Lesson 4.2.1

4-52. a. The histogram for the treatment A group (males) should be centered at a lower number of words recalled than the histogram for the treatment B group (females).

b. Students should conclude that there is a difference in the treatments and/or in a difference in the ability attributed to the confounding variable. For example: "Females are able to recall significantly more words than males."

4-53. Answers vary. Randomization with as many trials as possible is needed.

4-54. a. Histograms should be similar.

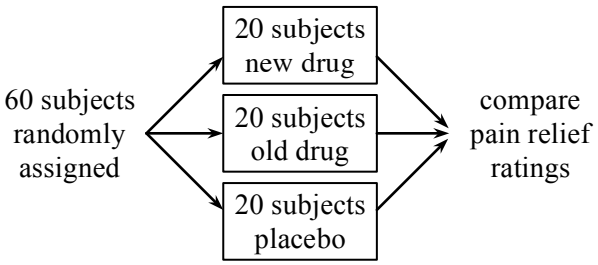
b. It is most likely the treatments that are responsible for the observed difference and not a confounding variable such as gender.

c. Randomization approximately balanced the identified confounding variable along with any possible others, so in the second experiment the difference can be attributed to the treatments.

d. If students knew they were receiving different techniques, the effects due to the treatment may not have had the impact it did.

e. Have a group of volunteers receive no instruction on memorizing and measure record the number of words they memorize. A comparison to the treatments groups could reveal that the treatments are no better or perhaps worse than no treatment at all.

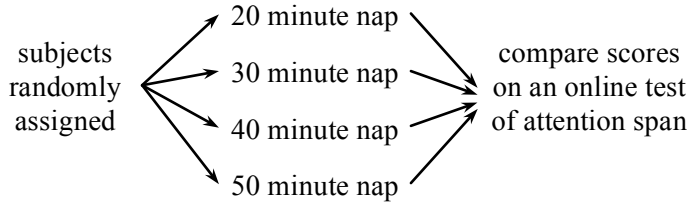
4-55. a. Participating in a clinical trial may provide psychological benefits to patients who routinely suffer from headaches. By comparing the treatment group to the placebo group, researchers can determine if the new drug has any benefits beyond the psychological benefits of participating in an experiment.

b. 

c. Personal beliefs about the effectiveness of a treatment may influence the outcome of an experiment. Whenever possible, subjects should not know which treatment they are receiving. Likewise, researchers often have predisposed beliefs about treatments and could influence how the subjects respond and how that response is measured.

4-56. It would be unethical to pretend to do surgery on a patient and your patient should get the best available treatment under reasonable conditions.

4-57. a. Subjects: people; explanatory: length of nap in minutes; response: level of productivity or length of time on task.

b. 

c. Other variables may include a person's health, stress level, or amount of sleep they got the previous night. Also of concern would be whether or not a person reclines while they nap, the amount of light in the room, and any noise in the room.

4-58. a. Explanatory variable: new pain medication, existing pain medication, and a placebo; response variable: reduction in self reported pain; All subjects should self report their pain level on a numeric scale before they begin treatment. After 8 weeks, the subjects should self report their pain level again and the difference recorded. Researchers will look for overall differences in self reported pain levels by each of the treatment groups. The experiment should be double-blind to ensure that the subject's and the researcher's beliefs about how the new medicine will work do not affect the outcome of the experiment. The experiment should have a placebo to compare the medications. The placebo group would tell us if the new and existing drugs are offering any pain relief at all.

b. Explanatory variable: diet patch or placebo patch; response variable: amount of weight lost. The experiment should be double-blind to ensure that the subject's and the researcher's beliefs about how the patch will work do not affect the outcome of the experiment. The experiment should use a fake patch to work as a placebo. This allows for comparison to see if the weight loss patch actually has medical benefits.

c. Explanatory variable: green tea or no green tea; response variable: whether or not a subject develops Alzheimer's disease. Subjects will be randomly assigned to one of two treatment groups. One group will be told to drink green tea for 5 years and the other group will be told to drink fake green tea, a placebo. At the end of 5 years, the subjects will take a test to determine whether or not they have developed Alzheimer's disease. The researchers will compare the proportion of subjects with Alzheimer's in each group.

4-59. a. Warm temperatures are causing more people to buy ice cream and to swim. It is the increase in swimming that is leading to more drownings, not ice cream sales.

b. Women wear more jewelry than men and, on average, speak more words in a day.

c. As children grow, their shoe size gets bigger and their ability to read also increases.

4-60. a. The placebo would control for the psychological benefits subjects gain from being a part of a study.

b. They may assign people they find favorable or healthier to the treatment group. Their body language and attitudes while interacting with the subjects may also give away information.

4-61.

	Republican	Democrat
supported proposition	$\frac{234}{450} = 52\%$	$\frac{286}{550} = 52\%$
did not support proposition	$\frac{162}{450} = 36\%$	$\frac{198}{550} = 36\%$
undecided	$\frac{54}{450} = 12\%$	$\frac{66}{550} = 12\%$
	100%	100%

Compare the percentages across the rows. They are all the same, indicating that there is no association between political party and preference for the ballot proposition. 52% of voters supported the ballot proposition regardless of whether they were a Democrat or Republican.

4-62. a. The data appears randomly scattered. There is apparently no association between time running a mile and heart rate. Only 1% of the variation in heart rate can be explained by a linear association with time to run a mile. The LSRL is nearly horizontal. There are no outliers.

b. Answers will vary. Example responses: D ran a fast mile but seemed to be giving little effort. This athlete might already be in outstanding physical condition or have an attitude problem. F had a strong run and strong effort. Keep this player. N and O ran slowly and gave little effort. Along with player M, students do not know these players' potential or motivation. Cut? P was the slowest of the group but with the highest effort. This player may improve substantially over time.