Genes and Behavior

Read how inherited differences and experiences shape behavior.

SS24.P.6 "Explain how behavior genetics has contributed to the understanding of behavior and mental processes, including differentiating among deoxyribonucleic acid (DNA), chromosomes, and genes and identifying effects of chromosomal abnormalities."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the definitions of DNA, gene, and chromosome, circle the twin comparison, and label the chromosome change 1 and one possible effect 2. Use your marks to trace how researchers connect biology with mental processes.

What Can Genes Tell Us?

1. At a school science fair, Maya hears someone say, "Genes and chromosomes are the same thing." She checks what each term means. DNA is a long molecule that stores genetic instructions. A gene is a stretch of DNA that helps make a functional product, often a protein. Chromosomes are packages of DNA and proteins inside cells; each chromosome carries many genes. Most human body cells have 46 chromosomes arranged in 23 pairs, with one chromosome in each pair usually inherited from each biological parent. These parts are related, but they are not interchangeable names for one object.

2. Maya also learns that behavior genetics asks how inherited differences and environments contribute to differences in behavior and mental processes. Researchers may compare identical twins, who share nearly all their DNA, with fraternal twins, who share about half of their varying DNA on average. If identical twins are more alike in a trait, such as attention, than fraternal twins raised in similar settings, inherited differences may help explain variation in that trait. The comparison cannot prove that a particular gene causes a person's attention level. Sleep, stress, learning opportunities, and other experiences can also affect attention, and even identical twins can differ.

3. A change in chromosome number can also affect development. Down syndrome usually results from an extra copy of chromosome 21, called trisomy 21. This chromosomal difference can affect learning and memory and is associated with a higher chance of intellectual disability. Its effects vary among people, and support and opportunities matter. Many people with Down syndrome learn new skills throughout life. A chromosome-level change is not the same as a change in a single gene. Studying such conditions helps researchers investigate how biological differences relate to mental processes without reducing a person's abilities to a diagnosis.

2 ANSWER WITH EVIDENCE

Use the passage

1. How are DNA, a gene, and a chromosome related, and how are they different?

2. Why might greater similarity in attention among identical twins than fraternal twins point to an inherited influence?

3. What chromosome change usually causes Down syndrome, and what is one possible effect on mental processes?

4. Why can't a twin comparison alone predict one student's attention level? Use two factors from the passage.

3 YOUR TURN

Your own words

A student says, “Identical twins will always pay attention equally well, and a person with Down syndrome cannot learn new skills.” Write a four-sentence response that corrects both claims, explains how DNA, genes, and chromosomes fit together, and uses the twin comparison and chromosome change as evidence.

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PART 1 · READ AND MARK

Underline the definitions of DNA, gene, and chromosome, circle the twin comparison, and label the chromosome change 1 and one possible effect 2. Use your marks to trace how researchers connect biology with mental processes. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How are DNA, a gene, and a chromosome related, and how are they different?	**DNA stores genetic instructions. A gene is a stretch of DNA, while a chromosome is a package of DNA and proteins that carries many genes.**
2	Why might greater similarity in attention among identical twins than fraternal twins point to an inherited influence?	**Identical twins share nearly all their DNA, while fraternal twins share about half of their varying DNA on average. If the twins grow up in similar settings, the greater similarity may point to an inherited contribution.**
3	What chromosome change usually causes Down syndrome, and what is one possible effect on mental processes?	**An extra copy of chromosome 21 usually causes Down syndrome. It can affect learning or memory.**
4	Why can't a twin comparison alone predict one student's attention level? Use two factors from the passage.	**A twin comparison does not establish that a particular gene causes a person's attention level. Experiences such as sleep and stress can also affect attention.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

DNA carries genetic instructions, genes are stretches of DNA, and chromosomes package DNA along with proteins. Identical twins share nearly all their DNA, but sleep, stress, and other experiences can affect their attention, so they need not pay attention equally well. Twin comparisons can suggest that inherited differences influence attention without predicting what either twin will do. Down syndrome usually involves an extra copy of chromosome 21, which can affect learning, but people with Down syndrome vary and can learn new skills.

Accept accurate explanations in students' own words. Responses should treat inherited influences as contributions, not guarantees, and should not assume that all people with Down syndrome have the same abilities.