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## 4.2 DOES SPONGEBOB IMPAIR THINKING? – RANDOM ASSIGNMENT

### INTRODUCTION

1. What is your favorite cartoon?
2. Just your best guess, do you think that cartoons can impair children's thinking?

### THE SPONGEBOB SQUAREPANTS STUDY

As reported in the journal *Pediatrics*, researchers Angeline Lillard and Jennifer Peterson conducted a study to determine whether cartoons could produce an impact on the thinking of 4-year-olds. Sixty 4-year-olds were randomly placed into one of three different groups. One group of twenty watched a fast-paced cartoon (*SpongeBob SquarePants*), a different group of twenty watched an educational cartoon (*Caillou*), and the final group of twenty was allowed to draw pictures. At the end of the study, all sixty children were asked to perform four tasks and their mental function was measured.

For this activity, you will “conduct” a similar, but fictitious, study to analyze the reason that researchers randomly assigned students to groups. Your **subjects** (participants) will be a group of fourteen 4-year-olds whose parents have consented to their participation in your research. The goal of your research is to compare the effects of a *SpongeBob* cartoon to *drawing pictures* on the mental function of 4-year-olds. The *SpongeBob* cartoon and *drawing pictures* are called **treatments**.

1. Your instructor will provide you with fourteen index cards. Each card will represent one child from the table below. On one side of each card, write the name of the child, their IQ, and their gender. For example, the card for Albus would read “Albus, 130, Male.”

Name	IQ	Gender
Albus	130	Male
Bellatrix	92	Female
Draco	103	Male
Fred	100	Male
Ginny	106	Female
Harry	110	Male
Hermione	122	Female
Lily	103	Female
Luna	105	Female
Minerva	114	Female
Mundungus	97	Male
Ron	98	Male
Severus	119	Male
Voldemort	116	Male

We will simulate the process of randomly assigning seven subjects to the *SpongeBob cartoon* treatment and seven subjects to the *drawing pictures* **treatment**. Turn the cards upside down (so that you cannot see your writing) and shuffle them so that they are well mixed. Then, deal out the cards into two piles without looking at them. Choose one group to be the *SpongeBob cartoon* group and the other to be the *drawing pictures* group. Record your groups in the table below.

SPONGEBOB CARTOON GROUP			DRAWING PICTURES GROUP		
Name	IQ	Gender	Name	IQ	Gender

2. Compute the proportion of females within each group (round your answer to the nearest thousandth). Compute the mean IQ for each group. Record your answers below.

	SPONGEBOB CARTOON GROUP	DRAWING PICTURES GROUP
Proportion of Females		
Mean IQ		

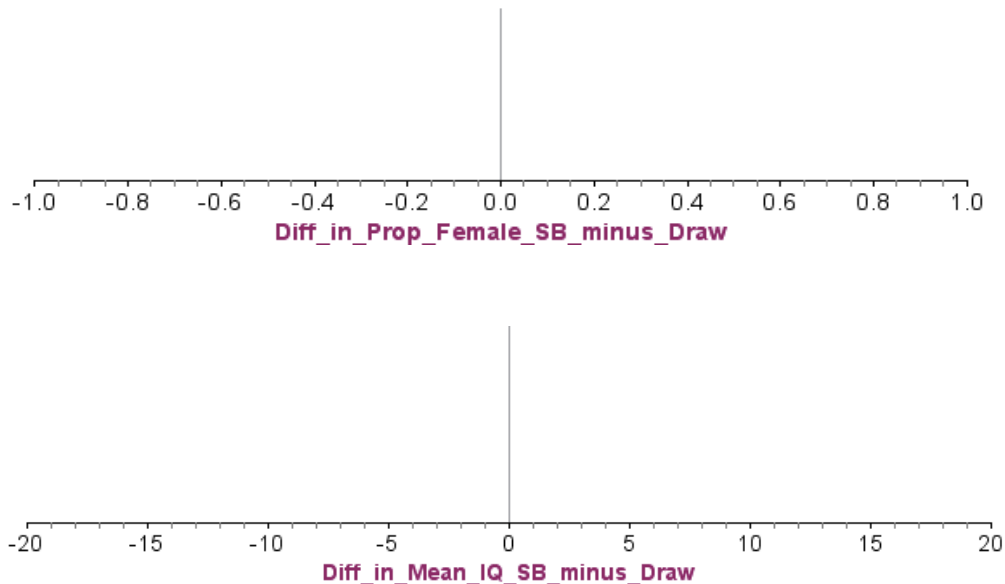
3. Compute the difference in the proportion of females in each group (*SpongeBob cartoon group* – *drawing pictures group*). Compute the difference in the mean IQ in each group (*SpongeBob cartoon group* – *drawing pictures group*). Record your answers below.

Difference in proportion of females (*SB* – *Draw*):

Difference in mean IQ (*SB* – *Draw*):

4. Thinking of the difference in proportions of females you calculated above, what would a difference of 0 indicate? a difference that is positive? a difference that is negative?
5. Thinking of the difference in mean IQs you calculated above, what would a difference of 0 indicate? a difference that is positive? a difference that is negative?
6. Combine your results with the rest of your class by creating dotplots of the differences on the board. Does a pattern appear to be emerging?
7. Does random assignment *always* balance gender between the two treatment groups? Does random assignment *tend* to balance gender between the two treatment groups?
8. Does random assignment *always* balance IQ between the two treatment groups? Does random assignment *tend* to balance IQ between the two treatment groups?

9. To see if there is a recognizable long-run pattern, you would need to keep shuffling, dealing, and calculating differences. However, to save time, your instructor will show you a demonstration with Fathom software. Below, recreate a rough sketch of the resulting dotplots after the demonstration is done.



10. Would you be surprised to see two treatment groups that were very different if random assignment was used to create them?

This investigation highlights an important property of random assignment: it tends to balance out variables among groups. This helps create similar groups so that when different treatments are applied to the groups, a large difference in their effects (difference in mental function) can reasonably be attributed to the treatments. Thus, if the *SpongeBob cartoon* group shows a significantly higher or lower mental function than the *drawing pictures* group, we could conclude that the *SpongeBob cartoon* caused this difference since the groups should have been roughly similar in mental function before we applied the treatments.

A statistical study in which researchers apply treatments to subjects is called an **experiment**. When random assignment is used in experiments, it has two important consequences:

1. **treatment groups tend to be roughly equal** for all variables that the researchers cannot directly control, and
2. **cause-and-effect inferences (conclusions) may be drawn.**