

different interests and behavioral styles even before they're born. But prenatal testosterone is not everything. What happens next, when these small, immature brains meet our inexorably gender-divided culture, is also crucial. From their faint beginnings, sex differences become quickly magnified as babies enter a world that sees them as, above all, either boys or girls.

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Under the Pink or Blue Blankie

WE HAVE A NEW BABY in the family. He's so small and sweet that everyone keeps squabbling over who gets to play with him and cuddle him at night.

Okay, he's a kitten, but our affectionate urges are much the same. And just like a human baby's, his gender is not much of an issue at this point. While full-grown male and female cats have very different personalities, little of that is evident in kittens. (Then again, little Snookie isn't going to experience much life as a tom, since we plan to neuter him at six months of age.)

Similarly, when it comes to boys and girls, few differences are obvious in early infancy. Scientists have certainly looked for them, reasoning that the earlier they can detect sex differences, the likelier they're due to purely innate factors and not simply to moms and dads nurturing their tiny sons and daughters differently. Sure enough, when scientists look closely and study large numbers of newborns, they have been able to document a few significant differences between infant boys and girls. But generally speaking, the differences are few and far between, nothing like what we see later in childhood.

In this chapter, I'll explain what's known about the similarities and differences in boys' and girls' bodies, brains, skills, and maturation in the first year of life. Some differences are present at birth; others turn up along with the many new skills infants acquire during the exciting first year. Hormonal surges, while not as dramatic as before birth, may also

play a role in the growing differentiation of boys and girls during infancy.

But parents are another big part of this equation. In spite of our best efforts, moms and dads don't treat sons and daughters exactly the same. The two sexes start out a little bit different, and we, with our own lifetimes of cultural experience, react differently to them from their earliest days. In this chapter, we'll explore what psychologists have discovered about the different ways parents interact with boys and girls, not all of which are conducive to raising strong, well-rounded children. I'll conclude with suggestions of what parents can do from the very beginning to promote the emotional and cognitive development of their infant sons and daughters.

Boys and Girls at Birth

Like kittens, newborn babies are all pretty much the same. Don't get me wrong; I find newborns amazing—almost magical in their tiny perfection. But aside from marveling at their microscopic toes and startlingly strong grips, parents don't have a whole lot to “ooh” and “ahh” about. They sleep (blessedly), feed, cry, and sometimes make amazing eye contact. But there is little that jumps out to reveal their future personalities, interests, talents, or even endearing quirks.

Still, there are a few consistent differences between the sexes, and these probably do influence the way boys and girls get started in life. The most obvious is size: at birth, boys are larger than girls, on average about four to five ounces heavier and half an inch longer. This difference helps explain why boys have a more difficult time being born. Women labor an average of twenty-four minutes longer and are more likely to use analgesic medications when delivering boys. Electronic monitors are now used to track the baby's heartbeat throughout the birthing process, and boys are found to undergo fetal distress more often than girls do during this dicey time. This means that boys are about 50 percent more likely to end up being delivered by C-section, an operation that, while often lifesaving, is associated with greater risks than vaginal delivery for both mother and baby. At birth, boys are about 30 percent more likely than girls to receive a low Apgar score, which is a measure of a newborn's color, breathing, and cardiovascular function that indicates how well the baby fared during the birthing process and how the baby is adjusting to life outside the womb. Newborn boys also score a bit lower than girls do

on the Brazelton scale, which is a more thorough assessment that measures many aspects of neurological maturity.

All of this should sound a bit familiar by now. As we saw in the last chapter, male vulnerability—both physical and emotional—is a common theme in early development. From conception through at least four years of age, boys have a rougher time fighting off infections, adapting to new environments, and generally overcoming the many hurdles that threaten early growth. Some of this vulnerability has to do with their larger size, but it's also a reflection of more specific physiological differences, such as boys' higher metabolic rates and less mature lung function at birth.

Happily, my boys fared fine during childbirth, but I learned that larger infants are indeed harder to deliver. Both Sam and Toby weighed in at close to nine and a half pounds at birth; compare that to their eight-pound sister. I'd say it's at least twice as painful to push out that extra pound and a half of baby!

With bigger bodies come bigger heads. Boys' heads are about one centimeter (four-tenths of an inch) larger than girls' at birth and about one and a half centimeters (six-tenths of an inch) larger by four years of age. Pediatricians still use head circumference as a quick check for how well a child's brain is growing; wrap a tape measure around the head and you can get a rough idea of how big the brain is. And just as they use different growth charts for boys' and girls' heights and weights, pediatricians use different graphs to track head size for boys and girls.

Parents of boys tend to get very excited about this fact: a bigger head indicates a bigger brain, so this must mean that boys are smarter, right? In fact, head circumference is a pretty inaccurate way of estimating brain size. Some people have more hair, thicker skulls, and so on, all of which tends to distort brain-size estimates. With the advent of MRI, we now have much better ways of measuring brain size, and in the last few years, scientists have been able to track sex differences in brain volume as children grow. One large study of children between four and eighteen years old confirms that boys' brains are about 9 percent larger than girls'. This is the same difference found between men and women. So males really do have larger brains, from birth onward, though it is not clear how this relates to the different mental abilities of the two sexes. (Boys also have larger kidneys than girls—even during the prepubertal age, when boys' and girls' heights and weights are indistinguishable—but no one seems to be arguing that this gives them better urinary function.)

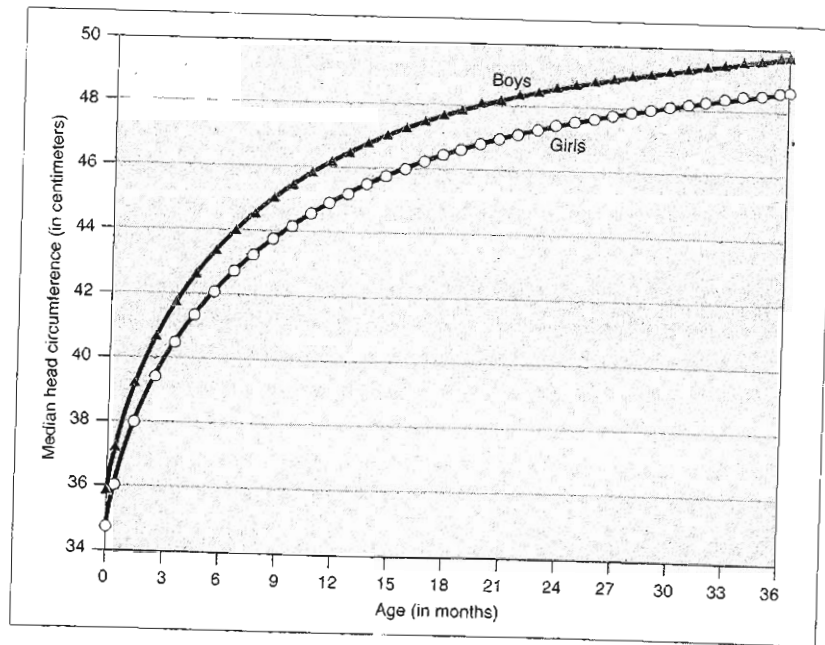


Figure 2.1. Median (50th percentile) head size of boys and girls from birth to age three. Data are from the Centers for Disease Control.

What boys have over girls in head size, girls appear to make up for in maturity. Girls develop faster, beginning from midgestation and ending with their earlier entry into puberty. At birth, their skeletal system is some four to six weeks more mature than boys'. Greater maturity is said to be the reason why infant girls handle labor, delivery, and early infancy better than boys and why in early life they are generally less vulnerable to most illnesses, including asthma and infections of the ear, respiratory system, and gastrointestinal tract.

When it comes to brain maturity, however, the evidence for girls' faster development is surprisingly weak. The easiest method for measuring brain activity, electroencephalography (EEG), has not demonstrated any global maturity advantage for girls. While one Swedish EEG study did find more mature cortical function in girls at birth, another found little sex difference at three months but a female maturity advantage emerging at six months. And, surprisingly, several studies of school-age children have reported more mature EEG patterns in boys, with girls not catching up until adolescence.

So it's not accurate to say that girls' brains are globally more mature than boys'. A likelier scenario is that *certain aspects* of brain function mature earlier in girls and, likewise, certain aspects mature earlier in boys. As infants, boys are typically a bit fussier and more irritable than girls, suggesting that at birth, their nervous systems simply aren't as ready to tackle the transition from their quiet, protected wombs to a noisy, complex world. But the truth is that there is no simple neurological explanation for why boys are at greater risk for the many developmental disorders involving the brain.

Sensory Differences

Do boys and girls differ in their basic sensory abilities at birth? Babies learn primarily through their senses, so any differences here could, in principle, launch the two sexes down very different developmental roads. The physician and author Leonard Sax has built his movement for single-sex education based in large measure on the idea that girls and boys see and hear differently from birth. But a close look at the research on sensory differences in newborns reveals that they are small and of little relevance to children's learning.

Consider tactile ability. In 1974 psychologists Eleanor Maccoby and Carol Jacklin reviewed all the existing studies of newborn touch sensitivity in their landmark tome *The Psychology of Sex Differences*. Newborn girls were found to be more sensitive than boys in five out of thirteen different experiments, while there was no sex difference found in the other eight experiments. Not exactly overwhelming evidence for an innate sex difference in the response to touch, nor has more recent research revealed any dramatic differences between newborn boys and girls.

The findings are similar for pain. Although studies of adults generally find that women have a lower *tolerance* for pain than men, studies of pain *threshold*—the lowest intensity at which a stimulus is perceived as painful—have not revealed any reliable differences. Pain perception is notoriously subjective, strongly influenced by both prior experience and an individual's own sense of "toughness." So it's important to analyze responses to this sensation in newborns, who are blissfully free of such cultural expectations.

In one study of two-day-old infants, girls made more dramatic facial responses than boys did during the heel stick used for routine newborn

blood screening. However, there was no difference between boys and girls on another measure of pain that takes into account not only facial response but also crying, arousal, limb position, and breathing patterns. So either girls are more sensitive to pain than boys or they're simply more likely to express it on their faces. The latter conclusion seems to be the right one, based on recent research by Swedish scientists, who devised a fancy, noninvasive way of gauging brain activity by using infrared light to measure cerebral blood flow right through the skull. Surprisingly, this team found that it was the boys who exhibited greater cortical activation during the heel-stick procedure, suggesting they feel pain at least as well as the girls.

Misperceptions about boys' pain sensitivity have important consequences. Many newborn boys still undergo circumcision without any anesthetic, even though physiological measures tell us it is very painful: their heart rates accelerate and the stress hormone cortisol rushes through their bloodstream. The American Academy of Pediatrics appreciates this fact and recommends that all boys undergoing circumcision receive either a topical anesthetic or, preferably, an injection of a numbing agent prior to the procedure. But while young obstetricians, family practice doctors, and pediatricians are currently being trained to do this, many older doctors continue to circumcise boys without any pain relief. Some 65 percent of boys in the United States are circumcised at birth (versus about 15 percent worldwide). This fact raises a crucial issue when considering any reported difference between the sexes in the behavior of newborn boys and girls: whether differences in sensory responsiveness, fussiness, social interest, and so on are truly innate or are a consequence of boys' suffering from their recent circumcisions.

Surprisingly little of the research has controlled for this important variable, though there is one study—of olfactory perception—that included a comparison of circumcised and uncircumcised newborn boys. Psychologists at Vanderbilt University introduced one-day-old babies, both boys and girls, to a pleasant odor, either ginger or cherry. An hour after that, the baby was presented with both odors, each one soaked into a gauze pad and placed on either side of the bassinet. The girls in this study showed a consistent preference for the familiar odor—they would turn their heads toward the cherry scent, for example, if that was the one they had smelled an hour earlier. By contrast, boys turned their heads to the right, no matter which scent was on that side of the bassinet. (Most babies, male and female, do show a right-head-turning bias, which is

thought to predict later hand preference.) This study hints that newborn girls can smell or remember scents better than newborn boys can, whether or not those boys are circumcised. Similarly, another study of two-week-old infants found that girls preferentially turned their heads toward a breast pad that had previously been worn by a lactating woman. Remarkably enough (considering their later interest), boys showed no such preference for breast-milk odor over the odor of a clean nursing pad. So it seems that newborn boys, like males of all ages, have a less sensitive sense of smell than girls, although once again, recent measurements of newborns' cerebral blood flow revealed no sex difference in frontal-lobe activity when boys and girls were presented with strong odors.

Now let's consider the sense of hearing. While scientists have documented all kinds of auditory differences between men and women—some favoring one sex, some the other—these are generally too slight to have any impact on real-world hearing abilities. On the one hand, women's threshold for hearing is about 3 decibels lower (that is, more sensitive) than men's; while 3 decibels corresponds to a doubling of sound pressure level (because decibels are measured on a logarithmic scale), it is nonetheless a trivial difference in the real world, where most sounds are well above threshold and range across a scale of some 130 decibels. On the other hand, men are better at localizing sounds in space, a difference that is explained mostly by their larger heads.* Auditory differences between the sexes have also been measured using EEGs, where a particular brain-stem response to sound stimuli, known as wave V, is both larger and faster in women.

So what about babies? Are auditory differences present at birth? Researchers have indeed found that newborn girls and adult women both have the same faster wave V response, but the effect is small, with a *d* value of 0.26, meaning the average girl's response is faster than about 60 percent of boys'. What's more, another study found that the threshold for this response—the lowest level of sound that triggers wave V—was actually lower, or more sensitive, in newborn boys, just the opposite of what you'd expect from either the sex difference in adults or the EEG latency data.

There is, however, one unambiguous auditory difference between

* The brain calculates sound-origin location by comparing the difference in time at which a particular sound arrives at each of the two ears. Because men have larger heads, their ears are farther apart, increasing their ability to resolve slight timing differences between the ears.

girls and boys from birth. This shows up in the otoacoustic emission test introduced in the last chapter; it screens for hearing deficits, and most newborns now receive it in the hospital within the first day or two of life. OAEs are sounds generated by the tiny hair cells of the inner ear. You can't hear them with your naked ear, but sensitive earphones can pick them up and give a wonderfully accurate view of babies' auditory function, well before the age when children can actually tell you what they hear.

Many studies have now confirmed that from birth to adulthood, OAEs are slightly larger in females than in males. A notable exception is the group of girls who have twin brothers; their OAEs fall in the typical male range (suggesting some influence on the developing auditory system by prenatal testosterone or another male factor). But while OAEs are a great way of testing the integrity of a baby's inner ear organ, they do not translate directly to hearing ability. In fact, girls' approximately 1 decibel louder OAEs can be explained by the shorter length of the female cochlea, the inner ear's snail-shell-like coil in which sounds are converted to electrical signals. What's more, the sex difference is so small (with a d value of about 0.15), it doesn't even warrant separate OAE standards for boys and girls when screening for hearing deficits.

It's therefore disingenuous to suggest, as Leonard Sax does in his book *Why Gender Matters*, that "these built-in gender differences in hearing have real consequences." Based on the small differences in auditory thresholds and wave V latency, Sax claims that girls hear shouting when their dads speak to them in a normal tone of voice, and he advises teachers to seat the boys in the front of a classroom (where the teacher's voice is loudest) and the girls in the back. Or better yet, Sax advocates, send them to separate schools, where teachers can whisper to the girls and yell at the boys.

But if you really want to test the built-in hearing abilities of boys and girls, you need to test babies, using real-world stimuli and behavioral measures that reveal how infants are actually perceiving this cochlear and brain-stem processing. Happily, this was done more than thirty years ago, in data reviewed by Maccoby and Jacklin (but notably overlooked by Leonard Sax). Maccoby and Jacklin examined the existing research on newborns' hearing ability and found that in only one of six studies did girls respond more overtly than boys to auditory stimuli. The results were no different for older infants, leading them to conclude: "The bulk

of the evidence over the period from birth to 13 months shows that the sexes are highly similar in their attentiveness to auditory stimulation."

Maccoby and Jacklin's conclusions were the same for vision, the one sense in adults that is generally sharper in men than women. In nine different studies, involving nearly four hundred newborns, no differences were detected between boys' and girls' attention to checkerboards, colored lights, swinging objects, faces, geometric designs, and other stimuli. In another fifty-four experiments (published in thirty-three papers) involving babies between one and twelve months of age, girls were more visually attentive in nine experiments, boys in a different nine, and there were no sex differences in the remaining thirty-six experiments.

So the common belief that baby boys are more visual than girls is untrue. If anything, girls' visual systems develop a few weeks earlier than boys', based on EEG measurements and a handful of other recent studies. One of the more intriguing found that girls' stereovision emerges about three weeks earlier, on average, than boys'. Stereovision is the ability to fuse the images from each eye into a three-dimensional picture. It's critical for depth perception but not present in babies at birth. However, this 3-D perception pops up quite rapidly between three and five months of age, turning babies into highly visual creatures.

This particular ability is known to depend on the cerebral cortex, so the difference in onset between the sexes suggests that a girl's visual cortex matures about three weeks ahead of a boy's. There's even a hint that testosterone may contribute to this difference, based on a preliminary study that found a correlation between the hormone's level in baby boys' blood and their ability to fuse images.

Put all of this information together, and it's clear that at birth, boys and girls do not differ dramatically in their perceptual abilities. Although girls, like adult women, appear more sensitive to tactile and olfactory cues, the differences are quite small, and the more dominant senses, hearing and vision, do not differ meaningfully between young boys and girls. So it's a mistake to generalize, as many do, that boys learn through their eyes and girls through their ears. In fact, research by Carolyn Rovee-Collier and her colleagues at Rutgers University using various kinds of stimuli has uncovered no evidence for sex differences in infants' learning or memory. As we've seen, girls are actually more visual than boys in early infancy, and boys clearly learn a tremendous amount

through verbal and other auditory input. Normal-developing boys and girls are *both* eminently capable of learning through either sensory channel and indeed should be encouraged to exercise all senses, especially in infancy, when every mental advance has such a cumulative effect on later learning.

Motor Skills

Baby Jack is working so hard to lift his head and look around. Only six weeks old and used to sleeping on his back, Jackie starts fussing when his mom puts him face-down on his colorful play mat for some “tummy time.” To turn his head, he first has to lift it, not an easy feat for the little eleven-pounder, whose weight resides disproportionately in that well-protected cranium. But he’s getting close. Finally! He manages to raise his chin an inch above the mat and turn his head to the opposite side; then he collapses, exhausted, but with a brand-new view of the world around him.

Motor skills are the most obvious proof of a baby’s development. Compared to their more private sensory skills, babies’ motor abilities are right out there for all to see (and parents to obsess about). Whether it’s a newborn working on his head control or a one-year-old trying to take her first steps, parents pay more attention to their babies’ motor skills than to any other aspect of their development.

So how much do boys and girls differ in their motor development during infancy? Surprisingly little. You might expect girls to take the lead here, considering their greater sensory and physiological maturity. Girls are sometimes described as ahead in fine motor control, the ability to move their fingers in a purposeful way, though there is no sex difference in onset of the pincer grasp, the ability to hold a small object, such as a Cheerio, between the thumb and forefinger. Some studies give boys a slight advantage in other skills, such as crawling and grip strength. But for the most part, there are very few sex differences in motor development. So few, in fact, that pediatricians don’t bother with separate charts for boys’ and girls’ motor milestones, in contrast to their separate charts for physical growth. Even the two most widely used checklists of infant development, the Denver Developmental Screening Test and the Bayley Scales of Infant Development, have not revealed any sex differences in motor achievement. On average, boys and girls master the same skills, in

the same sequence, at the same ages after birth: rolling over in the fourth month, sitting in the seventh month, and walking at right around twelve months. My own children, though hardly a scientific sample, confirm this last statistic: Julia first walked at twelve and a half months, roughly in between Toby (twelve months) and Sam (fourteen months).

One difference that does show up at birth concerns symmetry of movement. When a baby is born, the pediatrician tests a number of reflexes that are good indicators of a baby’s overall health and development. And one feature that clinicians look for in these reflexes is symmetry: both sides of the body responding equally to the same stimulus. No child or adult is perfectly symmetrical. In fact, there are hints of later hand preference in the bias that most babies, male and female, show for turning their heads to the right side. But boys are more asymmetric than girls in certain reflexes involving the legs and feet, including the plantar grasp (gripping with the toes, one of several primitive newborn reflexes apparently left over from our ape ancestors). Such asymmetry, or lateralization (a difference between the two sides of the body), is also more prevalent in adult males, so this finding supports the idea that the male nervous system is innately more lateralized.

But beyond these minor differences, the striking fact about motor development in infancy is that it does *not* differ between boys and girls. Considering that girls are perhaps a month or so more mature in other functions, one way to think about this similarity is that boys actually have a motor advantage. That is, boys manage to hold their own in motor development despite their generally greater immaturity.

Size may be one factor keeping boys on par with girls. The fact that boys are bigger and heavier may help stabilize them better for weight-bearing skills such as standing and walking. Another advantage comes in boys’ higher activity levels. Though this difference becomes more pronounced later in childhood, it begins in infancy, when male infants are found to kick, punch, and, eventually, move around the house more than female infants. Like all athletic feats, motor milestones depend heavily on practice. Babies don’t just lie around waiting to roll over. They spend weeks pushing up, strengthening their arm and neck muscles, and learning to balance those big heads. Boys’ greater activity level may mean that they give themselves more practice from an earlier age, overcoming their slower maturation to keep pace with girls’ advancing movement abilities.

But parents are another important factor in boys' and girls' comparative motor development. Research shows that parents often place a higher premium on their sons' physical development than their daughters'. The difference becomes quite obvious by Little League age, but it's evident even in infancy. In one study, moms and their eleven-month-old babies were brought into the lab to teach the babies a new motor skill: crawling down a carpeted slope. In the first part of the experiment, the mothers were shown the sloped walkway, which was rigged with a hinge to adjust the angle of the slope. By pushing a button, a mom could change the angle to the maximum slope she judged her baby capable of crawling down. In the second part of the experiment, the babies were tested to see how steep a slope they were willing and able to crawl down regardless of their mothers' judgments.

The results of this study were eye-opening. Boys and girls did not differ in the steepness of the slope they were able to crawl down. Girls attempted and successfully descended slopes ranging in angle from 10 degrees to

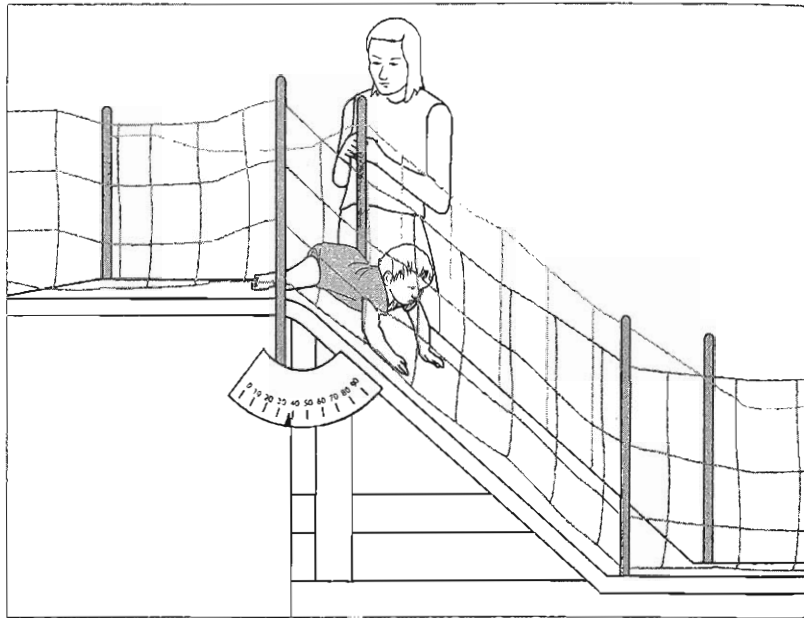


Figure 2.2. Setup for infant-crawling experiment. Mothers estimated the slope their babies would tolerate crawling down, and then boys and girls were tested on their ability and willingness to crawl down different slopes.

46 degrees, while boys attempted slopes between 12 and 38 degrees and successfully navigated those up to 30 degrees. So this study revealed no sex difference; if anything, infant girls had greater courage than boys for crawling down steep slopes. Mothers, however, had assumed just the opposite. While the mothers of boys were within 1 degree of accuracy in predicting their sons' slope-crawling abilities, mothers of girls underestimated their daughters' abilities by an average of 9 degrees.

Are mothers therefore the culprits in limiting girls' athletic prowess? This study does suggest that parents, aware of physical differences in older boys and girls, set up different motor expectations for their sons and daughters, even in infancy. So here is a place where parents can step in and challenge their daughters physically rather than hold them back. Moms who sign up their sons for infant gym classes—"because he's so active"—must be careful not to overlook their daughters, who may benefit even more. We may not be able to flip men's and women's Olympic records, but there is certainly more we can do to increase girls' physical confidence and fitness.

Language

"Girls talk earlier than boys." If there is one mantra most people can recite about sex differences in infants, this is it. And it is accurate, though like most gender traits, the difference is small and there are many exceptions to this rule. (Our own Sam was the earliest of our three babies to talk—and the chattiest—even compared with his sister.) The finding is present in rhesus monkeys as well; their female infants vocalize more and become fluent at an earlier age than their male infants, a difference that's known to be influenced by prenatal testosterone. So there may indeed be something innate about the sex difference in age of vocalization, though it's a long way from a few instinctive coos and cries to a fully fluent vocabulary. Much more important, for parents of sons and parents of daughters, is to appreciate how remarkably early language learning begins and how a baby's language exposure, from even the first days of life, crucially influences his or her eventual verbal ability.

Most babies manage to say their first real words* close to their first birthday. The typical girl, however, will tend to blurt out a *hi* or a *baba*

* Sadly, researchers don't count *mama* or *dada* as valid first words.

(for “bottle”) about a month earlier than the typical boy will. As parents, we pay a lot of attention to these first words. We write them down in the baby books, call the grandparents, and have lots of fun finally conversing, albeit in single words, with our babies. But first words are not the true beginning of communication. Babies begin much, much earlier to inform us of how they’re feeling—by crying, squealing, making eye contact, and pointing and other gestures. What’s more, babies perceive and understand language a long time before they’re able to make themselves understood. As we now know, language learning begins at birth, if not before, and sex differences in language, which are among the earliest of the cognitive differences between the sexes, have been found as early as researchers can study them.

Seven-pound Ellie lies comfortably sleeping in a reclining infant seat, oblivious to the measuring devices adhered painlessly to her fuzzy head. She’s cooperating beautifully for a research study in the hospital where she was born a mere twenty-one hours ago. As she rests, a loudspeaker located a few feet above her plays simple repeated speech sounds, *ba* and *ga*, in a varied order. Ellie is sleeping peacefully, but nonetheless, her ears take in all the sounds, convert them to electrical signals, and send them up to her brain, where the sensitive electrodes record some rather remarkable findings.

Newborns can tell the difference between speech and other forms of sound. Already, their little left hemispheres devote more effort to processing speech than their right hemispheres do. Other sorts of sounds, like bells or barks, do not get such preferential neural treatment, which tells us that even before birth, the brain is specialized to perceive language.

However, girls’ and boys’ brains do not handle language identically. When one-day-old Jacob is given the same test at the hospital, his sleeping brain produces a different pattern of brain waves. Researchers do not agree on exactly how boys and girls differ at this young stage: one early study said that baby girls’ brains are more lateralized, or left-biased, for processing language, a seemingly more mature pattern since most adults process language more with their left hemispheres. However, this frequently cited study has been disputed, while a very recent study of four-week-old babies found exactly the opposite result—stronger left-hemisphere activation in boys. In fact, studies of newborn auditory function indicate that boys, not girls, are more lateralized, producing

stronger otoacoustic emissions in the right ear and also showing a lower threshold, or higher sensitivity, for perceiving sounds with the right ear than the left. Because most auditory information crosses the brain on its way up from the ears, a right-ear advantage for perceiving sounds corresponds to a left-brain advantage. Adult males may be modestly more left-hemisphere dominant for language than women (see chapter 5). So this greater lateralization in newborn boys’ hearing suggests that they do not get as even an exposure to language as girls do, perhaps paving the way for later differences in verbal and written language skills.

Infancy is, by definition, a preverbal phase in development. (The Latin word *infans* means “without language.”) And yet, we now know that babies learn a tremendous amount about language during the first year of life. Most of their growth is in the realm of understanding, or receptive, language. Although it’s rarely obvious to parents, babies manage to recognize familiar speech sounds, words, and even grammatical patterns, all within the first year of life. Speech therapists appreciate the importance of receptive language to overall communicative development. While parents worry most if their toddler is late to talk, clinicians focus more on receptive-language skills to determine whether a child is language delayed.

In one large study of early language development, researchers at San Diego State University documented slight, but significant, differences between boys’ and girls’ receptive-language development. Female infants are about a month ahead of boys in the number of words they understand. The typical nine-month-old girl understands about fifty words, such as *no*, *dog*, *bath*, *bottle*, and the like. The typical boy reaches this vocabulary size at ten months of age (see Figure 2.3).

A similar difference turns up in babies’ early gesturing, a big part of communicative development. Many scientists believe speech evolved from gesture—that our progenitors “spoke” with their hands before using their vocal tracts.* Babies too gesture before they speak, a discovery that inspired all the popular sign-with-your-baby books and videos that teach parents how to use gesture to encourage their infants’ communicative development.

* This manual origin of speech might explain how language came to be localized in the brain’s left hemisphere, which controls movement of the (usually) dominant right hand.

Girls lead boys in the number of gestures they produce during later infancy. On average, they begin pointing, waving bye-bye, and raising their arms to be picked up a few weeks earlier than boys. Again, their advantage is rather small; in one large Swedish study, eighteen-month-old girls were found to produce just 5 percent more gestures than boys. However, some of the gestures babies make are already sex-typed: female babies between eight and sixteen months old are more likely than boys are to imitate parenting behaviors such as hugging or rocking a doll; boys in this age range pretend they are reading, driving a car, or pounding with a hammer.

After gestures come words, babies' first true expressive language. Girls maintain their small lead in expressive language throughout the toddler period, producing an average of three hundred different words by twenty-two months old, while boys get to this mark at twenty-three or twenty-four months.

After age two, children truly begin to talk—combining words into little sentences such as *Mommy home. More milk. Let's go park.* Here again, girls take the lead: by two and a half years old, girls are stringing together about eight words at a time, boys about six. From their first emergence, girls' sentences are longer and more complex than boys', a difference that holds throughout the preschool period.

These differences are reliable but really quite small. Compared to the overall range of language ability in young children, the average difference between girls and boys is tiny, accounting for just 1 to 2 percent of this total variance. Consequently, you can find many boys who are more verbal than the average girl, and lots of girls who are less verbal than the average boy. In practical terms, the very small magnitude of this gender difference means that parents should be just as concerned about a son's slow language development as a daughter's. Being male is no excuse for talking late (in spite of what many pediatricians tell parents).

There is ample reason for parents to pay close attention to their children's language development. Whereas language ability is only subtly affected by a child's gender, it is strongly affected by his or her environment. Study after study has now confirmed this startlingly simple equation: Language in = Language out. From the moment of birth, the amount and quality of language addressed to babies directly influences the quantity and quality of the babies' own verbal ability. Researchers have documented this relationship through painstaking studies: visiting

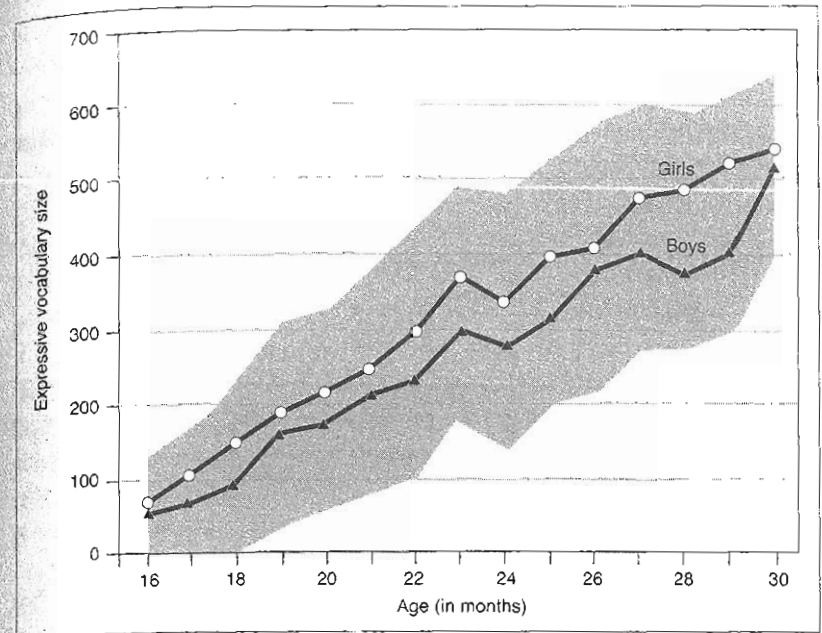


Figure 2.3. Girls lead boys by about a month in the number of words they can say, but the difference between sexes is much smaller than the normal range for all toddlers, two-thirds of whom fall within the shaded region. Data are based on more than eighteen hundred children as reported by Larry Fenson and colleagues.

families' homes and counting literally every word spoken from parent to child. By analyzing hours and hours of audio recordings, these studies were able to show significant correlations between the amount of language addressed to young children and those children's later vocabularies and other skills, including reading ability. The input doesn't have to be all talk; songs, stories, poems, and nursery rhymes are as good as or better than conversation. But it does have to be live: TV, DVDs, and recorded music simply don't provide the kind of feedback and encouragement children need to best develop language skills.

In other words, while boys may be at a slight disadvantage when it comes to language development, there is enormous opportunity to improve the verbal skills of every child, male or female. All it takes is talk: conversing, reading, singing, and generally narrating the events of the day can provide *both* boys and girls the optimal experience to hone the brain circuits that underlie language. Given their slight verbal and audi-

tory advantages and, possibly, their stronger social inclination, girls may participate in such exchanges more readily. All the more reason to engage your son in conversation from an early age, bathing his brain in the sounds, words, and grammar that will improve his speech and pave the way to better reading and writing skills later in childhood.

Social and Emotional Differences

Babies are instinctively social. Here he is, just three hours old, his head still a bit squished from his journey out of the birth canal, but tiny Daniel is already gazing deeply into his mother's eyes. His big dark pupils (dilated from the lingering stress hormones released by his body during birth) draw her in, like powerful magnets penetrating the mystery of his new being. Daniel's interest in his mother's face is especially remarkable when you remember how poor a baby's vision is at this stage. But it makes tremendous sense from a survival standpoint. Newborns are ultimately helpless without their parents' care, and eye contact—that deep, pupil-to-pupil gaze that only intimate couples can comfortably sustain—is probably the quickest way to get their dads and moms to fall in love with them.

Considering the importance of this early eye contact, it is not surprising that newborn boys and girls engage in it equally. Although one 1979 study found that girls held eye contact longer than boys, a larger 2004 study found no sex difference in the newborn period. Both studies were carried out blind—that is, the experimenters were deliberately kept unaware of each infant's sex, and all the pink-or-blue cues, such as balloons and gender-coded diapers, were carefully removed from the hospital rooms.

But wait a minute. Aren't girls supposed to be innately more people oriented than boys are? This idea has gained a lot of currency in the last few years, but it is based largely on a single study. Maybe you heard about it: it was carried out by a team of psychologists led by the University of Cambridge's Simon Baron-Cohen (not to be confused with his cousin Sacha Baron-Cohen, of *Borat* fame). The experimenters presented newborn babies with a visual choice: they could look at a live human face or at a colorful mobile with a little ball hanging down from it. One hundred and two newborn babies were tested in their hospital rooms the day after birth. And guess what: the boys spent more time looking at the mo-

bile, while the girls looked longer at the live human face. The difference was not large: boys spent an average of 52 percent of their time looking at the mobile and 46 percent looking at the face, while girls split their time 41 percent and 49 percent between the mobile and the face. (Girls must have been looking elsewhere for the remaining 10 percent of the time.) But it was statistically significant, which somehow emboldened the researchers to state in their peer-reviewed article that the results “demonstrate beyond a reasonable doubt that these differences are, in part, biological in origin.”*

Since it was published, in the year 2000, this experiment has been hailed by seemingly every commentator on sex differences: Leonard Sax, Louann Brizendine, Steven Pinker and his sister Susan Pinker, among others. It's been taken as proof that girls are pre-wired for social interaction and boys are pre-wired for objects and mechanical interests and its results extrapolated to explain later gaps in language, empathy, math, engineering—pretty much every social and cognitive sex difference ever described.

But there are some problems with this study that should urge a little more restraint. The most serious, to my mind, is the fact that the person whose face the babies were looking at, lead author Jennifer Connellan, was not always blind to the sex of the babies at whom she was smiling. As we've seen, researchers studying newborns have to be very careful to remove (or have others hide) all gender cues in the hospital room so that they do not unwittingly bias babies' behavior; for instance, by unintentionally making more eye contact with girl babies than boy babies. Another problem is that neither Baron-Cohen's group nor any other researcher has replicated the results of the study, even some nine years after its original publication.

And the results really need to be replicated, because as Elizabeth Spelke, a Harvard psychologist who has studied infant cognition for decades, has observed, it stands in opposition to many similar studies that have looked for but failed to find evidence for sex differences in object and motion perception. In 1996, for instance, Canadian researchers found that at eleven weeks of age, both boys and girls gazed longer at a

* Once again, the claim that any behavior is *biological* is hardly earthshattering (because all behavior, both learned and instinctive, is controlled by our biological brains), but the authors seem to be using this term to mean “innate” or “hard-wired,” which is how it has been construed by several commentators.

toy (a colorful mobile with small bells) than at their own mothers' live faces. Another study found that boys, not girls, paid greater attention to faces than to geometric displays. In fact, there was a much greater flurry of research in this area some years ago, from which Maccoby and Jacklin concluded that "there is no evidence that girls are more interested in social, boys in non-social stimuli."

So I'm not convinced that, as Louann Brizendine asserts, "girls, not boys, come out wired for mutual gazing." Nor is there any evidence, as she also states in *The Female Brain*, that boys' "testosterone surge in utero . . . shrinks the centers for communication, observation, and processing of emotion." If anything, existing data suggest testosterone grows the one structure most strongly associated with the recognition of faces and emotional expression—the amygdala—though this finding is based on research in rats and monkeys.

The amygdala is part of the limbic system, a complex network of conscious and subconscious brain zones that controls our rich social and emotional lives. But while girls do not necessarily pop out of the womb more socially wired than boys, there is another sex difference that hints at an innate difference in the limbic system.

The difference is fussiness. In contrast to their more stoic adult selves, infant males are actually the more emotional of the two sexes. As we've seen, boys are more irritable, more easily distressed, and harder to soothe than girl babies. They startle, cry, and grimace more often, at least during the newborn period, and take longer than girls to establish a stable sleeping pattern. Once again, these differences have mostly been described by examiners who weren't blind to the sexes of the babies, and some studies have failed to detect any sex differences in newborn irritability or consolability. But overall, a difference in emotional fragility appears more reliable than any social sex difference in newborns, and one study even found a possible physiological basis for it: compared to girls, newborn boys produced a greater surge in the stress hormone cortisol when they were disturbed by a surprising stimulus or an unwanted social advance. The release of cortisol is ultimately governed by the hypothalamus, the one part of the limbic brain most clearly shaped by prenatal testosterone. Since irritability and stress reactivity are also greater in preterm than in full-term neonates, this sex difference supports the idea that a boy's hypothalamic-endocrine system, along with the autonomic

nervous system that it governs, are less mature than a girl's at birth.

Parents may not be aware of this sex difference in fussiness, but it almost certainly influences the way we interact with our newborns, helping to shape some of the more obvious social-emotional differences that emerge later in infancy. Baby boys are generally not as "easy" as baby girls (though there are, as always, many exceptions to this generalization). I remember well the exhaustion I felt when Sam came along. Julia had been such a good baby, such a breeze to care for, but Sammy would fuss every few minutes. It seemed like I was always nursing him, holding him, or carrying him around in a sling or backpack. (Toby was somewhere between the two in fussiness.)

And it's not just me: Rutgers University researchers Jeanette Haviland and Carol Malatesta found that parents (particularly mothers) do work harder to manage the emotions of their infant sons. While it's easy to respond more positively to girls—since they are already a bit happier—parents may respond more negatively to boys, shushing them or ignoring their cranky bouts in an effort to dampen them. While their goal is to protect boys from their own emotional overload, the actual result may be to send a negative message to boys about their expressiveness, deterring further social interactions and contributing to the later suppression of emotion that is more characteristic of boys' development.

Whatever the cause, boys and girls do start diverging in their social responses over the next few months of life. The 2004 study that found no sex difference in newborns' eye contact found a very different pattern when the experiment was repeated with the same infants four months later. Boys had increased their eye contact only slightly, but girls had increased it more than four-fold! A similar increase in mother-daughter gazing was found during the third month of life in a 2002 Italian study that tracked boys' and girls' face-to-face communication from birth. In fact, baby boys begin to do something quite different over this period: they avert their gaze. Gaze aversion is the tendency everyone has to look away from an oncoming person when walking down the street or a grocery aisle, thus avoiding any awkward social engagement. Both sexes do it, but males of all ages resort to gaze aversion more frequently than females do.

Between three and six months of age, girls and boys also begin diverging in the variety of facial expressions they display. Although both sexes spend roughly equal amounts of time looking happy, sad, and angry, girls

in this age range show the raised eyebrows, relaxed mouth, and wiggly tongue that express *interest* more often than boys do. And, while Haviland and Malatesta found encouraging evidence that mothers are almost equally attentive to the emotions of baby boys and baby girls, their careful analysis did reveal a conspicuous lack of response to boys' expressions of pain, while another study found that mothers of girls tend to ignore their expressions of anger.

So while differences between the sexes in sociability and emotional expression are not obvious at birth, they grow significantly during early infancy. The differences probably originate in boys' greater fussiness and immaturity, but they are amplified by the way that parents respond to these differences, as well as our preconceived notions of what boys and girls are like. By ignoring boys' expressions of pain, mothers may be trying to "toughen up" their sons, while by ignoring girls' expressions of anger, mothers may be attempting to dampen their assertiveness. The fact that the sex difference in eye contact is not present at birth but emerges after a few months supports the idea that it is shaped, at least to some degree, by parents' different styles of interaction with boys and girls.

Are Baby Girls More Empathetic?

In 1971, psychologist Marvin Simner wanted to figure out if newborn babies were capable of empathy. So he set up shop in a quiet room next to the neonatal nursery at the Lying-in Hospital in Providence, Rhode Island. There he tested individual babies to see how each responded to a simple social stimulus—a brief audio clip of another newborn crying. Simner discovered that babies do indeed cry in response to one another, but he also observed that after hearing the tape, female newborns cried longer than males. Statistically, the sex difference was quite marginal, but the fact that girls outcried the boys in four different repetitions of the test, as well as in two later studies by other authors (where the effects were also not statistically significant), has been hailed as proving that girls are innately more empathetic than boys.

Now, it's a long stretch from this imitative crying to conscious recognition and sharing of another person's emotional experience. Nonetheless, a sex difference in empathy is one of the more reliable findings in adults: women outperform men at accurately deciphering whether

another person is displaying anger, fear, interest, and other emotions. There are some important caveats* to this rule, and the difference is not large, with a *d* value of about 0.40. But it raises the issue, as psychologist Baron-Cohen puts it, of whether "the female brain is predominantly hard-wired for empathy" and, conversely, whether boys have some innate deficiency in this area that renders them less fit for more interpersonally sensitive careers such as nurse, doctor, teacher, minister, social worker, and—oops!—psychologist.

Happily, there are actual data addressing this topic, based on about two dozen studies of babies' abilities to recognize or discriminate facial expression in others. As reviewed by Emory University psychologist Erin McClure, female infants are better than males at deciphering people's facial expressions, with a difference score of 0.26—smaller than the difference in adults but, surprisingly, *larger* than the difference during later childhood, when it shrinks to a modest 0.16. McClure speculates that girls are indeed more capable of detecting others' emotions in infancy, but their advantage is mostly a matter of neurological maturation. Just as their sensory and language skills are slightly ahead of boys' at birth, so girls' brains may be sufficiently more mature in infancy to enhance their awareness of other people and their facial expressions. With time, and experience with other people, the gap closes, and boys and girls are not so different in their sensitivity to others' feelings during the rest of childhood.

It's true, then, that girls are more empathetic than boys. But the difference is small and clearly shaped by learning. It is not the fixed, black-and-white distinction that many people believe. Consider this, from Louann Brizendine:

Anyone who has raised boys and girls or watched them grow up can see that they develop differently, especially that baby girls will connect emotionally in ways that baby boys don't.

* The size of the sex difference in empathy depends on how it's tested. Women are likelier than men to say they feel sorry or guilty about another person's experience, but the difference is much smaller when empathy is tested using more objective measures, such as identifying the emotion on another person's face. What's more, the ability to recognize others' emotions also depends on who is looking at whom. Men are better at detecting emotion on men's faces than on women's, while women perform about equally for men's and women's expressions (see chapter 7).

In fact, the d value of 0.26 in infants translates to about 60 percent of boys falling below the average girl in ability to detect emotion in other people. This means that 40 percent of baby boys are actually *more* attuned to other people's expressions than the average girl, and the proportion is even larger for older boys. Hardly a lack of emotional connection.

So Brizendine's statement is not only wrong, it's downright subversive. Imagine parents of a newborn boy *expecting* that they won't be able to bond with their son! Boys won't have a chance. As we've seen, parents already react differently to the emotional expressions of their very young sons and daughters. Telling them that their boys are not even equipped for emotional connection is only going to exacerbate this bias and further suppress boys' social-emotional development.

If anything, the small sex difference in a newborn's emotional awareness appears to be more a matter of timing than a fixed and permanent deficit. Neuroscientists have learned that the processing of facial expressions depends on a particular zone in the temporal lobe, known in monkeys as area TE. There is evidence that area TE develops more slowly in males than in females, and that this delay is due to testosterone. So, like other infant sex differences, girls' greater sensitivity to facial expressions may be a simple matter of a few extra weeks of neurological maturation—hardly enough to warrant an adjustment in parenting philosophy.

Emotional learning is a two-way street. Boys and girls enter the world with slight differences in social and emotional styles, but in reacting to these differences, parents end up training boys and girls in different ways. Girls' stronger social bias is highly reinforcing to parents and so becomes easily strengthened, while boys, who are less mature and consequently slightly less social and more fussy at birth, compel parents to a more cautious style of interaction, reinforcing boys' already weaker orientation toward other people.

The good news is that the small sex difference in emotionality and social responsiveness is not reflected in the depth of the bond between babies and their parents. Infant-parent attachment has been extensively studied over the past half a century, and there are no differences between boys and girls in the quality of attachment to either their mothers or fathers. So while boys and girls do begin differing in social style even early in infancy, this doesn't affect their fundamental connections to their parents or the sense of security the bond provides.

But parents aren't the only ones who interact with infants, and there is some research suggesting that boys may not fare quite as well as girls when they are cared for by other adults—either by babysitters or in daycare centers. Although most studies of daycare find few overall effects—either positive or negative—on children's development, there is some evidence that boys receive less positive caregiving in such settings, and even that infant daycare may impair boys' attachment to their parents. It has no effect on girls' attachment and may even benefit girls' cognitive development when compared to being home with their mothers. Considering that boys are both fussier and somewhat less social, they simply may not charm their caregivers as much as girls do, leading to less-positive interactions. While parents may be willing to go the extra distance with their sons, working harder to comfort and engage them, paid caregivers may not be so willing, or, given a choice between the girls and boys in the room, they may simply direct more of their attention in the pink direction . . . all of which could have a negative impact on boys' emotional and behavioral development.

Is Autism a Male Trait?

While the difference in empathy between boys and girls is relatively small, one glaring sex difference has pressed the idea that boys are innately less attuned to others than girls are: the high ratio of boys to girls in autism. This devastating disorder was not even identified until the mid-twentieth century but is now one of the most prevalent syndromes of childhood, diagnosed in 3.4 of every 1,000 children. And of these children, nearly 80 percent are boys.

Autistic disorders range in severity but share a core deficit: a lack of social awareness or understanding of other people's feelings and motives. Autism may be diagnosed as early as age two or, more typically, in the fourth year of life, although there may be some signs in the first year, such as a lack of shared gaze and joyful expressions. Children with autism (or its milder form, Asperger syndrome) fit Brizendine's stereotype of males being unable to connect with other people. Autistic children have difficulty communicating, making eye contact, and, especially, understanding that other people have thoughts and emotions different from their own. In other words, they lack empathy, and so the fact that three or four boys are diagnosed with autism to every girl with the dis-

order has suggested that boys are more vulnerable because their brains innately lack the circuitry for empathy.*

The strongest advocate of this view is Simon Baron-Cohen, who actually describes autism as the consequence of an “extreme male brain.” His theory is based on both the empathy and communication deficits of autism as well as the tendency for people with autism to demonstrate highly restricted interests—such as the compulsive calculating by Dustin Hoffman’s character in the film *Rain Man*. Baron-Cohen and his colleagues have constructed numerous questionnaires that probe these two dimensions—empathizer versus systematizer.† The questionnaires look like any battle-of-the-sexes game, and, not surprisingly, women do score higher on the empathizer scale and men higher on the systematizer scale. One problem, however, is that these scales rely on self-report instead of more objective measures of facial perception or analytic ability; in fact, men and women did not score significantly differently from each other on one of Baron-Cohen’s tests that required subjects to identify a person’s emotion based on a photograph that showed only the eye region of the face.

But the theory goes even further, suggesting that the same factor that makes a brain male is also what causes autism. Baron-Cohen and his colleague Rebecca Knickmeyer target the usual suspect: prenatal testosterone. In an ambitious research project, they measured testosterone in amniocentesis samples taken from dozens of women during midpregnancy. They then followed the babies to four years of age, when they tested the children for two autistic features, reduced empathy and restricted interests.

Their team has now published many articles on this project that have impressive-sounding titles, but the results are not so convincing when you read between the lines. While they have found that prenatal testosterone levels correlate with many measures—eye contact in infancy, vocabulary size in the second year, empathy and restricted interests in young children—these results often did not hold up when males and

* Then again, some experts believe that autism and Asperger syndrome may be underdiagnosed in girls, whose better language and mimicry abilities may mask the same underlying social deficit.

† The somewhat awkward term *systematizer* is supposed to encapsulate one’s tendency to focus on objects and how they are ordered or organized. A more accurate name for what this survey probes is *analytical* tendency.

females were analyzed separately. Obviously, boys are exposed to higher testosterone levels in utero than girls are, and boys, as we’ve seen, show less eye contact, smaller vocabularies, lower empathy scores, and more restricted interests. So, if you lump boys and girls together, you’re likely to find some correlation between testosterone and these various behaviors. (You’d also find a correlation between fetal testosterone and who’s wearing pink or blue Pampers, but that doesn’t mean the relationship is causal.) The real issue—and the way most studies of prenatal testosterone are conducted—is if the relationship between fetal testosterone and empathy is significant *within* either sex. For instance, if autism is caused by extreme testosterone exposure, then you would expect to find that boys with the highest prenatal testosterone levels are the ones who end up being diagnosed with the disorder, while boys with lower prenatal testosterone exposure would be diagnosed much less often.

This is not the case,* nor are autistic boys hypermale in any other sense, such as aggressiveness or body structure. These researchers have also yet to show a relationship between testosterone levels and empathy or systematizing measures within the population of girls alone. As we’ve seen from studies of girls with CAH (the genetic disorder that exposes them to high levels of male hormones), prenatal testosterone has been linked to certain masculine behaviors, such as a preference for trucks and balls, as well as to higher rates of lesbianism and bisexuality. However, girls with CAH are not any more likely to be diagnosed with autism than girls with normal prenatal testosterone exposure.

A last piece of Baron-Cohen’s extreme-male-brain theory concerns the brain itself. Recent research has identified several differences between the autistic and the normal brain, especially in areas known to be involved in social awareness and interaction, such as the amygdala. But the most definitive finding is the somewhat surprising *overgrowth* of the brain in the first year of life in children who are later diagnosed with autism. In other words, the brain is larger in autism (at least during the first year of life), and boys have larger brains than girls. So this observation is said to support the extreme-male-brain theory of autism.

But there is no evidence that prenatal testosterone is responsible for

* Very recently, Baron-Cohen’s group did report a correlation between fetal testosterone level and one measure of “autistic traits” that was significant within separate populations of boys and girls. However, none of these children, who were tested between six and ten years of age, actually suffers from autism.

the brain overgrowth in autism. For one thing, this overgrowth does not begin until at least a month or two *after* birth and is most dramatic between six and fourteen months of age. As we've seen, boys' head size is consistently larger than girls' from birth onward. If prenatal testosterone were causing the overgrowth, you would expect to find the extra brain volume present in autistic children at birth. In addition, girls with CAH do not have larger brains than normal girls, in spite of their exposure to excess testosterone and other androgens before birth.

So although prenatal testosterone may shape some of the social differences between boys and girls, it's a stretch to say that it causes autism. What, then, is responsible for this heartbreaking disorder?

The answer remains an agonizing mystery, especially for parents whose children suffer from it. Genes are the biggest factor, with heritability of autism estimated at between 60 and 90 percent. However, there is no single gene that causes autism, and the disorder appears to involve the interaction of many different genes. Nor is autism clearly linked to the X chromosome, unlike other disorders that occur primarily in boys (such as Duchenne's muscular dystrophy and colorblindness).^{*} Environmental influences, ranging from diet to TV exposure to the much-maligned vaccination program, have also been proposed. But none of these has been scientifically validated, nor do any purport to explain why autistic disorders are so much more common in boys.

There is, however, one thing we do know about autism, and that is that the earlier children are diagnosed and treated, the better their prognoses. The best treatment involves intense social interaction, as much as forty hours per week with a one-on-one therapist who encourages speech, eye contact, and other aspects of communication while motivating the child through play. It's an expensive proposition but well worth the effort for children who are not too severely affected and who begin such therapy early, preferably by age two. The reason for starting as young as possible is to wire in social and communicative circuits before the brain is taken over by the maladaptive repetitive behaviors and restricted interests that characterize older autistic children. In fact, new evidence suggests that a small percentage of children can even "recover" from autism if they're provided with this optimal early treatment.

^{*} An exception is the disorder known as fragile X syndrome, which is due to a mutation on the X chromosome and which is responsible for about 7 percent of autism cases.

So whether or not autism is caused by an extreme male brain, the treatment is the same as the solution to the gender gaps in language and empathy: early social immersion. Live engagement with responsive, sensitive caregivers is by far the most important experience any baby can have, and so a greater focus on this area by parents of boys—and especially those with a family risk for autism—is unquestionably beneficial.

How Parents Stereotype Their Baby Boys and Girls

There's another problem with this concept of autism as a symptom of maleness. Like any focus on extremes, it reinforces the same stereotype about boys that parents should be combating. Most boys are not autistic, and whatever the small differences in eye contact between boys and girls, boys' interpersonal skills will, like their verbal abilities, ultimately be acquired through learning. Telling parents that all boys are a little autistic by nature seems unlikely to promote this emotional tutelage.

Consider Steven, a thirty-four-year-old electrician who's thrilled to be a father. When his daughter, Meredith, was born, he couldn't wait to get home from work and hold her all evening, giving his wife a break during her all-too-brief maternity leave. Meredith would sleep peacefully on his chest, her warm little body emitting tiny sounds and the occasional little yelp to say it was time to move, or nurse, or have her diaper changed. Now they've got another baby, ten-month-old Kyle, and Steven interacts with him quite differently. Though he held Kyle plenty as a young infant, Steven can't get enough of tossing Kyle in the air and rolling balls across the floor to him, hoping it will translate into a passion for baseball or soccer in a few years.

Both types of interaction are great, but why should his daughter be treated in one way and his son in such a different way?

Boys and girls do differ subtly at birth, distinctions that contribute to the different ways parents interact with them. But moms and dads must also admit our own parts in fostering the social and emotional differences between boys and girls. Parents treat baby boys and girls differently, not only because they *are* different but also because of our pre-conceived notions of what it means to be male or female. Inevitably, we stereotype our babies, even when they're fresh out of the womb. Few of us are aware of this fact, and even those who are conscious of it find it difficult to avoid.

In one classic study, parents were asked to rate their newborns on

various attributes. Parents of girls tended to describe them as prettier, softer, more delicate, weaker, finer-featured, and less attentive than parents of boys described their infants, and fathers tended to more extreme characterizations than mothers. Of course, boys *are* larger than girls, so there is some basis for at least a few of these distinctions. However, some fascinating cross-dressing experiments have proven that the differences are less real than they appear in the eye of the beholder. Researchers have taken two approaches to address this issue: they disguise the babies' sex by dressing them in gender-neutral clothing; or they deliberately mislead adult subjects by calling a baby girl Jonathan or a boy Marie. In one such study, girls were described as angry or distressed by adults who thought they were boys more often than they were by adults who knew their true sex. Similarly, boys mislabeled as girls were more often seen as joyful or interested than they were when their sex was accurately revealed. Dozens of other gender-disguise studies confirm that people judge babies differently based on what sex they believe the babies are and regardless of the real sex under the diapers. In addition to rating babies' expressions and physical appearances differently, adults tend to choose different toys for each sex (footballs and hammers for babies they believe are boys, dolls and hairbrushes for those they think are girls) and to engage with them differently—interacting in more physical, expansive ways with boys and more nuanced, verbal ways with girls.

So for all our interest in raising strong girls and sensitive boys, parents still push gender distinctions from an early age. We find out our babies' sex as early as possible, so we can decorate their rooms in the appropriate hues and pick out the right birth announcements. We also receive different birth congratulations: according to one study, the cards parents receive for boys are likely to depict an active infant with balls or cars or sports equipment more suitable for an older child. Cards for baby girls tend to paint a more passive child, using adjectives such as *sweet* and *beautiful* and showing toys like rattles or mobiles that are more appropriate for a young child. So regardless of what parents profess to wish for them, our culture still values boys' strength and girls' appearance more than the other way around (except, perhaps, in Lake Wobegon).

The good news is that parents today are differentiating less between their baby boys and girls than they did a generation ago. For instance, a 1997 study of young women's responses to gender-disguised infants found little difference in the style of speech or amount they spoke to

“girls” or “boys.” The only significant difference was in their tendency to comment more on the physical activity of infants they thought were boys. A study published in 1995 found that parents perceived fewer differences between newborn boys and girls than parents in the 1970s had. Fathers, in particular, are shedding their stronger biases of a generation ago as they play an increasingly greater role in early infant care and discover that the stereotypes don't necessarily hold for their own children.

Parenting styles change quickly. Many of us would never dream of treating our children the way we were treated or of engaging in certain practices, such as spanking, that were once considered essential tools in child rearing.

Gender expectations are part of that change. While some parents maintain the traditional stereotypes and expectations for their children, many more are keeping an open mind, hoping to nurture both the masculine and feminine sides of their sons and daughters. This can only be to the children's benefit.

But parenting can take children only so far. When it comes to gender stereotypes, children are much less forgiving than adults in enforcing expectations for male-versus-female behavior. Why they're so tough on one another is anybody's guess, but there can be little doubt that their knowledge of gender stereotypes begins very early, and that their parents' examples are a big source of their learning.

What Do Babies Know About Gender?

If you thought infants were too young to be aware of gender differences, think again. Infants of all ages prefer the higher-pitched female voice to the deeper male voice, showing that they can tell the difference between male and female speech even shortly after birth. By three or four months of age, both boys and girls prefer to look at women's faces, even unfamiliar faces taken from a Land's End catalog. However, this holds true only when the mother is the primary caregiver. While most of the babies in this British study showed a preference for adult female faces, the small number of babies reared by stay-at-home fathers showed a preference for adult male faces.

These studies tell us that long before they consciously understand the concept of gender, babies begin to form their own stereotypes of male and female. Gender is just one of many categories babies figure out early

in life. Recent research has proven that infants also get the concepts of color, quantity, and animate/inanimate years before they have the awareness or words to express such generalizations. And they are particularly adept at conceptualizing opposites, with male/female perhaps the second dichotomy they grasp, preceded only by big/little.

In the case of gender, this unconscious understanding has a powerful influence on babies' development and self-concept. Babies learn an incredible amount through mimicry, and girls and boys begin to emulate the emotional expression, visual attention, and physical mannerisms of one or the other parent long before they consciously understand the male/female categories they are conforming to.

Gender is the first, most obvious, and often most significant attribute each of us shows the world. And infants understand much more about gender than we ever used to give them credit for. It is not long before this implicit understanding starts shaping their own behavior, actions, and emotional style, and boys and girls begin growing into the sex roles that they see modeled all around them.

In sum, social influences go both ways in molding boys and girls into their typical gender roles. Parents stereotype their babies based on a lifetime of experience with people of both sexes. And babies, in spite of their brief experience in the world, also begin to stereotype their parents, forming the concepts of male and female that will shape their behaviors and emerging gender identities. Socialization is obviously not the only factor making boys and girls different, but it is one that we can try to exert a little more deliberate control over, difficult though that might be.

Hormones and the Mini-Puberty of Infancy

Anna and Paul are both babies in the infant class at a gorgeous new child-care center. Anna is quite a talker, already pointing and babbling up a storm to anyone who comes her way. Paul is quieter but an insatiable climber, trying his hardest to reach the summit of every piece of furniture in the room. Ms. Kimberly, the lead teacher in the class, has seen all types in her many years of caring for babies, but she can't help remarking to Paul's parents, who notice the startling differences between the two babies: "It must be the hormones!"

In fact, by the time babies are babbling and climbing, it's already a bit late to be sorting nature from nurture. Still, when people see the kind of extreme differences between babies like Paul and Anna, many assume that the answer must lie in hormones or other innate factors. As we've seen, testosterone exposure before birth does indeed shape certain features of children's later behavior. But what about the sex hormones that circulate in babies' bodies after birth? Their levels also differ between boys and girls, though only for the first couple of months outside the womb. Thereafter, babies' gonads settle down, and there are virtually no differences between boys' and girls' levels of testosterone, estrogen, and other sex-related hormones until the onset of puberty.

It is, nonetheless, startling that newborn infants undergo what endocrinologists refer to as a "mini-puberty" during the first few postnatal months. Boys experience a surge of testosterone, which peaks within the first month or two and then subsides to its low childhood level by four to six months of age. Girls undergo an estrogen rise within a similar time frame. Both hormonal flurries are activated in the usual way—by pituitary hormones, which are suddenly released from the newborn's brain by a burst of activity in the hypothalamus. During pregnancy, mom's high hormone levels suppress activity in the fetal hypothalamus and pituitary gland, but soon after the umbilical cord is cut, these brain areas let loose, and the pituitary gland begins pumping out the stimulating hormones (known as gonadotropins) that travel through the bloodstream to turn on, if just for a month or two, the ovaries or testes.

Boys' postnatal testosterone surge promotes growth of the penis and scrotum. It is not known whether girls' estrogen spurt influences female genital development, although one study did find a correlation between newborn girls' estrogen levels and their amount of breast tissue at birth. Nonetheless, the fact of this mini-puberty in both sexes suggests neonatal hormones might also influence babies' brains. Just as the surge of testosterone before birth apparently organizes the brain for later male-type behaviors, so this neonatal surge might create a critical period for launching brain development down the boy or the girl trajectory, shaping, as some researchers speculate, everything from children's play styles in preschool to their sexual orientation as adults.

Evidence for such influence in rats is clear, as we saw in the last chapter. Suppressing testosterone in newborn male rats profoundly alters their style of play and even their later sexual proclivity. Female rats

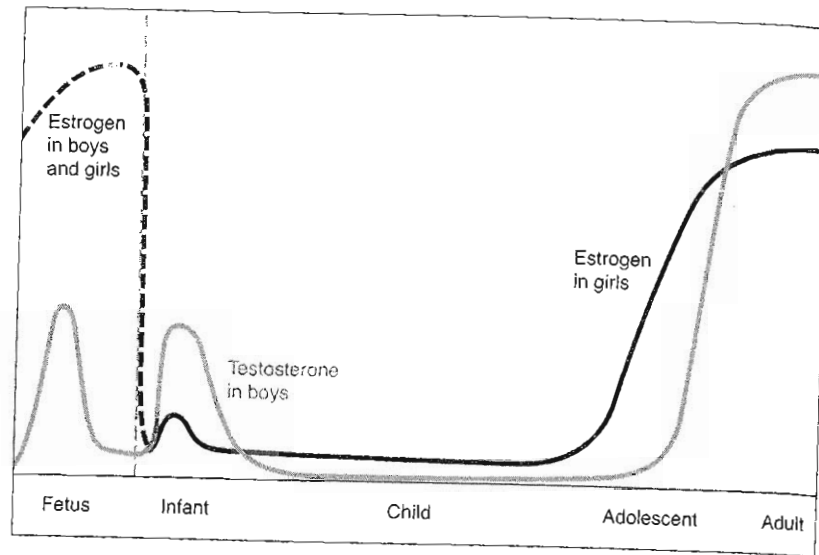


Figure 2.4. Relative levels of testosterone in boys (gray line) and estrogen in girls (black line) at each stage of development. The moderate peaks in both hormones during infancy define the mini-puberty of the neonatal period. During the fetal period, both boys and girls are exposed to their mothers' high levels of estrogen (dashed line), but this does not enter the brain or affect mental development because it is bound up by alpha-fetoprotein, a blood protein present during the fetal period only. The vertical line denotes birth.

treated with testosterone shortly after birth show the opposite change, a fondness for rough-and-tumble play. But because rats are born at a much more immature stage than humans are—corresponding to around the end of a human baby's second trimester of gestation—these effects are more relevant to the testosterone surge that human boys experience *before* birth. In rats, there is no distinction between males' pre- and postnatal testosterone surges. It is one continuous explosion whose effects on the developing brain happen to peak right around the time of birth. Human boys, by contrast, experience separate pre- and postnatal testosterone surges: the first begins around seven weeks after conception and subsides by about twenty-four weeks of prenatal development; the second, smaller rise occurs during the first and second months after birth.

This human pattern is better modeled in infant rhesus monkeys, which gestate for about five and a half months and are born at a developmental stage more similar to human babies than are rat pups. Like baby boys,

male rhesus monkeys undergo separate pre- and postnatal testosterone surges, allowing scientists to investigate the different effects of hormone exposure during these two developmental periods.

At first glance, such studies suggest that the postnatal testosterone surge is not all that important in primates. As scientists at the University of Cambridge found, blocking testosterone after birth does not diminish male monkeys' fondness for rough-and-tumble play or affect their mother-son interactions in any noticeable way. Similarly, these researchers observed no change in the play style or social interactions among young female monkeys that had received testosterone injections as newborns.

However, other research has uncovered more subtle effects of postnatal testosterone on monkeys' cognitive abilities. Corinne Hagger and Jocelyne Bachevalier at the National Institute of Mental Health found that young male monkeys learn more slowly than females do on a particular test of object discrimination—exploring several pairs of objects and then remembering which one of each pair conceals a tasty banana pellet. For normal young monkeys, it takes males about twice as long as females to remember which object in each pair will get them the treat. But Hagger and Bachevalier found that male monkeys deprived of testosterone (by neonatal castration) learned just as quickly as females. And females injected with a testosterone derivative learned more slowly than usual, at virtually the same rate as normal males. So this study, like others we've seen, hints that postnatal testosterone somehow slows brain development and may be one reason why boys' minds mature more gradually than girls'.

Other research on monkeys, by David Mann and his colleagues at the Morehouse School of Medicine, suggests that the effects of neonatal testosterone are more evident at puberty than in infancy. They found that blocking testosterone at birth delayed the onset of puberty in male monkeys, which typically occurs around three years of age. It also led to reduced testicular size and sex hormone levels once the animals had reached adulthood. Males with reduced neonatal testosterone underwent less bone growth, leading to a shorter stature and lower bone mineral density in adulthood. Neonatal testosterone even appears necessary for normal immune function in males, according to this research. Taken together, the findings of Mann and his colleagues indicate that the brief elevation in neonatal testosterone has significant consequences for male

physical and sexual growth, even though the effects are not apparent until puberty.

Does the neonatal testosterone surge similarly shape human boys' development? We don't really know, but there is evidence that boys with undescended testicles—a not uncommon medical condition known as cryptorchidism—experience lower than normal levels of testosterone during the first few months of life. This condition, easily treated by surgery in infancy, is not associated with any deficits in later growth or in pubertal development. However, men who suffered from cryptorchidism as boys often do experience fertility problems and tend to be less sexually active than other males. Whether the neonatal testosterone surge affects the brain, sexual orientation, or other mental functions is still unknown, although the little bit of information I described above—finding correlations between high neonatal testosterone levels and delayed visual or language-processing abilities—suggests it may have some impact on brain development.

Clearly, sex hormones are flowing in early life. Though there is little evidence of it in newborns' behavior, boys and girls are undergoing their separate mini-puberties, which may have lasting consequences for how their bodies and brains develop further. Some researchers propose that neonatal surges of testosterone, estrogen, and other less familiar hormones may even constitute another critical period that influences, for better or worse, outcomes as diverse as physical stature, the timing of puberty, cancer risk, cognitive skills, and sexual orientation. While fascinating, such possibilities are purely speculative at this point and await future research to sort out.

Are Plastic Bottles and Soy Formula Safe?

In spite of our limited knowledge about these early sex-hormone surges, researchers are actively studying how such hormones may run into interference from our increasingly contaminated environment. Attention has been focused on a slew of endocrine-disrupting chemicals: molecules that either mimic or block the actions of estrogen and testosterone. They include many of the usual suspects: pesticides, such as DDT and the fungus-killing agent vinclozolin; industrial chemicals, such as dioxin and PCBs; and, more recently, two startlingly ubiquitous plastic additives, bisphenol A (BPA) and phthalates (also known as phthalate esters). Bisphenol A is a chemical with weak estrogen-like effects that is used in hard

polycarbonate plastics (including some, but not all, products with the recycling symbol) as well as in dental sealants and the lining of many food cans. Phthalates are found in soft, flexible plastics, including PVC (polyvinyl chloride, which is used for, among many other purposes, medical tubing and IV drip bags), and in many personal care products, such as hairspray, lotion, fragrances, and nail polish. What's more, endocrine disruption is known to result from phytoestrogens, a large category of natural plant-based compounds. These are generally less potent than the industrial chemicals but act in much the same way and have come under special scrutiny because of their widespread use in soy infant formulas.

The evidence linking such substances to developmental (or other health) problems is largely indirect. Most have been identified based on their effects on rodents. Certain pesticides and phthalates are known to disrupt testosterone's action and can lead to reproductive malformations in male rats that are exposed during the critical prenatal period of sexual differentiation. Two such defects, cryptorchidism and hypospadias (a malformation of the penis in which the urethral opening is located in the shaft of the penis instead of on the tip), have become increasingly common over the last few decades, raising worries that endocrine-disrupting chemicals are responsible. Another concern is a rather alarming worldwide decline in men's sperm count—as much as 50 percent between 1930 and the present—which some researchers have suggested is also attributable to estrogen-disrupting chemicals. Still other fears revolve around the apparent decrease in age of girls' puberty onset, which is easy to imagine being caused by environmental estrogens (though much harder to prove).

These are worrisome issues, but it's important to point out that the risks vary for different endocrine disruptors and that there is little data showing harm in humans, as opposed to rats or mice. The evidence is strongest for agricultural pesticides, which one American study found associated with lower sperm count in male farm workers with higher exposures (especially to the herbicide alachlor and the insecticide diazinon), while a Spanish study found higher rates of cryptorchidism and hypospadias in baby boys whose mothers were heavily exposed to pesticides such as DDT and lindane. However, other studies have failed to find similar effects, and the evidence is weaker for a relationship between breast cancer and DDT exposure, or a connection between the mysteriously decreasing age of puberty in girls and PCB exposure.

Studies of the phthalates and bisphenol A are even newer and less

definitive. Both agents have been shown to produce certain reproductive and behavioral disturbances in rats, even at low doses, but the evidence of harm in humans is sparse. Still, there's enough concern, as scientists from the U.S. National Toxicology Program voiced in congressional testimony, to state that bisphenol A "cannot be dismissed" as possibly altering human development. The concerns are greater for phthalates, especially for baby boys and pregnant women undergoing medical treatments that expose them to a particular phthalate, DEHP, which is used in intravenous tubing and is known to interfere with testosterone action. In 2005, the European Union banned the sale of infant toys, feeding nipples, and other baby products that contained DEHP, as well as five other phthalates, but the U.S. government has yet to follow suit. It's simply too early to know whether these plastic additives accumulate in babies' bodies in high enough levels to cause harm; we don't even know how these different chemicals are capable of altering development of the brain or reproductive system. More research is urgently needed.

Compared to the attention paid to these plastics, there's much less focus on soy and other natural estrogens, even though babies' exposure to such chemicals may be much higher. Half a century ago, farmers in western Australia noticed that many of their sheep became infertile after grazing on a certain type of clover. Few people eat clover (though it's increasingly available in herbal supplements), but comparable levels of isoflavones, a major class of phytoestrogen, are found in soybeans, which are consumed by billions worldwide.

No one disputes that the isoflavones in soy and other plant foods act as weak estrogens. Indeed, many postmenopausal women purposefully increase their intake of soy, which is marketed as a natural estrogen, in the hopes of avoiding some of the negative side effects of pharmaceutical hormone replacement. Compared to the endocrine-disrupting pesticides, soy isoflavones are less potent, are cleared from the body much more rapidly, and, presumably, are far safer.

Still, infants reared on soy formula are exposed to much higher levels of isoflavones than adults. For one thing, their bodies are tiny, and formula is their only source of nourishment. So infants end up consuming much more isoflavone per pound of body weight than adults do. Scientists have measured these levels and found that babies reared on soy formula are exposed to isoflavone levels about ten times higher than the dose known to disrupt women's menstrual cycles. Research on rats has found

various adverse effects of exposure to soy phytoestrogens during prenatal and early postnatal development, ranging from altered reproductive development to changes in immune function to the masculinization of the female brain and behavior. Less research has been done on primates, but one study of male infant monkeys reared on soy formula found that it suppressed their testosterone levels by more than half. Animal research, then, does raise some concerns about soy's possible interference with normal estrogen and testosterone action in early development.

In the United States, about one-fourth of all the infant formula sold is soy based. In spite of this large exposure, very little research has been conducted on its effects. One study, published in 2001, found little evidence of harm: adults who had been fed soy formula from early infancy showed no difference in growth, pubertal development, or overall health when compared to adults who had been reared on cow's-milk-based formula. Women reared on soy, however, reported slightly longer periods and greater discomfort during menstruation than women raised on cow's-milk formula reported.

This study is encouraging, but most scientists agree that more research must be done before soy formula can definitively be declared safe. In 2003, the British Dietetic Association advised against the feeding of soy formula to infants under six months of age. Unlike in the United States, where soy formula is widely available, in Europe it can only be obtained with a doctor's prescription. Even in Asian countries, where soy-rich diets are more traditional and thought to contribute to lower rates of cancer and cardiovascular disease in adults, babies are generally not exposed to soy-containing foods. Most are exclusively breastfed until at least six months of age, beyond the period of normal estrogen and testosterone surges. In other words, while the estrogenic properties of soy may be health promoting in adults, they should be viewed with caution in very young infants. As always with infant feeding, breast is best.

Summing Up: Tips for Raising Boys and Girls in Infancy

Peering through the window into a hospital's newborn nursery, you'll find little evidence of the difference between boys and girls. Sure, they may be swaddled in either pink or blue blankies or be sporting similarly color-coded caps or bracelets, but without these artificial clues, few people could tell with certainty whether a given baby was male or female.

Still, as we've seen throughout this chapter, boys and girls do differ in subtle ways from early in infancy. Boys are a bit larger but paradoxically more vulnerable than girls. They are also fussier, harder to soothe, and—by three or four months of age—less socially attuned. Their senses of touch, smell, and hearing are a bit less acute, and their language, memory, and fine motor skills also lag during the first year of life. Where boys do excel is in gross motor development—sitting, standing, and walking at the same ages as girls in spite of their overall slower maturation.

All of which leads to the conclusion that boys need a little extra attention as babies. Perhaps, if we are aware of their slower development and specific vulnerabilities, we can help offset some of boys' slower maturation and greater risk for emotional and communicative problems. At the same time, we cannot ignore the special issues posed by girl babies. While girls are often easier to care for and more socially aware, they do not get as much encouragement as boys for their physical development and emotional independence, two concerns that become more pronounced later in childhood but that can be addressed from the first days of life.

What follows is a list of tips that can benefit all babies, though some are better suited to one or the other sex. Brain development is a cumulative process: each change builds on all those that came before, but there's no doubt that babies' brains are far more malleable in early life than at any later age. So the earlier parents are aware of the special needs of boys and girls, the better the chance that all babies will reach their full potential.

- **Talk to your babies, especially boys.** Of all the purported tricks for raising smarter children, this is the only one that has been scientifically proven: the amount of language directly addressed to a child in the first few years of life significantly influences his or her vocabulary size, reading ability, and writing skills for many years to come.

Parents of boys should err on the side of talkativeness. Use every interaction as a chance to communicate: narrate your activities ("Now I'm going to change your diaper"; "Let's put your coat on so we can go outside!"), sing songs, and introduce your baby to word play such as rhymes and alliteration. Baby talk, or "parentese," is an especially effective style of communication, as research has shown that it exaggerates and emphasizes the differences among speech

sounds. What doesn't work, however, are baby videos and DVDs (such as *Baby Einstein*). As one recent study found, an hour per day of such viewing between eight and sixteen months of age was associated with a 17 percentile drop in vocabulary development. Another study found that babies were able to learn foreign speech sounds (in this case, Mandarin) only when they heard the language spoken by a live, interactive storyteller, and not when they viewed the same storytelling sessions on TV.

- **Listen too!** Communication is a two-way street. Babies learn as much about language from their own attempts at vocalization as they do from our chatter. Most infants begin cooing, or vocalizing using protracted vowel sounds, somewhere around three months of age. They start adding consonant sounds, progressing to true babbling, around five or six months of age. By the end of the first year, there are probably several words hidden amid their *babababas* and *mamamamas*, though few parents pay close enough attention to notice them.

So here's another chance to promote your child's verbal development, especially in boys: Stop, listen, and respond to his vocalizations. In other words, talk *to* your baby, but don't talk *over* him. Babies don't coo or babble much without an audience. They do it to communicate, and you can increase and improve their verbal output by responding, commenting on, and, especially, imitating your baby's budding vocalizations. Luckily, babies are guileless enough to appreciate imitation as the sincerest form of flattery. Returning your baby's *ooooos* and *gagagagas* with more of the same not only shows him that he is communicating effectively but also gives him important auditory feedback about what he sounds like to others.

Research shows that babies whose parents respond to their babbling and other vocalizations verbalize more than babies whose parents are less attentive. What's more, by noting every new vowel or consonant sound your child can produce, you stand a better chance of detecting those first words when they begin slipping in among his other babblings, somewhere toward his first birthday. Speech is an intricate mental and motor skill, so anything you can do to encourage your baby's vocal practice is going to help, especially in boys, who have a greater propensity than girls for later speech problems.

- **Books for babies, especially for boys.** Of all the ways to talk to babies, reading aloud is the best. Reading is the single most effective way for adults to increase their own vocabularies, and guess what: it works the same way for children. Books take a baby beyond his immediate environment, introducing him to animals, places, characters, and events he is otherwise unlikely to encounter. Studies show that parents engage in their most thorough language instruction while reading to their young children, by emphasizing new words and pointing to the pictures that create concrete meaning in babies' minds. Books also inspire parents to ask their babies questions, coaxing along speech and vocal practice. Such dialogic reading, in which parents use picture books as steppingstones for more elaborate two-way conversations, has been shown to substantially accelerate young toddlers' verbal development.

Reading together is the ultimate quality time: cozy, educational, and a wonderful bonding experience. Of course, babies of both sexes should be treated to this experience on a daily basis, but it may be especially important for boys, many of whom could use the extra dose of language and emotional enrichment. Even if your baby's only interest in books involves grabbing them and chewing, this stage shall pass, and you will have extended your baby's "taste" for books into the larger world of literary enrichment.

- **Watch out for ear infections, especially in boys.** Babies need to hear to learn language, but young children are highly susceptible to infections of the middle ear, a secondary consequence of colds and allergies that can leave their ears filled with fluid, often for weeks on end. Such fluid muffles babies' hearing, obscuring the subtle differences among speech sounds that are usually mastered in the first year of life.

Boys are more susceptible to ear infections than girls are, so this can be another factor working against them during the critical phase of early language development. Fortunately, ear infections are both preventable and treatable. Secondhand smoke, formula feeding, and large-group daycare are all known to increase the risk of ear infections, and all can be modified. Another no-no is putting your baby to sleep with a bottle, which can permit milk to contaminate the middle ear.

If your child does come down with a cold or other illness, it's important to have his ears checked periodically for several weeks after he's sick. Antibiotics are not necessary for every ear infection. (They shorten the duration of infection in only one out of seven children.) But what is important is monitoring how long a baby's ears remain filled with fluid. Pediatricians often request that parents return to have their baby's ears checked after an infection appears to have cleared up, but many don't bother, assuming that if the fever is gone, the ears must be fine. This is not true.

Any child who suffers from persistent or repeated infections should have a thorough hearing test. If there is trouble in both ears, he or she may be a candidate for tympanostomy tubes—tiny grommets that allow the middle ear to drain to the outer ear, restoring normal hearing. Boys get these surgically implanted tubes more often than girls, reflecting their greater propensity for middle ear infections. However, ear tubes do have certain risks, such as scarring of the eardrum and slight hearing loss later in childhood. Tubes should therefore be inserted only as an absolute last resort—that is, after several months of careful monitoring to see if the baby outgrows his middle ear troubles.

- **Stop parking your baby.** These days, we have so many devices for holding and carrying babies that young children are not getting enough physical exercise or opportunity to challenge their developing balance and postural abilities. Think about it: between their car seats, strollers, bouncy seats, high chairs, ExerSaucers, and electric swings, babies are rarely free to stretch their limbs or try to support their own bodies. All these baby holders are not unlike the recliner seats that lead to adult paunches: neither adult nor infant recliner seats require people to use their stomach muscles or even to support their own necks. Many infant seats even come with cup holders, helping to create the ultimate junior couch potatoes.

This parking trend is bad for girls and boys alike, though for somewhat different reasons. While all children these days need more exercise, the many variations of infant recliner seats reinforce girls' less active tendency. Recall that girls do not lag behind boys in the attainment of most gross motor skills in infancy. However, differences in speed and strength do emerge during the pre-

school years, probably reflecting the greater amount of movement and motor practice that boys engage in from early infancy. Any change that gets girl babies moving and encourages their physical independence will therefore be beneficial for their later fitness, gross motor abilities, and perhaps even spatial skills.

Boys' motor development is probably also suffering from being parked in various infant holders. However, an additional issue for boys is the social isolation these seats enforce. Carted around like an extra handbag, a baby in a car seat simply doesn't get the same amount of attention he would receive if he were being held in his parents' arms or in a sling or front carrier. Holding a baby brings him close to a your voice, warmth, touch, and comforting, familiar smell. A baby who is merely carted from car seat to stroller and back again at each stop on an errand list gets about as much interaction as a sack of potatoes (the non-couch variety).

Car seats are for cars, not for holding a baby at the grocery store, doctor's office, or older child's basketball game. Stroller riding should come after, not before, a toddler has set out for a walk on foot. And ExerSaucers, well, these have little to recommend them. The danger of parking is very high when a baby can stand upright with a tray full of colorful toys (and, often, tasty treats) to entertain her. If you need a safe place to put your child while you're cooking dinner or folding laundry, try a doorway jumper. This harness clamps onto a standard doorframe and at least offers the older infant a chance to flex his legs, get some exercise, and master a new motor skill.

I suggest you limit the number of such seats to the bare minimum: a car seat (but only for car rides), a high chair (but only for meals), and a stroller (but only for longer walks).

- **Responsive, sensitive caregiving.** Close physical contact is just one piece of the larger equation for positive parenting. By staying closer to babies—holding them, carrying them, and even giving them daily massages (which has all sorts of benefits for both body and mind)—parents are likelier to be aware of their needs. Research consistently shows that caregivers who are more sensitive, responsive, and highly involved with their kids do the best job of building healthy relationships and promoting their children's security and self-confidence.

This advice sounds simple enough: you can't spoil a baby by responding promptly and warmly to him or her. However, the exact prescription for sensitive, responsive caregiving may differ for girls and boys, or for babies of either sex with different temperaments.

Simply put, boys are often more needy as infants than girls are. They are less physically mature and take longer to develop the self-calming skills, such as hand-sucking or pulling into a tightly tucked posture, that help them compensate when overwhelmed. Parents may need to step in sooner with a boy, picking him up, changing his position, or giving him a soothing ring to grasp and suck on. Here is where stereotypes can get in the way. In the general spirit of "toughening them up," parents may let their baby boys fuss and squirm longer, or they may resort to artificial stimuli—videos, electronic swings, and elaborate toy bars—to entertain them without helping them to discover their own self-calming skills.

Girls, on the other hand, can sometimes be too easy. Quiet, complacent babies may not get as much attention as fussier types, and they may actually suffer from a lack of the stimulation and interaction needed to fully develop their motor and cognitive skills. While there are plenty of exceptions, girls fall into this category more often than boys. So here is another way that close physical contact can pay off: by keeping your baby nearby, you are likelier to interact more—talking to her, pointing out interesting things in the environment, and generally integrating the baby into your daily life, making the most of her waking hours.

These issues are every bit as important—if not more so—for babies in child care. When one caregiver is responsible for several infants, the temptation to stereotype and respond to boys and girls in a one-size-fits-all way may be especially high. Parents should be on the lookout for sensitive, responsive caregivers who do not favor either sex and who appreciate the importance of communicating and connecting with both boys and girls.

- **Girls need challenge, even in infancy.** On a related theme, baby girls can benefit from a greater diversity of activities. Again, this pertains to the quieter, more compliant, and more observant girls—by no means all female babies—who may not be getting as much stimulation and chances to explore as their fussier age

mates. Parents often take an if-it-ain't-broke-don't-fix-it approach, but doing this may shortchange some babies, especially girls.

Girls need liberating! Out of those bouncy seats and onto the floor, where they can try pushing up, rolling over, and crawling. Out of their high chairs and into the kitchen, where they can crawl or cruise along the cupboards, rummage through pots and pans, and stack sippy cups. Out of their strollers and onto the jungle gyms, where they can test their growing physical strength. Sure, most babies get to go to the park, but boys, because of their more active nature, may demand it more, and so end up getting more physical exertion, muscular practice, and spatial experience than some of the quieter girls.

Because of baby girls' smaller size, and possibly because of lingering stereotypes, parents tend to be more cautious with infant girls, permitting them less freedom to explore and to push their physical limits. But later on, girls begin falling behind boys in their physicality and spatial skills, and it's clear that girls could benefit from greater physical challenges and earlier opportunities to explore.

So unharness your daughter, help her stretch her muscles, and encourage her physical exploration. You don't need to sign up for expensive baby exercise classes to give her this opportunity. Just head to the park or your own backyard and, most important, baby-proof your home early and often. The fewer no's your daughter hears, the more she will be inspired to follow her own natural curiosity and exuberantly explore every nook and cranny of the world around her.

- **Dads must do their part.** Fathers are more involved with their children today than they've been at any time in the past, but some are more involved than others. There is no question that babies learn a great deal about gender roles, even in the first few months of life. In other words, they notice who is taking care of them, and this awareness influences their own emerging gender identity and expectations about the nurturing tendencies of males and females.

Fathers have their own unique way of interacting with infants, which tends to be more fun, active, and physical than mothers. Fathers are very stimulating! But they also have a tendency to engage

their infant sons more than their daughters in this type of play. So once again, fathers need to watch out for their own stereotyping and use their unique nurturing style with their daughters every bit as much as with their sons.

- **Breastfeed for one year.** The American Academy of Pediatrics recommends exclusive breastfeeding for the first six months of life and continued breastfeeding (after the baby is started on solid food) until one year of age. Sadly, only a third of six-month-old babies in the United States receive any breast milk, and only 17 percent of all six-month-olds are exclusively breastfed—that is, receive no formula at all.

Boys, with their greater vulnerability to infections, can especially benefit from the immune components in breast milk. Unlike a formula factory, the factory inside a mother's mammary glands pumps all kinds of antibodies and immune cells into her milk, transmitting to her baby protection against many of the common infections of infancy. Breastfeeding is known to prevent ear infections, which boys are more susceptible to and whose onset in the first six months is known to increase babies' chances for repeated or persistent ear infections during the toddler years. Breastfeeding also protects babies from respiratory and gastrointestinal infections, promotes eye contact, increases physical contact, and even makes babies smarter than formula feeding does.

Of course, girls deserve to be breastfed every bit as much as boys. The same immune, sensory, and bonding advantages apply equally, while the cognitive advantages of breast milk have been found to extend well out to school age and adolescence.

- **Choose glass or safer plastics.** This reduces babies' exposure to phthalates and bisphenol A. While existing research does not clearly prove that these chemicals are disrupting boys' or girls' early hormone surges, some pediatricians urge a precautionary approach: avoid plastics with the 3, 6, or 7 recycling symbols (1, 2, 4, and 5 appear safer); avoid microwaving food or beverages in plastic containers or with plastic cling wrap; don't wash plastic containers in the dishwasher; choose glass or polyethylene (1) bottles or sippy cups, especially for warm or hot liquids; limit canned foods.

- **Watch out for stereotyping.** This applies to children of all ages, but no age is too young to begin revising expectations for our children. Just because your child is a girl doesn't mean she won't be interested in trucks and trains and rolling a ball across the living room floor with you. Just because your child is a boy doesn't mean he won't be scared of going down the slide or doesn't need lots of cuddling and nurturing. Girls should be praised as much for their strength as their beauty (perhaps even more, considering how society is going to treat them later); boys as much for their tenderness as their ball-handling abilities.

And yet, what is perhaps most striking in today's world is that parents continue to stereotype their infants, beginning even before they are born. Overcoming the tendency requires constant, vigilant effort, but it's best to start when your child is an infant. After all, this is the age when babies are their least sexually differentiated. Well before they start demanding their own pink or blue clothes, boys and girls can be seen more for who they truly are: social, active, fussy, compliant, vocal, quiet, alert, intense, relaxed, funny, curious, or squirmy. Parents of infants should savor this gender-free zone, following babies' own cues as to what they need as individuals rather than as tiny boys and girls.

3

Learning Through Play in the Preschool Years

IT'S A BIG EVENT: your child's first Happy Meal. You're feeling a little guilty about all the grease but genuinely pleased when you see how excited your three-year-old is to finally be getting her own nuggets, fries, and . . . *free toy!*

But hold on. You've already accepted the nutritional compromise, so what's this about selecting a boy toy or a girl toy? You stopped in for some fast food, not a decision about gender stereotypes. And the options this summer are particularly annoying: Extreme Action (skateboarders and stunt bikers) for the boys and Extreme Fashion (the usual Mattel harem) for the girls.

Thinking quick, you mutter, "Boy," hoping to postpone, at least for a while, your daughter's inevitable focus on clothes and beauty. But it doesn't work. She spots Barbie in the display case and loudly declares her own choice. You capitulate and change the request, not wanting to make a scene and deciding to save your energy for more winnable battles.

The food arrives, you gather your napkins and little cups of ketchup, and make your way to a table, where your little daughter is desperately tugging on the plastic packaging to extract her new toy. You rip it open for her and get your first glimpse at the skinny doll wearing platform shoes, a tube top, heavy eye makeup, and a fur coat.

What is this? you think. Some kind of streetwalker?