Which hand?

Brains, fine motor skills, and holding a pencil

- Right hand, left hand, or ambidextrous?
- What is handedness?
- How does handedness happen?
- Do left-handed people think any differently than right-handed ones?
- When should children begin to show a hand preference?
- How does handedness affect how we use tools—spoons, toothbrushes, and pencils?

At birth, parents and physicians make a quick check: 10 fingers, 10 toes—a symmetrical body. Both sides are the same. As babies grow, we expect reflexes, muscles, and movements to be fairly balanced on the two sides.

But it's not uncommon for infants to hold one hand more fisted than the other, to wave one arm more vigorously, or to turn the head to one side more often. Still, we can't say that a baby has a preference for the left or the right.

Though not an exact science, handedness can often be predicted by these early infantile movements. Why?

Handedness: Does it start with the brain?

Theorists speculate that handedness has to do with brain specialization. Different brain functions take place in different parts of the brain.

During prenatal development, while the brain and spinal cord are forming, nerves cross from one hemisphere or side of the brain, across the midline of the body, and connect to muscles on the opposite side of the body. The right hemisphere of the brain controls the muscles on the left side of the body, and the left hemisphere controls the right.

For right-handed people, the left side of the brain has a better developed nerve network that supports motor development and skills. For left-handed people, the opposite is true.

How we develop fine motor skills

Motor skills involve the movement of muscles throughout the body. Gross motor skills involve larger movements—swimming, walking, and dancing, for example. Fine motor skills describe the smaller actions of the hands, wrists, fingers, feet, toes, lips, and tongue. Fine and gross motor skills develop in tandem. Many activities depend on their coordination.

Infants. Newborns have little control over their hands. Typically the fist is closed. Hand movement

results from reflex and not deliberate control. For example, if you place a rattle in an infant's hand, the infant may grasp it momentarily and then drop it as hand muscles relax. The infant has no awareness of the object or its absence. Typically, babies swipe at objects when they are 1 month old and discover and play with their hands at 2 months.

Between 2 and 4 months, babies begin to coordinate their eye and hand muscles. Babies see an object and try to grasp it—often unsuccessfully.

By 5 months, most infants can grasp an object within reach—without looking at their hands. This important milestone in fine motor development allows more prolonged but clumsy grasps. Eager to discover and learn, infants not only grasp objects but also taste them. Hand-to-mouth exploration is a standard and expected developmental leap.

By 9 months, most babies begin to show a preference for reaching with their right hand—even if the toy is placed on their left side. They will, however, continue to use the non-preferred hand much of the time.

By the end of the first year, babies will usually be able to grasp an object with the entire hand, swipe surfaces, and poke at an object with one finger. Significantly, the pincer grip—the ability to hold an object between the thumb and index finger—typically appears at about 12 months. The pincer grasp gives infants the ability to manipulate and grasp an object and to deliberately drop it. At 12 months, babies can usually hold an object in each hand, drop an object into a bucket, and perform stacking and nesting tasks.

Toddlers. Toddlers continue to strengthen hand and finger muscles. They develop the ability to use their fingers independently—twisting, pulling, poking, pushing—and with greater control. They are typically able to turn the page in a board book. They are also able to hold a fat crayon in a palmer grasp (all fingers wrapped around the crayon).

By 15 months, most toddlers can eat independently, first with fingers and then with a spoon. Toddlers can reach for objects smoothly and with minimal effort. They can hold two objects in one hand, fit objects together (puzzles and snap toys, for example), and stack a few blocks into a tower.

By 30 months, most toddlers can draw using a finger grasp (holding a crayon with four fingers pushing in opposition to the thumb). They can pour liquids from one container to another, take off socks and shoes independently, and turn the faucet on and off when hand washing.

It's during this period that children start to display a preference for one side—that is, they use the preferred side more consistently than the non-preferred. This is clear not only when they grasp objects with the hand, hold a spoon, and turn pages in a book but also when they kick a ball, roll play clay into a snake, and push a wheel toy along a path.

Preschoolers. The preschool child's central nervous system is still developing and maturing, a

process that enables the brain to send complex messages to the fingers.

By age 3 or 4, most children are able to complete complex fine motor tasks. These include drawing deliberate shapes, stringing beads, cutting with scissors, spreading paint and paste with the index finger, dressing and undressing dolls, opening and placing a clothespin to hang artwork, and folding paper in halves and quarters. Each of these tasks reinforces a child's hand preference.

As these preferences become evident, you can accommodate them to maximize a child's hand strength. For example, for a child who shows a left hand preference, you can provide left-handed scissors.

Because preschoolers are still developing small muscle strength and hand-eye coordination, it is inappropriate to expect handwriting skills. Children this age are generally not ready for precise handwriting instruction.

Instead, introduce writing activities slowly and gently, recognizing that each child will have a different skill set and a unique developmental level. For example, a 4-year-old who does not show a hand preference is likely to have less overall muscle control and coordination.

Some tools for writing are easier to use than others. Some teachers like to start with markers because they require little pressure and minimal muscle strength. Other teachers start with crayons because they require more focus and muscle strength. Make sure you provide many tool choices and encourage children to use the tools to draw and paint before you expect them to write.

As children indicate their interest in writing letters and words—and you have observed and documented readiness—make writing tools available for exploration. Generally, markers and felt-tipped pens are easiest for inexperienced fingers to control.

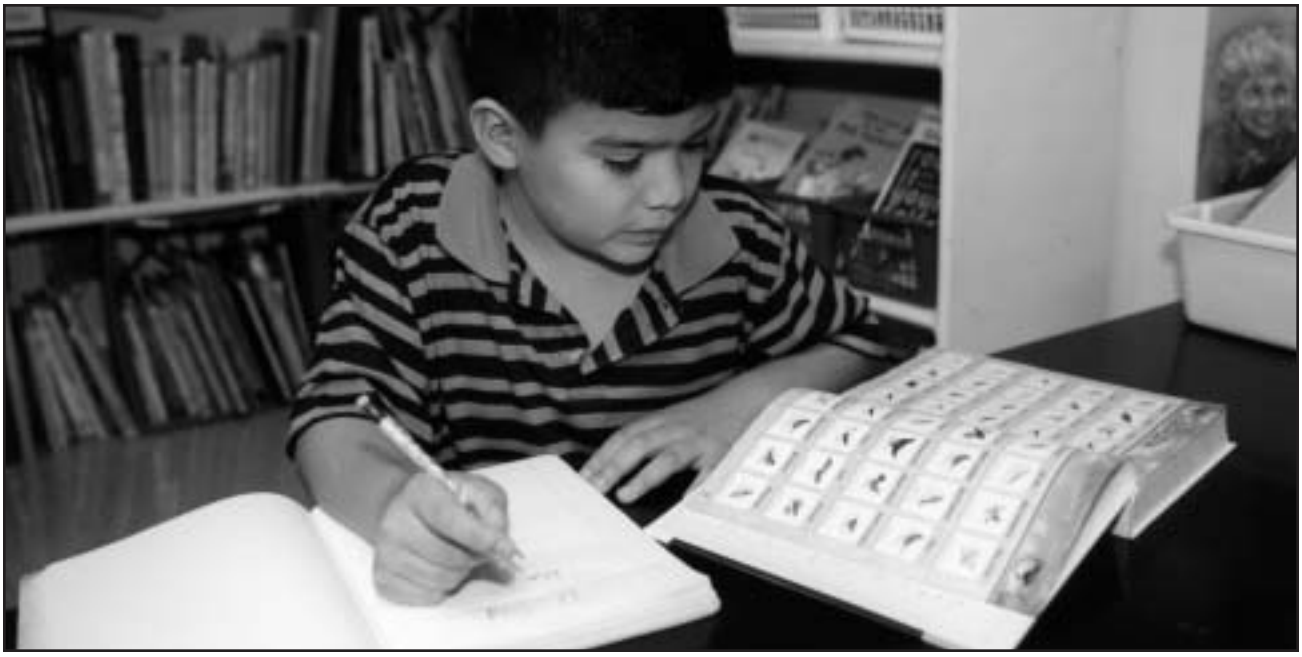
School age. By the age of 5, children will show better fine motor development and consistent hand preference for most tasks. Children can typically draw a complete human figure; cut out shapes with scissors; trace forms; manipulate buttons, zippers, and snaps; and copy letters. Some can play piano; build models; knit, crochet, and sew; use a computer keyboard and mouse; and help with basic household chores like sweeping, dusting, and washing dishes.

School-age children (as well as adolescents and adults) experiment with using the non-preferred side. And researchers hold that such experimentation can be useful in maintaining brain function and dexterity.

How do we develop handedness?

From the developmental review, it's clear that handedness is not just about hands. Consider:

- Which foot do you kick with?
- Which eye do you use to peer through a magnifying glass?



- Which hand do you use to unscrew a jar, hold your toothbrush, or sign your name?

Many people are consistent—all left-sided functions or all right-sided. Some have a combination of left and right dominance, sometimes determined by the task. For example, a right-handed knitter may be able to make stitches more quickly using the left hand. Sometimes handedness is determined by efficiency. For example, a person may complete a jigsaw puzzle or cut flowers with the preferred hand because it's less frustrating.

Consider these historical facts and current investigations.

- The percentage of left-hand dominant people has remained consistent (10 to 12 percent) in the population for generations.
- In colonial America, left-handed people were considered witches and were executed. More recently, well-meaning teachers used harsh methods—slapping wrists or tying the left hand behind the child's back—to "cure" left-handedness.
- Some research suggests that left-handed children are more likely to be creative, with high verbal and math ability. Other research finds no difference between left- and right-handed children.
- Children with autism and other developmental disabilities, as shown by some research, have a higher percentage of left-handedness than the general population.
- Dorothy Bishop (1990) concluded there is no consistent link between IQ and handedness.
- Can openers, spiral notebooks, telephone keypads, and automobile consoles are built for the convenience of right-handed users.
- Left-handed people are more likely to have a left-handed relative, but researchers have not identified a left-handed gene.

Getting ready for writing tools

Before children can use a pencil with precision, they must have control over the large muscles of the arm and fine muscles in the hand, wrist, and fingers. Make sure you offer these standard materials to help children gain hand-eye coordination and the control and strength they need for good writing.

Manipulatives: puzzles, construction blocks, snap beads, wheel toys to push and pull, stringing beads, clothespins with springs, nut-and-bolt boards, burlap or plastic stitching grids, and plastic sewing needles and yarn

Modeling materials: clay, sand, play clay, and mud

Art materials: long- and short-handled brushes, water colors, paints, scissors and paper, crayons, and hole punches

Building materials: blocks, boxes, and carpentry tools

- Most researchers believe that handedness preference is on a scale. Few people are strictly right- or left-handed. Most link a hand to a specific task: throw a ball with the left hand but stir a pot with the right, for example.
- Truly ambidextrous people—those indifferent to hand preference—are rare.
- In India and Indonesia, eating with the left hand is considered impolite.
- When necessary, such as after injury to the dominant hand or under cultural pressure, humans can learn to use the non-preferred hand.

About 1 person in 10 is left-hand dominant—a challenge in a right-hand dominant classroom and world. Some neurologists seek to explain the causes of handedness (likely a combination of genetics and environmental factors). Others explore whether left-handed people think differently. And teachers and parents strive to make left-handed children comfortable and successful in a right-handed world.

Hand to the task

When children are ready to write, make sure tools and materials support the intense effort. Handwriting is more than forming symbols on a page. Writing effectively—and efficiently—includes the selection of writing tools, gripping the tool, positioning the tool on paper, and having fine muscle strength, coordination, and control in the hand doing the writing.

Use these tips for helping all children—left- and right-handed—develop fine motor control and fluid writing skills.

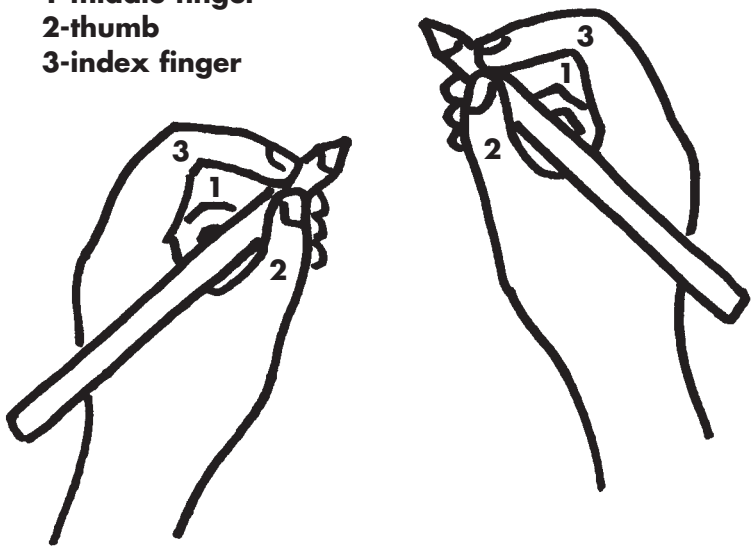
- Observe children's pencil grips. The photos below show typical pencil grips from toddlers to schoolagers. The pencil should be loosely held with the fingers above the shaved tip—about an inch up from the point—in a tripod grip. The index finger is on top of the pencil, the thumb and middle finger holding two sides. There should be equal pressure between the thumb, the side of the middle finger, and the tip of the index finger. The ring and pinky fingers are relaxed and in line with the middle finger. See diagram at right.

  Watch for excessive pressure on the index finger and all fingers pulled into a fist with knuckles flexed. When a child holds a pencil too tightly, fatigue and frustration will interfere with writing efficiency.
- Observe children's posture and body mechanics. When a child holds a pencil, the eraser end should point to the shoulder. The wrist should rest on the table surface. The arm from thumb to elbow should be in a straight line—the hand doesn't hook back toward the body.

  Position paper so that the sheet is angled—the right corner higher for right-handed writers, and the left corner higher for left-handed writers. The non-dominant hand should hold the paper in place.
- Provide child-sized chairs and writing table. Make sure the chair's height enables the child's feet to rest comfortably on the floor with hips and knees at a 90-degree angle. The table should be just above elbow height and support the arms without tensing and lifting or shrugging the shoulders.

- Help left-handed children discover that the best place at a table is not next to a right-handed friend. Bumping elbows while writing—or eating soup—is messy and frustrating.
- Help children relax. When a child has clenched teeth and a tense neck and makes deep indentations on paper from pressing too hard, it's wise to end the writing session and encourage general relaxation. Check the position of the pencil and the wrist.
- Schedule whole-body writing time with non-traditional materials. Invite children to write letters in the air with their hands or feet. Offer finger paint, shaving cream, and sand trays for finger writing. Invite children to write with water on the sidewalk or a brick wall.
- Explore print with tactile tools like Wikki-stix® and clay. Fill zipper-top bags with hair gel and invite children to form letters and shapes with one finger.
- Provide colored markers—felt-tipped and of varying thicknesses. Often children refine their grip—and relax muscles—when they are absorbed in color on unlined paper.
- Offer a variety of writing implements—pencils, fat pencils, colored pencils, and markers—that have a triangular and not round shape.
- Explore pencil grips. Mechanical pencils and gel pens often have built-in grips. Encourage children with awkward to tight pencil grips to use them.
- Provide stencils, alphabet charts, and tracing grids for fun writing practice. Crossword puzzles give children practice in precise letter spacing.

1-middle finger
2-thumb
3-index finger



Activities for left and right

Eric Chudler, University of Washington, has a Web site called "Neuroscience for Kids." It includes games, quizzes, and links to brain development and function. The following activities are adapted from his work.

Each activity offers school-agers opportunities for charting and graphing, surveying, and evaluating evidence. Have plenty of chart paper and markers on hand. Encourage children to make notes of their observations. If your classroom has Internet access, children can upload their data and exploration results.

Left hand or right hand?

Rather than ask children which hand they use, set up observation experiments that rely on more than self-reporting. Prepare observation charts with three columns: Left Hand, Right Hand, Either Hand. Have observers chart peers in tasks such as using a fork, painting at an easel, turning a door knob, and throwing a ball.

Left foot or right foot?

Set up the same observation system as in the previous activity. Have observers chart their peers in tasks such as kicking a ball, walking up stairs (Which foot steps first?), time spent balanced on each foot, and stepping on a picture of a cockroach.

Left eye or right eye?

Check for eyedness. Chart these tasks: looking through a paper tube, looking through a magnifying glass, and winking (Which eye winks more easily?).

You can chart eye dominance too. Cut a coin-sized hole in a sheet of construction paper. Ask the subject to hold the paper and look through the hole at a distant object using both eyes. Ask the subject to bring the paper closer and closer to the face while still looking at the object. As the paper comes close to the face, only one eye will be looking through the hole. Which one?

Left eat or right ear?

Chart which ear is preferred in different tests. Which ear does the subject cup to help make a whisper louder? Which ear does the subject hold against a small box when trying to determine what's inside? Which ear does the subject hold against a door to hear what's going on outside?

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