

# Just a Bang to the Head?

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## Part 1: Jose's Story

Just before his 16<sup>th</sup> birthday, Jose collided with another player during a soccer game. In the video of the game, the collision looked harmless. Jose was slow to get up, but did not lose consciousness. After a minute or two he stood up and was able to walk and talk. He told his coach that his head hurt but he felt he was fine to return to the game. Ten minutes later, however, he had a seizure and then lost consciousness.

The coach didn't know, that one week earlier, Jose had hit his head on the pavement when he fell off his skateboard. Following this accident, he had headaches and difficulty sleeping. He also found it difficult to concentrate. He did not report his symptoms to his parents or his coach. He never saw a doctor or even the school nurse for his symptoms.

A year after the soccer accident, Jose still has problems with his vision, coordination, memory, and concentration.

1. Do you think that Jose had a concussion? \_\_\_\_\_

Underline four parts of Jose's Story that support your answer.

2. List three things that you know about concussions.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

3. List five kinds of activities that can cause a concussion.

_____	_____
_____	_____
_____	_____



## Part 2: Concussion Quiz

Mark each of the following statements as True (T) or False (F).

1. \_\_\_\_\_ A concussion is a brain injury.
2. \_\_\_\_\_ Concussions can be caused by a fall, a bump, or blow to the head or body.
3. \_\_\_\_\_ A blow to the head is not dangerous unless it results in a loss of consciousness.
4. \_\_\_\_\_ Concussions are less dangerous for children and teens
5. \_\_\_\_\_ Concussions can occur in any sport or recreational activity.
6. \_\_\_\_\_ You cannot see a concussion and some people may not feel or report the symptoms until hours or days after the injury.
7. \_\_\_\_\_ Following a coach's rules for safety and rules of the sport, practicing good sportsmanship at all times, and using proper protective equipment are all ways that athletes can reduce the risks for a concussion.
8. \_\_\_\_\_ Careful observation and testing of mental abilities is important for accurate diagnosis of a concussion.
9. \_\_\_\_\_ Nausea, headaches, sensitivity to light or noise, and difficulty concentrating are some symptoms of a concussion.
10. \_\_\_\_\_ Athletes who have a concussion should not return to play until they are symptom free and have received approval from a doctor or health care professional.
11. \_\_\_\_\_ A repeat concussion that occurs before the brain recovers from the first concussion can slow recovery or increase the likelihood of having long-term problems.
12. \_\_\_\_\_ X-rays or brain-imaging techniques such as CAT scans or MRI's are the best way to diagnose a concussion.
13. \_\_\_\_\_ Some symptoms of concussions may not appear until days or even weeks after the injury.
14. \_\_\_\_\_ Mental test scores may not return to normal until 10 to 30 days after a concussion.

Quiz Modified from: *A Quiz for Coaches, Athletes, and Parents* [http://www.cdc.gov/concussion/pdf/quiz\\_Eng.pdf](http://www.cdc.gov/concussion/pdf/quiz_Eng.pdf)

**Use the information in the *Fact Sheet for Athletes* to check your quiz answers.** If there are quiz questions that are not answered by the information in this fact sheet, circle the questions. You should find the answers to these questions as you do further research on concussions.

## Part 3: Concussion Awareness Campaign

Work with your team to create a **product that could be used in a public awareness campaign** to inform community members about the dangers of concussions.

Use the following information sources for your research:

- **Concussion: What Happens to the Brain?** (handout provided by your teacher)
- **Headbanger Nation: Kids and Concussions**  
[http://www.time.com/time/specials/packages/article/0,28804,2043395\\_2043506\\_2043494,00.html](http://www.time.com/time/specials/packages/article/0,28804,2043395_2043506_2043494,00.html)
- **Facts About Concussion and Brain Injury: Where to Get Help**  
[http://www.cdc.gov/concussion/pdf/Facts\\_about\\_Concussion\\_TBI-a.pdf](http://www.cdc.gov/concussion/pdf/Facts_about_Concussion_TBI-a.pdf).
- **Heads Up Online Training Course for Coaches**  
[http://www.cdc.gov/concussion/headsup/online\\_training.html](http://www.cdc.gov/concussion/headsup/online_training.html)

**Your product should include the answers to the following questions:**

1. What happens to your brain and the neurons when you have a concussion?
2. What are the signs and symptoms of a concussion?
3. How is a concussion diagnosed?
4. What should you do if you think you might have a concussion?
5. What should you do to recover after a concussion?
6. What could you do to prevent concussions?
7. What are the potential long-term effects of a concussion?

### Potential Products:

- Presentation for a sports team at your school
- Infomercial on school morning announcement
- Brochure for an elementary school class
- PowerPoint slideshow with script
- Medical advice column
- Illustrated children's book
- A poem or rap
- Magazine personal interest story
- Another product (obtain teacher permission first)

**Be sure to refer to the Scoring Guide for Concussion Awareness Campaign so that you know how your product will be graded.**

# Scoring Guide for Concussion Awareness Campaign

Team member names:

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<b>Criteria</b>	<b>Good</b> Detailed information	<b>Fair</b> Covers only basic information	<b>Poor</b> Little no information
What happens to your brain and neurons if you have a concussion?	At least 4 specific	At least 2 specific	Less than 2 specific
What are the signs and symptoms of a concussion?	At least 4 specific	At least 2 specific	Less than 2 specific
How is a concussion diagnosed?	At least 4 specific	At least 2 specific	Less than 2 specific
What should you do if you think you might have a concussion?	At least 4 specific	At least 2 specific	Less than 2 specific
What can you do to recover after a concussion?	At least 4 specific	At least 2 specific	Less than 2 specific
What can you do to prevent concussions?	At least 4 specific	At least 2 specific	Less than 2 specific
What are the potential long-term outcomes of a concussion?	At least 4 specific	At least 2 specific	Less than 2 specific
Organized and easy to understand	Definitely yes	Some weaknesses	Many weaknesses
References cited accurately	At least 3	At least 2	Less than 2

## Part 4: A Blood Test for Concussions?

### Blood Tests Could Help Diagnose Concussions

Blood vessels that supply oxygen and nutrients to the brain also protect the neurons from outside molecules. This protection is due to the presence of a blood-brain barrier which acts as a “gatekeeper”, by allowing entry for the good molecules and keeping out the harmful molecules.

Researchers have identified a brain protein, S100B, which is highly concentrated in the brain and cerebrospinal fluid. If the blood-brain barrier is damaged, S100B appears in the bloodstream within a minute.

Scientists are conducting research to determine if the level of S100B in the blood could be used to determine if a concussion has occurred. For this research, football players used helmets with sensors inside them to record the number and severity of hits to the players' heads. Their blood levels of S100B were tested before and after a football game.

Modified from: [http://www.foxsportsouth.com/12/22/11/Blood-test-could-help-diagnose-concussion/landing\\_browns.html?blockID=632058](http://www.foxsportsouth.com/12/22/11/Blood-test-could-help-diagnose-concussion/landing_browns.html?blockID=632058)

1. Your team has cards with information on 9 football players. The information on these cards describes data collected at the beginning and at the end of a football game including:
  - Number of hits
  - Hit intensity for each hit
  - Symptoms reported by the player
2. Your team also has 9 tubes of blood plasma collected from the players at the end of a game.
  - Use the S100B test paper and the **S100B Levels** color chart to determine the S100B levels for each of the players. *Hint: Dip a strip of test paper into each of the blood plasma samples. Remove the test strip and immediately compare the color of the test paper with the colors on the chart.*
  - Record the S100B level information on each player's card.
3. Use the information on the player cards to design an experiment to determine if blood S100B levels are correlated with hits to the head during a football game. Answer questions a. through e. to help your team design the experiment.
  - a) What is the research question for your experiment?

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b) What is the hypothesis for your experiment? State your hypothesis as an “If....., then” ....statement.

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c) What independent variable (manipulated variable) did you select for your experiment?  
*Note: Different groups may select different independent variables.*

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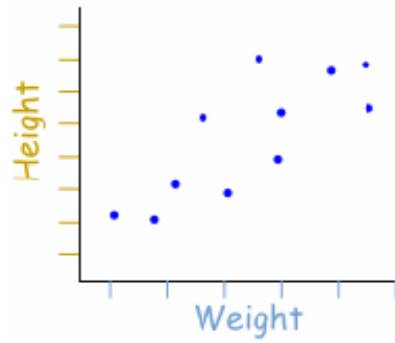
d) What dependent variable (responding variable) did you select for you experiment?

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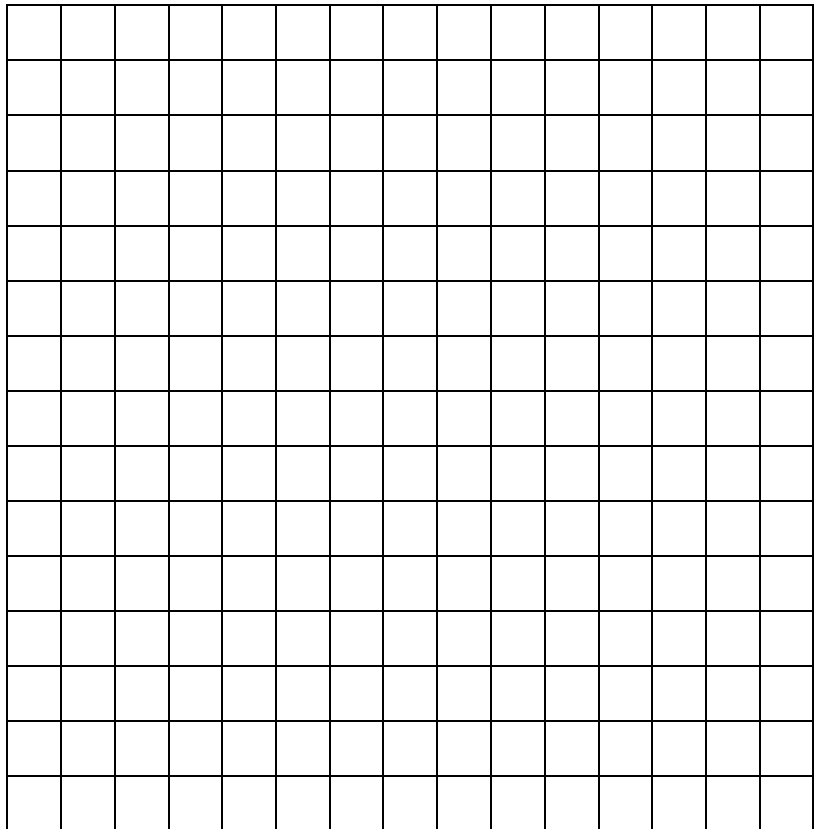
e) Complete the data table below. Include a column with your independent variable and a column with your dependent variable.

<b>Player Number</b>		
<b>1</b>		
<b>2</b>		
<b>3</b>		
<b>4</b>		
<b>5</b>		
<b>6</b>		
<b>7</b>		
<b>8</b>		
<b>9</b>		

A **Scatter Plot** is a graph of plotted points that show the relationship between two sets of data. For example, the scatter plot shown on the right shows the relationship between peoples' weight and height.

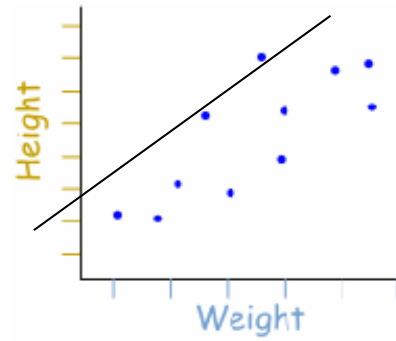


4. Use the graph grid below to make a **scatter plot** of the data in your data table.
- Label the horizontal axis with the independent variable that you selected in question c. Include an appropriate scale.
  - Label the vertical axis with the dependent variable that you selected in question d. Include an appropriate scale.
  - Plot the data from the data table on the previous page (question 3e). Draw a small circle around each of the plotted points.
  - Do not include the player numbers.
  - Do not connect the dots with a line.





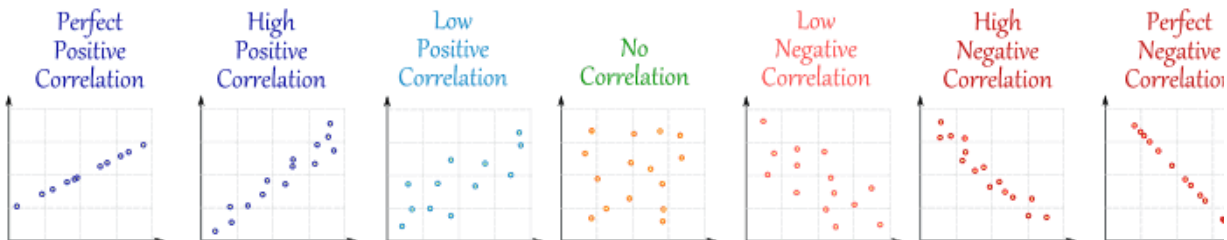
To summarize the relationship between the two variables, you can draw a **Line of Best Fit** (also called a "Trend Line") on a scatter plot. For example, see the line of best fit on the graph to the right.



5. Draw a line of best fit on your scatter plot. To do this you draw a straight line through the scatterplot so that an approximately equal number of points lie on either side of the line.

When two sets of data are strongly linked, they have a high correlation.

- Correlation is **Positive** when the values **increase** together, and
- Correlation is **Negative** when one value **decreases** as the other increases



6. What type of correlation is shown in your scatter plot?

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7. Write conclusions based on the data in your graph.

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8. Describe two ways that the experiment design might be improved to determine whether S100B levels could be used to determine if a concussion has occurred.

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Base your answers to question 9 on the information below, the results of your experiment, and the information in the box on page 6 (*Blood Tests Could Help Diagnose Concussions*).

### Cause and Correlation

Cause and correlation are terms that are often confused or used incorrectly. A correlation means a relationship between two or more things: when one increases, the other increases, or when one increases, the other decreases. A cause is something that results in an effect; for example, heating water causes the temperature of water to increase.

The crucial point is that a correlation between two things does not necessarily mean that one causes the other. Just because one variable is correlated with another, it does not mean that one is the cause of another. To claim a factor causes an outcome, there has to be a mechanisms or processes that explain how the factor causes the outcome.

9. Do you think the correlation between hits in a football game and S100B levels indicates that that hits to the head CAUSE increased S100B levels? Explain why or why not.

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10. Do you think the correlation between hits in a football game and S100B levels indicates that that S100B levels should be used to determine whether a person has a concussion? Explain why or why not.

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