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# K-12 Partnership Lesson Plan

# Sarah Jones

# *Roid Rage: Is It Just for Boys?*

# *How “true” are gender stereotypes? Is there a biological basis for them?*

## Overview

Using a critical reading exercise and discussion, students will explore the perceptions and realities of sex differences in behavior, the causes of these differences. They will then use spotted hyenas, an unusual African mammal with a primate-like social system, to explore how scientists learn about individual and sex differences in aggressive behavior. The lesson will end with an activity that allows students to act as behavioral researchers. The lesson can be divided into three portions which can easily be made to stand alone, so teachers can do any and all portions as time permits.

**Objectives**

At the conclusion of the lesson, students will be able to:

* Read science presented in the media with a critical eye
* Consider the causes of variation in animal and human aggression
* Become more familiar with how scientists study behavior
* Learn about current research in spotted hyena behavior

**Length of Lesson**

One to two 60-90 minute class periods (depending on which activities are selected)

**Grade Levels**

6-12

**Standards covered (NGSS)**

Disciplinary Core Ideas:

* **MS-LS1-4**: use argument based on empirical evidence and scientific reasoning to support an explanation for how characteristic animal behaviors and specialized plant structures affect the probability of successful reproduction of animals and plants respectively
* **MS-LS1-5**: construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms

Cross Cutting Concepts:

* Patterns
* Cause and effect

Science and Engineering Practices

* Engaging in argument from evidence
* Obtaining, evaluating, and communicating information

***Previous Michigan Standards Met:***

* **B1.1E**: give evidence to support conclusions- students indentify evidence in articles to support author’s conclusions
* **B1.2C**: access information from multiple sources- students determine if there is a difference in gender behavior and why
* **L.HE.05.11**: explain that the traits of an individual are influenced by both the environment and the genetics of the individual

**Materials**

Portion 1: Thinking critically about stereotypes and media articles

* Survey A (listed on “Roid Rage” lesson plan on the KBS GK-12 website)
* Articles on gender stereotypes (listed in “Resources” below)

Portion 2: More in depth discussion of biological causes of behavior

* Survey B
* Powerpoint presentation (listed on “Roid Rage” lesson plan on the KBS GK-12 website)

Portion 3: Ethogram grame

* Dixie cups (1 for each student)
* Buckets (1 for each student)
* Water fountain or other source of “food” to be gathered (only 1)

**Background**

**(Portion 1)** Many stereotypes exist about the differences between how men and women behave, including the idea that men are more aggressive and competitive than women. Behaviors such as competition and aggression can be defined and measured in many ways. For instance, competitive may be defined as having or displaying a strong desire to be more successful than others, while aggressive may be defined as ready or likely to attack or confront. Both traits can be measured in various ways, including with psychological surveys or activities. Thus, many different studies are needed to truly understand differences between the sexes. Though there is certainly evidence that men and women (on average) differ in behaviors such as aggression, individual differences are often greater than or equal to sex differences in behavior. Furthermore, both sex and individual differences in behavior can be attributed to biology and/or the environment. Some studies find a positive correlation between biological factors and behavior, but scientists need controlled studies in order to know what *causes* differences inbehavior.

**(Portion 2)** Recent research has exposed some of the factors that predispose individuals towards aggression; these include molecular and genetic influences on behavior, sex, and environmental influences, such as parental care. Molecular influences on behavior include the actions of hormones. Hormones are chemical messengers produced by one tissue that spread throughout the body. They can affect the activity of many different organs/tissues, including the brain. Testosterone and estrogen are hormones that affect sex and individual differences in behavior by acting on the brain. Hormones can cause fairly permanent changes to the brain and behavior during important developmental stages, including before and shortly after birth and during adolescence. They can cause more temporary changes in behavior while acting on adult brains. Changes in an individual’s internal and external environments can affect the actions of hormones on the brain, making the study of the relationship between hormones and behavior complex.

**(Portion 3)** Scientists can better understand human sex differences in aggression by studying aggressive behavior in other mammals. For instance, laboratory animals allow us to conduct controlled experiments, helping to find a causal relationship between behavior and a biological or environmental factor. Sometimes, studying a mammal that is actually quite different from humans can provide surprising insights into our own behavior. One example of this is the study of spotted hyenas. In spotted hyenas, females engage in more frequent and intense aggression than males. If we can figure out which hormones in spotted hyenas influence this role reversal in aggression, we can pinpoint which body systems are important in determining which sex is more aggressive than the other. First, we must decide how to measure aggression in spotted hyenas. Since we can’t ask animals questions, we often use ethograms to study their behavior. An ethogram is simply a list of behaviors exhibited by an animal. An ethogram of spotted hyena behavior, including aggression, allows scientists to asses individual and sex differences in aggression in a standardized way. From there, we can examine which biological and environmental factors are associated with more or less aggression in individuals and sexes. Students will practice using ethograms with videos and pictures of spotted hyenas, and then build their own ethogram to study human behavior in an activity.

### Activities of the session

### Portion 1: Thinking critically about stereotypes and media articles

### Students take a survey A- how competitive are you?

### Reading Activity

### Are men or women more competitive?

### To answer this question, assign students readings that will allow them to consider an answer to this question and possible reasons for their answer.

### Divide class into two groups, A and B. Assign each group two readings, taking care to give each group a different bias. Reading strategy: Ask students to look for the three “golden lines” as a way for them to find the big ideas in each article.

### In sub groups of 2-3, have the students

### Create an overall summary for their articles

### State if there is a gender difference

### Identify data to support their conclusion

### Discuss whether the cause is biological or social.

### Select a sub group from Group A to report out. Repeat with a sub group from Group B. See if the class can identify any patterns.

* At some point, discuss how the students were defining aggression and competition
* Have the students line up by the calculated scores in the survey. Look at the variation and talk about the importance of understanding both individual and sex differences in behavior and what might cause them. How much variation does sex explain? All of it? Some of it? None of it?
* Discuss correlation vs causation – an example can be the relationship between sex hormones and aggression. How can we tell whether it’s a causal relationship or just a correlation? Can talk about using lab animals and the effects of drugs like steroids on behavior.

**Portion 2**: More in depth discussion of biological causes of behavior

1. Have students take Survey B (beliefs about hormones) and discuss answers
2. Short presentation about causes of sex differences.

**Portion 3**: Hyenas in the Wild: Animal Behavior Lesson

1. Introduction to spotted hyenas and aggression patterns (presentation)
2. Introduce ethograms (presentation)
3. Have students practice constructing an ethogram using either
	* Ron Burgundy Video OR
	* Game activity: Hyenas in the Wild Simulation
		+ Description: The water fountain is a carcass. Students are hyenas trying to feed their cubs. Whoever fills their bucket up with the most water (ie. gets the most food for their cubs) wins the game. You can’t move your or anyone else’s bucket, and you must fill your bucket up by using the Dixie cup you’ve been provided and the designated water fountain. Whoever has the most water in their bowl gets a prize at the end of 2 minutes. Ask for 2-3 volunteers who would prefer not to play (see if there is a sex difference) to help the instructor make an ethogram. Display completed ethogram on screen for a class discussion afterwards.
	* Brief discussion on how we study the hormonal basis of aggression in spotted hyenas, depending on the level of the group

**Resources**

* Powerpoint presentation, Survey A, Survey B, and answer key included on the “Roid Rage” lesson page on the KBS GK-12 website
* Hyena videos (link also provided on website):
	+ Hyenas playing in water: <https://youtu.be/CqWiHS3yKTk>
	+ Aggression at a carcass: <https://www.youtube.com/watch?v=_tTW6e2V4Bk>

**Articles:**

For articles claiming that men are more competitive

1. <http://www.chicagobooth.edu/capideas/sept04/gendercompetition.html>
2. <http://www.nytimes.com/1983/06/20/style/aggression-still-a-stronger-trait-for-males.html>
3. <http://www.telegraph.co.uk/science/7725655/Men-developed-thicker-foreheads-and-jaws-due-to-fighting-over-women.html> (Note: This article is meant to be an example of a poor way of substantiating claims of sex differences)
4. <http://www.psychologytoday.com/blog/just-listen/201210/women-are-the-only-chance-the-world> (Note: This article is meant to be an example of a poor way of substantiating claims of sex differences)

For fewer gender differences

1. <http://www.apa.org/research/action/difference.aspx> <http://www.voxeu.org/article/women-and-corridors-power-new-evidence>
2. <http://www.scientificamerican.com/article.cfm?id=are-men-the-more-belligerent-sex&page=2> (Note: There is an error in this article about spotted hyenas. Adult males do have higher testosterone levels than females. However, the difference in testosterone levels between males and females is not as great as seen in other mammals like humans)
3. <http://www.sciencedaily.com/releases/2008/05/080522075940.htm>

**Video Clips:**

* Anchorman Fight Scene (NOTE: may not be appropriate for all age groups) <https://www.youtube.com/watch?v=ipsPgNEmAXI>
* (As juxtaposition to the anchorman scene, this is a stereotypic “girl fight” scene): love your skirt! Regina George <http://www.youtube.com/watch?v=kfLSjobM9bg>

**Extensions and Modifications**

Incorporate or go into more depth on sex steroids and neurotransmitters as a part of the mechanism driving sex differences and behavior in a future lesson.

For younger students, the anchorman fight scene should be replaced with a less “mature” clip.

Also, the APA reading (<http://www.apa.org/research/action/difference.aspx>) mentions masturbation, and can be substituted with another article arguing that men and women are basically similar if needed.

**Assessment**

May ask to discuss another stereotypic difference between the genders (examples: nurturing, leadership, anxiety), if this is based in real differences, and what might cause these differences. Then discuss how scientists could test the students’ ideas.

**Survey A: How competitive are you??**

Rate each statement 1-5, based on how well it describes you.

1- strongly disagree, 2-disagree, 3-neutral, 4-agree 5-strongly agree

1. I feel upset/angry if I lose a competitive game.
2. I often feel jealous of my friends.
3. I like sports in which I can make physical contact with my opponent.
4. If a newcomer is getting all the attention at a social gathering, I will devise ways to stay in the spotlight.
5. If my friend hit on my boyfriend/girlfriend, I would react by getting into a physical confrontation.
6. If my friend hit on my boyfriend/girlfriend, I would react by getting into a verbal confrontation.
7. If my friend hit on my boyfriend/girlfriend, I would react by trying to make them look bad (either by gossiping about them or making sarcastic remarks/rolling my eyes when they say something)
8. I would like have a career in which I compete with my coworkers for promotions.
9. If I really don’t like someone, I’ll eventually get into a physical fight with them.
10. If I really don’t like someone, I’ll insult them to try and make them feel bad.
11. If I really don’t like someone, I’ll ignore them and encourage my friends to do the same.
12. I tend to say mean things when I’m upset.
13. Being the best at what I do is important to me.
14. I am motivated by competition.
15. I think women are competitive
16. I think men are competitive
17. I think women are aggressive
18. I think men are aggressive
19. Add up your total score for questions 1, 2, 4, 8, 13, and 14. (use to make the line: competitiveness)

If you want, you can have the students calculate and form lines for the following three types of aggression as well:

Add up your score for questions 3, 5, and 9. (physical aggression)

Add up your score for questions 6, 10, 12, 14. (verbal aggression)

Add up your score for questions 7 and 11. (indirect aggression)

**Survey B: Beliefs about hormones (with answers)**

Write T for True and F for False:

1. Changes in hormone levels (for both men and women) can happen and affect your mood/behavior at every point in your life. (T)
2. Cortisol and adrenaline are both hormones. (T)
3. Changes in your behavior can cause changes in your hormone levels. (T)
4. Changes in the behavior of people around you can cause changes in your hormone levels. (T)
5. Sex hormone (eg. testosterone) levels in the womb cause permanent changes to your brain that will be present throughout life. (T)
6. Sex hormone levels just after birth often cause permanent changes to your brain that will be present throughout life. (T)
7. Sex hormone levels during adolescence often cause permanent changes to your brain that will be present throughout life. (T)
8. Sex hormone levels during adulthood often cause permanent changes to your brain that will be present throughout life. (F)