconsciously change their behavior during the experiment and give one treatment an advantage.
- In an experiment, **replication** means using enough subjects or conducting enough trials to ensure that convincing evidence of a difference in *ABILITY* is found if there really is a difference. In other words, proper replication helps to avoid Type II errors.