SN IN HIGH SCHOOLS

June 24, 2017

Flamingos' Bones Favor One-Leg Stance

Article-Based Observation

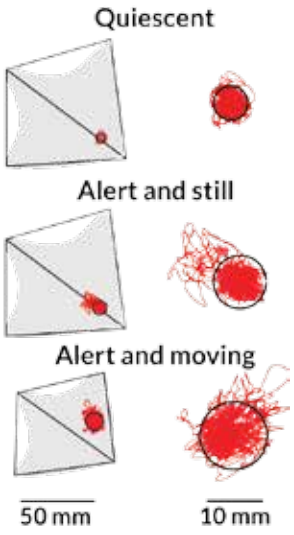
Directions: Read the article "Flamingos' bones favor one-leg stance," and then answer these questions:

1. **What were scientists trying to determine about flamingos, according to the article? Summarize what they studied.**

2. **What does neuromechanist Lena Ting study, in general? How would you describe the field of neuromechanics?**

3. **How did Lena Ting and Young-Hui Chang test flamingo balance? Specifically, what data was measured in their study?**

4. **The graphic "Wobbly Ways" (also below) shows the researchers' data on shifts in pressure from flamingo feet. Summarize the findings and state their importance.**



5. **Does a flamingo expend less energy when it stands on one leg than when it stands on two? Explain.**

6. **Describe the flamingo's leg anatomy. How does it compare to human anatomy?**

7. **The new study examines how a flamingo stands on one leg, but not why. What did comparative psychologist Matthew Anderson give as a possible explanation for why flamingos do this? What other factors can you think of that might affect how a flamingo stands?**

8. **Try to stand on one leg like a flamingo. Taking leg anatomical differences between flamingos and humans into account, what would this position look like? What do you observe about your own balance?**

SN EDUCATOR GUIDE

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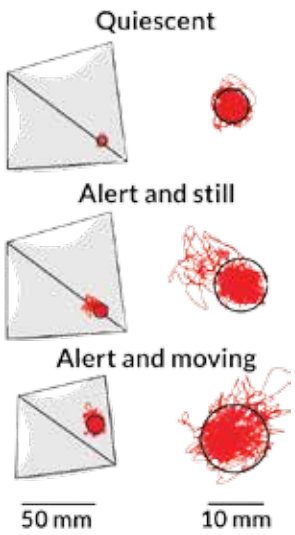
Responses to Article-Based Observation

1. **What were scientists trying to determine about flamingos, according to the article? Summarize what they studied.** Possible student response: Scientists were trying to determine how flamingos stand on one leg by studying their unique anatomical structure and its function. The research provided insight into how a flamingo stands on one leg.

2. **What does neuromechanist Lena Ting study, in general? How would you describe the field of neuromechanics?** Possible student response: The article mentions that Lena Ting does research to measure the postural sway in standing humans and other animals. Neuromechanics studies the interaction of the nervous system with mechanical activity by living organisms. Neuromechanics is an interdisciplinary field of neurology and biomechanics.

3. **How did Lena Ting and Young-Hui Chang test flamingo balance? Specifically, what data was measured in their study?** Possible student response: Ting and Chang tested balance in young Chilean flamingos using an instrument that measured their sway. As a flamingo wobbled, its pressure center varied and was recorded by the instrument. The approximate area of pressure variance was measured while the scientists observed and recorded certain flamingo behaviors (quiescent, alert and still, and alert and active).

4. **The graphic "Wobbly Ways" (also below) shows the researchers' data on shifts in pressure from flamingo feet. Summarize the findings and state their importance.**



Possible student response: When a bird was at rest, its center of pressure wobbled within a radius of about 3.2 mm. When the bird was alert and moving, its center of pressure wobbled within a radius of 5.1 mm. When the bird was alert and still, its center of pressure wobbled within a radius roughly 4.6 mm (using the diagram to estimate). Scientists found that the least wobbling occurred when the birds had tucked their heads in for a nap. This data shows that flamingos are very stable on one leg and use the least amount of muscle effort to balance while resting or sleeping.

5. **Does a flamingo expend less energy when it stands on one leg than when it stands on two? Explain.** Possible student response: The study showed that a dead flamingo specimen's body was more stable on one leg than on two, but it does not prove that flamingos' one-legged stance allows them to expend less energy overall. As scientist Reinhold Necker points out, for example, the recent study does not measure the energy required to retract the second leg up to the body.

6. **Describe the flamingo's leg anatomy. How does it compare to human anatomy?** Possible student response: The hip and knee are inside the flamingo's body. A flamingo's ankle bends backward in the center of the exposed leg, about where the human knee would be. According to scientists, the bones don't seem to have a locking mechanism but do have features that would facilitate standing. The flamingo's center of gravity is close to the knee, which is inside its body and at the top of the column that extends to the ground to support the bird. A human's center of gravity while standing is not directly above one leg, whether the other leg is tucked up or not.

7. **The new study examines how a flamingo stands on one leg, but not why. What did comparative psychologist Matthew Anderson give as a possible explanation for why flamingos do this? What other factors can you think of that might affect how a flamingo stands?** Possible student response: Anderson found that more flamingos rest on one leg when temperatures drop, so it may also be a way of keeping warm. Other environmental factors could affect a flamingo's stance, such as whether the flamingo is standing in water or not. Flamingos' age, sex and health might also affect its preferred stance.

8. **Try to stand on one leg like a flamingo. Taking leg anatomical differences between flamingos and humans into account, what would this position look like? What do you observe about your own balance?** Possible student response: A human would have to bend his or her knee at a 90-degree angle standing on one leg to achieve a flamingo stance. In order to achieve this position (if you are even able to balance), the upper body needs to be bent forward over the knee. Technically, you would also need to be standing on only your toes while bent over. Balancing in this position requires a lot of upper leg strength and energy. It's more like a yoga pose for a human than a way to save energy.