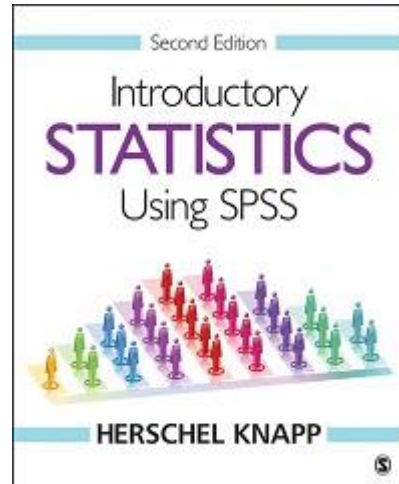


Chapter 1

Research Principles

Solutions to Odd Numbered Exercises



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NOTE: It is not expected that your answers will match the solutions below verbatim or that your methods will be identical, but they should concur conceptually.

Exercise 1.1

(a)

Will 30 minutes of square dancing, 5 days a week, help reduce pediatric weight?

(b)

This would be a two-group study: The control group would have recess as usual with no structured activities; the kids can do whatever they want (except participate in the square dancing). The treatment group would participate in the square dancing.

(c)

The briefing sheet that would be distributed to teachers would instruct each teacher to go through their roll list, and flip a coin one time for each student: Heads assigns the student to the square dancing, tails assigns the student to have regular recess.

(d)

H_0 : Aerobic square dancing 30 minutes a day, 5 days a week, facilitates no weight loss among elementary school students.

H_1 : Aerobic square dancing 30 minutes a day, 5 days a week, facilitates weight loss among elementary school students.

(e)

At the conclusion of the study, the school nurse will weigh each student. The statistician will compare the weights of those who participated in the aerobic square dancing against those who had regular recess. If there is no statistically significant difference between the weights of these two groups, then we would accept H_0 , otherwise, we would reject H_0 in favor of H_1 .

Exercise 1.3

(a)

Will placing a security camera on cashiers reduce cash shortages?

(b)

This will be a two-group study: The control group will have no cameras installed. The treatment group will have a camera installed focused on each cashier, and all cashiers in the treatment group will be notified that their actions are now being recorded.

(c)

The name of each of the 10 stores will be written on a chip and placed into a bag. The bag will be sealed, shaken, and then opened; a staff member will reach into the bag and without looking, withdraw five chips. The stores indicated on these five chips will constitute the treatment group; the other five stores will constitute the control group.

NOTE: Since this is a two-group design, one could have simply used the coin-flip method; the chip selection is one potential alternative to consider when there are more than two groups, as will be the case in Chapter 6 (“ANOVA and Kruskal-Wallis Test”).

(d)

H_0 : Video recording will have no effect on cashier balances.

H_1 : Video recording will reduce cashier losses.

(e)

The statistician will gather data from all 10 stores and compare cash register losses from the stores with no cameras to the stores with cameras. If there is no statistically significant difference between the cash losses of these two groups, then we would accept H_0 , otherwise, we would reject H_0 in favor of H_1 .

Exercise 1.5

(a)

Will entering on-time employees in a weekly “get out of Friday free” lottery reduce morning lateness?

(b)

Two of the four buildings should participate in the “get out of Friday free” lottery, these sites will serve as the treatment groups, and two should continue business as usual, serving as the control groups.

(c)

A staff member writes the name or address of each of the four buildings on four identical cards, and places them in a box. Without looking, the staff member draws two cards out of the box, one at a time. These two cards will constitute the treatment groups; the other two will serve as the control groups.

(d)

H_0 : Rewarding on-time arrivals with the chance to win a free day off will have no effect on lateness.

H_1 : Rewarding on-time arrivals with the chance to win a free day off will reduce lateness.

(e)

After running this lottery program for a month, the statistician will gather and analyze the time cards from each of the four buildings and compare the minutes late from those in the two buildings that had no day-off lottery (in the control groups), to those who did participate in the day-off lottery (in the treatment group). If there is no significant difference in the minutes late, comparing the employees in the control group to those in the treatment group, then we would accept H_0 , otherwise we would reject H_0 , in favor of H_1 .

Exercise 1.7

(a)

Does singing 1 hour a day improve memory?

(b)

Members in the control group will sit quietly for an hour, and then take a memory test. Those in the treatment group will sing well known songs for 1 hour (karaoke style) and then take the memory test.

(c)

Professor Madrigal will recruit 60 participants for this experiment. Prior to the arrival of the first participant, the professor flipped a coin (heads for control group, tails for treatment group)—the coin flip rendered tails, hence, the first participant who shows up will be assigned to the treatment group. Each remaining subject would be assigned to the control/treatment group on an alternating basis, upon arrival, thereby keeping the groups balanced.

(d)

H_0 : Singing has no effect on memory.

H_1 : Singing enhances memory.

(e)

Upon the departure of the last subject, the professor compares the memory test scores of those in the control group to those in the treatment group. If there is no statistically significant difference in the scores, then this supports H_0 , otherwise, the professor would reject H_0 in that the data supports H_1 .

Exercise 1.9

(a)

Do flash cards help students memorize the multiplication table?

(b)

Members in the treatment group will each be issued a set of 100 flash cards (1×1 through 10×10), and will be instructed to work with them for 30 minutes a day for 1 month. Members in the control group will use the usual multiplication teaching method (no flash cards). Members of both groups will be tested once a week; they will be given 10 minutes to answer 100 multiplication problems ($1 \times 1 = \underline{\quad}$ through $10 \times 10 = \underline{\quad}$).

(c)

Ms. Fractal calls each student to the front of the room one at a time; she holds up a coin and asks the student to guess heads or tails. She then flips a coin; if the student guessed correctly, then that student is assigned to the treatment group, and given a set of multiplication flash cards, otherwise the student is assigned to the control group, and receives no flash cards.

(d)

H_0 : Flashcards do not help students learn the multiplication table.

H_1 : Flashcards help students learn the multiplication table.

(e)

Ms. Fractal will grade the tests. If the treatment group's overall score is statistically significantly higher than the control group's score, then she would reject the null hypothesis (H_0), in favor of the alternative hypothesis (H_1), otherwise, the findings suggest support for the null hypothesis (H_0).