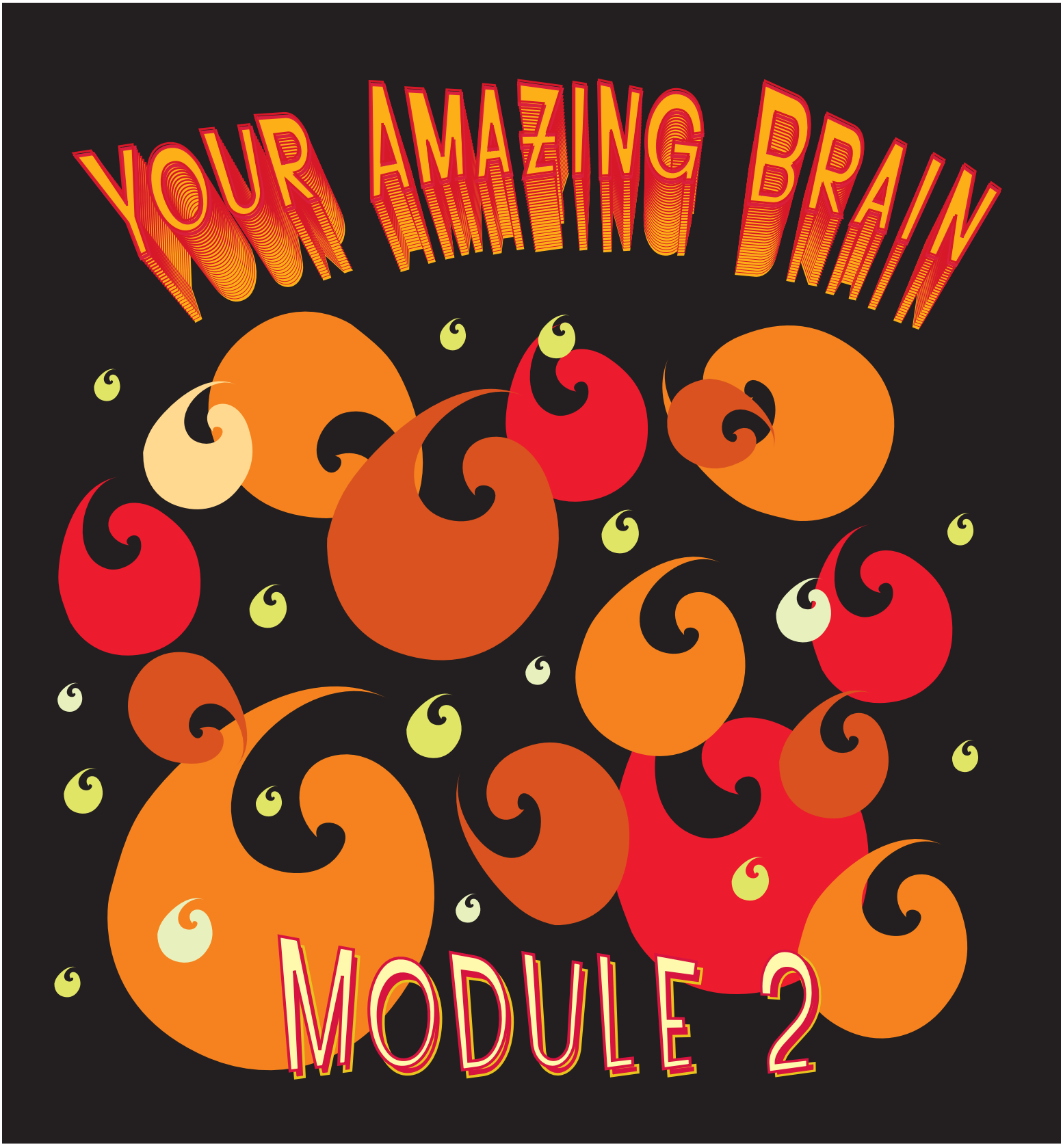
YOUR AMAZING BRAIN



MODULE 2

National Institute on Drug Abuse

MODULE 2: YOUR AMAZING BRAIN

Introduction

During the second *Brain Power!* mission, the students learn about the major parts of the brain and their functions. They learn about different techniques used to study the brain—Positron Emission Tomography (PET) scan, Single Photon Emission Computed Tomography (SPECT), and Magnetic Resonance Imaging (MRI)—and discuss what each can tell us about the brain and its functioning. The students also learn about the work of brain researchers.

Learning Objectives

- ★ Students learn about different parts of the brain and the function of each part.
- ★ Students discuss three different techniques used to study the brain.
- ★ Students analyze pictures taken with each device and figure out what information can be obtained from each kind of picture.
- ★ Students learn about the work of different brain researchers.

Relationship to the National Science Education Standards

This mission aligns with two standards identified in the NSES: unifying concepts and processes, and standards for science and technology. The chart below identifies how the mission aligns with each of these standards.

Unifying Concepts and Processes

Levels K-4	How Mission is Aligned
Systems, order, and organization	The mission explains the key concept that the brain is part of a larger system—the human body—and that both systems work together to make all human behavior possible.

Standards for Science and Technology

Levels 5-8	How Mission is Aligned
Understanding science and technology	Students learn about three devices and how they are used to further knowledge about the brain.

Background

Module 2 provides the students with important information about the structure of the brain. They will refer to this information later in the program, when learning about the effects that drugs have on different parts of the brain.

In the *Brain Power!* program for the students in grades 2 and 3, they learned about four parts of the brain—the cerebral cortex, composed of the right and left hemispheres; the cerebellum; the brain stem; and the limbic system. In this program, they will learn more detail about the different functions localized in each area. If they haven't already completed the second- and third-grade curriculum, review the basics about the brain in more detail.

Cerebral cortex: right and left hemispheres

In people, the *cerebral cortex* is the brain's largest part, making up more than 3/4 of the brain. It is considered to be the most highly developed part of the brain and controls thinking, perceiving, and understanding language.

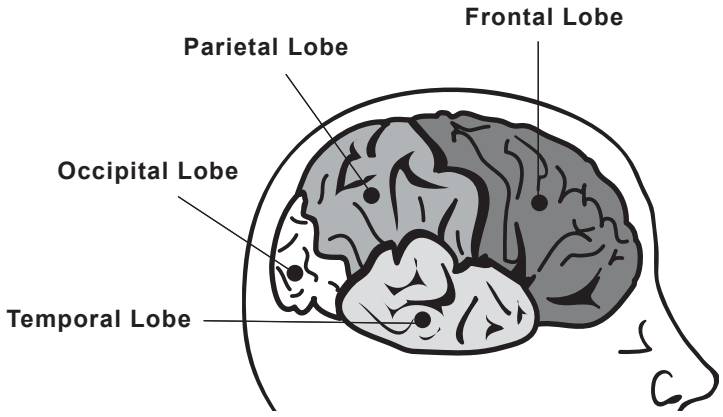
The cerebral cortex is divided into two hemispheres—the *right hemisphere* and the *left hemisphere*. The right hemisphere controls the left side of the body and is largely responsible for artistic expression and understanding relationships in space.

The left hemisphere, which controls the right side of the body, is largely responsible for mathematical ability, problem solving, and comparing information needed to make decisions. It is also the brain's center of language.

The two hemispheres can communicate with one another because of a bundle of fibers called the *corpus callosum*. The corpus callosum serves as the bridge between the two hemispheres.

The cortex is specialized—specific areas of the cortex, called *lobes*, are responsible for different tasks, such as the following:

- The *frontal lobe* is responsible for initiating and coordinating motor movements and higher cognitive skills like problem solving and thinking.
- The job of the *parietal lobe* is to process sensory information from the whole body—like information about pain, touch, and pressure.
- The *occipital lobe* processes all the visual information coming into the brain.
- The *temporal lobe* is in charge of making sense of the auditory information from the environment. It is also involved in integrating sensory information from various senses, such as smell and vision.



Cerebellum

The *cerebellum* controls posture, movement, and the sense of balance. Playing ball, picking up objects, and playing musical instruments are just a few of the activities that fall under its control.

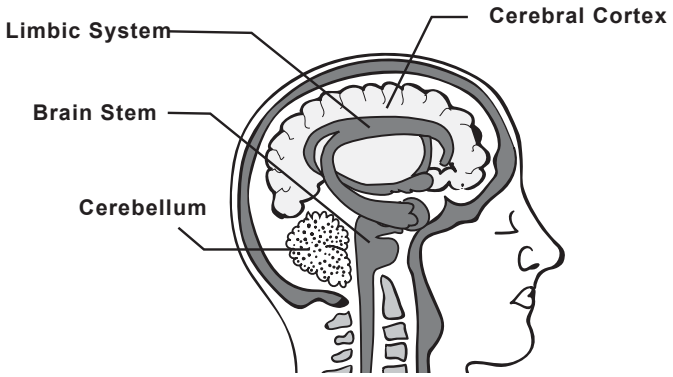
Brain Stem

The *brain stem* is the brain's most primitive part. Its two main parts are the *pons* and the *medulla*. The pons contains fibers that connect the cerebral cortex with the cerebellum and the spinal cord. The pons also controls sleeping, awakening, and dreaming.

The medulla controls heart rate, respiration, and blood pressure. The brain stem also controls simple reflexes, such as coughing, sneezing, and digestion.

Limbic System

The *limbic system* has many parts, but two of the most important are the *hippocampus* and the *amygdala*. The hippocampus is mainly responsible for learning and memory. The amygdala plays an important role in emotional behavior. The limbic system is greatly affected by drugs such as nicotine, alcohol, and illegal drugs.



New Tools for Studying the Brain

Scientists now have very sophisticated techniques for studying the brain. Three important tools that are used are PET, SPECT, and MRI. Each of these tools is described below.

PET scans. Radioactive glucose is injected into the bloodstream; the radioactive glucose is then taken up by parts of the brain that are active and using energy. These areas, which are using either radioactive oxygen or glucose, show up on the image. The advantage of this technique is that it can actually show what parts of the brain are more active than others. The disadvantages are that it is expensive to use and involves radioactive material, which has the potential to be dangerous.

SPECT scans. Similar to PET scans, radioactive material is injected into the bloodstream and travels to the brain and body. Scientists and doctors can view the material on computerized images, which helps them identify brain activity. The radioactive substances used in SPECT are different from those used in PET scans, and the SPECT images are less detailed than those of PET. On the other hand, SPECT is less expensive than PET, and SPECT centers are more accessible than PET centers because they have fewer equipment requirements.

MRI. MRI uses radio frequency signals produced in a strong magnetic field to create an image of the brain and show what it looks like. MRIs show the structure of the entire brain, as opposed to the other types of imaging, which show the specific parts that are working. While MRIs produce clear images, they are expensive to use and can be uncomfortable for the patient, who must lie still in a very small space for a relatively long period of time. However, a big advantage is that MRI is noninvasive and doesn't use injections or radioactivity.

During the activity, the students will have an opportunity to look at images produced from these three different tools to see what each shows and how the images can be used to learn more about the brain.

Materials

- ✔ Paper and markers
- ✔ Videotape and VCR
- ✔ Computer with Internet access
- ✔ Sheets found in the back of the Teacher's Guide:
  - Brain Instruction Sheet
  - Brain Fact Sheets (Parts of the Brain and Lobes of the Brain)

Preparation

- ★ Review the Background material about the parts of the brain and the tools used to study the brain.
- ★ Preview the video before starting the activity. Decide which sections you want to use with the class.
- ★ Use the Brain Instruction Sheet to make an overhead transparency of the brain.
- ★ Make enough copies of the Brain Instruction and Brain Fact Sheets for each student in the class.

Procedure

1. Begin the mission by asking the students what they know about the brain. Do they know the names of any of its parts? Do they know what the different parts do? Write down their ideas on a sheet of newsprint. It might be helpful to create a chart for this information. The chart can hang on the wall in the classroom.
2. Project the transparency of the brain. Go over each part and describe its function. After discussing all the parts, ask the students to think of examples of different activities that each part controls. For example, they may say that the cerebral cortex enables them to play card games, and the cerebellum is involved in their ability to play soccer.

3. To make sure the students know the parts of the brain, pass out the Brain Instruction Sheets and Brain Fact Sheets from the guide. After splitting the class into pairs, ask the students to label each part of the brain and jot down some activities for each part. After they have completed the sheet, tell them to keep it for reference during the second part of the activity. The students can practice sharing what they learned by teaching someone else the information (e.g., parent, sibling, or friend).
4. Tell the students that during the second part of the mission, they will be learning about some different tools available to scientists for studying the brain. For this activity, it would be preferable for them to work in the computer lab, if possible.
5. Have the students watch the video. Stop the video at the break.
6. Divide the students into pairs. Have them visit the following Web site:

   • http://faculty.washington.edu/chudler/image.html

   Give the students a few moments to look at the images on the Web site developed from each brain imaging tool. Using their Brain Instruction Sheets, have them identify the different parts of the brain. They can write their responses on a separate piece of paper. Tell them to make sure to indicate to which image their labels are referring.
7. Have the students watch the remainder of the video. Conclude the lesson by asking them what they think of the different machines used to study the brain. How do they all work together to give scientists a more complete picture of the brain?

Discussion Questions

? Tell the students to use the information they learned in the video to fill in the following chart. They can watch the part showing the researchers again if they need to.

Name of Researcher	Brain Part Studied	Machines Used to Study the Brain	Drugs Studied That Affect the Brain

? Discuss the findings with the students. What role do the different tools play in allowing the scientists to study the brain? What do they learn from the images produced from these tools?

? Tell the students to keep this chart for further reference. They may need it when they start studying different drugs and how they affect the brain.

Extensions

The activities listed on the next page provide a link to other areas of the curriculum.


Language arts


Math


Drama


Art


Science


Social Studies


Reading

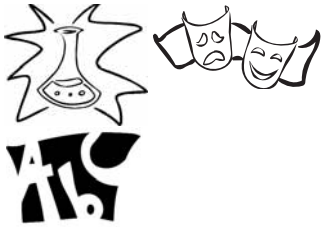
	Have the students look through newspapers and magazines. Tell them to cut out any articles that relate to the brain or brain research. They can compile their articles into a scrapbook.
	Have the students write a story based on what they learned about the brain and brain research. The story could be about a child who needed to undergo a test because of an illness, a scientific breakthrough, or what brain research will be like 50 years from now. Encourage them to use their imaginations as well as their knowledge to write a creative, interesting story.
	Have the students draw a cartoon strip illustrating a day in the life of a brain researcher. Suggest that they base their comic strips on the video they watched.
	Have the students take a brain dominance self-assessment to find out if they are left or right brained. These tests can easily be found on the Internet. The students can also find information to help strengthen their weak side: www.web-us.com/brain/braindominance.htm

Assessment

1. As the students work on these activities, look for evidence of the following:
    - Are the students grasping the concept that the brain is a complex organ made up of different parts that perform different functions?
    - Do the students understand how the different tools work that researchers use? Do they understand that each tool is used for a specific purpose?
    - Can the students apply what they have learned to new situations? For example, can they use the information to write a story?
2. Put each student's Brain Instruction Sheet in his or her student portfolio.

Additional Activities

Below are some additional activities that can be used after the students complete the first mission. These activities are extensions to many other areas of the curriculum.

	Draw a class illustration of the brain. Be sure to label all of the parts the students studied during the mission. Include the functions of each part.
	Write a class play about the brain or brain research. The play could focus on the work of the brain researchers that the students learned about, how each device is used to study the brain, or the function of each part of the brain.
	Make a class chart with ideas on how to protect the brain. Some suggestions include wearing a helmet when bike riding or rollerblading, eating a nutritious diet, and wearing a seatbelt when in a car. After developing the list, discuss specifically how each idea could protect the brain.

Notes:

Resources for Teachers

National Institute on Drug Abuse (NIDA)

301-443-1124

www.drugabuse.gov

This Web site contains information about drug abuse and a section designed specifically for parents, teachers, and students. Publications and other materials are available free of charge.

National Clearinghouse for Alcohol and Drug Information (NCADI)

1-800-729-6686

www.health.org

NCADI is the world's largest resource for information and materials concerning substance abuse. Many free publications are available here.

The Human Brain: A Guided Tour. [Greenfield, S. A.] New York, NY: Basic Books, 1998.

Written for a lay audience, it provides a holistic view of the brain as an integral part of the body; part of the Science Masters Series.

A Celebration of Neurons: An Educator's Guide to the Human Brain. [Sylwester, R.] Alexandria, VA: Association for Supervision and Curriculum Development, 1995.

The book discusses the structure and function of the brain, and explains how we think, dream, digest food, and much more.

Resources for Students

Neuroscience for Kids

http://faculty.washington.edu/chudler/neurok.html

Contains information on the brain and neurotransmission, activities, experiments, pictures, and other resources for students and educators.

Focus on Drugs and the Brain. [Friedman, D.] Frederick, MD: Twenty-First Century Books, 1990.

This book, part of the "Drug-Alert Book" series, gives a good overview of the brain, neurotransmission, effects of drugs on the brain, and addiction.

Phineas Gage: A Gruesome but True Story About Brain Science. [Fleischman, J.] Boston, MA: Houghton Mifflin Co., 2002.

Written for ages 9 through 12, this book tells the story of a railroad employee who experienced personality changes after a 13-pound iron rod shot through his brain.

The Brain: Our Nervous System. [Simon, S.] New York, NY: William Morrow, 1997.

This book offers simple, yet comprehensive, information on the brain and the nervous system.

Big Head! A Book About Your Brain and Your Head. [Rowan, P.] New York, NY: Alfred A. Knopf, 1998.

Gives an overview of the different parts of the brain; includes detailed color pictures and transparencies.

Brain Fact Sheet — Parts of the Brain

Cerebral Cortex: right and left hemispheres

- Largest part of the brain
- Most highly developed part of the brain
- Controls thinking, perceiving, and understanding language
- Corpus callosum connects the two hemispheres

Right hemisphere

- Controls the left side of the body
- Responsible for artistic expression and understanding relationships in space

Left hemisphere

- Controls the right side of the body
- Responsible for mathematical ability, problem solving, language, and decision making

Cerebellum

- Controls posture, movement, and sense of balance

Brain Stem: two main parts – pons and medulla

- Brain's most primitive part
- Controls simple reflexes, such as coughing, sneezing, and digestion
- Pons contains the fibers that connect the cerebral cortex with the cerebellum and spinal cord, and also controls sleep, awakening, and dream onset
- The medulla controls heart rate, respiration, and blood pressure

Limbic System: two main parts – hippocampus and amygdala

- Hippocampus is responsible for learning and memory
- Amygdala plays an important role in emotional behavior

Brain Fact Sheet — Lobes of the Brain

Frontal lobe

- Located behind the forehead, extending back to the parietal lobe
- Responsible for initiating and coordinating motor movements and higher cognitive skills like problem solving and thinking

Parietal lobe

- Located behind the frontal lobe
- Processes sensory information from the whole body (information about pain, touch, and pressure)

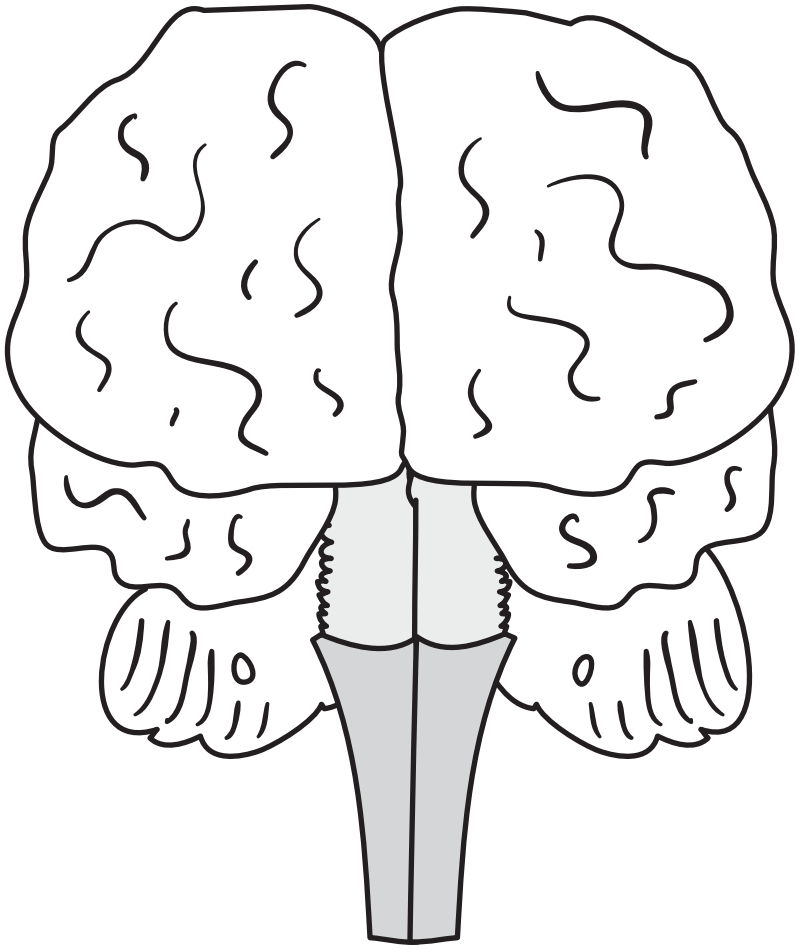
Occipital lobe

- Located in the back of the brain
- Processes all the visual information coming into the brain

Temporal lobe

- Located behind the temples and just above the ears
- In charge of making sense of the information you hear
- Integrates information from various senses, such as smell and vision

Brain Instruction Sheet



Introductory Story for Module 2: YOUR AMAZING BRAIN

Beth and Juan are sitting at a table in the *Brain Power!* Clubhouse looking at model brains. Beth says, "The brain is really so cool. You don't have to think about it, but it still does all your thinking for you."

Juan picks up one of the brains and looks it over. He says, "We couldn't even breathe if we didn't have a brain."

Juan picks up one of the brains and squeezes it a little as he looks at it. He puts it back and goes for another brain. It leaps out of his hands – it's Corty! Juan jumps back.

Corty looks at Beth and Juan who are still holding the brain models and winces saying, "Hey, you're giving me a headache playing with those things."

Beth says, "But Corty, we're really interested in brains. They're very important, and we want to learn more about them."

Corty says, "Now that's food for thought! So, what do you want to know?"

Juan replies, "We want to learn how scientists know so much about brains. I mean, how do they study brains? You'd need to have x-ray vision to look inside someone's head."

Corty says, "OK! I have the perfect mission for you. How about teaming up with the other club again so you can help out each other?"

"We don't need any help. I mean, we're Junior Scientists," Beth says.

"You're right. But you know what would be fun?" asks Juan. "What?" says Beth.

"What about if we compete with them?" Juan says. "That's a great idea!" says Beth.

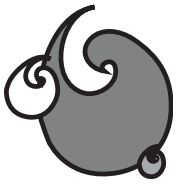
Corty says, "You're wasting brainpower by splitting up!"

The kids just stare at him. There's no way they're working together.

Corty says, "Okay, okay. I'll tell the *Spectacular Scientists Club* members the plan. Now listen up. How do scientists know so much about brains? How do they learn about brains? And what can we learn from them?"

Beth says, "It seems like we'd have to talk to some scientists to learn the answers to those questions."

Corty says, "You're right! And I'm going to introduce you to some of my scientist friends who study drug abuse research."



Corty snaps his fingers, and scientists show up on the computer monitor who explain different imaging techniques that can be used to see the effects of drugs on the brain. These techniques include MRI, PET, and SPECT. Anna Rose Childress explains that MRI uses radio frequency signals produced by magnets to create an image of the brain. Bob Malison and Nora Volkow explain that in PET and SPECT scans, radioactive material is injected into the bloodstream, which allows scientists to view computerized images of the brain.

Juan says, "Wow! They sure said a mouthful! I didn't realize there's so much for scientists to do and learn."

Beth says, "That's the truth! I have got to organize this information so I can study it better. Let's make a chart."

Juan goes off to get markers and rulers. Then, they begin to make their chart of the scientists—what they do and what machines they use. When they finish, they pin up their chart.

Corty says, "Very nice! You've really been paying attention! Great job, but I can't stick around. I've got to give a mission to the kids in the *Spectacular Scientists Club*."

"What's their mission?" asks Juan.

Corty replies, "Can't tell you. It's top secret. If you'd cooperated instead of competing, you'd be in on it, too, but... see ya!" Corty starts to leave, but both kids yell for him to help them out.

Corty responds, "You wanted to compete."

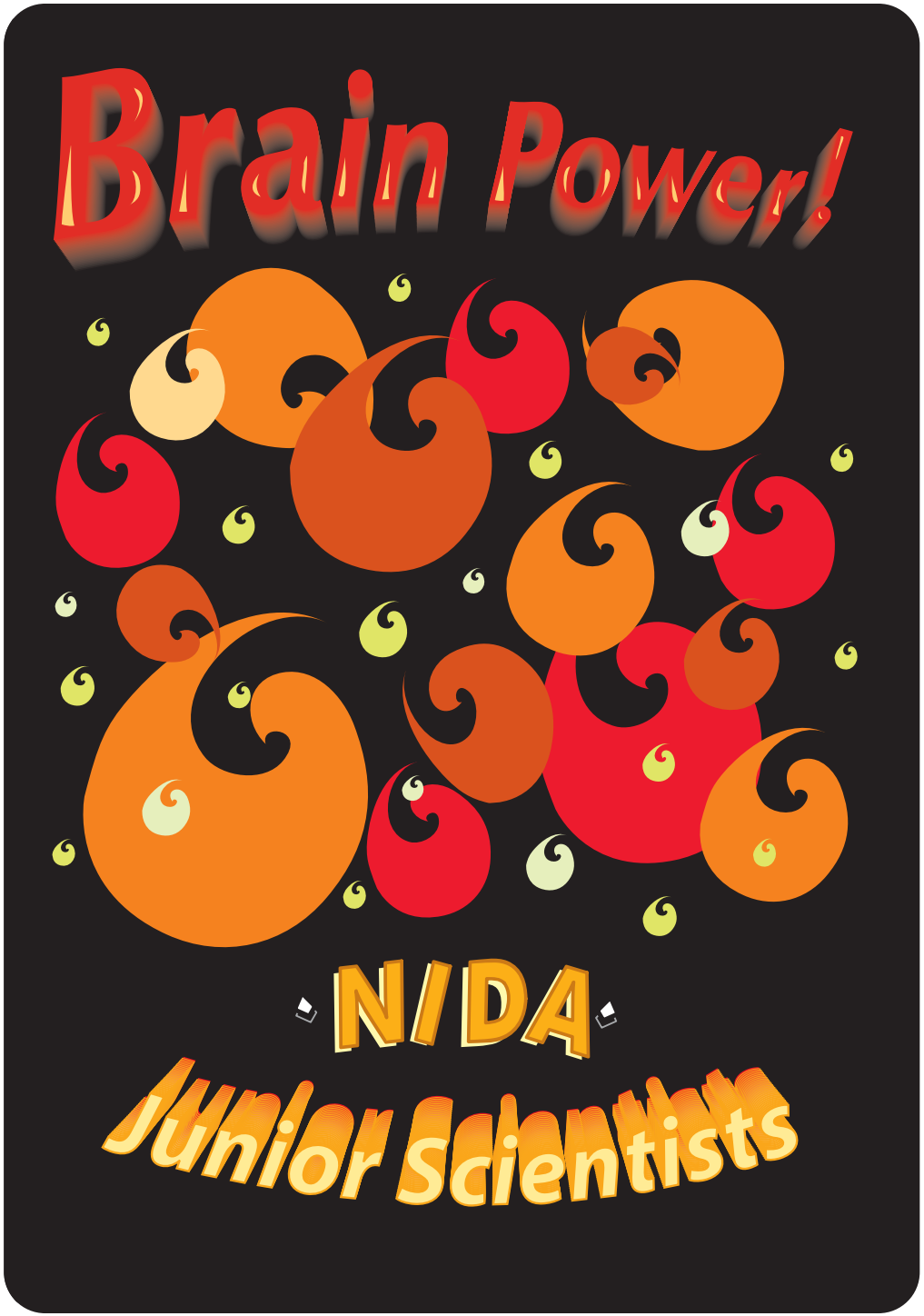
Beth says, "Just a hint?"

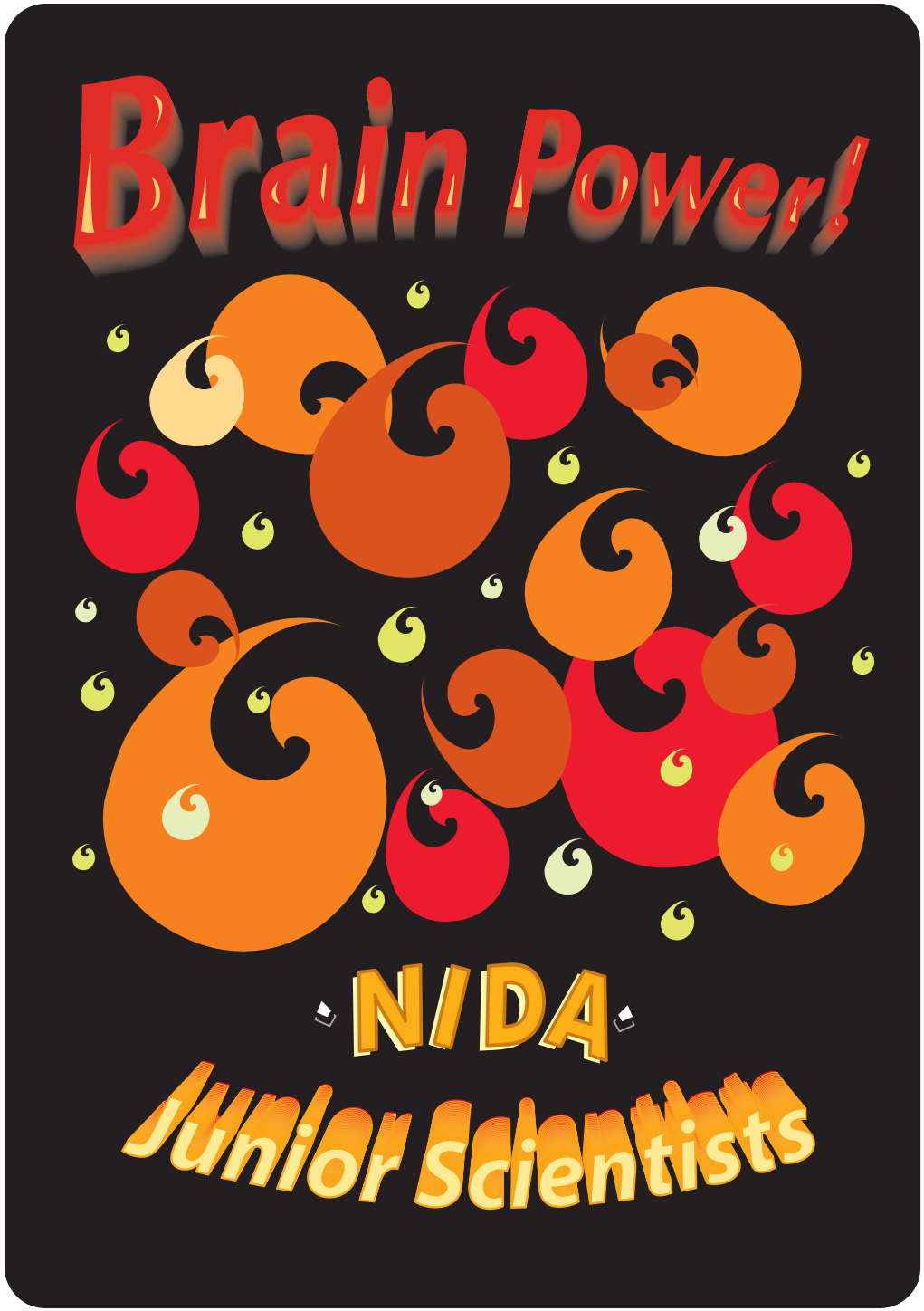
Corty can't resist responding. He says, "Okay, okay, I'll give you a hint: neurotransmitters."

Beth and Juan look at each other, confused.

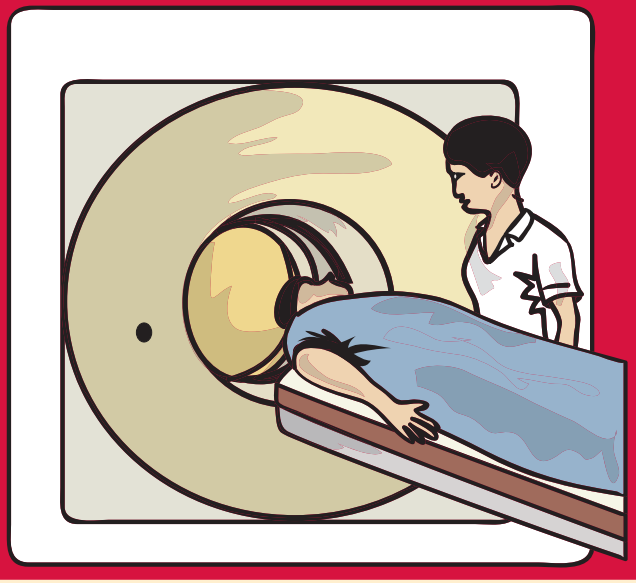
Corty continues, "The brain's no good without them. They go together like PB and J, cereal and milk, synapses and neurons." The kids just stare at him blankly. Corty says, "So, you could say neurotransmission is another example of teamwork."

Beth says, "Corty, you're a brain with a one-track mind!"


Brain Power!
NIDA
Junior Scientists

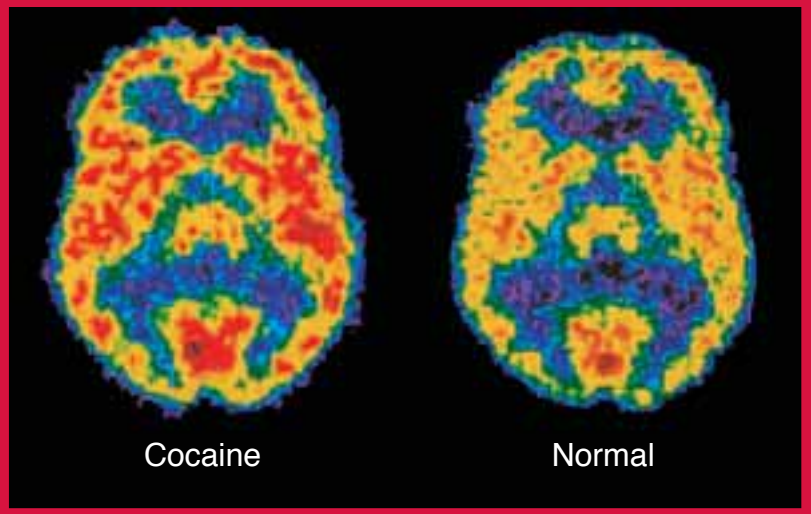

Brain Power!
NIDA
Junior Scientists

MRI

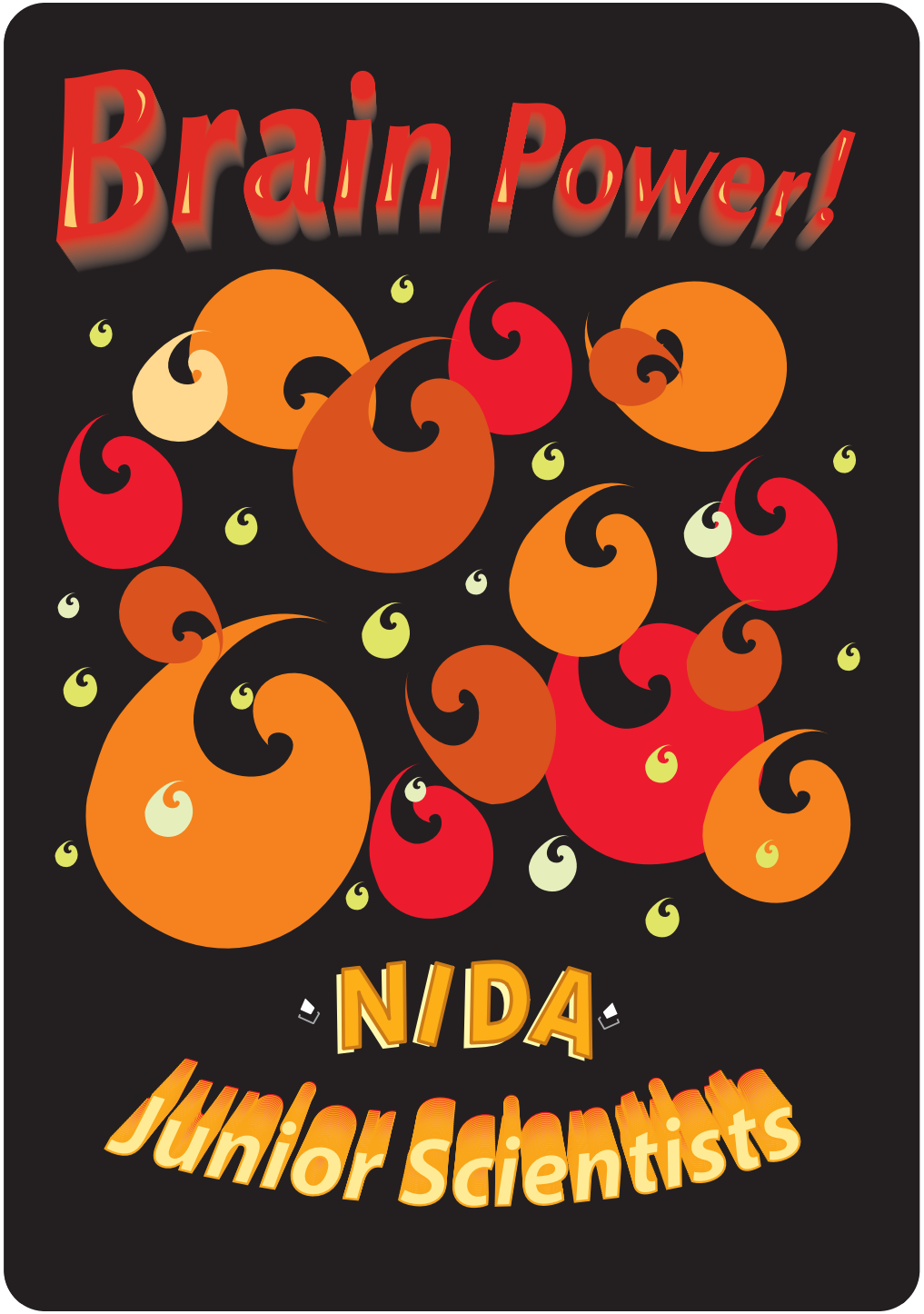


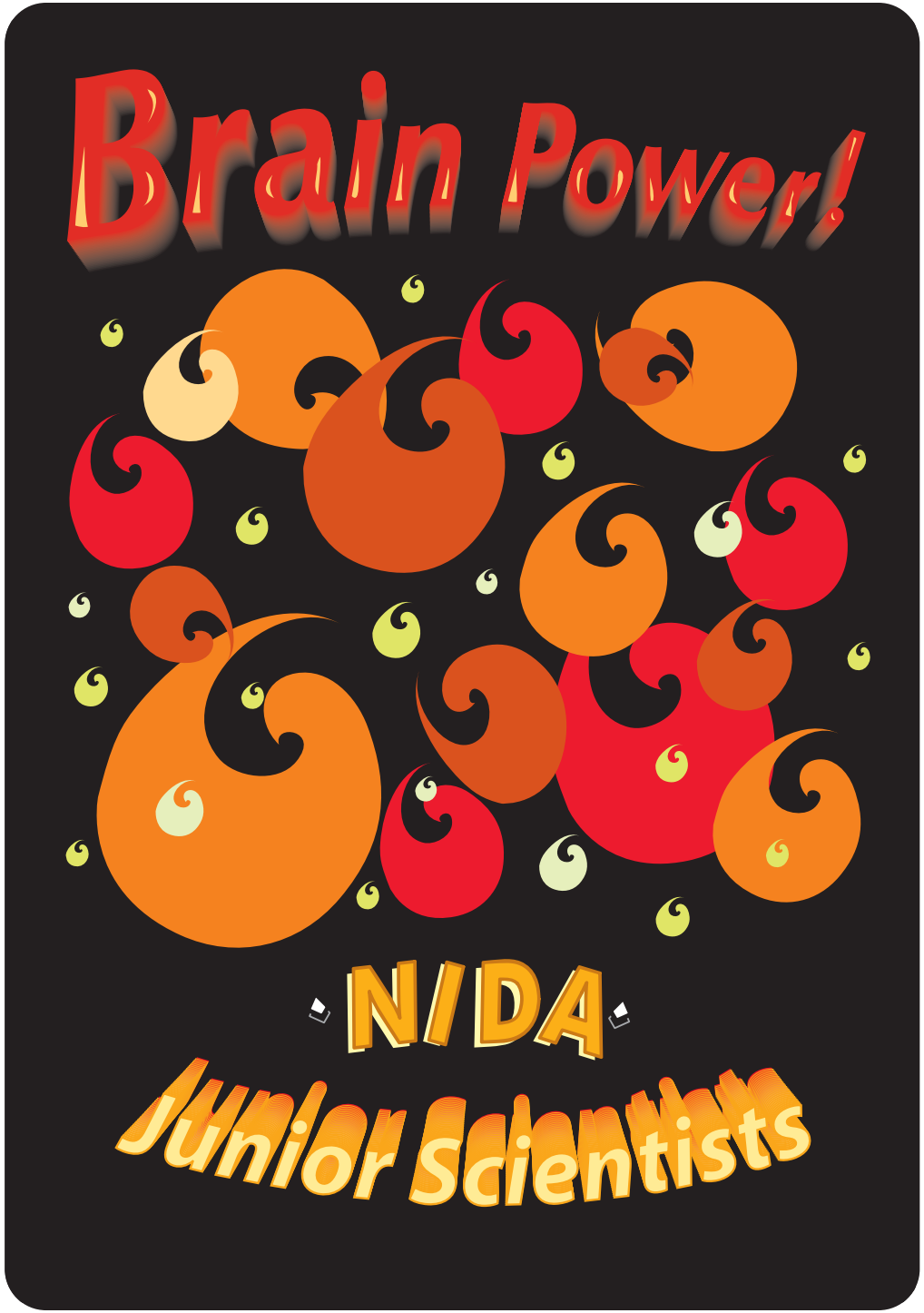
MRI is short for "magnetic resonance imaging." Doctors and scientists use MRI to take a picture of a living person's brain. The MRI machine uses magnets and radio waves to create pictures that show the structure of the brain. Doctors and scientists can use MRI to understand how different parts of the brain are affected by different drugs.

PET Scan



PET means "positron emission tomography." Doctors and scientists can use PET to take pictures of a living person's brain. PET scans use radioactive material to show the parts of the brain that are working. This is helpful in showing which parts are affected by different drugs. In this picture, red shows the parts of the brain working the hardest. This scan shows that the brain on cocaine isn't working as hard.


Brain Power!
NIDA
Junior Scientists


Brain Power!
NIDA
Junior Scientists

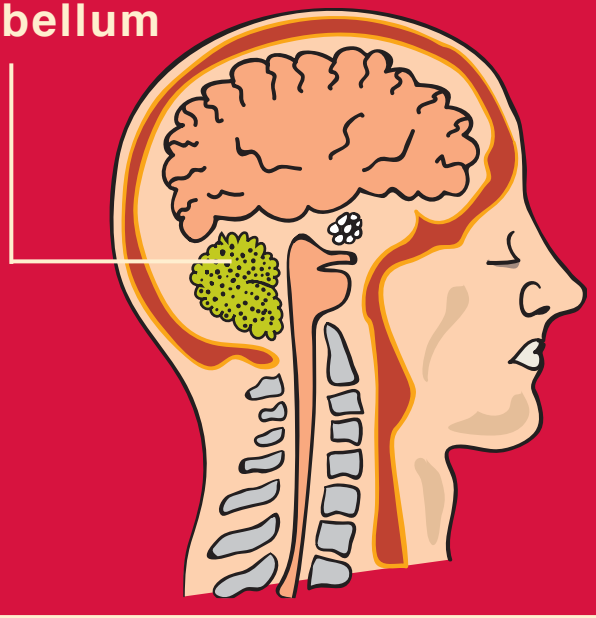
SPECT

NIDA

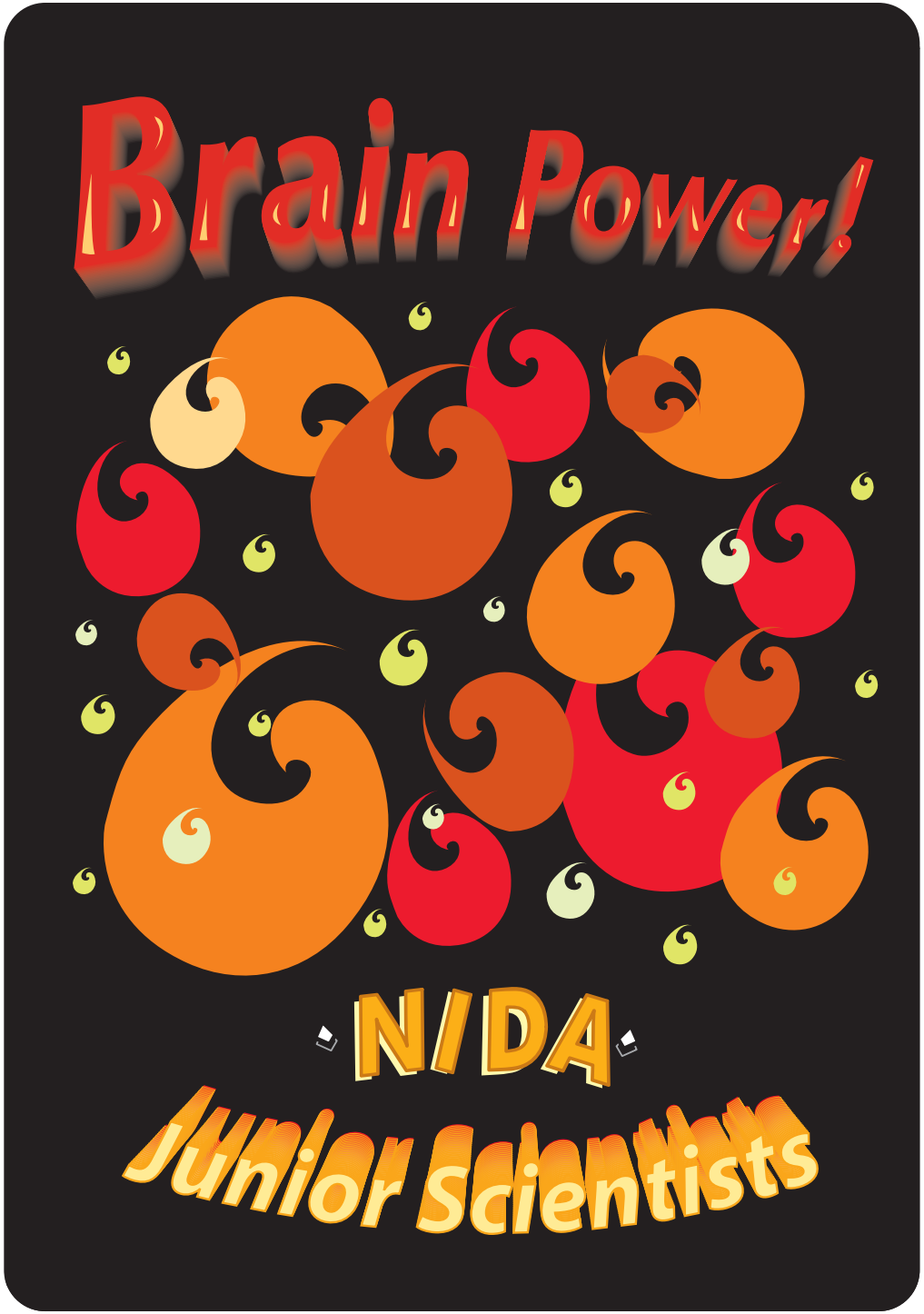
"Single photon emission computed tomography" is known as SPECT. It is similar to a PET scan because both use radioactive material to show the parts of the brain that are active and using energy. Both are common in drug abuse research. SPECT scans use different radioactive material than PET scans and are less expensive.

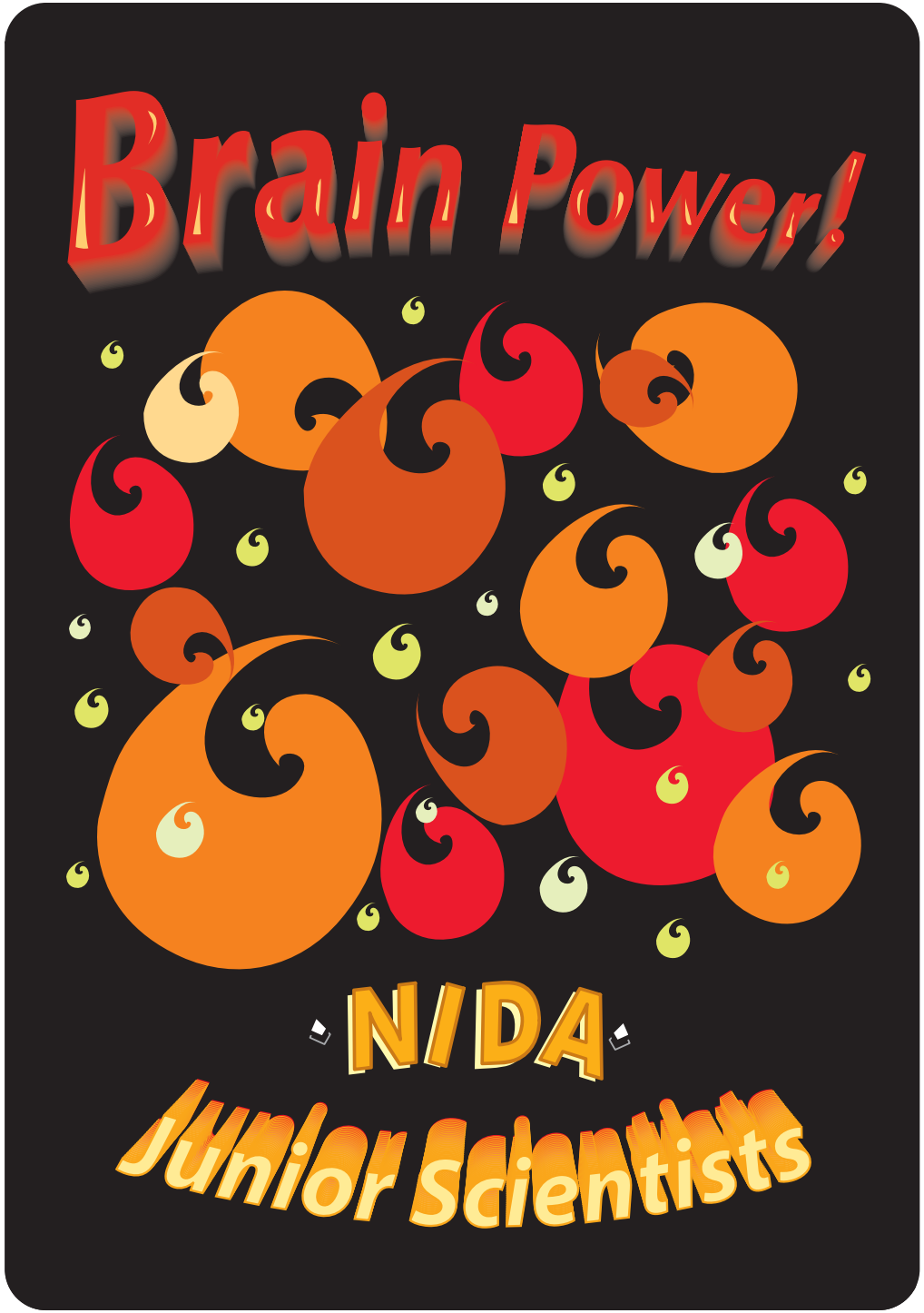
Cerebellum

NIDA



The cerebellum is the part of the brain located in the back of the head. It controls posture, movement, and the sense of balance. When you are playing basketball, picking up your backpack, or playing guitar, you are using your cerebellum.

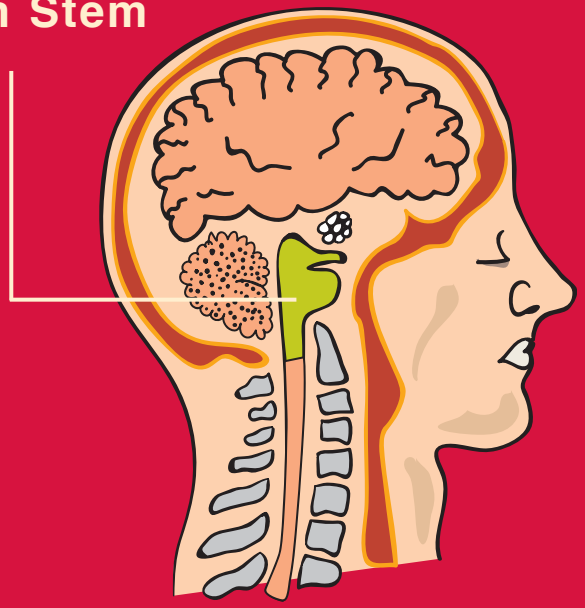

Brain Power!
NIDA
Junior Scientists


Brain Power!
NIDA
Junior Scientists

Brain Stem

NIDA

Brain Stem

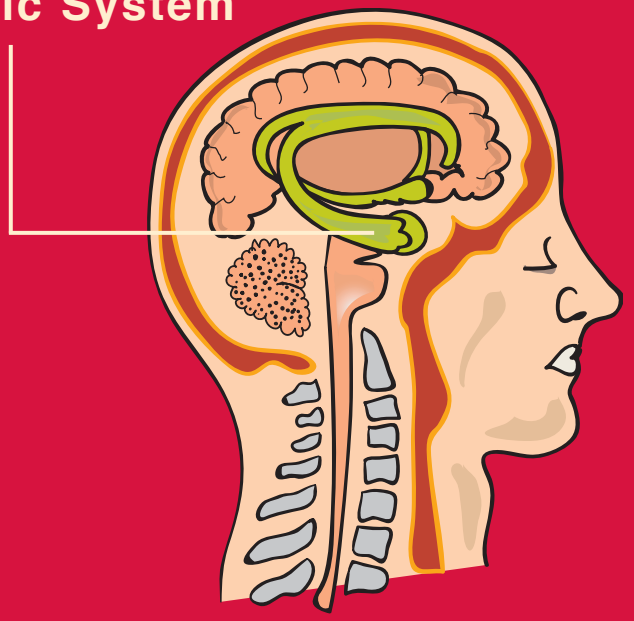


The brain stem is in the bottom of the brain, at the top of the spinal cord. It has two main parts: the pons and the medulla. The brain stem controls many activities in the body that happen automatically, such as sleeping, awakening, and dreaming. When is the last time you told your brain to dream?

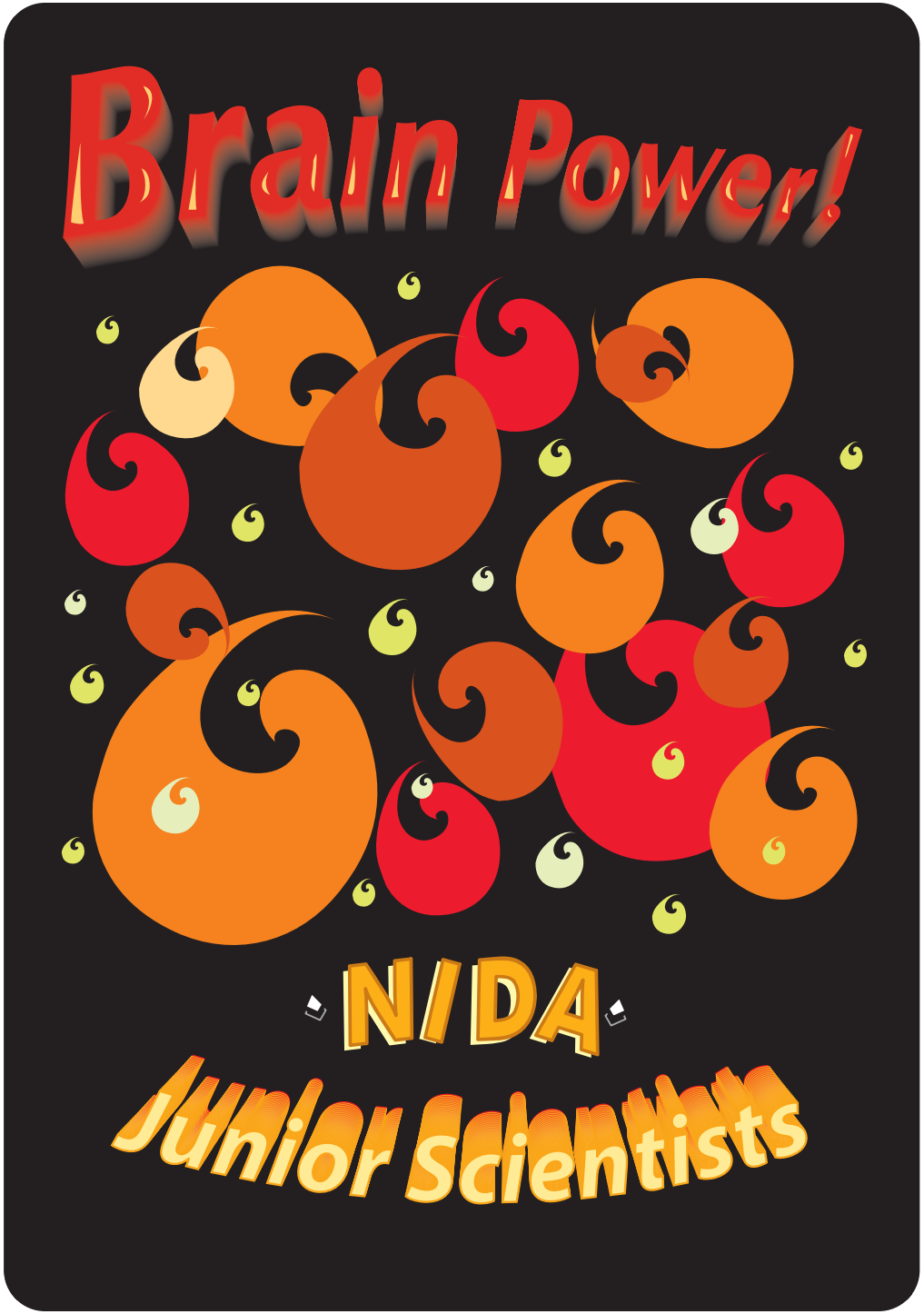
Limbic System

NIDA

Limbic System



The limbic system is found deep inside the brain. The limbic system is made up of several parts, including the hippocampus and the amygdala. It is responsible for learning, memory, and emotions. This part of the brain is greatly affected by drugs, such as alcohol and nicotine.


Brain Power!
NIDA
Junior Scientists

Cerebral Cortex

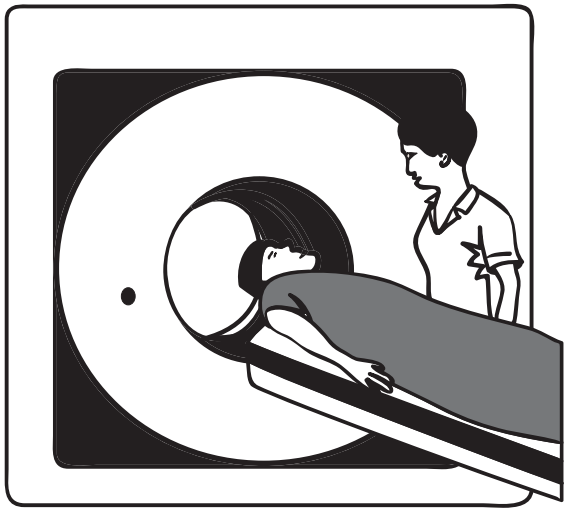
NIDA

Cerebral Cortex

In humans, the cerebral cortex is the largest part of the brain. It is divided into two parts: the right and left hemispheres. The right hemisphere is responsible for artistic expression and understanding relationships in space. The left hemisphere is responsible for analytical thinking, problem solving, decision making, and language.

MRI

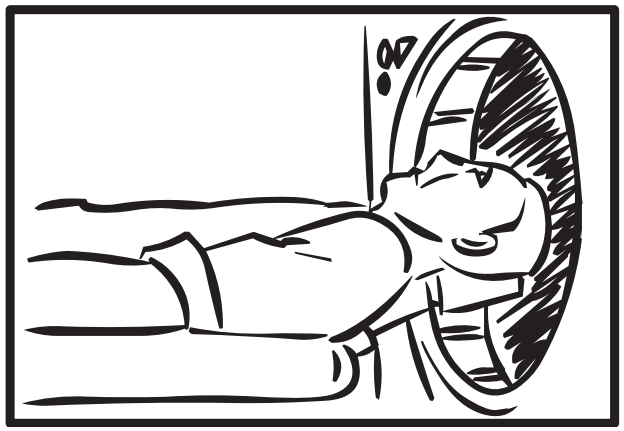
NIDA



MRI is short for "magnetic resonance imaging." Doctors and scientists use MRI to take a picture of a living person's brain. The MRI machine uses magnets and radio waves to create pictures that show the structure of the brain. Doctors and scientists can use MRI to understand how different parts of the brain are affected by different drugs.

PET Scan

NIDA

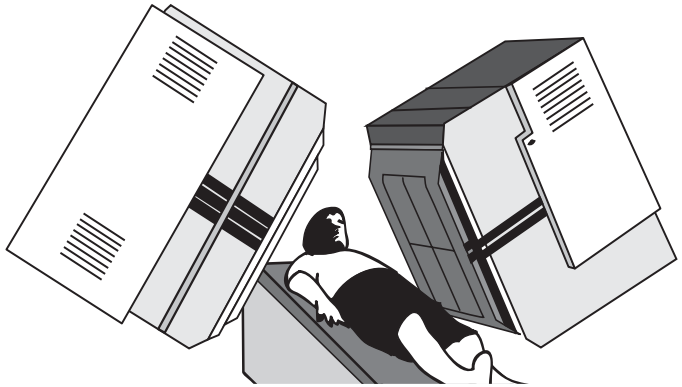


PET means "positron emission tomography." Doctors and scientists can use PET to take pictures of a living person's brain. PET scans use radioactive material to show the parts of the brain that are working. This is helpful in showing which parts are affected by different drugs. The scans show the parts of the brain that are working hardest.

SPECT

NIDA

SPECT Scan

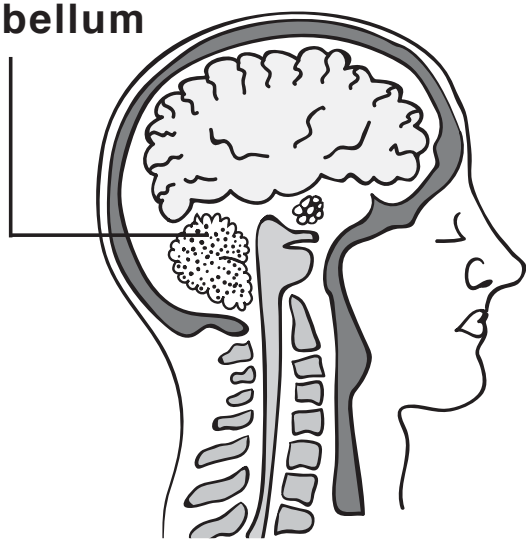


"Single photon emission computed tomography" is known as SPECT. It is similar to a PET scan because both use radioactive material to show the parts of the brain that are active and using energy. Both are common in drug abuse research. SPECT scans use different radioactive material than PET scans and are less expensive.

Cerebellum

NIDA

Cerebellum

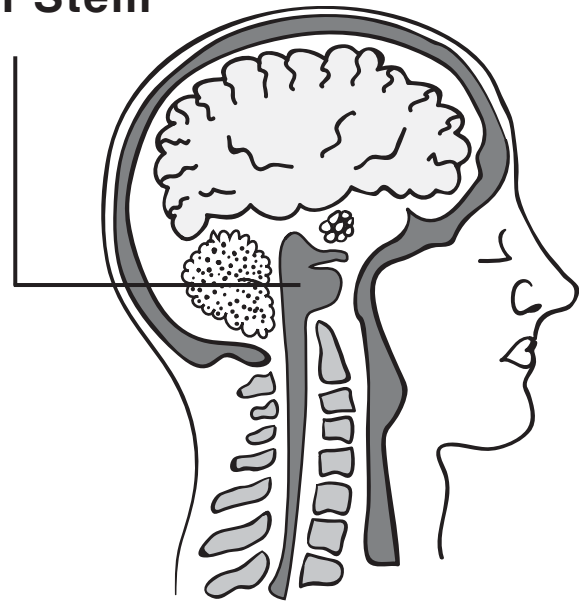


The cerebellum is the part of the brain located in the back of the head. It controls posture, movement, and the sense of balance. When you are playing basketball, picking up your backpack, or playing guitar, you are using your cerebellum.

Brain Stem

NIDA

Brain Stem

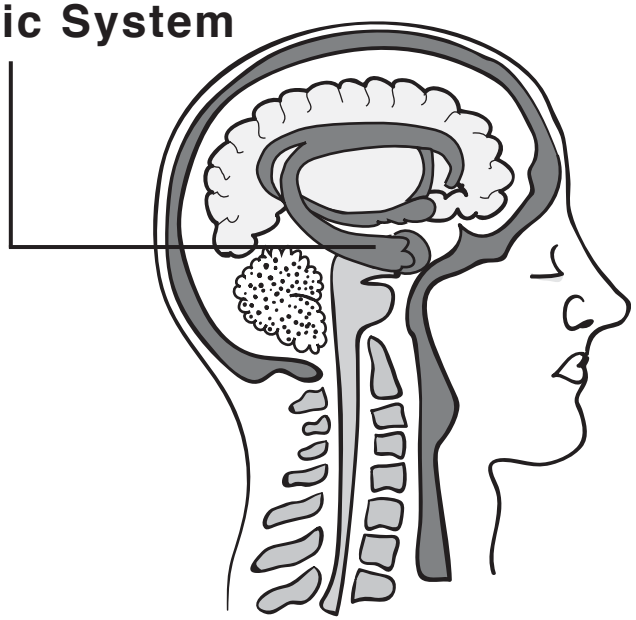


The brain stem is in the bottom of the brain, at the top of the spinal cord. It has two main parts: the pons and the medulla. The brain stem controls many activities in the body that happen automatically, such as sleeping, awakening, and dreaming. When is the last time you told your brain to dream?

Limbic System

NIDA

Limbic System

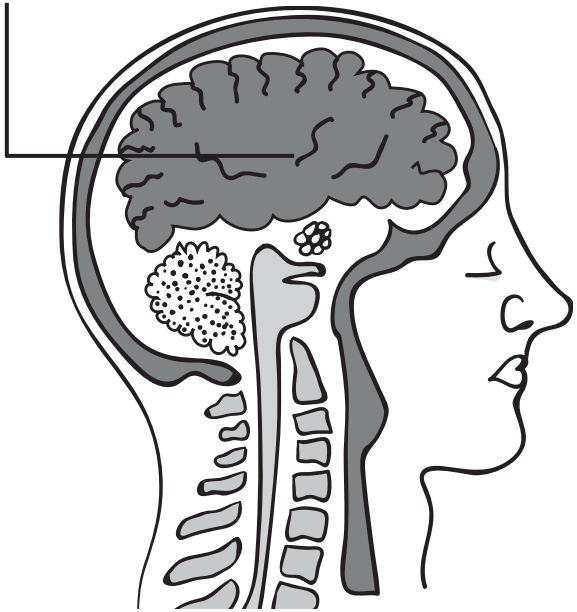


The limbic system is found deep inside the brain. The limbic system is made up of several parts, including the hippocampus and the amygdala. It is responsible for learning, memory, and emotions. This part of the brain is greatly affected by drugs such as alcohol and nicotine.

Cerebral Cortex

NIDA

Cerebral Cortex



In humans, the cerebral cortex is the largest part of the brain. It is divided into two parts: the right and left hemispheres. The right hemisphere is responsible for artistic expression and understanding relationships in space. The left hemisphere is responsible for analytical thinking, problem solving, decision making, and language.

BRAIN POWER NEWS

PARENT NEWSLETTER VOLUME 1, NUMBER 2

Your Amazing Brain

Your child is learning about the most important part of the body—the brain! The brain is the control center for the entire body. It controls everything a person does. This module teaches children about the five major parts of the brain and their functions.

Part of the Brain	Function
Cerebral Cortex: right and left hemispheres	The cerebral cortex, comprised of the right and left hemispheres, is responsible for artistic expression, understanding relationships in space, mathematical ability, problem solving, and comparing information needed to make decisions. It is also the brain's center of language.
Cerebellum	The cerebellum controls posture, movement, and the sense of balance. Playing ball, picking up objects, and playing musical instruments are just a few of the activities that fall under its domain.
Brain Stem	The brain stem controls sleep, awakening, dreaming, heart rate, respiration, and blood pressure. The brain stem also controls body temperature; simple reflexes, such as coughing and sneezing; and digestion.
Limbic System	The limbic system is responsible for learning, memory, and emotional behavior. The limbic system is greatly affected by drugs.

In *Module 2* the students are learning about different methods researchers use to study the brain. Scientists now have very sophisticated imaging tools for studying the brain. The three main tools used are:

- Positron Emission Tomography (PET) – uses radioactive substances linked to sugar to show which parts of the brain are using the most energy. Areas of the brain with the highest radioactivity will look bright red, and therefore are working hard. Areas that have little activity will be dark blue.
- Single Photon Emission Computed Tomography (SPECT) – uses radioactive material to show which parts of the brain are using energy. SPECT produces images that are less detailed than PET, but SPECT techniques are less expensive and more accessible than PET.
- Magnetic Resonance Imaging (MRI) – uses radio frequency signals produced in a strong magnetic field to create an image of the brain. These images provide more details about brain structure, but they don't show specific functions like SPECT and PET scans.

This activity aligns with two standards identified in the National Science Education Standards: unifying concepts and processes, and science and technology. The activity explains the key concept that the brain is part of a larger system—the human body—and that both systems work together to enable people to function. Students also learn about PET, SPECT, and MRI and how they are used to further knowledge about the brain.

Science at Home

Ask your child what he or she learned about the brain. See how many parts he or she remembers and can identify. Act out different activities and have your child guess which part of the brain is being used. Then ask your child to draw a picture of the brain and label it.

Additional Resources

National Institute on Drug Abuse (NIDA) — www.drugabuse.gov
301-443-1124
This Web site contains information about drug abuse and a section designed specifically for parents, teachers, and students. Publications and other materials are available free of charge.

National Clearinghouse for Alcohol and Drug Information (NCADI) — www.health.org
1-800-729-6686
NCADI is the world's largest resource for information and materials concerning substance abuse. Many free publications are available here.

Neuroscience for Kids — http://faculty.washington.edu/chudler/neurok.html
This Web site contains information on the brain and neurotransmission, activities, experiments, pictures, and other resources for students and educators.

Phineas Gage: A Gruesome but True Story About Brain Science. [Fleischman, J.] Boston, MA: Houghton Mifflin Co., 2002. Written for ages 9 through 12, this book tells the story of a railroad employee who experienced personality changes after a 13-pound iron rod shot through his brain.

Focus on Drugs and the Brain. [Friedman, D.] Frederick, MD: Twenty-First Century Books, 1990. Part of the "Drug-Alert Book" series; gives a good overview of the brain, neurotransmission, effects of drugs on the brain, and addiction.

Big Head! A Book About Your Brain and Your Head. [Rowan, P.] New York: Alfred A. Knopf, 1998. Gives an overview of the different parts of the brain; includes detailed color pictures and transparencies.

NOTICIAS SOBRE EL PODER DEL CEREBRO

BOLETÍN INFORMATIVO PARA PADRES VOLUMEN 1, NÚMERO 2

Su asombroso cerebro

Su hijo está aprendiendo sobre la parte más importante del cuerpo: ¡el cerebro! El cerebro es el centro de control de todo el cuerpo. Controla todo lo que hace una persona. Este módulo enseña a los niños acerca de las cinco partes principales de su cerebro y sus funciones.

Parte del cerebro	Función
La corteza cerebral: hemisferios derecho e izquierdo	La corteza cerebral, compuesta por los hemisferios derecho e izquierdo, es responsable de la expresión artística, la comprensión de la noción espacial, la capacidad matemática, la resolución de problemas y la comparación de información necesaria para tomar decisiones. También es el centro del lenguaje del cerebro.
El cerebelo	El cerebelo controla la postura, el movimiento y el sentido de equilibrio. Jugar a la pelota, recoger objetos y tocar instrumentos musicales son tan sólo algunas de las actividades que están bajo su dominio.
El tronco encefálico	El tronco encefálico controla el sueño, el despertar, los sueños, el ritmo cardíaco, la respiración y la presión arterial. El tronco encefálico también controla la temperatura corporal, los reflejos simples tales como toser y estornudar, y la digestión.
El sistema límbico	El sistema límbico es responsable del aprendizaje, la memoria y el comportamiento emocional. El sistema límbico se ve seriamente afectado por las drogas.

En el *Módulo 2*, los estudiantes están aprendiendo sobre los distintos métodos que utilizan los investigadores para estudiar el cerebro. Hoy en día, los científicos tienen herramientas de imagen muy sofisticadas para estudiar el cerebro. Las tres principales herramientas que se utilizan son:

- Tomografía por emisión de positrones (TEP, o PET por sus siglas en inglés), que utiliza sustancias radioactivas vinculadas al azúcar para mostrar qué partes del cerebro están usando más energía. Las áreas del cerebro con más radioactividad se verán en color rojo brillante y por lo tanto están trabajando mucho. Las áreas que tengan poca actividad se verán en color azul oscuro.
- Tomografía computarizada por emisión de fotón único (TCEFU, o SPECT por sus siglas en inglés), que utiliza material radiactivo para mostrar qué partes del cerebro están usando energía. La TCEFU produce imágenes menos detalladas que la TEP, pero las técnicas de la TCEFU son menos costosas y más accesibles que las de la TEP.
- Imágenes por resonancia magnética (IRM, o MRI por sus siglas en inglés), que utilizan señales de frecuencia de radio producidas en un fuerte campo magnético para crear una imagen del cerebro. Estas imágenes proporcionan más detalles acerca de la estructura del cerebro, pero no muestran funciones específicas como lo hacen la TCEFU y la TEP.

Esta misión cumple con dos estándares identificados en los Estándares Nacionales de la Educación Científica (National Science Education Standards): unificación de conceptos y procesos, y ciencia y tecnología. La misión explica el concepto clave de que el cerebro forma parte de un sistema mayor (el cuerpo humano), y que ambos sistemas trabajan juntos para permitir que las personas funcionen. Los estudiantes también aprenden sobre la TEP, la TCEFU y la IRM y cómo se usan para saber más acerca del cerebro.

La ciencia en el hogar

Pregunte a su hijo lo que aprendió sobre el cerebro. Vea cuántas partes recuerda y puede identificar. Represente varias actividades y haga que su hijo adivine qué parte del cerebro está usando. Luego, pida a su hijo que dibuje un cerebro y que escriba los nombres.

Recursos adicionales

National Institute on Drug Abuse (NIDA): www.drugabuse.gov
301-443-1124
Este sitio Web tiene información acerca del abuso de drogas y una sección destinada específicamente a padres, maestros y estudiantes. Hay publicaciones y otros materiales disponibles sin costo. Muchas publicaciones estan disponibles en español.

National Clearinghouse for Alcohol and Drug Information (NCADI): www.health.org
1-800-729-6686
El NCADI es el recurso mundial más grande para encontrar información y materiales relacionados con el abuso de sustancias. Aquí se pueden obtener muchas publicaciones gratuitas.

Neuroscience for Kids
http://faculty.washington.edu/chudler/neurok.html
Este sitio Web contiene información sobre el cerebro y la neurotransmisión, así como actividades, experimentos, dibujos y otros recursos para estudiantes y educadores.

Phineas Gage: *A Gruesome but True Story About Brain Science*. [Fleischman, J.] Boston, MA: Houghton Mifflin Co., 2002. Escrito para niños de 9 a 12 años, este libro cuenta la historia de un empleado ferroviario que sufrió cambios en su personalidad luego de que una barra de hierro de 13 libras [unos 6 kilos] le atravesó el cerebro.

Focus on Drugs and the Brain. [Friedman, D.] Frederick, MD: Twenty-First Century Books, 1990. Parte de la serie de libros de alerta sobre las drogas; proporciona un buen compendio del cerebro, la neurotransmisión, los efectos de las drogas en el cerebro y la adicción.

Big Head! A Book About Your Brain and Your Head. [Rowan, P.] New York: Alfred A. Knopf, 1998. Ofrece un compendio de las diferentes partes del cerebrol incluye transparencias y dibujos a color detallados.

Your Amazing Brain

Frontal Lobe

Temporal Lobe

Limbic System
- Hippocampus
- Amygdala

Cerebral Cortex
- Right Hemisphere
- Left Hemisphere

Cerebellum

Brain Stem
- Pons
- Medulla

Occipital Lobe

Parietal Lobe