Scientific Secrets for Raising Kids Who Thrive
Course Guidebook

Professor Peter M. Vishton
The College of William & Mary
Professor Peter M. Vishton is Associate Professor of Psychology at The College of William & Mary. He received his B.A. in Psychology and Computer Science from Swarthmore College in 1991 and his Ph.D. in Psychology and Cognitive Science from Cornell University in 1996. From 2000 to 2004, Professor Vishton served as an Assistant Professor in the Department of Psychology at Northwestern University. He also has served as the Program Director for Developmental and Learning Sciences at the National Science Foundation and is a consulting editor for the journal *Child Development*.

Professor Vishton has published articles in many of the top journals in the field of psychology, including *Science, Psychological Science, Experimental Brain Research, Teaching of Psychology*, and the *Journal of Experimental Child Psychology*. He is also the creator of the DVD *What Babies Can Do: An Activity-Based Guide to Infant Development*.

In addition to teaching, Professor Vishton studies the perception and action control of both infants and adults. His interests include cognitive, perceptual, and motor development; visually guided action; visual perception; computational vision and motor control; and human-computer interfaces. His research has been funded by the Eunice Kennedy Shriver National Institute of Child Health and Human Development and the National Science Foundation.

Professor Vishton has presented his research at numerous conferences and invited talks throughout the United States. He has found a variety of evidence, among both children and adults, that the nature of sensory processing is altered by the actions we choose to perform. In essence, our intention to act on something changes how we perceive it. His ongoing work
continues to explore how this aspect of the human senses develops and how the motor systems of the brain are involved in mediating the areas of the brain involved in perception.

Professor Vishton has also produced *Scientific Secrets for a Powerful Memory* and *Understanding the Secrets of Human Perception* with The Great Courses. When he isn't exploring human cognition and action, Professor Vishton enjoys spending time with his family, reading, and distance running. He has completed the Chicago Marathon twice and hopes to complete others in the future.
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Scientific Secrets for Raising Kids Who Thrive

Scope:

No one needs to look hard for advice about parenting. Hundreds of books, talk shows, family members, and even strangers will happily tell you how they think you should raise your child. But how do you know what actually works? This course considers what decades of scientific research on children and parenting suggest about maximizing your child’s development. How should you set up an ideal learning environment for your infant? Can you teach your baby to read? What types of games will boost your child’s brain development at different ages? What is the best way to discipline a child? When and how much should you allow your child to use computers? What should you look for in your child’s teachers and classrooms? How can diet choices affect your child’s brain and body? With special attention to the science of cognitive development during early childhood, as well as everyday challenges faced by parents, this course surveys the scientific state of the art in relevant areas and draws practical lessons for every parent of young children.

Each of the 24 lectures contains between 3 and 10 specific tips for parents that are supported by careful, published scientific research. You’ll learn not only the tip itself but the methods, data, and reasoning that support it.

Along the way, the course also teaches a great deal about the science of child development in general. The course features evidence-based tips for parents throughout, but we never lose sight of the fascinating process by which children develop from small, seemingly helpless infants into walking, talking, exploring toddlers. Eventually, children become thinking, reading, writing, opinionated, and socially adept adolescents. This journey of development happens for children all over the world, yet every trip is unique and fascinating in its own way.

The lectures are organized around topics that are important to helping children thrive. After an introduction to key concepts in Lecture 1, including important benefits of movement for cognition, we consider infants and their
surprisingly complex perceptual and cognitive abilities. Two subsequent lectures consider basic physical needs of sleep and nutrition and provide a series of tips to ensure that your child gets enough of both. One lecture describes early language development, including exciting research suggesting that infants can use gestural sign language to communicate long before they begin speaking, and how teaching your child sign language can boost language development in general.

Two lectures then consider discipline and parenting style. We explore ways in which children learn and behave “like rats,” according to behaviorist theories, such as those of B. F. Skinner, but more importantly, we then consider how and why, in fundamental ways, humans learn—and should be trained—very differently from rats. By talking with children and parenting from an “authoritative” perspective, a happier, healthier child—and family—will result.

Several lectures focus on classic academic, scholastic topics: reading, writing, mathematics, memory, homework, and IQ testing. There are many ways to introduce these to children and encourage greater mastery. A large body of thoughtful research has compared a huge variety of possible methods and suggests which of the many ways are most effective—those most strongly associated with high levels of academic achievement and mental development. For instance, it’s far more important to promote the early development of “number sense” and concrete models of mathematical operations than memorization of “math facts.” Indeed, studying the latter can get in the way of the former. Two lectures on the value of Montessori approaches to education are included, along with many tips about how to implement those ideas outside the walls of a Montessori school and even at home.

Several lectures are organized around topics of particular relevance to modern parents. Is educational television effective? Are video games good or bad for a developing child? The answers to both questions depend on a wide range of factors, including the age of the child, the type of media, and how a parent uses these tools. In both cases, however, the answer is sometimes an emphatic yes.
Social development is also considered in several lectures. Promoting good social skills and prosocial tendencies is not only good for the future of our society but also leads to enhanced achievement and happiness in our children.

The course encourages parents themselves to become “parent-scientists,” keeping records and looking for important trends in their own children’s development and academic achievement. The next-to-last lecture specifically provides examples and suggestions for how parents can and should do so.

Throughout, the course discusses science but stays focused on the fact that these are children, not science projects for us to pursue. We emphasize this approach in the final lecture, which considers the great importance of making time for unstructured, child-directed play.
One of the things a new parent learns is that there is a wide variety of sources of advice available about parenthood, including relatives, neighbors, and friends, not to mention thousands of websites and books. Some of this advice is good, but much of it is not. What we really need to address parenting issues is simple: a scientific approach. Science provides a set of tools for answering questions about what works and doesn’t work. Science can even tell us how and why something works or doesn’t. This course is based on that type of parenting advice—not just stories and anecdotes, but tips and ideas that have been supported by careful, systematic scientific research.

Supervised “Tummy Time”

- Before the 1990s, almost all babies were put to sleep on their bellies at night. Since then, however, most parents in the United States have switched to putting their babies to sleep on their backs—and with good reason. Sleeping on the stomach has been related to accidental suffocation and sudden infant death syndrome (SIDS), a tragic situation in which the child can suffocate if the nose and mouth are blocked by soft bedding.

- As parents have switched their children to back sleeping, however, there have been some developmental consequences. Babies started crawling significantly later than they did before. Crawling generally starts at around 6 months for most children. Several studies, published in the late 1990s, found that the average had moved up substantially. However, those same studies that reported the delay in the onset of crawling found that babies caught up to regular gross-motor milestones by 18 months.

- There are a number of important mental developments that accompany the onset of self-controlled locomotion. If you want to enrich the experiences of young children in a natural way, helping
them to learn to crawl is an easy and effective choice. All you need to do is spend a few minutes each day on the activity commonly referred to as “tummy time.”

**Beginning the Process**

- Three- or four-month-old infants may not initially react positively to being placed on their stomachs. Their neck muscles are weak relative to the weight of their heads. Many babies may fuss and cry, but gently soothe the baby and then try again.

- If you repeat this several times, you will gradually be able to increase the amount of time that the baby spends on his or her stomach. What you will see at first may look like uncoordinated wriggling and flailing, but that movement will stretch and work the baby’s muscles. Within a few weeks, the baby will be able to look around and even make some forward progress. Around 6 months, self-produced locomotion will emerge. Then, the real excitement begins as the child starts to explore the world independently for the first time.

- Motor development and cognitive development go hand in hand through infancy. Although studies show us that there is no right age at which a child should start crawling, supervised tummy time can give your child an opportunity to become stronger both physically and mentally.

**Setting Up a Cruising Course**

- As the baby becomes more mobile, tummy time can give way to cruising. This is when the baby starts to stand while holding onto something and then begins to toddle around while grasping furniture and other objects. Try setting up a small cruising course in your living room. Line up the furniture so the child has something to hold onto and can move around freely.

- Because cruising toddlers fall frequently, you should move sharp, hard objects out of the way. And, of course, you should always monitor this activity closely. Toddlers, that is, children ages 1 to 3, benefit from 60 to 90 minutes or more of active movement every day.
At each stage, parents can help by interacting with the child, building trust, and allowing the child time to freely explore, under parent supervision.

**Traditional Tae Kwon Do**

- The connection between physical and mental development continues as the child grows older. For older children, involvement in a disciplined form of physical activity, such as traditional tae kwon do, is beneficial.

- One of the best scientific studies on the effects of tae kwon do was published in 2004 by Kimberley Lakes and her colleagues at the University of California at Irvine. A group of more than 200 children between kindergarten and fifth grade were randomly assigned to either a tae kwon do group or a standard physical education group.

- At the end of the three-month intervention phase of the study, the standard and tae kwon do groups were tested using a variety of psychological assessments. The tae kwon do group did better in their ability to remain focused on a task and resist distraction; at regulating their own emotions; and in terms of sharing, cooperation, and other related “prosocial” behaviors.

The value of involving children in activities that promote self-awareness and self-control may be even greater for those who have difficulty with concentration and self-regulation.
Teachers’ reports about the children (teachers were not told which children were in which group) suggested that the tae kwon do group behaved better in their classrooms and even performed significantly better on a standardized math test.

**Mischel’s Marshmallow Test**

- Why would learning to break boards, kick, and shout have anything to do with performing better on a math test? To give the full developmental science answer to this, let’s take a few steps back and look at an experiment involving marshmallows.

- In the 1970s, a developmental scientist, Walter Mischel, performed a simple test of children’s self-control, testing whether or not they could refrain from eating marshmallows.

- In essence, Mischel wanted to see if the children were capable of engaging in one of the most basic processes of rational economics: delay of gratification. Those children who could resist the immediate, smaller reward of a single marshmallow would get a delayed but larger reward of two marshmallows.

- The children who were best at resisting the marshmallow were those who came up with creative strategies for distracting themselves from the impulse to eat the marshmallows. They were the best able to maintain control over themselves and their impulses.

- Interestingly, about 10 years after the original marshmallow study, Mischel and his colleagues looked again at the children in the initial study, using a variety of surveys for both the subjects and their teachers. They also obtained access to records of the children’s grades. What Mischel found was unexpected and amazing. Those who, as 5-year-olds, managed to wait longer before eating the first marshmallow, tended to be more competent teenagers than their peers who ate the marshmallow after only a relatively short delay.
• The children who exhibited poor self-control as 5-year-olds tended to have fewer friends and more behavioral problems. Those with good self-control as 5-year-olds were significantly less prone to depression.

• Later studies have shown that the children who resisted eating the marshmallow longer tended to get better grades in school and to earn significantly higher salaries as adults. Those who ate the first marshmallow quickest were even more likely to end up in trouble with the police.

Self-Regulation

• Returning to the study of the children doing tae kwon do, it’s not the yelling and kicking that matter but the emphasis on self-regulation. Note that not all martial arts focus on self-monitoring and self-regulation, but traditional tae kwon do does.

• A part of martial arts training that also seems potentially relevant is sparring. This task involves being aware of the position of both the self and the opponent. Knowing just when you are balanced but your opponent is not is a physically and mentally challenging task.

• Given the intense engagement of the mind in this situation, it is understandable that regular practice might lead to improved concentration, awareness, and even better performance on a math test.

Principles of Science

• While taking this course, and as you consider other information in the future, keep in mind some important principles of science. Any time someone presents you with evidence for a claim, such as “Doing $x$ will enhance your child’s mental function,” you should look carefully at the evidence presented. Ask whether a careful study was conducted with a large number of children, how the children were recruited, and how the effects of $x$ were measured.
• Most important, determine if randomization was used in the study. That is, find out if every child recruited for the study had an equal chance of being in the experimental condition or the control condition. Without randomization, any result may be suggestive of an effect, but there may have been biases in how children were placed in the two groups.

• This course is not an instruction guide about how to make your child a superstar genius who will go to Harvard University, cure cancer, and sit on the Supreme Court. It is not about how to supercharge your child’s development. In fact, we will discuss some ways that interventions aimed merely at supercharging child development have backfired.

• Children have been developing much longer than scientists have been studying them. Most of the best and most significant aspects of child development can happen quite well if we parents provide a good environment and then just stay out of the way.

Tips for Parents

1. Give your child supervised tummy time, even as early as 2 months of age. This will support muscle development and the onset of eventual crawling.

2. Get children involved in a disciplined form of physical activity, such as tae kwon do or yoga.

3. Make a “cruising course” for babies who are just starting the toddler phase of locomotion development.

Suggested Reading and Resources

The Bibliography contains full citations for the Suggested Readings from each lecture. Note that citations for additional scientific references specific to each lecture appear in the References section at the end of this guidebook.
Many of these scientific articles may be available online or through an interlibrary loan service for no charge. See the References section for more details.

Dawson and Guare, *Executive Skills in Children and Adolescents*.

Bodrova and Leong, *Tools of the Mind*.

Questions to Consider

1. Self-control and our ability to delay gratification seems to mediate a great deal throughout the course of our lives. In general, more seems to be better here. On the other hand, would a child with adult-like self-control would miss out on a lot of the “fun” of childhood? Is there such a thing as too much self-control?

2. Quiet meditation aims to clear the mind, relax the body, and seek greater self-awareness and focus. Should all children engage in regular meditation? Could a 2-year-old be taught to meditate?

Activities to Try

Self-control freeze game: At the beginning of the day, work with your children to pick a “pose” for the freeze game. For instance, standing on one leg with your hands clasped behind your head. At random times throughout the day, the parent loudly says, “Freeze!” The children should adopt the pose and attempt to hold it for 60 seconds. (You can adapt this duration to your particular child.) The game exercises a child’s memory and self-control, two critical mental faculties for young children.

Mischel marshmallow test: As described in the lecture, you can try this experiment with your child. Give the child one item of desire, such as a marshmallow. Explain that if the child can wait to eat the marshmallow until you return, you will give him or her a second one. Secretly watch the child, perhaps with a video camera, to see how long he or she can hold out and what strategies are developed for doing so. Repeating this game every few months will reveal a clear developmental trend.
Bumbo Floor Seat (bumbo.com): There is no specific study supporting the value of this product, but it does help babies who are unable to sit independently to do so. Even with very young children—4 months of age or so—the chair can be effective. When children can sit, they can see better and use their hands to interact with people and objects.
Human infants are utterly fascinating. Although they are incredibly helpless and incapable of just about everything, at the same time—if you know how to look for it—they are clearly aware and thinking about the world around them. Not all parents understand this. According to a nationally representative survey conducted by the Zero to Three organization, about 70 percent of parents do not think of 6-month-olds as individuals who experience feelings, such as sadness and fear. A wealth of evidence suggests, however, that even very young infants are seeing, hearing, thinking, and feeling creatures.

**Early Toilet Training**

- One of the best examples of babies’ being more capable than most people think is in the realm of potty training. Most children in the United States go through a potty-training period around 2 or 3 years of age. However, thousands of parents have become involved in programs to train their infants to leave diapers behind as early as 7 months of age.

- Infants don’t get it right away, but over time, they learn to “hold it” until a parent is ready for them to go. Parents report developing a sense of the child’s rhythm in this domain. Some parents also report liking the bond that forms with the child around this activity. It’s often referred to as “elimination communication.”

- Should all parents try to get their babies to leave the diapers behind after 7 months? That question remains open. There hasn’t been any careful study of the long-term behavioral impacts of this approach. In general, however, it’s an excellent example of the idea that babies are capable of much more than we typically think they are.
Addition and Subtraction

- Researchers have conducted hundreds of studies with babies between birth and 12 months of age. These studies involve showing a carefully crafted set of stimuli and events to the child and recording responses. In many cases, the babies behave in surprising ways—ways that are downright adult-like in their perceptions and actions.

- In a study reported in the *New York Times* in 1992, an experimenter demonstrated that 5-month-old babies are capable of simple addition and subtraction. This particular study was scientifically sound; it was repeated several times by different research groups, in different locations, with different sets of children.

- The study procedure involved a baby in a seat looking at a small stage. On that stage was a Mickey Mouse doll. After a few seconds to allow the baby to look at the doll, an occluder panel blocked the baby’s view of the doll. Then, a hand appeared that moved another Mickey Mouse doll behind the panel. The occluder panel was then raised so that the baby could see the stage again. At that point, there were two Mickey dolls in full view.

- The curtain was then lowered to hide the entire stage, and the process was repeated, except in this round, only one Mickey doll was revealed at the end.

- If you saw this as an adult, you would realize right away that something strange had just happened. The experimenters seem to have performed a magic trick: They have made a Mickey Mouse doll vanish into thin air. An adult would react with surprise and would look around the stage to try to find the missing Mickey doll.

- The same is true of children, even very young infants. In this experiment, the infants looked consistently longer at the outcome with only one Mickey doll than at the outcome with two. It seems that they know that one plus one is two.
The question is: What is going on in the infant’s mind? Perhaps infants have a sort of mental pointer that they direct at objects. When the objects disappear from view, the pointer keeps track of their approximate location. If when the occluder panel is removed there are more mental pointers than objects, that might attract the infant’s attention. Alternatively, a new object that doesn’t have a pointer attached to it might also attract extra attention.

Although it’s not clear that infants can really do math, in an abstract, symbolic way, there seems to be a lot going on for the infants to act as they do. They must be able to see the objects and then remember them after they can no longer see them. They must be able to compare the things they remember to the things they later see. And they must be able to notice when the memory doesn’t match what they see. Finally, their behavior must be influenced by this difference in a consistent fashion.

Babies’ Reasoning

Repeated experiments have demonstrated that babies reason about a lot more than math. For example, if a set of displays seems to indicate that two solid objects have passed through each other, even babies younger than 4 months will look longer. Babies seem to know something about the physics of solid objects.

If a baby sees an object pushed off a shelf, and that object simply hangs in midair without falling down, 5-month-olds look longer relative to baseline preferences. Babies seem to know something about the physics of gravity.

If babies see images of a male face and a female face and they then hear the sounds of a female speaking, they look longer at the female face than the male face. If they hear a male voice, then they look at the male face. Babies seem to know something about the types of sounds that go with certain types of images.
• If an infant sees a ball roll across a stage and bump into another ball, causing that second ball to move, they will look at it for a certain period of time. If the first ball stops short of the second ball, but the second ball is launched anyway, infants look significantly longer. It seems that babies know something about inertia and causation.

• This evidence supports the first tip of this lecture: It’s important to provide infants with a rich perceptual and social world, right from the beginning. They are clearly ready for it. Although babies might not seem to react in a very adult-like fashion, their brains are processing information at a much higher level than most people think.

Parents should be aware of daily opportunities to show their infants interesting things in the world around them.
Enriching Environments

- Studies of the infant brain have revealed something fascinating about young children: They have more synapses than the typical adult. It is the interconnections and the flow of activity through the neuronal network that is responsible for our cognitive function. Children have a denser network of brain cells than adults.

- A wide range of products is targeted to enriching the lives of infants and toddlers.
  - The reasoning behind these products is that if you miss the window of early development—the first three years—you will have missed a critical period of brain development. And if a child develops a brain network that is lacking in that high-synapse density, he or she may be doomed to a life of cognitive mediocrity.
  
  - Although early enriching experiences are critical, there is little or no evidence that providing super-enriched experiences will provide a super-powered infant brain or even one that is any better than one that is given a moderate amount of enriching experience.

- It’s also important to note that the data on development of synaptic density is not from humans but from a species of monkey that is genetically similar to humans. That said, the precise age range across which human synaptic density develops may be somewhat different. It might be that the critical phase in humans lasts long beyond age 2 or 3, perhaps even into adolescence.

- Further, the great reduction of synapses associated with becoming an adult is not a disaster that reduces mental function—quite the opposite. This is how our brains are meant to develop. First, the process greatly overproduces neurons and synapses. Second, those neurons that are not connected in the right way are “pruned.” The resulting highly pruned network is the adult brain.
• The pruning process—the cell death that occurs—is a positive and important step. If you were to find some way of providing stimulating experiences that prevented this from happening, it wouldn’t create a child super-genius. The resulting brain would likely not be very smart at all.

• The second tip, then, is not to go overboard with stimulation using high-tech toys and expensive crib display systems. There is no evidence that any specific toy or activity will affect brain development in any critical way.

**Physical Interaction with the Environment**

• Another important tip is to engage in activities that provide babies with opportunities to practice physical interactions with the world around them.

• A favorite physical action game for 5- to 6-month-olds is to play catch. Sit with the baby on your lap, pushed in close enough to a table so that the baby can reach the surface. You will want a small rubber or wooden ball for the game.

• Hold the ball at arm’s length and gently roll it back toward the area on the table that the baby can reach. Have the baby look at the ball before you start to roll it. If you repeat this several times, a remarkable thing is likely to happen: The baby will reach out and catch the ball as it rolls past.

• Think for a moment about the mental and physical ability required for the baby to accomplish this task. If you want to catch a moving ball, you can’t reach for it where it is currently located. You have to anticipate where it will go in the future. You have to reach ahead of the ball, along its future path of motion, so that the ball and the hand come into the same location at the same time.

• From the first minutes after they are born, human infants move their arms around. Researchers have determined that even those early movements tend to be directed toward objects at which the infant
looks. By 1 or 2 months of age, infants will be able to swat at targets placed nearby, within their reach. At 4 months, infants typically can reach out and grasping an object. As infants start to grasp stationary objects, they begin to exhibit the future-oriented catching needed to catch a rolling ball.

**Tips for Parents**

1. Provide infants with a rich perceptual and social world right from the beginning. Even newborn infants are seeing, hearing, and thinking creatures who can benefit from interaction with people and the environment.

2. Avoid going overboard with efforts at early stimulation. There is no evidence that “super enrichment” leads to “super development,” and the anxiety associated with that endeavor could lead to unwanted stress for the parent and the child.

3. Provide physical action opportunities for your children, such as tummy time and “playing catch” with babies as young as 4 months of age. Constructing “sticky mittens” and attaching hook-and-loop tape to toys can facilitate a reaching game in children as young as 2 months of age. The development of physical action abilities is strongly connected with the development of mental abilities in children.

4. It is possible to successfully potty train many infants as early as 7 months of age. Most parents who do so report enjoying connecting with their infants via “elimination communication.”

**Suggested Reading and Resources**

Gopnik, Meltzoff, and Kuhl, *The Scientist in the Crib*.

Gross-Loh, *The Diaper-Free Baby*.


1. Children’s motor development milestones seem to be related to associated milestones in cognitive and perceptual development. Some research has suggested that the motor milestones are what drive the mental development. That is, children don’t start to reason about different types of objects until they can handle (and chew on) them. If we could give a newborn all of the action abilities of a much older child, do you think the newborn would also seem to think like a much older child?

**Activities to Try**

Make and play with sticky mittens for an infant. Fabric stores sell iron-on or sew-on hook-and-loop tape. Attach the soft side to baby mittens or socks (with small thumb holes cut in them) and the rough side to some toys. The mittens allow babies to reach for and hold onto toys. Be sure to put away or discard leftover small pieces of hook-and-loop tape because some babies may put them in their mouths and eat or inhale them. Also, when you are picking toys to use, keep in mind that the child is likely to bring them close to or even in contact with his or her face. Use soft toys so that any impact with the head won’t cause an injury.

**Recommended Equipment and Materials**

Baby walker: These wheeled devices enable pre-locomotor children to move around independently. Old models have a bad safety record, but those produced in the past 5 years or so have features that keep children from driving over an edge (such as a staircase) and are stable. You should always supervise children when they are in a walker—don’t use it as a babysitter—but note that the onset of locomotion seems to lead to important mental developments.

Crib mobile: Look for a mobile that provides a pleasant, visually stimulating display, with toys that can be safely grabbed and mouthed by a baby—and wash periodically. Supervised opportunities to move the mobile by kicking can add further interest.
In this lecture, we’ll discuss the importance of sleep. We’ll examine research on sleep and its relation to cognitive development, discuss how much sleep children need at different ages, and describe findings on the importance of going to bed at a consistent time every night. Essential tips to keep in mind include establishing and maintaining a consistent bedtime routine, watching for signs that your child needs more sleep, and avoiding computer screens and televisions for at least an hour prior to bedtime.

Sleep Is Essential

- All humans need sleep. Sleep isn’t just about downtime; many important functions occur when we are asleep. There is evidence, for example, that our memories are consolidated when we sleep. During sleep, our bodies perform maintenance and repair. People who chronically sleep too little are much more likely to suffer from heart disease and other circulatory disorders.

- At least two types of body processes that are critically important for children take place largely during sleep. First, the physical growth of a child’s body is regulated at night. This is when most growth hormone is released, especially during the deepest stages of sleep that occur a few hours after a child falls asleep.

- Hormones that regulate appetite and blood sugar are also produced during sleep. When we are sleep deprived, we tend to feel hungrier and, as a result, consume more calories. Not sleeping enough as a child can have lifelong consequences for physical fitness and health in later life.

Consistent Bedtime Routines

- Typically, when children arrive home as newborns, they don’t have much of a sleep cycle, certainly not one that seems closely linked to day and night. Some survey studies have found that newborns sleep
a bit longer at night than during the day, but newborns’ sleep cycles are mostly driven by their stomachs. A newborn baby likes to eat about every 2 to 3 hours. And when they get hungry, they wake up and call for more food—typically by crying.

- For this reason, establishing a consistent bedtime won’t really generate productive results until the child is around 4 months of age. If you work on providing a consistent bedtime ritual from about that age, most babies will be able to go to sleep at bedtime by about 6 months of age.

- One of the easiest ways to establish a bedtime ritual to increase the chances of a good night’s sleep is for mothers to breastfeed if they can. Breast milk contains an amino acid called tryptophan. The human body uses tryptophan to make melatonin. Melatonin, in turn, functions as a hormonal regulator of human sleep patterns. Mothers naturally begin to manufacture extra melatonin as they head toward their normal sleep time; this results in more tryptophan in the breast milk and, thus, a sleepier disposition in the baby after the evening feeding.

### Swaddling

- Swaddling has also been shown to help with lengthening the amount of healthy sleep. When swaddled babies are monitored through the night, they tend to experience fewer startle responses—a response in which the sleeping infant suddenly tenses up, flails the arms and legs, and sometimes opens the eyes.

- Babies, like adults, usually go back to sleep, but startle responses cut into the effectiveness of sleep. Researchers have run many studies in which children are observed while sleeping, either swaddled or unswaddled. The swaddled babies have significantly fewer startle events, and they tend to sleep better because of it.

- It might be hard to imagine that babies would feel comfortable being wrapped tightly in a blanket. It seems like it would be confining and claustrophobic. However, newborns do not have good
control over their arms and legs. It’s not uncommon for a newborn to hit himself in the face from time to time. Swaddling can prevent that and help with sleep.

- Swaddling is also soothing to infants because, for the last weeks of pregnancy, they are in a very confined space within the womb. A tight, confining space is actually much more familiar to a newborn than is freedom of movement.

**Bedtime Rituals and Circadian Rhythms**

- A bedtime ritual has been shown to be effective in improving children’s sleep and in helping their brains to learn about the 24-hour cycle. By far the best tip for establishing a child’s circadian rhythm is to provide numerous sensory and behavioral cues in phase with the 24-hour cycle. Eat dinner and feed the infant at about the same time every day. Play familiar music, have bath time, get into pajamas, and spend time reading books at about the same time every evening.

- During the time you are slowing down and relaxing for sleep, it can be tempting to turn on the TV or the DVD player. For children and adults, this turns out to be one of the worst things you can do to signal to your brain that it’s time to go to sleep.
  - Our bodies follow a daily circadian rhythm that lasts about 24 hours. A dose of bright, broad-spectrum light resets our clock, telling us that it’s daytime, and our nervous systems respond. Exposure to the light produced by LEDs in many electronic devices triggers that same clock-setting mechanism.
  - For adults, adolescents, and even infants, exposure to bright lights has been shown to disrupt subsequent sleep.
Jodi Mindell and her colleagues at St. Joseph’s University in Philadelphia published a meta-analysis on the topic of getting children to sleep.

- A meta-analysis pulls together data from many different studies, conducted in many different places, with many different groups of people. If you, as a consumer of science, read that some result is based on meta-analysis, as opposed to one particular study, you can have much greater confidence in that result.

- Mindell’s paper finds tremendous support for behavior-based techniques for getting children to sleep. When parents are educated about an approach in which children are put down to sleep at a consistent time, following a particular set of calming, relaxing behaviors, those parents are highly likely to report that the child was able to get to sleep faster and spend more time in that important restful, sleeping state.

**The Ferber Method**

- If a baby wakes up and won’t stop crying, many parents believe that it makes sense to go and spend the rest of the night with the baby. An alternative associated with Dr. Richard Ferber and one that has received much recent support is that children should be allowed to learn to put themselves to sleep—both at bedtime and if they awaken shortly after falling asleep.

- In general, the system involves soothing and relaxing children, then devoting progressively less attention to them until they learn to “self-soothe” and go to sleep on their own. The system is effective for children older than 6 months, not newborns.

- For example, put the baby down in the crib, say good night, and then leave the room. A child may get distressed and cry in this situation. Wait about a minute, let the baby fuss a bit, and then return to the room. Calm the baby down and repeat the process. This time, wait a bit longer—and repeat.
Eventually, the baby will fall asleep. The first few nights of using this method can be emotionally exhausting for parents and stressful for the child. According to Ferber method fans, however, once babies learn to put themselves to sleep—to self-soothe—there will be much less crying.

The Actigraph

- Many studies have explored the relation between sufficient sleep at night and success in school. For many years, these studies involved asking parents and children to keep sleep diaries. Although this method identified some connections, the records weren’t really about the amount of sleep but about how long the child spent in bed.

- A more recent technique involves an actigraph, a small device worn on the wrist, like a watch. It contains motion sensors and a computer system for storing the data from those motions. Using the actigraph, a researcher can precisely determine when subjects went to bed, when they fell asleep, how still and restful that sleep was, and how long they slept before getting up.

- The actigraph has established the importance of a consistent bedtime. Even if two children get the same amount of sleep, if one of them goes to bed at the same time each night, that child is likely to do better in school.

- Over the past several decades, it has been repeatedly found that children who grow up in relatively impoverished situations tend to do worse in school than children from more affluent backgrounds. Research using the actigraph has suggested that much of the variance might just be about sleep.

Paying Attention to Sleep Needs

- Guidelines for a child’s sleep needs recommend about 16 hours a day—including naps—for the first month. This drops to about 14 hours a day until the end of the first year; then to about 12 hours a
day through the end of the third year; about 10 hours a day through age 12; and the typical 8 to 9 hours associated with adults after age 12.

- Different sources give different estimates, however. What’s more, many tables of sleep needs are not from studies of how much sleep children need; they are estimates of how much sleep children actually get.

- Pay attention to your child and his or her sleep needs. It’s a good idea to keep some sort of record of the amount of sleep your child gets and then look over that sleep diary to see if you can identify connections between variations in sleep duration and variations in behavior.

- If your child seems extra irritable or has trouble concentrating, take a look at the sleep journal. Try moving bedtime up a little, wait a few days, and see if things get better. Also, children who have more difficulty falling asleep may have gotten too little exercise during the day.

- Social gatherings, concerts, and other activities often get scheduled after bedtime. Think about the pros and cons of sleep versus staying up. Staying up a little late and being a little tired the next day is fine for special occasions. Sleep is important, but so is a child’s waking life. Fortunately, for most children, parents are around to make those judgment calls.

### Tips for Parents

1. Establish and maintain a consistent bedtime routine by about 4 months of age.

2. Loosely follow the guidelines for how much sleep your child needs.

3. Avoid screens and televisions for at least an hour before bedtime.
4. Make sure you get enough sleep, as well. Sleep deprivation is associated with depression and bad decision making that can affect the whole family.

5. Breastfeed, if possible, to convey tryptophan and support the emergence of circadian cycles in young children.

6. Swaddle infants in the first month to reduce “startle” responses during sleep.

7. To establish a consistent bedtime and promote healthy sleep, provide sensory and behavioral cues in phase with the 24-hour cycle.

Suggested Reading and Resources

Ferber, *Solve Your Child’s Sleep Problems*.

Karp, *The Happiest Baby on the Block* and *The Happiest Toddler on the Block*.

Questions to Consider

1. It has been argued that part of getting children to sleep enough has to do with parents being able to get enough sleep and maintain a sense of balance and control in their own lives. Is that just good for adults, or can you argue that it is good for the child, as well?

2. Most parents follow the recommended guidelines for how much sleep children need at different ages—a table you can find many places online or at the pediatrician’s office. But these tables are not about how much sleep children “need.” The numbers are calculated from surveys of the amount of sleep that children typically get. How could one undertake a research program to assess how much sleep children need? What sorts of experiments would address that question?
Track the sleep times of your child in a written diary. Regardless of the child’s age, over time, this diary will give you a characterization of how much sleep your child typically needs. An abrupt change in sleep habits may be associated with behavioral and cognitive problems. Many problems can be solved with more sleep and/or a more regular bedtime.

Try turning off the television, computer, and other video screens for a full hour before bedtime each night for a week. You may not continue this for the long term, but the positive experience is likely to lead you to repeat it from time to time throughout your child’s life.

**Recommended Equipment and Materials**

*Goodnight Moon* by Margaret Wise Brown and Clement Hurd: The idea of having a consistent nighttime ritual that ends with sleep time is embodied in this classic book that you can read with your child. Also, the words and the pictures are lovely.
One of the oldest and most consistent challenges facing parents is how to get their children to eat healthy food. Young children are growing beings who expend a great deal of energy. The rapidly developing brain of a young child needs protein; fatty acids, such as DHA; iron; zinc; copper; iodine; selenium; vitamin A; vitamin B6; choline; and folate. Children also need plain old calories—but fortunately, that’s not so hard in most modern societies. In the short term, it’s important to get children to eat well. In many regards, however, this challenge is even more crucial in terms of its long-term effects—the eating habits they will take with them into later life.

Taste Preferences

- All human infants are born with some common flavor and smell preferences. A few drops of sugar water placed on the tongue will cause babies to lick their lips and look happy. But a few drops of a bitter solution will cause babies to clench their mouths closed, squint their eyes, and furrow their brows. It seems obvious that babies not only can taste the bitter flavor but also have a clear dislike for it.

- Julie Mennella, a researcher from Philadelphia, ran a study in which one group of mothers ate many carrots during their pregnancies; a second group ate many carrots while breast-feeding their babies; and a third group avoided carrots.

- A few months later, as the children were beginning to eat solid foods, Mennella tested them with a baby food prepared with carrot juice. She found that the children exposed to carrots, either during pregnancy or breast-feeding, consumed more of the carrot food.

- Children learn about food flavors and eating preferences long before they start eating solid foods themselves—even before they are born. If mothers eat healthy food on a regular basis, then their children will have healthy eating tendencies, as well.
**Finicky Eaters**

- Many studies have characterized a shift that takes place in children around the age of 2 years. At that time, many children who were voracious eaters as 18-month-olds rather abruptly become picky eaters. They may focus on just a few familiar, especially bland foods and greatly resist eating anything else.

- The best way to get a finicky eater to eat more vegetables and more varied food in general is simple: exposure. Make sure children eat at least a little of everything that you eat. That food will get into their systems, where it will be broken down and analyzed by their digestive systems. To the extent that those strange flavors are associated with materials that the body really needs, they will be back for more.

- One of the best studies in this area was done by Catherine Forestell and Julie Mennella. They fed 45 infants (less than 6 months old) the same type of baby food each day for eight days in a row. Half the children ate green beans; the other half ate green beans followed by peaches. The researchers recorded: (1) how much of the food the infants ate before they stopped accepting it and (2) what facial expressions the infants made while they were eating.

  - It’s probably not surprising that the babies liked the peaches better than the green beans. All infants are born with a natural craving for sweet things. As they ate the green beans, though, the babies were likely to make facial expressions that we adults associate with distaste.

  - Some parents might see this reaction and stop feeding their babies green beans. Over the course of eight days, however, a remarkable thing happened with both groups of babies: They started to eat more green beans—and, finally, more green beans than peaches.

  - This all fits well with the theory: Exposure to a nutritious food increases a child’s future desire for it. A clear tip that emerges from this study is that parents should, to a large extent, ignore
facial expressions and general negative reactions to food. As long as the child tries at least some of the nutritious food, the normal taste development process will take over.

Introducing New Foods

- An important question is whether presenting the green beans along with the peaches might make children more accepting of them. Elizabeth Capaldi at Arizona State University presented 50 children between 2 and 5 years of age with a drink of grapefruit juice. For some of the children, the juice was sweetened with sucrose. The other children were given unsweetened grapefruit juice.

- A few weeks later, the children were brought back to the lab and given some more grapefruit juice. This time, none of it was sweetened. After drinking some, the children were asked how much they liked it. Those who had consumed the sweetened grapefruit juice two weeks earlier claimed that they liked this juice more, even though it wasn’t sweetened.

Avoid giving children snacks, particularly sweet and calorie-rich snacks, near the time when you plan to introduce a novel food.
• The tip here is if you want your child to start eating some new food, don’t present it alone. Serve it to your child along with some other things that he or she likes.

**Hunger and the Brain**

• Almost everyone has had the experience of being hungry and tremendously enjoying a meal. Even mediocre, everyday foods can seem downright delectable if we are hungry enough. Several brain imaging studies have demonstrated that this is not just imagined. There are particular parts of our brain, in the orbitofrontal cortex, that respond to the tastes and smells of food.

• Most studies are based on the increase of blood flow to these areas a few seconds after the food is presented. That pattern of blood flow can be recorded by a functional magnetic resonance imaging (fMRI) device. When we eat good food, specific areas of the brain can be seen to “light up” significantly. The flavor of the food mediates the extent of the activity.

• Something else also influences activity in the orbitofrontal cortex: hunger. The circuits in the brain that sense when our body is low on fuel—in particular, when it has started to convert glycogen and fat into usable energy—are connected to this area of the brain. When we get hungry, this area of the brain is potentiated.

• When the brain is in this potentiated state, its typical responses to food are magnified. If you want to introduce a new food in the hopes that you child will taste it, eat it, and enjoy it, make sure your child is hungry.

**Strategies to Avoid**

• Avoid introducing novel foods when a child is feeling ill. There is another brain system that keeps track of foods that have proved poisonous. This system was once so central to our survival that it needed only a single exposure to learn something new, and it seems it never forgets.
Experiments have shown that if you feed a rat a novel food, then you make the rat ill, the rat will avoid that food for the rest of its life.

This same rapid learning system is present in humans. Even if an experience was coincidental, the link between the novel food and the illness is indelibly made in the brain.

- There are tremendous benefits from encouraging children to taste novel foods, at least in small quantities. However, pressuring children to eat large quantities of things that they don’t want to eat is actually associated with negative outcomes.
  - In an experiment conducted by Amy Galloway and colleagues, children who were pressured to finish their soup didn’t actually eat much more than children who weren’t. What’s more, children who were frequently pressured by their parents to eat more at home were significantly more resistant to pressure from the experimenters.

- A sound approach is to provide good food for children to sample, be sure they taste everything, and let nature—and the children’s brains—do the rest.

Healthy Eating for Parents

- One of the most effective approaches for parents who want their children to eat more healthy food is to eat more healthy foods themselves. Children are highly influenced by their most frequent adult role models—their parents. When children see you eating and enjoying healthy food, they will tend to mimic you and do the same.

- One study tested this specific theory. Researchers visited the homes of about 1,600 families with children between ages 1 and 6. For a randomly selected half of the families, education about good eating habits was provided, along with specific suggestions for increasing their intake of fruits and vegetables.
• The parents responded by increasing their own consumption of fruits and vegetables—and so did the children. In fact, the best predictor of how much the children increased their intake of fruits and vegetables was how much the parents increased their own.

• Something that wasn’t predicted by the study but emerged from analyses of the data was that there was also a significant reduction in the parents’ use of coercive eating practices. That fits nicely with the other studies that suggest those practices are not especially effective.

Tips for Parents

1. Pair new foods with familiar foods.

2. Encourage children to try new foods, but don’t be harsh or forceful.

3. Eat a variety of foods yourself—especially those that you’d like the children to try—in front of your children.

4. Avoid filling children up with familiar food if you’re trying to get them to taste something new.

5. Be patient and have faith in your child’s own taste and nutrition-seeking system.

6. Don’t introduce new foods when the child might be ill or on the verge of becoming so.

Suggested Reading and Resources

Lapine, *The Sneaky Chef*.

Logue, *The Psychology of Eating and Drinking*.

Physicians Committee for Responsible Medicine with Lanou, *Healthy Eating for Life for Children*.

Seinfeld, *Deceptively Delicious*. 
Lecture 4: Healthy Eating Habits for Life

Questions to Consider

1. The human taste system learns to crave flavors and smells associated with materials that it needs to thrive. Why, then, do we crave so many things that are bad for us? Or do we?

2. Many cultures include highly spicy foods as a standard part of their cuisine. The chemicals associated with spicy flavors have healthful properties for the body and reduce bacteria levels in food. But children younger than 5 years of age, even within these cultures, typically do not enjoy spicy food. Why might that be?

Activities to Try

Visit a restaurant that specializes in foreign cuisine. Your children may still prefer to order the child’s hamburger or chicken nuggets, but the exposure to unfamiliar tastes and smells can encourage them to be open to more culinary experiences as older children and adults.

Involve your children in cooking as soon as they’re old enough to participate in some way. You might even buy child-size pots, pans, and mixing bowls for your children to use. Cooking can be fun—even if cleaning up afterwards is less enjoyable—and an activity that children who are as young as 5 years old seem to enjoy. Finicky eaters may be less so when they themselves have been involved in food preparation.

Recommended Equipment and Materials

Child-size pots, pans, and mixing bowls
Children communicate in many ways from the moment they are born. They convey interest with their eyes and facial expressions; they indicate when they are unhappy by making noise. Eventually, at about age 1, children begin using words and putting them together into simple sentences. What’s more, almost all children seem capable of learning and using simple hand-based sign language well before they are able to use speech-based words. Along the way, during that first year of life, a great deal of thinking and social interaction takes place. Parents should encourage this interaction by talking to infants from birth.

The Speech Process

- At around 2 to 3 months old, most infants already turn toward voices and make gentle cooing sounds. By around 6 to 7 months, infants recognize their own names. Around 9 months, they can understand a few basic words.

- For about three out of four babies, the breakthrough to speaking—using words—occurs around age 1. That first word is usually a noun and is almost always used in isolation. This is an exciting moment for parents, representing the child’s first foray into the world of vocal communication. It’s a first step toward a deeper connection to the parents and to the social world in general.

- Most children don’t start to use verbs for a few more months after the first noun, and they don’t start to consistently use verbs and nouns to make simple sentences until they are a little less than 2 years old. Those two-word sentences are developmentally significant.
Learning signs, even simple ones, can lead to a stronger connection between children and parents.

Using Sign Language

- A large number of parents have undertaken the task of teaching their babies to use sign language for two good reasons.

- First, it is now clear that infants as young as 8 months old can learn a vocabulary of simple signs and use them to both receive and send messages. By 10 months, almost all children seem capable of learning and using simple hand-based sign language, well before they are able to use speech-based words.

- The second reason parents teach their babies sign language is that it is just plain fun. Infants are seeing, hearing, thinking creatures right from the time they are born, and they want to communicate. Making signs and successfully communicating can make babies happy.
• Using sign language also promotes spoken language development. At any given stage in learning to speak, there is a certain maximum level of complexity present in the syntactic structure of children’s speech. But a child who knows sign language routinely exceeds that maximum level when producing signs.

• Most parents don’t undertake the teaching of sign language with the idea that their children will progress into fluent American Sign Language, as formally defined and used as an adult language. If your goal is to communicate with your baby, have some fun, and promote general language development, then it doesn’t really matter what signs you use.

**Hindrance of Speech**

• When the baby sign movement first became prevalent, parents, pediatricians, and researchers worried that if sign language became the preferred method of communication for children, it might hinder normal development of spoken language.

• Several studies have put this concern to rest, however. One of the most notable was sponsored by the National Institutes of Health under the direction of Susan Goodwyn and her colleagues at California State University. They recruited a sample of 103 participants at around 11 months of age. The parents of one-third of the participants were encouraged to use baby sign language; another third were assigned to a nonintervention control group; and the final third were assigned to a second control group in which parents were encouraged to use verbal labeling more often but not encouraged to use gesturing or signing.

• The results of this and several similar studies have been consistent. Children who learn to sign with their parents did not lag behind their speech-only peers. It seems clear that learning to sign does not remove the motivation or in any other way hinders children’s ability to learn to speak. A close look at the data suggests that the children who learned to sign even learned to speak earlier than they otherwise would.
Speech versus Nonspeech Sounds

- Parents should talk to their children often, right from birth, as they would talk to other adults or older children, and use cues from children to help guide the conversation. Signing can be included in this interaction, but parents should also talk to infants in regular, spoken, complex language that is attentive to the interests of the child.

- Most people don’t realize it, but infants learn a great deal about the cadence and tonality of a language long before they learn the words of it, and talking about topics that interest the child means that more of the language parents are offering is likely to be absorbed.

- There is good evidence that newborns have a strong preference for human speech over almost any other type of sound. A standard study procedure in this domain involves presenting recorded sound played from one or more speakers located to the left and right of the baby. Children have a tendency, from the moment they are born, to orient their heads to face things that are interesting to them. Given a choice between prerecorded speech and nonspeech sounds, the speech sounds will get the most attention.

- The infant auditory system is built to receive and encode human speech. The range of tones to which the human ear is most sensitive corresponds closely to the sounds that are made during human speech. In addition, babies are better able to hear sounds in the high-frequency range of human speech than they are in the low range. This is largely due to physical properties of the ear canal and eardrum when babies are small, but it has some behavioral consequences.

Motherese

- When talking to infants, in addition to raising the pitch of our voices, we tend to talk in a singsong mode of speech. This is often referred to as “motherese” (or “fatherese”)—or, more recently, “parentese.” The scientific term is “infant-directed speech.”
It is an interesting fact that people all over the world, in hundreds of different cultures, use this type of speech whenever they talk to babies. We also tend to speak more slowly and clearly and to use only simple grammatical structures. All of this works to simplify the linguistic input for a novice language learner. By modulating our voices with both high and low tones, we accentuate the information that infants need in order to learn language.

Many studies have demonstrated that babies prefer motherese and consistently direct their attention to the source of motherese. As young as 1 month of age, infants look in the direction of a motherese sound longer than at an acoustically similar adult-directed version of the same words.

Other studies have shown that older infants learn better from motherese speech than from standard speech. If children are taught an object name using motherese, they are significantly more likely to remember the name of the object. Motherese doesn’t just attract the attention of the infant; it seems to result in better learning of vocabulary.

Patricia Kuhl and her colleagues at the University of Washington have conducted a wide-ranging cross-cultural study of motherese. There is some variability of the extent to which motherese is used, but it seems to be a nearly universal phenomenon. When faced with an infant, we slow down, simplify our grammar and vocabulary, extend our vowels, and accentuate our tonal variations.

The Language Instinct

Our language consists of sentences made up of individual words. As someone speaks, we don’t hear a continuous stream of sound but, rather, a set of discrete, separate words. However, think about the last time you heard someone speaking a language that you didn’t understand. One of the first things we experience is that the people seem to talk very quickly, without any break in their speech.
• Using our own language, the reason we hear breaks between words is that we recognize word units and parse them out of that continuous, rapid speech stream. The question is: How do babies learn to find those breaks in the sound stream?

• A series of studies by Jenny Saffran and her colleagues at the University of Wisconsin suggests that a “statistical learning” process is responsible for this.
  ○ Saffran brought 8-month-old infants into her lab and played them an invented, artificial language. She presented the infants with a speech stream for about two minutes, then tested how long they would listen to speech streams with either the same statistical structure or a different statistical structure.

  ○ Saffran found that when she shifted the word boundaries around, 8-month-old infants perked up and paid more attention. Even at 8 months, with just a few minutes of listening time, infants were able to extract at least some of the statistical structure present in an artificial language. These findings seem to suggest that humans have a “language instinct.”

Tips for Parents

1. Talk with infants from the time they are born. Provide a rich linguistic environment during infancy.

2. Use sign language with infants and young children to promote language development.

3. Use “parentese” or “motherese” and infant-directed speech.

4. In addition to using parentese, also talk with your children using normal speech. Engage in “child-directed” conversation. Allow what you say to be influenced by your child’s particular interests and responses. Take cues from the child to practice the “dance” of spoken communication.
Many adults don’t realize how much infants’ emotional state is influenced by the moods of the adults around them. Happy adults seem to make a baby happy, and sad adults make a baby sad. To what extent is that mediated by language understanding?

Have a conversation with your infant about your day—and his or hers! You might not understand each other’s words, but you may be surprised at how “conversation-like” the interaction can be.

Make up a gesture that refers to something you and your baby use, such as milk or a favorite toy. Whenever you say the name of the object, make the gesture. After a few days, look to see if your baby begins making the gesture, as well.

Put a bottle of milk and a favorite toy on the table in front of your baby, within easy view but out of reach. Watch where the baby looks when you say, “Look at the milk! Where’s the milk?” Do the same with a toy bear. Your baby can tell you, with his or her eyes, what words are understood well before any actual speaking takes place.

Sign language books: There are many board books aimed at young children and their parents that teach basic sign language terms. Socializing children with books and teaching sign language seem likely to be fun and positive experiences for young children.
Signing Time: My First Signs (vol. 1, Two Little Hands Productions, 2007): This DVD series uses songs and attractive videos to teach basic sign language. Make sure you don’t just sit your child in front of it unattended; by watching it together and interacting with each other, you’ll see that basic sign language communication will emerge.
In this lecture, we discuss the science of shaping and molding the behaviors of children. Much of our thinking in this area is influenced by theories of reward and punishment. Conditioning and behavior are topics that psychologists usually study with rats—not children, but parents should not treat their children like rats. Nor should they hit their children; corporal punishment simply doesn’t work and has deleterious side effects. Finally, parents should explain their reasoning for punishment in detail—sometimes in even more detail than the children can understand. Although rats don’t get anything out of an explanation, even very young children do.

B. F. Skinner and Behaviorism

- Let’s wind the clock back to the 1950s and study the second-most-cited psychological scientist in history: B. F. Skinner. Skinner was the undisputed champion of a school of thought called behaviorism. The basis of the theory is that we all—rats and humans alike—learn based on the reinforcement and punishment histories that we collect as we go through life.

- According to Skinner, there are four main types of results that an experimenter—or the real world—provides: positive reinforcement, negative reinforcement, positive punishment, and negative punishment.
  - Positive reinforcement is the easiest to conceive. If you engage in some behavior and afterward you experience something positive, then you will increase the likelihood of performing that behavior in the future.
  - Negative reinforcement is often confused with punishment, but it is not the same. Negative reinforcement is the reduction of something bad. Imagine that every time you come home late, your mother yells at you. If you hurry home, you may find that
the likelihood of this yelling is reduced. The negative change in the aversive stimulus—yelling—is reinforcing.

- Positive punishment is an increase in the frequency of some aversive stimulus. If you fight with your sister at the table, you get yelled at. Because this increase in yelling is something you want to avoid, you will reduce the fighting behavior.

- Negative punishment is the last option. Imagine that you get a cookie every day when you get home from school. If you throw your coat on the floor, you don’t get the cookie. This negative change in the frequency of a positive event—getting cookies—will make it less likely you will throw your coat on the floor.

**Equipotentiality**

- If parents pick some behavior that they want a child to do, and they consistently apply these principles, that behavior will increase in frequency. In this regard, children seem to be just like rats—except they aren’t.

- One of the central tenets of Skinner’s theory of behaviorism is the concept of “equipotentiality,” the idea that all stimuli, behaviors, and reinforcers are equally likely to be linked. It’s all just a matter of which links, which associations, happen to have been related by selective reinforcement.

- Part of this idea suggests that it doesn’t matter whether you choose to reinforce a good behavior or punish a bad behavior. The original behaviorist theories suggested that you should do whichever is most convenient. However, there have been dozens of studies that suggest that this is simply not true—and certainly not with humans.

- If you punish a child, especially if you use corporal punishment, such as spanking, the child will learn to avoid engaging in the behavior that sparked the punishment event. But the child will
also learn to avoid engaging in the behavior specifically when the punishing parent is present.

- In addition, the child learns a higher-level cognitive concept: a strategy. He or she learns that if someone does something that you don’t like, then the response is violence. Children who are hit at home, even infrequently, are significantly more likely to hit their peers at school.

- Children imitate their parents all the time. “Do as I say, not as I do” doesn’t work. Parents are role models, not only in how they interact with other adults but also in how they interact with children.

**Findings on Corporal Punishment**

- There is a broad consensus among developmental scientists and pediatricians that any potential benefits of spanking are greatly outweighed by the potential negatives. However, there is an inherent confound in many of the studies on corporal punishment: individual differences. For example, if a child is especially bad at regulating behavior or is very strong-willed and defiant, then there is a greater likelihood that corporal punishment will be administered.

- The use of corporal punishment has been linked to a wide range of negative outcomes, but it might not be the spanking that leads to those negative outcomes. Perhaps children who are especially bad at regulating behavior or who are very strong-willed and defiant are more likely to experience negative outcomes later. Perhaps the spanking is completely epiphenomenal—simply an outcome caused by some other underlying cause.

- There is definite evidence that corporal punishment is bad for children’s development and their relationships with their families and peers. A number of studies have worked around the individual differences confound by using longitudinal methods—in which individuals are followed over time to see how they develop. Over time, children who have more experiences with corporal punishment tend to increase in terms of negative, antisocial outcomes.
There is good evidence that corporal punishment leads to developmental problems—not with every child every time, but on average, the effects are present. At times, children can make their parents very angry. In those moments, it might be worth thinking about this research and counting to 10.

**Positive Reinforcement**

- Perhaps the best reason not to use corporal punishment is that it doesn’t work. If you really want to shape the behavior of children, there are two things you need to do on a consistent basis: Use positive reinforcement and explain why you want your children to behave in a certain way.

- The first tip—to use positive reinforcement—is Skinnerian. You should positively reinforce your children for good behavior so that they will engage in good behavior more frequently. This might sound obvious, but it can be surprisingly challenging because the events that capture our attention and concern as parents are typically negative ones. If children misbehave, parents take notice. If children are playing together nicely, parents most likely won’t notice.

- Parents are unlikely to say anything when their children are playing nicely because they think there is no behavior to shape—but there is. This is exactly the time when you can do the most good to reduce...
the frequency of bad behaviors. You need to positively reinforce your children for doing what you want them to do.

- This positive reinforcement can be as simple as talking with your children in the moment: “You two are doing a great job of playing together. Isn’t this nice? Thank you so much. I really appreciate it.”

**The Sticker Game**

- Especially with younger children, if the targeted behavior is specific, sometimes a sticker-based system can be effective. For example, if children are good about listening and getting ready for bed, then in the morning, they get two stickers to put on a card. If they are not so good about listening at bedtime, then they get one sticker. And if they are not good at all, they get no stickers. When they get 10 stickers on a card, they get a new toy.

- The change in behavior will be almost instantaneous. Parents can adapt this sticker game to almost any situation and to almost any behavior in which they would like to see a lasting change.

- There are two keys to this game. One is to reinforce the positive. Encourage children to engage in the behaviors you’re seeking. Second, do not punish children for engaging in the behaviors you want them to avoid.

**Explaining Your Reasoning**

- To maximize a change in behavior, parents should explain to their children why they want a pattern of behavior to change. Humans in general are much more willing to change their behaviors if they understand the reason for making that change. Indeed, in the absence of a good explanation, most people can be quite stubborn about changing.

- This is especially true with children. If you can make that clear connection with your child, even if he or she doesn’t completely understand it, your actions are more likely to have an impact.
• It’s interesting to note that with the sticker game, the stickers aren’t the real reward at all. The game is more of a strategy for getting children’s attention and communicating with them, as well as showing them that they can have a nice time talking, reading, and playing quietly at bedtime.

• Human children are simply not like rats. Although they are subject to influence by reinforcement and punishment, they are, like adults, far more influenced by their own thinking, their own communication and their own decisions. If we interact with children at that level, we are much more likely to connect.

**Tips for Parents**

1. Don’t treat your child as if he or she is a rat. Human learning functions in ways that are very different from the simple changes associated with reinforcement and punishment.

2. Never hit your children. Hitting doesn’t result in general changes in behavior, and it has several negative consequences in terms of psychological development.

3. “Catch” your children being good and reward them for it.

4. When you want your children to change their behavior, explain why, even if that explanation is a little too complex for them to understand. Just the act of explaining enhances the effects of reinforcements.

**Suggested Reading and Resources**

Hyman, *The Case against Spanking*.


Skinner, *Verbal Behavior*. 
1. Hermer and Spelke, in their toddler toy search study, found that children become able to use color information for reorientation when they develop the ability to use language to describe spatial and color relations. Are there other instances in which our language changes how we conceptualize things during childhood? What about during adulthood?

Activities to Try

Play the sticker game described in the lecture. Pick some behavior that you would like your child to reduce in frequency or stop altogether. Recast the negative behavior as a positive behavior that you would like your child to perform more frequently. For instance, “Stop shouting at the table” might be recast as “Be polite at the table.” Set up rules for getting sticker rewards and an agreed-upon prize when enough stickers are collected.

Make your own sticker game for yourself, in which you give yourself points whenever you “catch your children being good” and praise them for it.
Parenting involves making decisions and choices every day, many times, without much opportunity to ponder them. Over time, parents develop a style of interacting with their children that drives many of these moment-to-moment decisions and ultimately affects their relationship with their children and shapes child development. This lecture explores research on parenting styles that reveals how parenting styles can affect children’s behavior, social and cognitive development, and even their long-term happiness. This lecture also examines the important question of moral development.

Four Styles of Parenting

- There is only one main tip for this lecture, but it is a crucial one: To enhance your child’s development and well-being, you should strive to be an “authoritative” parent and resist being “authoritarian” or “permissive.” You should also not be “uninvolved.”

- These four styles of parenting were first proposed by Diana Baumrind at the University of California at Berkeley in 1966 based on her observations of parents interacting with their children.

Authoritarian Parents

- Authoritarian parents are those who are relatively strict in their control of their children. When an authoritarian parent asks a child to do something, he or she will typically react negatively if the child asks for an explanation. The response “Because I said so” is a core tendency of authoritarian parenting style.

- Authoritarian parents tend to control their children’s behaviors with punishments or threats of punishments. They are often not willing to explain the reasoning behind their responses. An authoritarian parent tends not to be warm in dealing with the child or particularly responsive to the moment-to-moment needs of the child.
• That said, authoritarian parents may love their children very much. Indeed, most authoritarian parents would say that they are strict in teaching their children how to behave explicitly because they love and care about how they grow up.

**Permissive Parents**

• Permissive parents tend to be nurturing, warm, and responsive to the moment-to-moment needs of their children. A permissive parent only rarely imposes limits on his or her children’s behavior.

• A permissive parent is likely to discuss with a child the reasons behind certain desired behaviors. They only rarely tell children to behave in certain ways simply because they say it is the right thing to do.

• Most permissive parents would say that they want their children to learn to control their own behavior and have the freedom to make mistakes and learn from them. A permissive parent sees this as the way to promote good development in the child.

**Uninvolved Parents**

• Uninvolved parents are low both in warmth and control. By and large, they just don’t seem to be particularly interested in their children, perhaps due to clinical depression or because they are modeling the parenting they received when they were children.

• Not being involved in your children’s lives—essentially not paying much attention to them or interacting with them—is a bad thing. Children are highly dependent on their parents to mediate normal development. Although there are some problems associated with authoritarian and permissive parenting styles, the outcomes for uninvolved parents are much worse.

**Effects of Parenting Style**

• Over the past several decades, dozens of large-scale studies have found correlations between parenting style and developmental outcomes in children.
Children raised by authoritarian parents are, perhaps not surprisingly, better behaved than other children. They tend to get in trouble at school less often, and they tend to be better at following rules.

That said, however, children of authoritarian parents are more likely to experience depression and anxiety issues in later childhood and even adulthood. Other studies have suggested that these children also experience more frequent social problems. For instance, they have lower self-esteem and tend to feel less accepted by their peers.

The children of permissive parents also seem to exhibit a host of negative outcomes. They misbehave more, including at school. They tend to watch many more hours of television than other children and are more likely to be obese. As older children, they are more likely to have problems with alcohol and drug abuse.

**Authoritative Parents**

- All the problems associated with both authoritarian and permissive parenting are less frequent and severe in children raised with an authoritative parenting style. Although strong parental control is important, so is parental warmth. The real challenge is to incorporate both at the same time. An authoritative parent sets limits, provides reasons for those limits, and clearly guards against any breaking of that framework.

- But an authoritative parent also maintains a warm and respectful relationship with the child. Discussing the reasons for a given rule—even taking a problem-solving approach in which the child is a partner—seems to be absolutely critical in this domain. Even if the child doesn’t understand the explanation fully, the mere act of taking the time to give the explanation seems to matter a lot.

- Authoritative parents are more likely to engage in a practice referred to as inductive discipline. The basic idea here is that, when you ask a child to change his or her behavior, you explain how that change might affect others.
A study by Craig Hart and his colleagues at Louisiana State University assessed the extent to which 106 parents of children between 3 and 5 years of age used inductive discipline on a regular basis. The researchers then observed these children as they played on a playground.

The study found that the more often inductive discipline that was used at home, the less frequently the children engaged in disruptive behaviors on the playground.

**Instilling Discipline, Practice, and Hard Work**

- Some parents might be conflicted about using authoritative parenting in the area of discipline and practice—factors involved in hard work that will help children succeed in life.

- Imagine that you have a 7-year-old who is learning to play piano—an activity that requires practice, discipline, and hard work. But these aspects of learning music are problematic for most children. Although they have great energy and enthusiasm, it is a rare 7-year-old who has the ability to work hard at something that is not fun—at least not all the time.

- This situation has often been described in terms of brain development. Children’s frontal lobes—the parts of the brain that are responsible for long-range planning and the self-control involved in delayed gratification—are still developing in the late teens and early 20s. At age 7, they still have a long way to go.

- Perhaps our role as parents is to instill the values of discipline and hard work and make our children practice. But how? And how much?

- There are many stories about parents who have pushed their children, in an authoritarian fashion, to achieve great things. In 2011, Amy Chua released a book entitled *Battle Hymn of the Tiger Mother*. This memoir of her experiences raising two daughters and of how her parents raised her sparked a media firestorm over the next several months.
Children around age 7 have difficulty with activities that require practice, in part because they haven’t learned that practice leads to performance enhancement.

- In the book, Chua described using very forceful, coercive parenting practices to motivate her children to achieve success. One of the most memorable stories is about her 7-year-old daughter trying to master a particularly difficult piece on the piano.

- Chua threatened her daughter with no lunch or dinner unless she mastered the piece. She threatened no presents or birthday parties. Chua accused her daughter of being lazy, cowardly, and even pathetic. The child was even forbidden to take a break to use the bathroom.

- At last, late at night, the child made a breakthrough, learning to play the piece without mistakes. As harsh as the conflict between Chua and her daughter had been throughout the day, once the goal was achieved, there was great emotional warmth and closeness.

- Many people find this story disturbing, bordering on mental and emotional abuse. That said, Chua’s methods got results.
Providing Encouragement

- The problem with using such stories to make parenting decisions is that they are simply anecdotes—single stories about particular individuals. In contrast, the results of research based on data pulled together from hundreds of children have demonstrated that authoritarian parenting is not the way to go.

- The science says that it is acceptable to set limits, and there may be situations in which you need to be very encouraging, but how you encourage children is critical. You should discuss the consequences of the decision that your child is making about how to spend his or her time.

- If the child refuses to practice, then from an authoritative perspective, you should leave the decision alone. Your response “because I said so” will not work well in the long run. If you continue to provide attractive opportunities, it’s likely that your child will eventually return to the piano on his or her own initiative. When that happens, you should offer praise. In addition, you should pay attention to what works for your child, discuss issues in depth, and provide a clear framework of limits.

Moral Development

- Recent research is quite clear about which parenting style is best for promoting moral development in children: authoritative parenting.

- In one study, a child is presented with a box with a closed lid and told not to peek inside. Eventually, nearly all children give in and look in the box. The real test comes later, however, when the experimenter returns to the room and asks the children if they peeked.

- Children raised in an authoritarian environment are significantly more likely to lie about having peeked. Children raised in an authoritative environment, in contrast, are more likely to internalize moral standards and feel guilty when they violate them. They are more likely to share and behave altruistically in general. Even their reasoning about moral dilemmas seems to be at a higher level.
Tips for Parents

1. To enhance your child’s development and well-being, you should strive to be an authoritative parent. Conversely, you should avoid using an authoritarian or permissive parenting style. Certainly, you should not be an uninvolved parent.

2. Use inductive discipline when you correct your children. Explain how their behavior—and changing it—will affect other people around them.

Suggested Reading and Resources

Agassi, *Open*.

Chua, *Battle Hymn of the Tiger Mother*.

Steinberg, Darling, and Fletcher, *Authoritative Parenting and Adolescent Adjustment*.

Question to Consider

1. Authoritative parenting style involves being warm and considerate with your children but also setting clear limits and enforcing them. It involves explaining why you set certain rules, as well as enforcing those rules when they are challenged. Good teachers often do these same things. Do good managers and bosses? Should they?

Activities to Try

For one full day, make a point of never telling your children what to do without also explaining why. At the end of the day, ask if they noticed.

Spend some time paying attention to other people as they parent their children through difficult transitions or interactions. Are the other parents being authoritative, authoritarian, or permissive?
The Joy of Reading and the Place of Phonics
Lecture 8

There is nothing quite as enjoyable or rewarding as teaching your children to read. More important than helping them sound out words and understand sentences is the emotional togetherness you can enjoy by sharing books and words. The ideas that we acquire from reading are limitless—the adventures we take, the things we learn, the people we meet. When we open children’s minds to the amazing world of reading and writing, we are connecting them to the human species and human history in a deeply profound way.

Reading Aloud

- Most parents know that they should read to their children, even when the children are infants. Children who are socialized with books are much more receptive to them later.

Take time to enjoy and appreciate the experience of helping children learn to read; once reading becomes automatic, this special time is over.
• There is a large body of evidence relating reading experience to higher levels of reading mastery in school. Part of reading mastery likely has to do with actually learning about words and letters, but a big component is just becoming socialized to the act of getting enjoyment from books.

• There is interesting evidence suggesting that reading aloud can be beneficial for older children, as well, even up to age 14. Even when children are capable of reading themselves, they can learn to get more out of reading by hearing a more experienced adult read to them.

Choosing Books
• Young children like to read the same books over and over again. They aren’t being lazy or obsessive when they do this; they are learning. The rhyming structure of a children’s picture storybook may be obvious to you the first time you read it, but if you are a beginning reader, there is a lot to take in.

• Part of the reason children seem to like reading the same book repeatedly is that as they become more experienced readers, they experience aspects of the book that they didn’t notice earlier.

• In general, it’s a good idea to involve your child in the decision-making process for what book to read. This is an important part of the joy of reading, and one they should learn right at the beginning.

• Judy DeLoache and her colleagues at the University of Virginia ran a study of children’s picture books to test whether books with moving, pop-up parts are more effective. They recruited children between 20 and 36 months of age and read picture books with them. In some cases, the books were simple, with just photos of letters and animals. In other cases, the books had pop-up features built into them.
• Children in the 2 to 4 age group greatly enjoy anything they can manipulate. The researchers wanted to determine if the presence of pop-up parts would keep the children more engaged with the book material, allowing them to learn more from the picture book experience.

• The pop-ups held the children’s attention, and the children seemed to enjoy them, but they didn’t learn more from the pop-up books. In fact, they learned less. Books that have moving parts or play music you can be fun, but when it comes to learning, “less is more.”

Reading Development

• The period from 4 to 5 years of age is usually described as a pre-reading phase. Children don’t typically learn to read during this time, but they lay the foundation for learning to read age 6. A child of age 4 or 5 learns that some words rhyme. Typically, children also learn to sing the alphabet song and write some letters around 4 or 5 years of age.

• Around 6 years of age, children are ready to read their first books. They will develop a vocabulary of about 100 words that they can read easily, including such common words as and, but, or, the, cat, and so on. Children need a good basic vocabulary to start reading, but once they get going, reading becomes an important source of learning new vocabulary words. When children encounter new words, the context implies their meaning.

• By second grade, children are typically able to recognize the sounds of all the letters and recognize and use uppercase and lowercase letters. As children progress into third grade, around age 8, they become increasingly fluent as they read. Parents may notice that they pronounce phrases and short sentences as whole units rather than reading individual words one at a time.
• Beyond 11 years, children continue to make dramatic and rapid strides in improving their reading, but the phase is more accurately described as the time when they shift from the “learning to read” phase into the “reading to learn” phase. By age 11, and certainly beyond, children seek out reading, not for reading’s sake, but because they can get information and entertainment from reading.

**Phonics**

• As we said, the pre-reading phase occurs around ages 4 to 5, when children begin to learn that particular letters are associated with particular sounds. This is the stage when many parents turn to phonics-related songs and games that teach children to read and pronounce words by learning the sounds of letters and groups of letters.

• Often, within a relatively short period of time, children will be able to “read” these simple texts. But keep in mind that children who are trained in phonics are doing only one part of reading: They are converting written symbols into sounds. That’s not all there is to reading. When we read a sentence, our goal is to comprehend its meaning.

• Children who learn to read using phonics can acquire meaning, but they don’t do it directly from the written words. In order to know what they are reading, they must become very good at symbol-to-sound conversion. They must practice until it becomes automatic—almost effortless.
• Perhaps the best approach for parents is to use phonics at first, then discontinue it. Phonics can be effective at helping children start to learn to read, and you can find many phonics resources available free online. Use phonics for a few weeks or months with your children, then move on.

• After you’ve tried phonics, the next step is just to practice reading. Read stories that are meaningful to your children so that they can practice using text to navigate a series of events and ideas. Encourage them to practice reading whole words at once and piecing together whole sentences without actually needing to read every word.

Dyslexia
• The exact causes of reading disorders, such as dyslexia, remain a mystery to cognitive scientists and neuroscientists. They are the subject of a great deal of research, and some interventions have already been developed.

• Paula Tallal and her colleagues at Rutgers University have pursued the hypothesis that dyslexia is caused, at least in part, by slower-than-normal rates of neuronal response in certain critical areas of the brain. They developed computer-based training systems that enhance the temporal resolution of children’s behavioral responses. In several intervention trials, the team found significant improvements in reading among dyslexic children.

• Most children with dyslexia report particular difficulties in discriminating between letters that are mirror images of each other, such as lowercase $b$ and $d$. This has led some researchers to explore a visual, sensory-based approach to diagnosis and treatment.

• It may be that dyslexia is a combination of memory, temporal resolution, and perceptual issues. It may be that it is some subset of these for any individual. Regardless of the exact cause, it can result in great frustration for a child learning to read. This is especially true prior to a diagnosis of dyslexia or other reading disability.
**Slow Readers**

- It is quite common for children with dyslexia—and their parents—to think that perhaps the children are just not that smart. The first thing to note is that there is absolutely no evidence that children who suffer with dyslexia have lower intelligence than typically developing children.

- This lack of evidence is underscored by the fact that most IQ tests emphasize text-related information. That is, even if you administer an IQ test without any writing—perhaps you read the items to the child with dyslexia—you are still testing for such skills as comprehension and spatial reasoning that children develop while engaging in reading.

- If your 6-year-old is slow to begin reading, the first suggestion is to do nothing. You should continue to play reading games with the child up to the point that those reading games are no longer fun. You should also read stories together and encourage the child to participate in the reading as much as possible. You might also pick out different books with your child that piques his or her interest.

- Perhaps your child just isn’t quite ready to read yet. In almost all cases, this problem sorts itself out. If it doesn’t, by around age 7, then a trip to a reading specialist is probably warranted.

- If your child is diagnosed with a reading disorder, then work on that issue when you come to it. Get to know the research in that area. Above all, however, don’t despair, and don’t allow your child to despair. A child with dyslexia will likely take a different path to knowledge and expertise than a child without it, but that journey is no less authentic.

**Tips for Parents**

1. Read to your children from the time they are very young, even as infants. Socialize children to be familiar with, and feel positive about, books. When they are able to do so, let children hold books as you read.
2. After your children are able to read, continue to read aloud with them periodically, even as late as 14 years of age. Even as reading develops, most children’s “listening” level for understanding words remains higher. They can use this experience to learn to get more out of reading.

3. Start with phonics-based teaching to help children learn to decode letters into sounds. Use simple books so that children can have the experience of completing a book independently as early as possible.

4. Don’t stop with phonics. Once children can sound out words well, you should move beyond that approach and focus on “whole word” reading, practicing with real words, in real sentences, in meaningful stories. This will enable your children to go directly from “print to meaning” without having to think about the sounds involved.

5. Allow your children to read the same books repeatedly, which they are likely to want to do as they are learning to read.

6. Involve your child in decisions about what books to read.

7. As soon as it’s possible, practice reading with your child “in the real world” outside of books. Read labels at the supermarket. Read signs on the street. Teach your child that reading can be used to get useful, real-world information.

8. Invest in a simple alphabet book, one that allows children to focus on the letters rather than the overly attractive decorations.

9. Encourage your child to read, but resist the urge to push too hard. Early readers are not always better readers in the long run, especially if they experience negative associations with it. (That’s why schools in Finland don’t even try to teach reading until children are 7 years old).

10. Play rhyming games with your children as they are starting to learn to read.
11. Make use of educational television to promote basic reading skills. There’s no substitute for practice, but many television shows promote phonics-type skills very effectively. For instance, check out *Between the Lions*.

12. If your child is slow to read, don’t panic. Just keep reading with and to your child and practicing phonics and other activities up the point at which those activities become frustrating. Then, take a break and try later. Most reading problems resolve themselves. Of course, don’t feel bad about seeking an evaluation by a reading specialist if reading delays become a problem.

### Suggested Reading and Resources

Engelmann, Haddox, and Bruner, *Teach Your Child to Read in 100 Easy Lessons*.

Gladwell, *Outliers*.

Shaywitz, *Overcoming Dyslexia*.

### Questions to Consider

1. As described in the lecture, children love to reread books repeatedly. At what point should a parent put a stop to this and make sure that the child benefits from the experience of tackling a new text?

2. To get better at reading, children should practice reading as much as possible. Many elementary-aged children will read comic books more readily than other, less action-packed and illustration-rich books. How much comic book reading is too much?

### Activities to Try

A quick Google search for “teaching children to read” will result in many free online resources, such as [http://pbskids.org/island/](http://pbskids.org/island/) and [http://www.starfall.com/](http://www.starfall.com/). Many of these sources are of high quality and include games and other activities that you can try with your early reader. Most include
phonics-based approaches discussed in the lecture. That said, don’t get so involved with these computer-based activities that you neglect reading actual books with your child.

**Recommended Equipment and Materials**

Bob Books (large series available for beginning to novice readers), Scholastic Publishing, http://www.bobbooks.com: These books are carefully written so that readers at a very beginning level can read them from start to finish with some effort and sometimes a little help from a more advanced reader, such as a parent.
Although our society tends to overemphasize the importance of IQ scores, IQ tests are here to stay—as is their influence on children’s lives. In this lecture, you’ll learn what you can do to enhance your child’s intelligence as defined by modern IQ tests. Three effective strategies are to encourage them to play with blocks, to exercise regularly, and to master a musical instrument. You’ll also learn how to promote learning and achievement in your children—whatever their IQ scores. Finally, you’ll see the importance of explaining to your children that intelligence is a malleable property of the human mind, not a fixed trait, and of praising your children for their hard work, not for being “smart.”

An Imperfect Predictor

- As a general rule, resist the temptation to have great faith in an IQ score. If a child or the parents decide that the child is just not good at math, then, a few years later, he or she will probably not have learned math very well.

- At the same time, if a child or the parents decide that the child is just brilliant and doesn’t need to work very hard to learn, then a few years later, he or she may not have learned very much.

- Intelligence tests can be fascinating tools that tell us something about the academic aptitudes of a child, but they are far from perfect.

The IQ Test

- At some point early in the elementary school years, many children are pulled out of their regular classrooms and given IQ tests. A school psychologist or other professional sits across the table and delivers a series of timed tests.
For example, a child might be shown a line drawing of a car and asked what is missing from the picture. The child might be shown a printed pattern on a page and asked to reproduce it using colored blocks. The child might be read a series of numbers and then asked to recall them in order. The child might be given a set of letters and asked to unscramble them to form a word.

The testing process typically lasts for more than an hour, depending on the age and speed of the child. At the end, all the data are combined to produce the intelligence quotient (IQ) score.

The IQ Score

Whatever the average score is for a particular age group of children is set to be an IQ score of 100. IQ 100 means “average intelligence” in the testing domain.

The tests tend to produce a normal distribution of scores. If you make a histogram to see the frequency with which each score is produced, you see the typical bell curve shape. The raw scores are scaled so that each jump of 15 IQ points corresponds to a move of 1 standard deviation up or down along this bell curve.

The IQ number assigned to a child after about an hour of testing can have a significant impact on his or her life. Alone or combined with various achievement tests, the IQ number may determine the classes into which the child is placed, the group of students with whom the child will interact, and in some cases, the quality of education that he or she will receive.

Development of IQ Tests

At least five different IQ tests are used on a regular basis in the United States: Raven’s Progressive Matrices, the Wechsler Intelligence Scale for Children, Stanford-Binet, Woodcock-Johnson Tests of Cognitive Abilities, and the Kaufman Assessment Battery for Children. Each was developed independently, and each undergoes significant revisions every few years.
• Educators and cognitive scientists develop the test questions. Based on their knowledge of how cognition functions, the questions are their best initial guesses for testing instruments that might tap into intellectual aptitude. They are educated guesses, but they are very much guesses.

• IQ tests are constructed largely on a trial-and-error basis, such that they provide a good prediction of how well children will perform in school. And even then, predictions of a child’s grades are only about 25% more accurate with an IQ score than without it. This indicates that there is a good percentage of children with high IQ scores who perform rather poorly in school and a good percentage with low IQ scores who perform rather well.

The Stereotype Threat
• An IQ score can have an indirect effect on how children think of themselves and how parents think about their children. Several studies have demonstrated the strong effects that children’s beliefs about themselves can have on academic performance. For example, Claude Steele of Stanford University has extensively studied a phenomenon that he named “stereotype threat.”

• There is an existing stereotype in our culture that males are better than females at math. If a group of males and females is given a hard math test, along with instructions that mention that some studies have shown that males outperform women in math, the men tend to do significantly better. It’s as if the threat of the stereotype—the belief by the women that they might do poorly and confirm the stereotype—creates extra anxiety that hinders their performance.

• The same test may then be given to another group of males and females, but this time, the experimenters make a point of contradicting the value of the stereotype. For instance, the experimenters might say that some studies have demonstrated gender differences on math tests, but those studies have not been performed with high-caliber math students like the test takers, who have been specifically selected based on math ability.
This small change in procedure affects the female participants in a significant way. Once the stereotype threat is reduced, male and female performance becomes very similar. If you believe you can learn and perform well on tests of your knowledge, then you will perform at a high level. Conversely, if you believe that you cannot do something, you will fail.

Playing with Blocks

A variety of computer programs and high-tech devices are marketed as “brain boosters” that will increase a developing child’s intelligence. There is little to no evidence to support most of these claims. However, there is a good body of evidence to support the intelligence-boosting benefits of a common, simple toy: wooden building blocks.

A typical study involves performing an IQ test with young children, then giving half the group blocks to play with over the next few weeks or months. After that time, the IQ test is repeated.

Just how blocks are related to intelligence remains a subject of some debate among researchers, but a great deal of evidence points to the positive effects of block play.
• Studies have found significant effects of block play with 4-year-olds, particularly with aspects of IQ tests that assess spatial reasoning abilities. Other studies have found that children who played with blocks as 4-year-olds score better on math achievement tests than those who didn’t play with blocks.

**Regular Exercise**

• A variety of experimental intervention studies have found that when children are encouraged to be physically active for at least 30 to 60 minutes per day, they produced better scores on IQ and related cognitive function assessments.

• This research translates to encouraging children to exercise on a regular basis, even just climbing on a jungle gym or playing tag.

• Some recent research has found that when adults exercise, they release extra amounts of particular growth factors responsible for creating new neurons and connections between neurons. It’s likely that this happens with children, as well, and provides a reason for at least some of the observed improvements in cognitive performance.

**Musical Training**

• In many reported cases, children who received several months of musical training showed greater improvements, relative to a no-music control group, on IQ tests that tapped spatial skills.

• There is a great deal of evidence that the brains of musicians are larger and more active than those of non-musicians. There is good reason to suspect that when children learn to play a musical instrument, they are stimulating brain development and the brain’s ability to rapidly and accurately process information.

**Crystallized and Fluid Intelligence**

• Parents should promote the belief to their children that intelligence is malleable, as opposed to being a fixed, congenital trait. When IQ tests were first developed, intelligence was thought of as something
that people were born with and likely a consequence of some biological aspect of the brain.

- An alternative view, far more prevalent among modern intelligence researchers, is that intelligence is more like a muscle. Some people are genetically larger and more muscular than others. However, those who exercise their muscles on a regular basis will get bigger and stronger.

- Brain development seems to function in much the same way. There are certainly some genetic components to intelligence, but a large component of our cognitive ability comes from how we use our brains, not from our genes. Some researchers make a distinction between “crystallized” intelligence and “fluid” intelligence.
  - Crystallized intelligence refers to particular mental skill that someone possesses within a certain domain. It’s closer to the concept of expertise than what most people think of as basic intelligence.
  - Fluid intelligence is the opposite—a mental skill that one brings to bear when faced with a completely novel mental challenge. A person with high fluid intelligence will do well on a variety of intellectually challenging tasks.

- When children think of intelligence as malleable, they tend to learn better and, ultimately, perform better on tests of academic achievement. Many studies have supported this.
  - Several longitudinal studies have tracked student achievement scores in math. At the start of the study, the experimenters survey the children to assess the extent to which they think of intelligence as malleable. They also collect data about their math proficiency.
  - A few years later, when math achievement is tested, the students who believed in malleable intelligence tended to have improved significantly more than those who thought of intelligence as fixed.
Effort versus Being “Smart”

- We have described how children might be hindered by learning to think of themselves as “not smart.” At the same time, children who are told repeatedly that they are very smart are especially subject to problematic attributions when they perform poorly. Frequent praise of children for being smart seems to motivate them to be protective of that self-image.

- Several studies have compared children who are praised after success for “being smart” to those who are praised for “working hard.” When researchers look at the academic achievement of children praised for effort, they consistently outperform those praised for being smart.

Tips for Parents

1. Resist the temptation to place great faith in your child’s IQ score. IQ scores are not infallible estimators of intelligence; they are far from perfect. Both high and low scores can be misleading.

2. To boost intelligence (and IQ scores), give your children blocks to play with when they are young, encourage them to exercise on a regular basis, and get them involved in learning to play a musical instrument.

3. Talk with your children about intelligence as a malleable property of the human mind rather than a stable, genetically endowed trait.

4. Praise your children for their hard work—not for “being smart.”

Suggested Reading and Resources

Dweck, *Mindset*.

Mackintosh, *IQ and Human Intelligence*. 
1. IQ tests are designed—and refined on the basis of trial and error—to predict children’s academic achievement. Research, however, has suggested that a child’s knowledge of his or her IQ score can hinder learning. Would it be possible or ethical to use IQ scores without telling children what they are?

**Activities to Try**

Find and take an online IQ test yourself. If your child is going to take one and reason about its meaning, your parenting will likely be helped by having recent firsthand experience with such tests yourself.

If you play a musical instrument—even if you don’t play it very well—give your children a few lessons yourself. Musical learning is associated with boosts in mental development, and the activity may enhance your relationship with your children. Even if you eventually choose to have your children work with a professional teacher, even a small amount of time spent in this activity might be rewarding.
In this lecture, we’ll explore the principles of human memory function and describe tips parents can use to enhance their children’s memory ability. One strategy to try is to teach children the benefits of using mental images. If you can turn a word, name, or number into an image, then you can remember the image and, later, decode the mental picture back into the original information. Parents should also teach children the basics of “rehearsal” as a way to keep short-term memories fresh until they can be encoded into more permanent form. Finally, organization and mnemonics are additional helpful encoding strategies.

The Brain and Memory

- The human brain stores long-term memories as patterns of connections between the neurons in the brain. Those neurons—about 100 billion of them—are highly interconnected. Something like 100 trillion connection sites—synapses—are present in the brain.

- When any particular neuron becomes active, it influences the activity levels of the neurons to which it is connected—either by increasing or inhibiting their activity levels. When you form a new memory, the pattern of connections in your brain has been altered.

- Infants and toddlers don’t yet have good verbal memories for complex information. However, young children have as many as 10 times more synapses than adults. As a child matures, the vast majority of these connections are pruned. Memory and cognitive function are in some flux during this process, which may explain why we don’t remember much before about 3 years of age.
• That said, some memory systems are clearly present from birth. Babies will look at a new toy for a long time, but if they see the same toy again, they will look at it for a shorter time. This habituation tendency means that children recognize familiar objects from birth.

**Working Memory and Long-Term Memory**

• We think that we encode many details of images and of our experience of the world around us, but we don’t. It is the nature of the human visual system and the human brain to focus attention and processing on a relatively small number of different things. And if you don’t focus your attention on something, then you can’t possibly remember it later.

• Once we focus our attention on some element of our sensory input, we bring it into “working memory.” This is the part of our cognitive system where we temporarily store information that we need to process and reason about.

• Working memory is also referred to as short-term memory because input doesn’t stay there for long. Within about 30 seconds or so, unless you refresh the information in working memory, it will fade away.

• In order to remember things for a long time, we need to transfer the information from working memory to long-term memory. Although short-term working memory is associated with limited storage space and fades rapidly over the course of seconds, long-term memory seems to be essentially unlimited in terms of how much information can be stored, and once something is encoded there, it seems to stay a long time, maybe for the rest of your life.

**Digit-Span Memory Task**

• One simple tool that memory researchers have used extensively with children is called the digit-span memory task. For this task, the person administering the test reads a set of digits to a child and asks the child to repeat them back. Some basic results of the test have been clear and quite consistent.
A child’s working memory capacity is quite a bit smaller than that of an adult. A typical 4-year-old has a digit span in the neighborhood of two to three digits. By 6 years of age, this will have doubled to around five digits. By 12 years of age, the digit span is essentially the same as that exhibited by most adults, around seven digits.

A child’s performance on this number memory game is a significant predictor of his or her success in school. Creativity, reading ability, and ability to focus attention on a single task are also related to future grades in school, but interestingly, the ability to remember a few numbers and repeat them back is a better predictor than these other factors.

Expanding the working memory capacity of a child has the potential to result in great benefits down the line. Some research has even suggested that many children with working memory limitations are misdiagnosed with attention deficit hyperactivity disorder (ADHD). In some cases, enhancing working memory has resulted in resolution of the ADHD-like problems.

Memory Training

The most exhaustive experiments in improving working memory have been done with computer-based video games. The most well-known program is called Cogmed, which involves games that require children to encode and retain information about the identity, locations, and properties of various pieces of visual or auditory information. As children succeed with short sequences of information, the program gradually increases them, making the task progressively more challenging.

In carefully controlled studies, children who played these games for about 20 minutes a day for several weeks showed significant improvement in terms of working memory—and not just with the games.
• What’s more, when a follow-up study was run six months later, the benefits of playing the games were still apparent. Children with ADHD symptoms who participated in this study showed a significant reduction in their symptoms and generally better performance in school.

• Even without explicitly playing games, you can give your children memory practice. From time to time, try giving children a sequence of instructions to follow. Start with just two instructions, and when they have mastered following those, move up in difficulty.

Strategies to Enhance Memory

• Parents can also help their children make better use of the working memory capacity they have. Teach your children to use simple strategies, such as “rehearsal,” visual imagery to enhance memory encoding, and mnemonics and other methods of organizing information in order to remember better.

• Imagine that you want to remember a telephone number. With rehearsal, you repeat the number to yourself several times—keeping it stored in your short-term memory. Most children eventually discover this rehearsal strategy independently, but there is clear evidence that they can be taught to use it.
  ○ The rehearsal strategy is the first foray that most children make into the realm of “metacognition”—that is, thinking about how the brain thinks.

  ○ We have a short-term memory that is limited in size to something like seven digits, words, or other units. The only way to hang on to information for a longer time period is to create a more durable representation, either by writing it down or encoding a long-term memory of it.

• Another strategy for enhancing memory is to use visual imagery. Our brains seem to have evolved to recognize particular visual inputs, and they are quite amazing in this capacity.
- A standard image memory experiment involves showing a subject a set of images for just a few seconds apiece. A second set of images is then presented, some of which are new images and some of which were contained in the original set. The subjects must say whether or not they saw each image earlier.

- Humans are remarkably accurate at this task, even with a large number of images. In one study, 1,000 images were presented for two seconds apiece. Adults identified these images in a test set with about 90 percent accuracy.

- Children aren’t quite as proficient at this task as adults, but several studies have shown that children between 3 and 5 years of age are able to perform with about 98 percent accuracy using sets of up to 50 images.

- Sometime during elementary school, children are typically required to learn the names of all of the states in the United States. You can help children with this task using a map of the states and visualization techniques. For example, point out that Michigan looks like a mitten, and the word *mitten* provides the first two letters of the state. Maine looks somewhat like a lion’s head; children can think of a lion’s mane to remember it.

**Using Mnemonics**

- You can also help children with memorization tasks using mnemonics. For example, you can use the bizarre name “Mvem J. Sunp” to remember the names of the planets in the solar system in order: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto. “King Philip came over for good soup” works well in biology class to remember the order of classification in biology: kingdom, phylum, class, order, genus, and species.

- Mnemonics are actually just one example of a broader memory strategy having to do with organizing information. Working memory seems capable of holding onto seven “chunks” of information. A chunk is a meaningfully connected set of information.
In general, if you want to memorize some list of items or set of information, you can improve your ability to do that by first organizing that information to form as many meaningful chunks and meaningful associations between the individual items as you can.

For example, consider the task of memorizing a list of Spanish words. If you first break the list down into animal names, plant names, tools in a kitchen, and so on, your study will be more efficient, and you will find it easier to remember the material in the future.

This technique has been shown to work with both adults and children. Many studies have been done with elementary school children, particularly with populations who have exhibited memory difficulties. Essentially all have shown that some version of this organization strategy is effective.

### Tips for Parents

1. By exercising and challenging working memory, you can enhance its development. This is true for both adults and children.

2. Teach your children to use mental rehearsal to remember things better at around 4 or 5 years of age.

3. Teach your children to use mental imagery to remember things better at around 8 or 9 years of age.

4. Teach your children to use mnemonic strategies to remember things better at around 9 or 10 years of age.

### Suggested Reading and Resources

Foer, *Moonwalking with Einstein*.

Lorayne and Lucas, *The Memory Book*.

Vishton, *Scientific Secrets for a Powerful Memory* (DVD).
Lecture 10: Enhancing Your Child's Memory

1. The lecture suggests that children should receive a “user’s manual” to go with their brains when they start elementary school. As with any “appliance,” the manual should spell out what the brain can and cannot do. Other than memory limitations, are there any other things that should go in that manual?

We seem to remember things better when we are tested in the same context in which we learned them. When you return to an old, familiar place that you haven’t visited in a long time, it’s worth spending some time reminiscing. You may find that you can remember things you haven’t thought about in a long time.

The next time you make a trip to the store to purchase several items, memorize the list and enlist your child to help in the process.

About once a month, write a journal entry with your child. Date the page and list the activities and events that went on that day. Later, revisit this entry. Revisiting the past can be interesting, and this activity will also expose your child to the characteristics of memory over time and the strategy of writing things down when you want to encode them in a durable format.

Memory match game cards: There are dozens of different versions of this classic game available with different themes, such as Dr. Seuss, Disney, or Curious George characters. Ordinary playing cards can work fine, too, especially with older children. In all cases, children play the game by remembering where particular cards are. They may even develop strategies that are based on the limitations of human memory, such as rehearsal and organization. The mind, in many respects, responds to exercise like a muscle—by getting stronger.
School presents opportunities for students to learn and discover things about the world and about themselves. It provides countless outlets for self-expression and presents students with the tools for self-advancement. School represents a substantial investment by our society into children’s knowledge and skills—tools those students can use for the rest of their lives. Homework is an important extension of schoolwork that has several purposes: It enables students to learn material more fully through additional practice, and it gives students a chance to work independently. This lecture offers research-based tips for parents to help their children deal with their homework and to learn their school material well.

The 10-Minute Rule

- Some schools send children home with hours of homework to do. In other schools, a child occasionally has big projects, but on many nights, homework takes less than an hour.
Harris Cooper, a researcher from Duke University, conducted a meta-analysis that found a positive correlation between the amount of time spent on homework and the level of academic achievement. Although homework is effective, Cooper noticed that it works only up to a point. If students are given too much homework, the data suggest that students “burn out” on the material, and there are reductions in levels of academic achievement.

Cooper developed a widely adopted guideline, known as the “10-minute rule.” According to this approach, a student should get approximately 10 minutes of homework per grade level—that is, a third grader should have about 30 minutes of homework; a sixth grader, an hour; a senior, two hours.

Sound Homework Procedures

- As you begin to help your child deal with homework, the first step is to make some plans about homework procedures together. You should explain the importance of homework for learning and its value for doing well in school.

- You should also establish a consistent time and place for doing homework. Calling it “study time” allows you to carve out a routine time for deliberate learning, even when no homework has been assigned.

- Many parents have a rule that homework must be finished as soon as the child arrives home from school. Others make sure homework is done after dinner. Whatever time you choose, it’s useful to involve the child in the decision.

- Avoid starting the homework too close to bedtime, when it could cut into the child’s sleep time. As we saw earlier, sleep deprivation is connected with a variety of other negative outcomes, including problems at school the next day. Further, like all people, most children won’t be as good at concentrating when they are tired and starting to ramp down their activity for the day.
In addition to deciding when to study, decide where study time will take place. It should be a relatively quiet place, free from as many non-homework distractions as possible. The kitchen table works, but only if you can be confident that everyone will clear out for the duration of homework time. A bedroom can also work, as long as it doesn’t have a television or radio.

These types of homework procedures not only make good organizational sense, but their effectiveness is also supported by research.

- In several studies, parents were recruited, along with their children, as participants. Half the parents were taught about recommended homework procedures, including the importance of consistent timing, access to a distraction-free space stocked with needed supplies, and above all, an agreement developed with the child about a standard homework procedure each day.

- The exact measures of success vary from study to study, but they all point to the same conclusions. The children who operated under good homework procedures completed their assignments on time more frequently, the quality of the work was generally improved, and the children and parents had fewer arguments about homework. Improvements in homework have been well established as related to overall better learning and school achievement.

### Parental Help

- How much should a parent help a child with homework? Two different studies show a surprising and counterintuitive finding with parents and their elementary school children: The more a parent helps with homework, the worse a student performs on later tests of the material.

- Harris Cooper developed a questionnaire called the Homework Process Inventory that targets what types of homework practices are associated with high academic achievement. Cooper found a significant correlation between the amount of time that children...
spent on homework and their scores on achievement tests. Interestingly, the correlation was higher when the time estimates were provided by the children rather than by the parents.

- The most interesting questions had to do with how involved the parents were with the children during homework. In many cases, parents reported that they supported their children by keeping the house relatively quiet while the child was working. Many parents reported that they spent time working through actual homework assignments with children to help when their children got stuck.

- The most striking finding from this study was a negative relation between how much the parents worked directly with the child and the child’s performance on achievement tests. The more the parent helped, the worse the child did.

- The takeaway point is clear: You should encourage your child to put in the hours and praise the child when he or she does so, but the ultimate goal should be to support the child in doing homework independently.

**Scaffolding**

- In the case where the child is truly floundering because he or she hasn’t learned what was needed to complete the assignment, help is essential. Research supports an approach from the perspective of “scaffolding.”

- Lev Vygotsky was a famous developmental scientist, a contemporary of Jean Piaget. Whereas Piaget’s theories were centered on individual children and the way their cognitive development was guided by the environment and their relatively independent interactions with it, Vygotsky’s theories were about social structure and development. Piaget watched babies independently interacting with objects. Vygotsky noticed that parents were very involved, right from the start.
As children become more developed, it’s not always that they accomplish new things; development is often about doing things with less and less parental support. Vygotsky called that parental support “scaffolding” and likened development to a gradual removal of it.

When you help with homework, this idea should be at the forefront of your mind. You should provide only the minimum amount of help required. For example, if you look over a math problem and see where a mistake has been made, you could correct it, but it would be better to point to the place on the page and ask, “Are you sure this part is right? Why? Talk me through your thinking here.”

A perfectly completed homework assignment isn’t really all that important. What matters is the learning that takes place as the children are doing the homework.

Spacing

It’s also important that children take frequent breaks during long homework assignments. One of the most basic findings in all the research on human learning is that spacing out study and practice times results in more effective learning.

If you study once for two hours, you will learn a certain amount. If you study twice for one hour each time—the same total amount of effort but separated by a break time—you will learn and remember more. If you study six times for about 20 minutes a session, you will learn even more.

Cognitive scientists have known about spacing effects on learning for many decades. Indeed, most recent research on the topic hasn’t been about when the spacing effects occur but why.

Part of the effect is certainly related to simple fatigue. But part of it also stems from the idea that what students learn is no longer dependent on specific states or contexts.
Context-Specific Learning

- For adults and children, the more similar a testing situation is to the situation in which they learned the information, the more likely they are to recall the learned information.

- In several experiments, students are initially taught information in a particular classroom. After the teaching session is complete, half of the students, selected at random, are taken to another room for testing. The other students remain in the same room for testing. The children in the same room consistently perform better on the exam.

- Context-specific learning is a potential problem, however. Students learn, by and large, in classrooms, and that’s where they take tests, but it isn’t where we want them to be able to use their learning. Ideally, we want students to take their knowledge with them and use it in the “real world” outside the school building.

- Fortunately, researchers have identified a solution to context-specific learning. If you want to recall information in a wide variety of contexts, then be sure to study it in more than one situation.

- Earlier, we emphasized a consistent time and space for doing homework. Although that consistency is definitely beneficial, research suggests that it might also be valuable to do some studying in different places around the house.
  - Children might start working on a list of vocabulary words in the homework space, then take a break and later practice the words at the kitchen table.
  - If there’s no time for breaks, children can still reap some of the benefits of varying context and spacing just by rotating homework tasks. Encourage your child to work on math for 20 minutes, then English for 20 minutes, then back to math.
1. Create a good environment in which your child can pursue homework assignments. Organize this well-lit, quiet, consistent space in collaboration with your child.

2. Make yourself available to help your child with homework, but minimize the amount of help you provide. The more parents help with homework, the worse the child’s learning (and grades) will be.

3. When you teach your child something new during homework, use a technique called scaffolding. Provide the child with enough support to succeed in any given problem. Then, as you repeat the process with other problems, remove these supports until the child is able to succeed independently.

4. Make use of spacing practice techniques to maximize the benefits of study time.

5. Let your child’s teacher know about the Cooper 10-minute rule. Ten minutes of homework per grade is appropriate, e.g., 30 minutes per night for third graders.

6. Talk to your children about homework and its value. Perhaps even describe the research showing that children who do more homework learn more and score better on tests.

7. Encourage your children to make “learning time” or “study time” a routine part of their day. Even if no homework is assigned, this block of the day should be used for learning—perhaps reading books or engaging in other intellectual activities. Children should be involved in choosing the specific time of day.
Questions to Consider

1. What would you like to know more about? Could you pursue extracurricular learning of that topic? Could you involve your child?

2. Aren’t teachers supposed to teach material during the actual school day? What role should parents play in their children’s education? This would be a good question to consider with your child’s teacher at a scheduled parent-teacher conference—a traditional ritual in nearly all school systems.

3. The idea of a public education system aims for all children to have equal access to a high-quality education. If a significant chunk of the teaching is done by parents, is that access really equal?

Activities to Try

As suggested in the lecture, it’s a good idea to establish a daily study hour that takes place even if there is no homework to do. The study hour can be used to pursue learning about anything the child might choose. Parents should do the same thing! Try joining your child for study hour each day for a week—and continue if you like.
Learning is best when it is motivated by personal interests and questions. As you talk with your child, questions often arise. Sometimes, even adults don’t have complete and detailed answers. Pick a question and do a research project with your child. Ideally, break the project into pieces, such that you do some of the reading and your child does some. Then teach each other something new.
Getting a Jump on Math—Without Math Anxiety
Lecture 12

There have been many debates over the last couple of centuries about what makes humans different than other animals. An important human capability is our capacity to understand symbolic, conceptual mathematics. Math is, in many respects, the language of science. This lecture provides parents with tips on how to help their children get a jump on math—developing and applying number sense and understanding and using fractions.

Significance of Math Achievement
- There are certain aspects of development and education in which enhancement matters mostly in the short term. For example, if we use a behavioral intervention to enable one child to crawl two months earlier than others, then at around age 6 months, that child is likely to have physical and mental advantages over other children. But if we check in with the child after a year or so, after all the other children have been crawling and walking on their own, those advantages will have largely vanished.

- With math education, however, there is a persistent effect. When you test children’s math abilities in kindergarten, some will be ahead of others. If you check back in first grade, all the children will be better at math than they were in kindergarten, but those who were ahead at age 5 typically remain ahead at age 6. This ordinal sorting of math performance seems to be consistent for many years thereafter.

- Math achievement isn’t just an arbitrary indicator of school performance. Children with higher math achievement scores are more likely to start college and to graduate. A number of economics and business researchers have explored the relations between certain types of high school education and eventual success in the
business world. Math education—both grades in math and number of math courses completed—is significantly correlated with the likelihood of employment and average annual salary. Math isn’t just beautiful; math pays.

**Development of Math Ability**

- The basics of developing mathematical knowledge follow a standard order of progression. The exact age at which children reach particular milestones varies, not only because of differences between children, but because this ability can be accelerated with practice.

- Interestingly, when children are learning to count, they do so without understanding the notion of individual objects. Somewhere around age 4, however, children understand that the counting song corresponds to the concept of enumeration. Most 4-year-olds will be able to enumerate up to about five items.

- At about 5 years of age, children will generalize counting to do small-number addition. At this age, most children can recognize and even write some numerals. As they do, they build up the association between the symbols that represent the numbers and the quantities that go with them. As soon as they do that, they will begin their first real symbolic processing of printed numerals: $1 + 1 = 2$.

- Eventually, when children learn about multiplication, they are introduced to the notion of sets or collections of items. Most of the math education beyond this stage in U.S. public schools involves memorization of math facts.

- When children learn how to multiply larger numbers, the standard algorithm of writing one number on top of another and lining up the 1s and 10s columns is commonly used. That’s good from an efficiency standpoint, but there are some problems that can emerge from it—problems that can be avoided if children are given a solid foundation in number sense.
Number Sense

- The development of a number sense is far more important than any specific math fact or operation that children can possibly learn. By starting with number sense at the beginning, math learning will be faster, and the enjoyment associated with it will be significantly greater.

- The term *number sense* was coined by Stanislas Dehaene at the Collège de France. It refers to the ability to approximate—to estimate—a numerical problem, separately from having to go through all the steps of performing a calculation. It’s critical for accomplishing complex mathematical reasoning.

- Number sense may emerge eventually for most people, but it is useful if children can acquire it as they are just beginning to understand the world of numbers.

The Hundreds Board

- The hundreds board, originally developed by Maria Montessori, helps develop number sense. Basically, a hundreds board is a 10-by-10 grid of spaces; it’s used with tiles, numbered 1 to 100, that can be placed in each square of the grid. The first lesson is to teach the child to place the tiles on the board in order.

- Children engage in counting behaviors by age 2. By age 6 or so, most children can figure out how to arrange the tiles on the board. By playing different types of games using these materials, you can give your child a good number sense in terms of the base-10 number system. With this concept internalized firmly, addition and subtraction will be much easier to learn.

- Once a child has mastered placement of the tiles, the hundreds board becomes a concrete tool to use to process numbers. A typical next lesson is to practice counting by 2s, then 3s. To reinforce this, you can have the child take every second or third tile out and line it up
next to the board. Adding single numbers is easy; to add 5 and 8, have the child put a finger on the 5 tile, then take 8 steps forward on the board.

- It’s a good idea to give the child some written problems. Many children get excited when they realize that they can do math. The hundreds board provides a scaffold for their reasoning. At first, it is a physical tool (a “manipulative”), almost like an abacus, but eventually, they will internalize the concept of the hundreds board and no longer need it.

**Board Games**

- Solid evidence suggests that children with a great deal of experience playing board games are better at math. Most board games involve numbers, counting, and differences—basic mathematical concepts. When children play, they are building numerical competence.

- Robert Siegler and Geetha Ramani have run several studies to see if playing board games can enhance children’s understanding of math. In one experiment, they had preschoolers play Chutes and Ladders. They then tested the children before and after this game-playing intervention and found significant improvements.
A Crucial Mathematical Tool

- Between about 8 and 10 years of age, children are fairly mathematically sophisticated, but they still have several challenging years in front of them. Interestingly, knowledge of fractions by about the age of 10 seems to make the math that follows much easier.

- Robert Siegler studied a large database of math achievement tests, completed by thousands of children in England and the United States when they were around 10 years old, in the fifth grade. Siegler and his colleagues also gained access to the math achievement scores of those children when they were in high school, six years later. The researchers found, as expected, that overall math performance as 10-year-olds was correlated with test scores six years later.

- The researchers then examined individual items on the math achievement tests to determine whether particular categories of knowledge were strongly predictive of later math grades. The strongest correlations, by far, were with the test questions about fractions. But the researchers also noted that perhaps children who are good at math in general are also good at fractions.

- The researchers controlled for that alternative explanation via statistical means. For every child in the sample, they first accounted for the relation between the overall 10-year-old achievement score—excluding the fraction test questions—and the later 16-year-old math achievement. With that effect removed from the dataset, was there still a significant effect for fraction scores? The answer was a resounding yes.

- The lesson here is that it’s vitally important for children to have a solid understanding of fractions by the time they are 10. Parents can use a number of approaches to increase this understanding:
  - Use math workbooks, available online and in most bookstores, that target fractions, particularly those for children around 10 years of age.
○ Talk with your child’s teachers about beefing up their focus on fractions.

○ Explain to your 9- and 10-year-old children why fractions are important.

○ Fractions come up in the real world with regularity. Point out and verbally solve some real-world questions that involve fractions with your child. For example, you might say, “I want to serve only half of this birthday cake, and there are 8 people here. How should we cut the slices to be fair? What if there were 12 people?”

• With a little practice, you can be confident that your 10-year-old has the solid foundation that he or she needs for middle school math—and the future.

Tips for Parents

1. When you teach children about math, start with number sense. This foundation can enhance future learning and overall level of mastery.

2. Play board games to promote the development of number sense and math achievement.

3. Work hard on fractions with children between the ages of 8 and 10. Understanding of fractions is correlated with later math achievement.

Suggested Reading and Resources

Bascomb, *The New Cool*.


Dehaene, *The Number Sense*.


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Questions to Consider

1. Fractions seem to be vital to mathematical understanding during the middle and high school years. Why might this be? Is understanding of fractions a key concept for all high-level mathematics? Or are fractions perhaps just the hardest things that children face in math class up through elementary school?

2. When do you use math in your everyday life? Can you involve your child in performing mathematical reasoning?

Activities to Try

When you make a long drive, calculate the number of miles and the time required by your trip. Ask your child to calculate when the halfway mark will be reached. If you have covered some number of miles, figure out what fraction of the trip remains to be completed.

When making up everyday math problems to try with your children, have them draw pictures to represent the information, including the answer. Be as simple and concrete as possible. Use scaffolding to help them succeed at this task and help them to eventually draw diagrams independently.

Recommended Equipment and Materials

Hundreds board

An abacus (and a book about how to use one)

Chutes and Ladders board game
Advantages of a Second Language
Lecture 13

In this lecture, we’ll discuss exciting research showing the benefits of early acquisition of a second language. A large number of studies have shown that children who learn a second language enjoy a variety of cognitive benefits: improved memory, creativity, and flexible problem-solving abilities. Parents themselves don’t need to be bilingual or make a major commitment to intensive language training in order to enhance their children’s mental development. Recent evidence suggests that relatively small amounts of exposure to and use of a second language, taking place regularly and over time, can be sufficient to reap significant benefits.

Research on Bilingualism

- Researchers have become interested in bilingual development because of a host of recent findings suggesting that children who grow up bilingual also grow up with a range of advantages in terms of general cognitive ability.

- Ellen Bialystok and her colleagues at York University in Toronto, Canada, have done extensive research in the area of cognitive performance of bilingual children outside the language domain. In one highly cited study, they asked preschool children to sort different shapes into two piles.

- The initial task of the children was to sort shapes into bins with matching colors. Regardless of whether they were monolingual or bilingual, they were able to quickly complete the task. At that point, Bialystok changed the instructions; the children were told to sort the shapes into bins labeled with matching shapes.

- All the children were slower, particularly initially, with this new matching rule. But a striking difference emerged: The bilingual children were faster than the monolingual children at the sorting
in this second phase of the task. Their ability to switch from one sorting rule to another was better. Their bilingual brains seemed to be more flexible.

- Since that highly cited study was published, a wide range of related results has emerged. One study, published by Esther Adi-Japha and her colleagues at Bar-Ilan University in Israel, suggests that bilingual children are more creative.

- Other studies have specifically targeted language use abilities. Laura Ann Petitto and her colleagues at Gallaudet University conducted a study comparing the reading comprehension of bilinguals and monolinguals and found that the bilinguals performed better.

- Other studies have explored how basic cognitive faculties are affected by bilingual development. For example, several labs have assessed the working memory limitations of children in the

Bilingual children as young as 3 know which language to use with familiar speakers, switching easily between the two languages they know.
elementary school age range, comparing monolingual and bilingual children. At essentially every age tested, the average working memory capacity of bilingual children has been significantly larger. Working memory capacity has been strongly linked to children’s math achievement and general success in school.

**Increased Neural Activation**

- There are several hypotheses as to why language learning can have effects on many other aspects of cognition. One of the simplest is the idea that the brain receives more overall activation from a bilingual environment. For example, there is evidence that when a bilingual person listens to speech in one language, concepts related to the sounds and meanings in the other language are activated also.

- Activation of the brain is associated with brain health and development in general. Neural activation is a critical part of the process that builds and maintains the synaptic connections that form the neural networks of our brain—the networks that perform cognitive processing.

- As such, a bilingual might just walk around with a brain that is more densely interconnected and active all the time. This could result in a more creative brain, with better memory, more effective reading, and the host of other enhanced capacities revealed by researchers.

**Improved Inhibitory Control and Creative Thinking**

- Neuroimaging research has suggested that there may be anatomical differences in the brains of developing bilinguals. A brain imaging technique that has been developed for use with children over the last decade or so is functional near-infrared spectroscopy (fNIRS).

- An fNIRS system makes use of a tight-fitting cap that contains dozens of sensors, distributed around the surface of the head. By looking at the patterns of oxygen depletion in the head, researchers can assess patterns of underlying neural activity. Researchers have conducted many studies in which monolingual and bilingual children wear an fNIRS cap while performing cognitive tasks.
By and large, the brains of the two groups are similar in patterns of activity; however, in the frontal cortex, particularly the inferior frontal cortex, bilingual children exhibit greater activation. The magnitude of that increase is especially large when the children are engaged in reading activities.

The inferior frontal cortex is associated with many activities, including language, but it is also associated with inhibitory control and creative thinking. It may be that this is one of the particular areas of the brain whose development is enhanced by growing up bilingual.

The notion that bilingual development can alter the physical structure of the brain also connects with another recent outcome measure with bilinguals. Bilingual development seems to reduce the likelihood of dementia. Follow-up studies have suggested that when patients are trilingual, the protective effects are even greater, resulting in even later onset of mental decline.

**International Competitiveness**

- Monolingualism is not the norm—internationally or even historically in the United States. In the 1700s and 1800s, dozens of languages were spoken in the United States. Bilingualism was a highly valued skill and quite common among respected members of society.

- The future, even in the United States, also seems likely to be a place of more frequent bilingualism. In 1980, only about 11 percent of Americans were bilingual; by 1990, that figure increased to 14 percent; and as of 2009, the number was 20 percent and climbing.

- It’s also worth noting that most of the world outside of the United States is bilingual—if not polylingual—already. A large majority of Europeans and Asians speak more than one language. Indeed, this fact suggests another reason to support bilingualism in our children: international competitiveness.
• Parents can take a number of steps to help their children develop bilingualism.
  ○ About a quarter of U.S. elementary schools now offer foreign language classes, and foreign language instruction is already common at the high school level. If parents request foreign language instruction in their local schools often enough, then such classes could become a more frequent reality.
  ○ In addition, if it is ever practical for your family or your child to spend a summer or even a year abroad, such an adventure is worth considering. Especially if your child is younger than 12 years of age, you may return to your home country with someone who is a fluent speaker of the language of your destination.

**Human Language Learning**

• Let’s consider some general characteristics of human language learning. First, children learn languages much more easily when they are young, particularly before the onset of puberty. Researchers used to think that humans had a “critical” period for language learning that started at birth and ended at puberty. According to this theory, it would be impossible to fully learn a new language and reach fluent levels of proficiency unless you accomplished that before about age 12 or 13.

• A large body of research on this topic suggests that this idea is incorrect, however. In fact, there are certain aspects of language in which older children and adults excel relative to younger children. They grasp grammatical rules and learn vocabulary much more quickly. Motivation is also important.

• That said, young children, as opposed to post-pubescent, seem able to learn language without being explicitly taught. Children seem to possess a knack for language acquisition that diminishes as they move from childhood into adulthood.
Effective Learning Techniques

- Several foreign language training programs are based on the concept of immersion. After some brief introductions—or sometimes none—the teacher begins speaking in the foreign language and never again speaks a word of the native language in which the students are fluent.

- Ellen Bialystok and her colleagues found improvements in metalinguistic skills related to the cognitive enhancements she has identified in lifelong bilinguals for children who participated in a French immersion program in Canada. The students had little to no exposure to French language prior to grades 2 and 5, when they enrolled in the program. After two years, they had taken large steps toward fluency in French and begun to exhibit general cognitive advantages, as well.

- There is also some evidence that even limited foreign language training can affect children. One study of elementary school students found that children trained in a standard, non-immersion foreign language program performed better on a test of creative, figure-based reasoning compared with monolingual children who did not participate in the foreign language training.

- In a separate study, conducted with sixth graders, advantages in cognitive skill and flexibility emerged after only a year of foreign language study. These students worked 30 minutes per day, five days per week. What’s more, researchers determined that the longer a student had pursued foreign language study, the greater were the gains.

- There is no clear evidence, at this point, that casual exposure to foreign language material—for example, watching an infant-targeted language DVD—has any positive impact in this regard. In all these instructional experience settings, children are taught to move toward fluent use of the language. They listen, but they also speak, using the language that they are learning in novel ways. This seems critical to language learning, whether of a first or a second language.
1. To promote cognitive flexibility, improved working memory, and creativity, expose your children to a second language in a meaningful way as early as possible, even in infancy. Allow them to enjoy the “bilingual advantage” demonstrated by many recent studies.

2. Ideally, find a way to provide your child with experiences in which he or she is immersed in a foreign language environment, such as spending a year or a summer abroad.

3. If immersion experience with a foreign language isn’t possible, then benefits can still be gained by enrolling your child in foreign language classes.

4. Encourage your child’s elementary school to offer foreign language training.

Suggested Reading and Resources

Bialystok, *Bilingualism in Development*.

Grosjean, *Bilingual*.

Questions to Consider

1. Arguments have historically been made for English-only classrooms based on a desire to promote national unity. Given the cognitive advantages associated with bilingual education and development, might there be other ways to promote national unity even within a bilingual environment?

2. When cognitive development researchers discuss bilingual development, they typically consider two different spoken languages, such as Spanish and English. Is there any reason to think that sign language would not also serve to promote bilingual advantages, that is, English and gesture-based-sign language?
Search online for local foreign language group meetings. Often, these groups meet once a month at a local coffee shop. Visit one with your child.

Study a foreign language with your child. The shared experience can be very enjoyable, especially if you find a way to involve travel with it at some point.

Computer- and video-based language-teaching systems: The evidence for whether such systems as Rosetta Stone® (and similar products) work with children is mixed, but some parents report positive results. If you choose to use one of these teaching systems, make a point of complementing it with real-world, real-person interactions. Find a friend who speaks a foreign language for a play date. Visit a foreign language group. In terms of language mastery, there is no substitute for real-world language interaction—either for children or adults.
What TV and Video Can and Can’t Teach
Lecture 14

Watching a great deal of television has been demonstrated to be detrimental to a child’s development and has been linked to childhood obesity. In this lecture, we’ll discuss how television and other video viewing can affect children’s mental development, as well as their physical health. Parents can take steps to minimize television exposure with children less than 2 years old, limit exposure to entertainment media to less than two hours a day, and avoid “junk TV” and the impact of violent media. We’ll also explore the positive effects of some educational television.

Sesame Street

- Most people don’t realize how groundbreaking Sesame Street was when it was introduced in the 1960s. It was the first television programming to try to actually educate children—as opposed to simply entertain them.

- The creators of the show consulted educators and cognitive scientists from the start. Since the show’s launch, researchers have been studying whether or not the program works—whether there is evidence that children know more after they watch it than before.

- The short answer is that Sesame Street works, as confirmed by hundreds of studies. Children who watch the show consistently show evidence of having learned from it.

- Children who are regular watchers of Sesame Street are highly likely to know the alphabet and numbers, and their language skills tend to be better. Once they are in elementary school, they tend to have higher achievement scores.
Further, the foundation laid down by Sesame Street continues to serve children well. One study conducted at the University of Massachusetts found that even college students were affected; those who had watched Sesame Street more were found to have higher SAT and achievement scores.

Limiting Exposure to Television

- In 1999 and again in 2011, the American Academy of Pediatrics (AAP) issued a specific recommendation: “Television and other entertainment media should be avoided for infants and children under age 2.”

- In its report, the AAP considered survey data that many people found surprising. A full 90 percent of parents reported that their children younger than 2 years of age regularly watched some form of electronic media. By the age of 3, about 33 percent of children had a TV in their bedrooms. On average, children younger than 2 years of age were watching one to two hours of television per day—crowding out activities that could be more beneficial.
Surveys show that many parents have used television as a kind of babysitter or pacifier, at least from time to time. A television is an easy way to hold a young child’s attention. But this activity is clearly not good for promoting mental development in children. Research strongly suggests that allowing your child to watch TV for many hours a day had negative outcomes.

In addition, with children younger than 2 years of age, there is essentially no evidence that even educational television is a good pacifier. A wide range of studies have found negative correlations between the amount of time children spend watching television and the scores of those children on tests of vocabulary and cognitive development in general.

**Background TV Exposure**

- There is another way that children are exposed to television and other media and one that most parents don’t really think about: passive background exposure. It’s not at all uncommon for a family to have the television or radio on in the background for much of the day. In one survey, 39 percent of parents of young children reported that they had the television on in the background “constantly”—all day long.

- In many situations, children may not even pay much attention to the television. But that constant background media can grab and hold the attention of adults quite well. A number of studies that have tracked parent–child interactions have reported that parents tend to interact with their children less when television is on in the background.

- Another study, conducted at Georgetown University by Rachel Barr and her colleagues over the course of three years, found that the more often 1-year-olds were exposed to programs designed for adults and older children, the lower the young children scored as 4-year-olds on tests of cognitive skills and executive function.
• As parents, you should turn the TV off during much of the day. The AAP media group recommends that “parents … establish ‘screen-free’ zones at home by making sure there are no televisions, computers, or video games in children’s bedrooms, and by turning off the TV during dinner.”

“Junk TV”

• Certain types of television, such as flashy, fast-paced programs, can reduce children’s ability to focus their attention and hinders their performance on problem-solving tasks.

• Although the effects of television viewing may appear after months and years of watching habits, watching a certain kind of television show for even a few minutes can affect a child’s mental state in the present.

• If you are planning to work with your child on some mentally challenging task, turn off the fast-paced cartoons. If it’s getting close to bedtime or time to go to school, the same advice applies.

• Parents should also closely monitor the viewing habits of older children. There is now some evidence that even a few minutes of watching certain types of programs—shows with rapid cuts and edits—leads to changes in children’s ability to focus their attention and resist distraction.

• In general, it’s best to avoid “junk TV.” It might be fun and entertaining to watch, but even small amounts of viewing have the potential to have a measurable impact on mental function.

Violent TV

• There is some classic research on imitation in which children watched an experimenter “beat up” a large toy by kicking and punching it and hitting it with a hammer. When young children were placed in a room with the same doll, they directly mimicked this aggression.
• There is strong evidence that children who watch violence on television on a regular basis tend to be violent and aggressive with peers more often. There has also been a great of research suggesting that watching violent content influences how children react to real-world violence.

• When a human is confronted with violence, it inspires a fundamental, adrenaline-rich fight-or-flight response. When we watch a violent video segment, the same thing happens to a lesser extent. It’s as if those ancient, deep-seated brain mechanisms cannot tell the difference between a movie and the real thing.

• If you regularly watch violent interactions, either in real life or in videos, these mechanisms tend to habituate in their response. The mind and body become desensitized to violence. Thus, even if children don’t act out a copy of what they have seen on television, their mental processing of aggression is affected by repeated viewing, particularly in the long term.

• Many people have conducted research on this topic. One of the most prolific has been Brad Bushman of Ohio State University. In one large-scale meta-analysis, he found consistent, long-term effects of violent television exposure on a variety of measures of children’s mental processing. Children who view high levels of violent television reported more frequent negative thoughts and exhibited less sharing behaviors with their peers.

Controlling Viewing Habits

• A great deal of research about video has been conducted over the past several decades, with good reason. It seems that both children and adults are watching more and more movies, television, and other types of video. Video screens are everywhere now, including on smart phones and in-car DVD players. Media companies have worked toward developing technologies, which they aggressively market, that enable you to seamlessly move from one platform to another without ever switching programs.
• Parents should limit their children’s interaction with entertainment video. The AAP media group recommends: “Children and teens should engage with entertainment media for no more than one or two hours per day.”

• Educational programming can help children learn to read, do math, and solve problems. Video of all kinds can take time away from normal social interactions, but if you watch with your children and actively talk about what you view, those effects can be mitigated.

• Television can show us places, people, and events that we might otherwise never see. The best programs on video can be no less sophisticated or meaningful than the best books, and sharing these experiences together can be a special treat for adults and children alike.

• This universal medium, in some ways, connects us to the world around us in a way that simply didn’t exist before. Your children are, like it or not, likely to grow up to be consumers of video in one form or another. During the years when you can influence their viewing habits, it’s valuable to urge them toward a wholesome media diet, with small portions of the healthiest material possible.

Tips for Parents

1. Let your 3- to 5-year-old children watch Sesame Street.

2. Let your children watch Between the Lions, CyberChase, and other shows that demonstrate evidence of program effectiveness. Typically, that information is available on the program’s website.

3. Avoid fast-paced, fanciful cartoons that may reduce children’s attention span. Avoid “junk TV,” especially if you are preparing to engage in a mentally challenging task in the near future.
4. After your children watch a television program, periodically talk with and quiz them to see if they’ve learned anything.

5. Use educational television, but be sure to use this sedentary activity in moderation.

6. Don’t allow your children to watch any television at all until they are at least 2 years old. It’s not clear that children learn from television during infancy, and it crowds out other activities for which there are clear developmental benefits.

7. Avoid exposing your children to “background” television and other media. “Second-hand” television reduces normal parent-child interactions and is associated with lower school achievement.

8. Closely monitor the viewing habits of older children. Avoid programming that depicts violent events.

9. Create a safe “screen-free zone” stocked with blocks, books, and other toys, where your child can play independently, with minimal monitoring. Use this space instead of a television if you need to spend some time engaged in an adult task, such as making a phone call. Of course, don’t leave the child unattended for any extended period of time without checking in on him or her.

10. Be intentional in selecting what you and your children watch on television. Avoid flipping through the channels just to watch whatever happens to be on at some arbitrary time.

**Suggested Reading and Resources**

Fisch and Truglio, eds., *G Is for Growing.*
1. Television can be educational. It can also be wonderfully entertaining. Is it acceptable for children to be entertained by television, as adults are?

2. Television is often described as being able to show us parts of the world that we would otherwise never see. Is that really true? Is it possible that television viewing reduces our actual travel to see places (and people) in person?

### Activities to Try

If you have access to a digital video camera and a computer, you likely have the tools available to make an educational video. (Free programs are available online. Search for “free video editing software.” Current Windows and Macintosh operating systems also come with video creation software as a standard add-on.) Work with your child to pick a question, record footage, edit clips, and record narration. Addressing video presentation as an active communication medium, you will likely help your child to be a much more expert consumer of video and other screen media.

Pre-watch an episode of some educational program and develop a set of test questions based on the material taught by the episode. Give the child a pre-test. Show your child the episode, then provide a second test. (Don’t reuse the same questions.) Did the show teach the material you expected it to?

### Recommended Equipment and Materials

Television programs that have been subjected to scientific assessment: *CyberChase*, *Blue’s Clues*, *Sesame Street* (and its international variants), *Dora the Explorer*. 
The variety of video games on the market today, as exciting as it is for gamers, has made the science of video games and development increasingly complex. Some educational video games are beneficial, helping children learn targeted information. Some games require children to divide their attention between two different types of tasks, which seems to promote their attention control capabilities. Other games, however, have been consistently associated with poorer achievement in school. In this lecture, we’ll explore research findings on three main issues related to children and video game play: (1) positive effects on children’s perceptual and cognitive development and self-esteem, (2) problems that arise from excessive play, and (3) negative effects from violent and realistic video games.

**Video Games and Creative Thinking**

- The answer to whether video games are good for your child is complicated, but there are evidence-based reasons to believe that, for some types of games, the answer is yes.

- The most frequently used method of assessing how video game play affects children’s development has been relatively straightforward over the years. Researchers survey children and parents to assess how much time the children spend playing video games. Researchers also collect data on mental and physical development, as well as school outcomes.

- Linda Jackson and her colleagues at Michigan State University conducted a recent study of this type that suggests that video game play is associated with increases in creativity. The researchers recruited a large group of 12-year-olds, surveyed them about their video game play habits, and then had them complete an assessment of creativity.
• The researchers found that children who played video games on a regular basis scored higher on the Torrance Test of Creative Thinking. Jackson and her colleagues suggest that modern video games, with their complex characteristics and story lines, require children to be creative problem solvers—and foster creativity that can be applied outside the domain of the game itself.

Visuospatial Reasoning
• Visuospatial reasoning is a different type of mental process from creativity. People who are good at spatial reasoning are much more likely than others to become chemists, mathematicians, and geologists. Students who have high spatial abilities when they start studying engineering in college are more likely to remain engineers.

• If we boost younger children’s spatial abilities, will we also see general improvements in their performance in math and science? Some recent work by Christopher Sanchez, at Arizona State University, suggests that the answer is yes. And one method for achieving this boost may come from playing video games.

• Sanchez and his colleagues recruited 60 college-age students and started by assessing their visuospatial skills. The researchers also assessed the students’ working memory and some other general mental capacities. Once the pretesting was completed, the participants all played video games for about 25 minutes.

• The visuospatial abilities of the participants were assessed one final time at the end of the study. The results were striking. Playing just 25 minutes of a video game improved the participants’ visuospatial abilities. The finding has been surprising to many researchers, certainly in terms of the sizes of the gains after such a short intervention.
Moment-to-Moment Attention

- Researchers have also drawn connections between video game play and children’s general abilities to allocate their attention effectively. Two different types of attention are relevant here. Some studies show that video games positively affect children’s moment-to-moment attention allocation and their ability to process incoming sensory information. Other studies suggest that video games negatively affect children’s ability to engage in sustained, proactively controlled attention.

- Moment-to-moment attention refers to the process whereby we move our focus of attention rapidly, processing incoming sensory information each time we do so, such as when we scan our visual field to find something. This task is called “visual search,” and it taps our ability to rapidly and accurately gather and process incoming sensory information. This visual processing ability is relevant for such activities as reading books and maps and even doing math problems. It’s also a type of attention that is important for certain types of action-intensive video games.

- Several studies have compared visual search abilities of children who have extensive experience with video games to those who do not play video games. The consistent finding has been that the action video gamers are faster than nonplayers.
• One study, conducted by Sandro Franceschini at the University of Padua in Italy, found that giving dyslexic children experience with video games improved their reading ability. The games didn’t have anything to do with reading, but it seems that the attention and visual search workout that we get from playing these types of games can improve visual abilities enough to have a significant impact on reading.

School Performance and Behavior

• A large body of literature suggests a significant potential downside to video games. Studies have often found negative associations between video game play and school performance and behavior. For instance, one group of education researchers, led by Erin Hastings, found a significant negative relationship between the number of hours spent playing video games and average grades obtained in school. The more time spent playing video games, the lower the children’s average grades.
  ○ The researchers also found that for violent video game play, this relationship was even stronger. That is, children who played many hours of violent video games performed significantly worse in school than children who played many hours of nonviolent video games.

  ○ The parents in the Hastings study filled out several sections of the Child Behavior Checklist, a well-established survey tool for assessing a child’s ability and tendency to behave well in school and at home. The parents’ responses on the checklist were associated negatively with the amount of game play, especially for violent video games. The children who spent more time playing video games, on average, exhibited more frequent negative behaviors at home and in the classroom.

  ○ These results do not imply causation, however. It could be that children who do not do well in school are more drawn to video games than others. Perhaps this is especially true for aggressive or violent children. This possibility means that the study didn’t
provide specific evidence that violent video games are to blame for bad grades. There may be other chains of causation or variables at work.

- Robert Weis and Brittany Cerankosky at Denison University performed a study of video games and children that allows at least a tentative causal connection to be drawn. These researchers recruited a group of parents with boys between 6 and 9 years old who indicated that they were considering purchasing a video game system in the near future.
  - The researchers decided to focus on boys because all the effects described thus far tend to be much more pronounced with boys. In general, boys tend to play more video games and more violent video games, as well.
  - Weis and Cerankosky randomly assigned the boys to a “video game now” or “video game later” condition. All the children completed initial IQ tests and writing assessments, and all the parents completed nightly records of how long their children spent playing video games, doing homework, reading, and engaging in other activities. Researchers also collected data about grades and behavior at school.
  - The results of this study showed what many correlational, survey-based studies of the past had suggested: Children who play video games receive lower grades in school.
  - Analysis of the data from this experiment suggests a simple, obvious reason for the conclusion: The more time the children spent with the video game play, the less time they spent on homework and reading. It seems obvious that working less on schoolwork results in lower grades. It may be that video games themselves are not especially insidious; they are just a distraction that eats up children’s limited available time.
Given the evidence, an important tip for parents is simply that before you give a child a new video game system, you should note how much time he or she spends on such activities as homework, reading, and exercise. If the video games cut into television time or other activities that don’t have a clear benefit, there will be less reason to be concerned.

**Sustained Attention**

- Another type of attention processing that video games seem to influence in a negative way is sustained, or “proactive,” attention. We use proactive attention to guide our mental resources to focus on some task and to stay focused on it. Unlike moment-to-moment, or rapid, attention allocation, proactive attention ability seems to be hindered by video game play—especially extensive play.

- In general, when we are engaged in some sensory processing task, our brain ramps up its activity just prior to the onset of a stimulus. When an important stimulus is about to appear, our brain prepares for it. The brains of heavy game users, however, seem to do this significantly less than others. Just prior to the onset of some test stimulus, there is less activation.

- Whether or not this theory is true, there is some work with children in classroom settings that is consistent with it. Several studies of grade-school children have found correlations between amount of video game play and difficulties in staying attentive in school.

**Violent Video Games**

- Parents should avoid allowing children to play video games that show violence, especially realistic, brutal violence. Researchers in this area have noted that some of the games that produce the biggest effects in terms of enhancing perception and attention are exactly this type of game.
• Watching violence on television has measurable negative effects, and some studies have shown increases in aggressive behaviors related to television viewing. In short, the type of effects for video games are the same as for television, but much more significant. It is one thing to observe violence; to participate in it, even virtually, seems to be much worse.

**Tips for Parents**

1. Video game play can have positive effects on children’s perceptual and cognitive development, including self-esteem. Allow your children to play video games.

2. Limit video game play to two to three hours per week.

3. Track the amount of time children spend on other clearly positive activities before introducing them to video games. Continue tracking these activities and work to maintain them after video game play has begun.

4. Avoid violent video games, especially those with graphic, realistic depictions of violence. Seek out other games that are engaging but do not have violent content.

5. Have children play engaging, spatially complex video games prior to studying educational material that is demanding in terms of visuospatial reasoning.

**Suggested Reading and Resources**

Blumberg and Fisch, eds., *Digital Games*.

Common Sense Media, Game Reviews, [http://www.commonsensemedia.org/game-reviews](http://www.commonsensemedia.org/game-reviews).
1. Many video games simulate something that actually happens in the real world. Why do we find the computerized version so much more engaging, at times, than the real thing?

2. Many modern video games can be controlled via whole-body, physical movements. Some fitness systems have even been developed based on video game interfaces. In the future, might video game play of this type be associated with lower rates of obesity?

Don’t just hand your child a video game and walk away; play video games together. You may get beaten by your digitally savvy child, but the interaction can be rewarding and potentially valuable. Just as good television can often be actively consumed by a group of interacting people, so video games can be, as well.

It’s difficult to recommend specific games for parents and children. Interests vary; there are many different gaming platforms, and not all games are available on all of them; and games come and go relatively quickly. As a result, there is rarely clear research indicating that a particular game benefits children. All of that said, below are listed a few games that might be worth evaluating.

JumpStart® 3D Virtual World: In this and similar games, children navigate a simulated environment, encountering puzzles and other challenges as they do so. The JumpStart game is a subscription-based online product that aims to help children between 3 and 10 years of age learn about the alphabet, math, and grammar. Again, the scientific assessment of effectiveness is very thin here, but several independent reviewers have supported it.
LEGO® City—Undercover: A number of recent games have implemented LEGO-like building in a virtual environment. These games promote spatial thinking and reasoning, although there seem to be no specific studies of them yet. Parents should try to have children build with both real and virtual LEGOs.

Wii Sports™ and Kinect Xbox Fitness: Video games have been associated with reductions in physical activity and, thus, decreased physical fitness and higher rates of obesity. For this reason, limiting children’s video game time is important. An alternative, complementary approach is to promote physical exertion during video game play. Both Wii and Xbox games make use of controllers that involve full body activity. Again, there is little specific science to support the benefits of this, but it seems reasonable to expect positive results.
In a way, this lecture is about something we all want for our children: happiness. We will discuss how to promote a good attributional style and how to leverage that into high self-esteem and levels of persistence and a generally curious, positive attitude about learning, work, and the world in general. Children are born with tremendous optimism and with an impressive ability to bounce back from failures and other negative events. But this optimism typically drops throughout childhood and into the teen years. This lecture will help you understand the developmental processes associated with these changes and suggest some ways that parents can help.

Attributional Style

- How we think about why we succeed or fail is a key element in optimism, persistence, and self-esteem. This thinking is characterized as our “attributional style.”

- Consider a moment of success for a child. If a child receives a good grade on a math test, it might be because he or she is talented and motivated—factors that have to do with internal attributions. Alternatively, sometimes people succeed because of things that are not in their control. Perhaps the child got a good grade because what he or she studied happened to be emphasized on the exam. This would be an external attribution.

- Attributions of success and failure can also be stable or unstable. Being talented or motivated is a stable attribution; it is not likely to change tomorrow or next week. Getting lucky on the exam is inherently unstable. There are also some attributional factors that are local and others that are global.
ASQ Score

- Research by Martin Seligman and his colleagues demonstrated strong connections between attributional style and a variety of factors. Those who attributed success to internal, stable, global causes tended to be optimistic in their outlook. Those who attributed success to external, unstable, local causes tended to be pessimistic in their outlook.

- When Seligman contemplated the world outside the lab, he found himself thinking of insurance salespeople. These are people who deal with failure on a regular basis. Attributional style, from Seligman’s perspective, should make a significant difference in their lives. Based on Attributional Style Questionnaire (ASQ) scores, Seligman determined that MetLife insurance salespeople who have made a career in insurance sales have done so only by having a very positive attributional style.

- ASQ score doesn’t just predict success in the domain of insurance sales. Attributional style matters in many different areas of endeavor. ASQ scores are even correlated with physical and mental health over the long term.

- A version of the ASQ has been adapted for use with children: the Children’s Attributional Style Questionnaire (CASQ). Children with optimistic attribution styles tend to work longer on difficult problems and to learn more because of it. Optimistic children tend to be healthier and recover quicker from illness. In general, they achieve more in school and earn better grades. They even score higher on the SATs once they get to high school.

- What’s more, a child with a good, optimistic attributional style is much more likely to become a teenager and an adult with that same type of style. Several large-scale longitudinal studies have consistently established these findings. Children with the best attributional styles in grade school tend to remain near the top several years later, and those near the bottom in grade school stay there, as well.
Learned Helplessness

- Parents can help their children develop and maintain a good attributional style. The most significant drivers of children’s attributional style, based on years of research, seem to be parents and teachers.

- Although children begin life as optimists, at around age 6, they go to school, where they encounter failure as part of the learning process. Usually, we learn by reading and encoding new information with some level of understanding, and then we attempt to apply that new information to novel problems. By failing, we figure out where the gaps in our knowledge are, and this information guides us when we re-study the original material. Eventually, we master the new information.

- The downfall in this process takes place when children give up before they master the new material. Children may attribute failure to something that is stable and probably internal: “I’m just not smart enough to do this.”

Learning takes place through a repeated process of trying and failing to master new information, but the tragedy occurs when children give up before they reach mastery.
When this happens, as can occur in classrooms where grading displaces learning, researchers often say that a child has learned to be “helpless.” Children who acquire learned helplessness, even if it is specific to some domain, then move beyond the reach of many teachers and their grade-based incentives.

**Changing Attributional Style**

- The good news is that helping children to change their attributional style can release them from this learned helplessness condition. A high-quality study demonstrating this was published by Joseph Fowler and Penelope Peterson at the University of Wisconsin.

- Researchers identified poor readers who were stuck in a learned helplessness state and assigned them to an “attribution retraining” condition. These children were set up to succeed at a reading task most of the time, but they were also asked to read some difficult sentences that were included to evoke failure.

- Children assigned to the attribution retraining group practiced saying certain responses when they succeeded and failed. When they succeeded, they said to themselves, “I got that right. That means I tried hard.” When they failed, they said, “No, I didn’t get that. That means I have to try harder.”

- The children were reminded of the practice of attributing success and failure to how hard they tried. After each trial, they were reminded that they should continue with their practice of silently reminding themselves of the reason they succeeded or failed.

- At the end, the experimenters repeated their assessments of the children’s attributional styles and their reading performance. The intervention work very well. The children became better readers, but significantly, in just four days, the children seemed to have changed their focus from why they couldn’t succeed to the need to continue making greater effort in order to succeed.
- In another experimental condition in the same study, the researchers provided all the attributions themselves.
  - When a child succeeded with a sentence, the experimenter would say, “That was good. That means you tried hard.” After an error, the experimenter would say, “No, you didn’t get that. That means you have to try harder.”
  - Listening to this adult figure make the attributions led to improvements in both reading and attributional style. Children learn their attribution styles, to a large extent, from their parents and teachers. To improve your child’s attribution styles, an important first step is to improve your own.

**Boosting Self-Esteem**

- In addition to attributional style, a related issue that has been studied is self-esteem. Children with relatively high self-esteem typically exhibit related positive attributes. They tend to try new things more frequently. They tend to be more flexible thinkers and better problem solvers. When they fail—and we all do—they are more likely to attribute the failure to the situation and less to their own inabilities.

- There are established correlations between a child’s self-esteem and a range of other developmental and school achievement outcomes. A variety of studies have also explored how children with different levels of esteem deal with mental challenges, including the challenges of school.

- Studies have consistently shown benefits from self-esteem–boosting procedures. The benefits have been quite variable, ranging from improvements in children’s sense of satisfaction and happiness to improvements in schoolwork. Some studies have found that physical health improves, as well.

- The most effective procedures have typically aimed directly at the child’s self-concept. Not every child draws his or her self-esteem from schoolwork. Some may be good at athletics, or art, or music.
Parents should help their children find at least one activity that the children truly enjoy doing and from which they can draw a sense of self-satisfaction.

**Depression and Suicide**
- Depression is close to the learned helplessness condition discussed above. It can be caused by many factors, ranging from conflicts with peers, to bad performance in school, to a death among family or friends. In some cases, the causes may even be biological—for instance, an extended period of sleep disruption. Although all people go through periods of sadness, if that period of time extends beyond several weeks, then it may be time to consider professional intervention.

- Clinicians commonly suggest physical exercise to help in dealing with depression. Parents may want to consider taking a walk or a short run with their children or trying a new game with many opportunities for success. Simply heading outside is another possible approach: Unstructured play and exploration outdoors can be a great relief for children—and adults—who have too many pressures to feel optimistic about trying new things.

- Of course, the worst possible outcome from serious depression is suicide. Suicide is exceedingly rare in children younger than 12. Among teens, the rates of incidence are higher. In 2007, about 35,000 teens committed suicide—about 1 out of every 10,000 teens in the United States. And it is estimated that about 11 unsuccessful attempts take place for every suicide death.

- A great deal of research has been done to determine the risk factors and behaviors that precede a teen suicide attempt. The list is long. Suicide is, in a sense, the ultimate response to learned helplessness. An extended period of depression, of course, is the leading indicator. Substance abuse is strongly associated with suicide, as are family histories of suicide or violence.
• Parents can be aware of several warning signs beyond simple depression, including a child who mentions that things would be “better” if he or she weren’t around or a child who begins to give away treasured possessions. It has also been frequently observed that most people tell someone else of their plan to commit suicide before they actually do it.

• Overall, we should all aspire to hang onto our childlike optimism as long as we can—and as often as we can. When we feel optimistic about our lives and the world around us, everything else about our minds and bodies just seems to work much better. Ultimately, being happy seems to be the best path to continued happiness. Adults who model that optimism are offering one of best gifts they can give to their children.

Tips for Parents

1. Model good attributional style for your children. When you or your children fail, seek to describe that failure, as much as possible, in terms of external, unstable, and/or context-specific causes.

2. By praising children’s effort, rather than focusing just on the outcomes of their efforts, parents can encourage good attributional style, persistence, and high self-esteem.

3. Watch for signs of depression—periods of sadness lasting more than several weeks, for instance—particularly among teens, and use attributional style changes to minimize associated negative effects. If children seem depressed, encourage physical activity and activity in general.

4. If a child has a problem in terms of negative attributions and lack of persistence, explicit attribution retraining can help. Teach the child to make good attributions, related to effort, such as, “I got that one wrong. That means I need to try harder.” On the positive side, “I got that one
right, because I have been working hard.” After a few hours of practice, elementary school children tend to improve their general attributional style and performance.

5. Help children find at least one domain of activity in which they feel highly capable. The sense of self-esteem that can emerge from this can promote self-esteem and lead to better persistence in general. Try to validate and appreciate whatever that domain is for your child, even if it is something unusual.

6. Half of all teen suicides involve a gun. Prevent children from having access to a gun, ideally by not having a firearm in your home.

7. Be aware of and watch for signs of suicidal intentions, such as statements by a child that things would be better if he or she weren’t around. Giving away treasured items to family and friends is also a key warning sign. Teaching your children to watch for these signs in their peers can potentially save a life.

Suggested Reading and Resources

Dweck, *Mindset*.

Seligman, *Learned Optimism*.

———, *The Optimistic Child*.

Questions to Consider

1. We often praise children, and adults for that matter, for persistence in the face of failure. That said, there is sometimes value in “giving up” and trying something else. How can we decide when it’s good to give up? Or is it ever?

2. The concept of learned helplessness was first discovered in studies of animals, such as rats and dogs. The notion of attribution thus seems to exist at a very basic, pre-linguistic level of processing in the brain.
If that’s so, then why do linguistic interventions work so well? For instance, just saying, “I should try harder next time” seems to promote improved performance and resistance to learned helplessness.

**Activities to Try**

Try spending an entire day without using the word *can’t*, as in, “I can’t do that.” Encourage your child to do the same thing. At the end of the day, discuss if and how your outlook on your daily challenges was affected. Should you spend another day doing this activity again?

Many biographies have been written for children about historical figures who have persisted in the face of great challenges and even failure. Find one of these for you and your child to read, then talk about the person’s attributional style. Were there times when a different attributional style might have changed the course of history?
This lecture is about teaching children to engage in helping, sharing, and cooperating behaviors. Most researchers define these as “prosocial” behaviors—actions that are influenced by caring about the welfare and rights of other people, feeling concern and empathy for others, and seeking to benefit others, not just the self. There are many positive outcomes associated with children who are socially adept, and many negative outcomes associated with children who are not. Those who help others tend to receive that help back in kind, and they tend to be happier, more accepted by their peers, and more academically accomplished than children who do not engage in prosocial behaviors.

**Enlightened Self-Interest and Altruism**

- Evolutionary theorists often talk in terms of the relentless, cold, rational competition between species—the survival of the fittest, the law of the jungle. This concept extends to competition among members of the same species. The mechanisms of genetic inheritance take place—or do not take place—on an individual basis, not a community basis.

- Although humans do share and cooperate, most evolutionary researchers would suggest that these actions are just “enlightened self-interest.” The alternative to enlightened self-interest is something called “altruism”—the idea that we help other people because it is the right thing to do.

- It is often difficult to tell the difference between altruism and enlightened self-interest. For example, those people who help others in a time of disaster are often regarded as heroes. They receive a great deal of attention and are treated with some reverence by their home communities. There might be an ingrained, maybe even genetically encoded, motivation to do this. Perhaps humans compete for mates, at least in part, by striving to be the most heroic.
Altruism as a Basic Instinct

- There has been astonishing research in recent years that has shifted the arguments in the evolutionary domain. This research doesn’t come from careful analyses of animal behaviors or models of rational decision-making processes in humans. The research comes from studies of toddlers.

- Altruism and prosocial behaviors in general have been studied a great deal over the past several decades, but the view of them has been changing. Altruism has traditionally been thought as something that emerges as the pinnacle of human behavior. To choose to ignore your own best interests to help another person is the sort of thing we associate with maturity. We certainly don’t associate it with toddlers.

- Felix Warneken, now at Harvard University, has completed some fascinating studies that suggest that helping others might be a basic instinct that we start out using on a regular basis.
  - In one of these study procedures, an 18-month-old is seated in a room with her parent. The parent is explicitly told not to do anything that might influence the behavior of the child.
  
  - After a minute or so, an experimenter walks in carrying a large pile of magazines but is unable to open the door to a cabinet to put them away. After the experimenter struggles for a few moments, in most instances, the child toddles over to the cabinet and opens it.

Rewarding Prosocial Behavior

- Parents do not have the job of teaching children to share, play nice, and be thoughtful about the feelings of others. That job is done, apparently from birth. Children are cognitively capable of complex social reasoning, and they use that reasoning for prosocial ends. That happens without anyone showing them how to do so.
Instead, the job of parents who want to promote empathy and prosocial behaviors in their children is to encourage (and not interfere with) the development of these basic tendencies that are already in place.

Interestingly, according to several studies, it is not effective to reward children for engaging in prosocial behaviors.

- When children behave nicely, perhaps sharing or helping spontaneously, they are engaging in naturally prosocial behaviors. However, giving these children a reward for the behavior will change how they think about sharing or helping.

- They start to think about the behaviors as resulting in extrinsic or overt rewards. The children may be more likely to perform in a prosocial way when rewards (or parents who give them) are present but less likely to be prosocial when there are no rewards to be gained.

Parents should seek to foster the underlying, intrinsic reward that goes with being prosocial. Children, like most adults, feel good after they help someone. If extrinsic rewards are introduced, they seem to overwhelm the more subtle intrinsic rewards and, ultimately, to block their effects.

It's difficult to say whether humans are altruistic by nature, but many studies show that we are naturally cooperative and attracted to prosocial behavior.
Modeling Prosocial Behavior

- If parents don’t use rewards, research suggests that one of the best ways to promote prosocial behaviors is to offer an environment that models desired behaviors.

- Many studies have found connections between how parents think about helping others and how their children think about these same issues. Parents who are prosocial in their thinking tend to have children who think the same way. Parents who are not particularly prosocial tend to have children who think similarly. This conformity between parents and children seems to decrease through the teenage years, but it is clearly present in early and middle childhood.

- A separate group of studies has demonstrated that children are more sensitive to the emotions of others when they themselves are emotionally secure. It’s hard to focus on the needs of others when you are feeling very much in need yourself. And children whose parents are generally helpful to others are likely to be sensitive and altruistic when it comes to their own children.

- Children learn about empathy and prosocial behaviors from talking with their parents. As your child plays with others, you may, from time to time, notice a situation in which one of the playmates is in need of some help. This is a perfect time to talk with your child about the situation. You can help your own child see the world through that other child’s eyes. It can be challenging for children to mentally take another person’s perspective on a situation.

- Children whose parents frequently engage in these conversations—discussions in which you explain what you think should happen and why—have been shown to be significantly better at engaging in empathy-based reasoning and more likely to engage in prosocial behaviors.
Violent Video Games

- As we’ve seen, violent video games can have an effect on children’s aggressive behaviors. If a child spends many hours behaving aggressively in a virtual environment, then there are significant increases in the frequency of aggressive behaviors in real life, as well.

- Although the size of these effects has typically been found to be quite small, larger effects have been noticed in terms of children’s reactions to the aggressive behaviors of peers. A child with extensive violent video game experience is much more likely to tolerate aggression when he or she sees a peer act aggressively toward another.

- In this context, aggression is, in many ways, the opposite of prosocial behavior and empathy. Children who play violent video games may not kick or punch their peers more often, but they are less likely to empathize with the emotional states of others and less likely to engage in helping behaviors.

Prosocial Video Games and Television

- That said, video games have a potential flip side. In fact, there are games in which players engage in simulated prosocial behaviors. Tobias Greitemeyer at the University of Sussex and his colleagues conducted an experiment that supported the idea that playing a video game that reinforces prosocial behaviors increases the frequency of prosocial behaviors in the real world.

- There is also evidence that prosocial television programming can have a positive effect on children. When the storylines conveyed in a video program include prosocial themes, such as helping, sharing, and cooperating, viewers of those programs seem to learn those lessons.
To assess the influence of violent television programming on children, researchers have conducted surveys in which they quantify the frequency of violent events in certain shows. Others have repeated this type of characterization for prosocial behaviors. In general, children who watch more prosocial programming tend to engage in spontaneous helping more frequently.

As a parent, you also have alternatives to video screens for interesting new forms of cooperative play. A variety of cooperative board games now exist, for example, where all the players work together to achieve a shared goal.

**Group Singing**

- Music is another good option for promoting cooperation. It’s quite common for children in classrooms to sing songs together. From this perspective, group singing is just another classroom tool for getting children ready to participate in the work of the day. Teachers may not think of group singing as a tool for promoting prosocial interactions among their students, but there is some recent research that suggests that it has that effect.

- A study of this outcome was recently published by Sebastian Kirschner and his colleagues at the Max Planck Institute. They recruited pairs of children from a kindergarten classroom to play two games. One game involved a cylinder of marbles that was designed to fail and spill the marbles.

- If the pair of children had earlier sung a song together, the child whose marbles did not spill was significantly more likely to spontaneously help the child whose marbles did spill. In general, better cooperation seemed to be created by the exercise of singing together first.

- Note that these types of effects are present at all ages. Singing the national anthem improves prosocial behavior at sporting events. Intensive marching in step makes soldiers more prosocial, and religions throughout history have created a greater sense
of community by chanting and singing together. Researchers at Stanford have found that subjects who are first asked merely to walk in step become more cooperative and even more altruistic. The mere fact of cooperating apparently makes us more cooperative in the future.

### Tips for Parents

1. **Do not reward children for engaging in prosocial behaviors, such as sharing, cooperating, and helping others.** The extrinsic rewards that you might provide will overshadow the intrinsic rewards naturally associated with prosocial behaviors.

2. **When you get angry with someone yourself, stay calm, and provide a good model for your child in terms of how he or she should deal with conflict.**

3. **Talk with your children about how to deal with strong emotions, ideally while they are feeling them.** It can be challenging to communicate with a child when he or she is angry, but this is exactly the time that the child is most aware of and ready to learn about how to deal with those strong emotions.

4. **Encourage your child to play prosocial video games.** Evidence suggests that these activities help encourage those behaviors outside the video game, in the real world.

5. **Many television programs feature prosocial themes, in which one character helps or even rescues another.** Encourage your children to watch those programs—in moderation, of course. Children seem to learn from these viewing experiences and become more prosocial themselves.

6. **Use group singing to promote good group cohesion and prosocial behavior.**
1. Many parents want to be sure that their children learn to “compete” when those situations arise. Is competition antithetical to prosocial behaviors? What types of activities might help children practice both of these skills at once?

2. There is evidence from studies of adults that simply adopting a “smiling posture”—raising the corners of your mouth—can influence ratings of happiness in a positive way. Similarly, the physical act of making an “angry face” tends to make people angrier. Given children’s tendencies to imitate parents, what does this suggest about how we can make our children happier?

Activities to Try

Have a sing-along with your family. Pick a song or two and just sing it together every few days. Keep track of how your family interactions are affected around conflict-prone activities.

Recommended Equipment and Materials

As with computer games in general, it’s difficult to recommend specific prosocial games for parents and children. Interests vary; there are many different gaming platforms, and not all games are available on all of them; games come and go relatively quickly; and labeling may not highlight prosocial features when they do exist in a game. As a result, there is rarely clear research indicating whether a currently available game offers prosocial benefits. All of that said, below are listed a couple of games that might be worth evaluating.
New Super Mario Brothers.UTM: This game is thin on academic-type information, but as players run, jump, and solve puzzles, they also cooperate to achieve goals. Games with this cooperation characteristic have been shown to promote real-world cooperation in children. Super Mario Sunshine, mentioned in lecture, is an earlier game from the same franchise.

Fireboy and Watergirl 3 (http://www.coolmath-games.com/0-fireboy-watergirl-3-ice-temple/): This free online game has been popular among elementary school children. Two players use the keyboard to control different characters. Cooperation and creative thinking are promoted. Again, there is no science to back up the benefits of this game specifically, but similar games have been shown to be valuable in the past.
Although many parents are mainly focused on their children’s cognitive development, there is another set of skills that is just as important for children to master: social and emotional development. Children need to learn to share with others, follow agreed-upon routines, lead others, and negotiate conflicts. They need to understand how to deal with negative emotions and how to interact with their peers when they are experiencing negative emotions. This is a large set of complex reasoning tasks. In this lecture, we’ll explore ways that parents can help with social and emotional development.

Dealing with Conflict

- One way that children learn to deal with conflicts and with social and emotional issues in general is by watching how their parents model these behaviors. That said, parents can also explicitly teach their children lessons about social and emotional processing. A great deal of evidence suggests that this is highly effective.

- Interpersonal conflict is a regular part of human social interaction. Sometimes, conflicts come from ways in which people disagree. Often, they come from moments when there is simply a lack of communication about what the two people want and need.

- Conflicts are, in many instances, simply problems to be solved. Children need to learn to identify the problem, characterize it, and figure out how to move from the current situation to a solution.

Conflict Analysis Checklist

- An effective exercise is to sit down with your child with a pen and some paper and begin a conversation about conflict. Talk about various kinds of conflicts. Write the word Conflict in the middle of the paper and circle it. Ask the child to think of words to describe conflict, and write them down, drawing lines from the
new word to the circle. After a few minutes of discussion, you will have a diagram that intuitively captures how your child thinks about conflict.

- Although most children think that conflict is bad, you should explain that it doesn’t have to be that way. Pick out one of the conflicts you explored in your discussion and think through the Conflict Analysis Checklist, which is a list of basic questions that gather and organize information so that the child can work toward a creative solution to the problem.
  - Who is involved in the conflict?
  - What did the people in the conflict do?
  - How is Person A feeling? How is Person B feeling?
  - What does Person A say he wants? What does Person B say she wants?
  - What does Person A actually need in order to feel happy with the solution to the conflict? What does Person B need?

Young children often have a negative view of conflict, but parents can show them that conflict can lead to better communication and win-win solutions.
• In working through this checklist, it’s possible to figure out win-win solutions to most conflicts and to focus on compromise. Refer to the checklist and note that conflict does not equal violence and is not necessarily bad.

**Teaching Social Skills**

• Parents should seek to engage their children in active, explicit teaching about social interactions. A growing community of teachers has begun to develop curricula for explicitly teaching social skills.

• These programs can result in better social interactions and, perhaps more important, better learning of more typical academic material. Programs that work best have a few key features in common:
  ○ They use a sequenced approach, moving from simple situations and lessons to more complex topics.
  ○ They use active forms of learning, in which children engage in discussion and problem solving, as opposed to just listening to a teacher speak.
  ○ They focus on social learning for a substantial amount of time—several hours of class time per month.
  ○ They have explicit learning goals.

• This list of four factors is actually a good description of how to teach almost anything—math, reading, or even music. And that’s an important message for parents: Social and emotional reasoning are intellectual skills, like many others, that can and should be taught.

**Regulating Strong Emotion**

• Children need to learn how to regulate strong emotion. As most parents know, children can be very passionate about things. A dollar-store toy truck is worth only a dollar, but if that new toy breaks, a 4- or 5-year-old may be distraught with grief. If another child broke the toy, even by accident, the original owner might be furious.
Parents should not shy away from reasoning with their children at these times. It can be difficult to talk with a furious 5-year-old, but that’s exactly when the child is ready to learn about anger and how to deal with it.

Parents should walk through such strategies as taking a deep breath and counting to 10. You might point out that breaking the toy was an accident and remind your child of a time when he or she broke a toy by accident. Most important, you can help the child reason about a future time when the anger will have passed.

Fostering Cooperation

- The ability to work in groups is an important life skill. In the business world, academia, or in almost any career, collaborating with others is necessary to achieve a goal. Some people are better at working in groups than others. A great deal of evidence suggests that this is a social skill that can be taught and one that improves with practice.

- Many teachers, as early as elementary school, give their students tasks to work on together, either in small groups or as a whole class. After the students come up with a solution, a direct discussion takes place in which good principles of cooperation are discussed, such as listening and getting everyone involved.

- Parents can also give their children cooperative tasks. Such tasks don’t have to be complicated, but they should involve at least a basic level of group coordination. For example, put the children in charge of working together to assemble the things that will be needed for a picnic. The result might not be the best lunch you’ve ever had, but the children will get the opportunity to practice working together.

Developing Play Skills

- Children go through an interesting progression as they develop the tendency to play with one another. From the time they are born, infants are very interested in other humans, particularly their faces.
• Although children may look at others from birth, they don’t try to interact with them right away. Around 2 or 3 years of age, children may engage in what is referred to as “onlooker play.” One child may watch closely as another child plays and may even start a conversation, but the overall role is that of an observer.

• A little later, around 3 years old, the child shifts from watching other children playing to an activity called “parallel play.” Here, children may watch each other quite intently while playing. They don’t talk to each other or interact in any complex way, but they mirror each other’s actions.

• Sometime around age 4, children engage in “associative play.” Now, children will talk to other children while playing in the same space and often with the same type or even set of toys. The only thing missing is coordinated interaction centered on the toys.

• The final stage of play is referred to as “cooperative play”—what we usually think of as truly interactive, communicative play. Games with shared rules and goals are the prototypical activities here.

• As children reach the end of the play-development phase, their games become increasingly complex and usually involve “pretending,” or what researchers refer to as “sociodramatic play.” This might seem fanciful, but pretending is actually quite a mentally engaging task. A number of studies have found connections between the frequency of pretend-based play and the development of executive function, creativity, and self-control. These factors are, in turn, strongly related to academic achievement and other measures of success later in life.

**Social Hierarchy Network**

• According to some recent work by Anthony Pellegrini and his colleagues at the University of Minnesota, the beginning of a new school year is one of the toughest and most aggressive social times of the year.
• Each year, children in every classroom establish a “dominance” hierarchy. Perhaps two children want to play with the same toy. One may try to take it from the other, and a conflict will ensue. One of the two children may notch a clear “win” from the conflict, which would mean the other would “lose” in that encounter. The other children in the classroom tend to watch these sorts of conflicts carefully.

• For many years, researchers have studied these classroom situations with children at different ages. The data are pulled together and analyzed to determine a social hierarchy network for the class. Interestingly, the network is remarkably stable from the beginning of the school year to the end. The hierarchy established in the first few weeks seems to remain in place for the long term, but the amount of conflict also drops off quickly after the initial few weeks.

• For children who find themselves at the bottom of that dominance hierarchy, the likelihood of being the victims of bullying can be much greater.
  ○ As a parent, dealing with bullying can be challenging. Children are often resistant to talking about bullying with anyone, including parents and teachers. Unless your child has obvious physical injuries, you might never know about it.
  ○ One of the best ways to avoid being bullied to begin with is through development of social skills. Children with many friends, or even a small number of close friends, are significantly less likely to be victimized by bullies.
  ○ Being able to reason about emotions, deal with strong emotions, navigate conflicts, and cooperate—all these skills enable children to build stronger connections with their peers. Building those connections and cultivating the ability to make new ones yields benefits that are not only immediate but also can last a lifetime.
Tips for Parents

1. Have conversations with your children that explicitly focus on conflicts and how to deal with them.

2. Along with teaching your children about dealing with conflicts, use the same approach to explicitly teach them about five other topics: recognizing emotions in the self and others, regulating strong emotions, cooperating, approaching others, and respecting differences in others.

3. Give your children cooperative tasks to accomplish and play games (such as “cooperative counting”) to help children practice cooperation.

4. Use a scaffolding-based approach to help children overcome shyness and get better at approaching others.

5. Create opportunities for children to play with peers to enable them to practice various styles of developmental play: onlooker play, parallel play, associative play, cooperative play, and sociodramatic play.

6. Provide opportunities and time for children to engage in sociodramatic play. This type of imaginative play is associated with good development of executive function, creativity, and self-control.

7. Be extra sure that children are well-rested and fed at the start of the school year. The first month of a new class, when the “social hierarchy network” is being sorted out, can be taxing in terms of physical and mental energy.

8. Encourage your child’s school to implement an anti-bullying campaign if there is not one already.

9. To minimize the chances of a child being bullied and the associated negative physical and psychological effects, build good social skills. Children with friends are much less likely to be victims of bullying.
Many parents and schools focus on teaching children to be effective leaders. Undoubtedly leadership is important, but you can’t have effective leaders without effective followers, as well. Should we be teaching our children how to be followers, too?

The lecture describes teaching children a lesson about conflict resolution as a problem-solving task. Is it ever appropriate to stop trying to resolve a conflict? How can we teach children to recognize a situation in which they should just “agree to disagree” and exit a conflict situation? Should we?

When your child next has some friends over, offer the group a reward—perhaps even cash—for performing a project that requires cooperation: cleaning out part of a garage or cleaning up a lawn. Of course, adapt the task so that the children will succeed. In addition to getting the work done, the more important value will come from giving your child practice in communication and cooperation with a team.
In this lecture, we’ll discuss Maria Montessori and the groundbreaking methods in early education she pioneered making deliberate use of children’s natural inclination to explore. In a Montessori classroom, children are encouraged to be active explorers and to learn through their interactions with real-world materials. There are about 4,500 Montessori schools in the United States, and about 20,000 spread across five of the seven continents. Whether or not your child attends a Montessori school, the methods described in this lecture can be readily adapted by parents for use in the home, and many of the materials can be easily constructed.

Maria Montessori

- Parents can help their children in many ways by following the example of Maria Montessori.
  - First, children should be given an environment that contains a collection of different materials that are appropriate for their current state of development. As children’s abilities progress, so should the materials. That is, some should be added, and some should be taken away.
  - Second, children should be allowed to explore this environment governed only by their own interest and desires.
  - Third, children should be given at least some responsibility for maintaining this orderly space, even when they are quite small.

- Maria Montessori grew up in Italy in the late 1800s. Originally, she was involved in helping mentally handicapped adults. She developed stimulating interactive materials, gradually increasing the complexity of what she called “sensorial materials” to extend the limits of mental processing for the adults with whom she worked. In 1901, many of these adults passed state achievement tests designed for normal children. Montessori became an international sensation.
Montessori applied these educational techniques in working with very young children, between the ages of 3 and 6. Her approach worked well with both preschool children and older children.

The Montessori Method

- A Montessori classroom contains child-sized furniture and is typically a carpeted space where children can sit, crawl, and “work” on the floor. The room is orderly, containing interesting, colorful things to do.

- One of the things that stands out in comparing a Montessori classroom to a typical daycare room is what is not present. There are no electronic toys, few stuffed animals, and no television or computer. The walls are not bare, but the decoration is intentionally muted to make it easier for children to focus their attention on what they are doing.

- The room is, by and large, quiet and peaceful. Above all, it is not cluttered. There is a tendency in many daycare settings to want to give children as many options as possible. Shelves in a daycare facility are often packed to capacity with puzzles, books, toys, and games. In a Montessori room, materials are neatly spaced apart from one another. New things are added from time to time, but when they are, other things are removed to make space.

Montessori Lessons: “Follow the Child”

- Children in a Montessori classroom are given “lessons” about how to do particular types of work. For example, one of the basic materials that a child might be given around age 3 is a set of wooden cylinders, all with knobs on the top. Each fits neatly into a corresponding hole in a wooden holder.

- Fitting the cylinders into the holes is an exceedingly simple task. But for 3-year-olds, the task exercises muscles that are important for fine motor control involved in writing. It also involves careful integration of the perception of the sizes of the cylinders and the holes. Perhaps most important, it requires a few minutes of concentration.
• In an environment crowded with technology, a child will choose a video game over the wooden cylinder activity. However, in a quiet, orderly environment, 3-year-olds find this simple task utterly engaging.

• Montessori developed a large set of activities of this type. Some involve small figurines of animals and a stack of cards, each with a picture that corresponds to one of the figurines. The child matches the objects to the images. Although this activity may seem too simple, young are at a phase of development where they are learning to perceive and reason about things. If you give them stimuli and tasks that match that level, they will be engaged by them and learn from them.

• This notion of letting the child’s needs guide the materials and tasks is a frequent refrain in Montessori circles. Teachers often talk about how important it is to “follow the child.”

**Montessori at Home**

• Parents can enroll their children in Montessori schools, or they can create similar spaces at home. There are now hundreds of Montessori lessons available, and many of the materials can be purchased or copied using household items.
• If you set up your own Montessori space, be sure to add new materials from time to time. Eventually, children will exhaust the interesting aspects of any task.

• When you add something new, remove some old work set at the same time. It would be a bad thing, from a Montessori perspective, to have a space that is overly cluttered with too many toys and activities. When the child takes one of these work sets out, there should be a clear gap left—a gap that the child will be able to see when it comes time to put things away.

Learning to Read

• There are many books about Montessori materials and methods, about ways to progress from simple to complex in order to promote reading and writing, logical reasoning, and mathematical knowledge and “number sense.” To give you an idea of how the Montessori method works, let’s consider the case of how a child could be taught to read using a Montessori approach.

• A first thing to note is that Montessori teachers usually teach writing and reading at the same time. In many ways, writing precedes reading, which seems counterintuitive to most people.

• The first stage in teaching children reading and writing is to build their general sensory and motor abilities. The cylinder set described earlier is just the sort of task intended to help with that. Any task that involves perceiving subtle difference between objects and manipulating them with fine motor control of the wrists and fingers is good for later reading and writing.

• The next phase of this process classically involves “sandpaper letters.” Many teachers use block capital letters for this task, but some Montessori educators like to work with cursive letters because they believe they mesh better with the motor actions we make to write. Children trace the sandpaper letters with their fingers.
• As a child traces the letter with the finger, the teacher pronounces each sound, and the child repeats it. The teacher starts with just a few letters and adds a few more once the child has mastered those. Next, the child learns to trace the letters with a pencil. Again, the sounds are made in conjunction with this activity. Once the child is good at tracing the letters, he or she moves on to copying them freehand.

• At this point, some teachers move to the next set of materials, the “movable alphabet”—a set of letter-shaped objects that can be manipulated and placed on a board in combination to make words. Children can then write simple words and read what they have written.

• In general, Montessori instruction works with concrete materials and simple concepts, gradually increasing their complexity at the particular pace of an individual child. That is, no one moves onto the next task, no matter what the schedule says, until he or she has mastered the previous one.

• Interestingly, because many activities can be performed using the same basic materials, many children of different ages and at different stages of learning to read and write can take turns using the same basic items.

• The benefits of this approach are striking. It’s not at all uncommon to see 4- and 5-year-olds reading and writing simple sentences in a Montessori classroom. The standard approach to learning to read used in most schools aims for reading at this level by around 6 years of age or a little older.

The Milwaukee Study
• As we’ve seen, in order to make inferences about whether any particular intervention is good for children’s development, researchers must design an experiment that randomly assigns
children to an experimental condition (in this case, children taught using Montessori methods) and a control condition (children taught using more typical approaches).

- In the late 1990s, Angeline Lillard at the University of Virginia found a situation that was suitable for conducting this kind of experiment. Milwaukee has a set of schools that use Montessori methods and other schools that use more typical methods.

- The results of Lillard’s study, which were published in the journal *Science* in 2006, provided the first widely reviewed experimental evidence demonstrating that Montessori methods are better than typical methods for teaching reading, math, and a host of other subjects. The methods mesh nicely with how humans actually learn.

- An even more surprising outcome of exposure to Montessori principles and practices is that children are not only more individually capable, but they also seem to have a stronger sense of community and ability to collaborate effectively in groups. Evidently, learning how to take care of oneself in solo play prepares the way for playing well with others, too.

### Tips for Parents

1. If children spend time in organized daycare, parents should find a place that is not only safe, nurturing, and entertaining, but also one that seeks to educate and promote development of the child. This is true even if the child is as young as 1 year old.

2. Try to construct a daily play (and work) environment according to the principles developed by Maria Montessori. Create an environment that contains materials that are appropriate for the current state of development of your children; allow children to explore this environment governed only by their own interests and desires; and give children at least some responsibility for maintaining this orderly space.
3. If you create your own Montessori space, be sure not to let it become cluttered. When you add something new, consider removing something old so that the space remains orderly.

4. Try using sandpaper letters with your children and repeating the sounds associated with each letter. This method may help young children with the basics of reading and writing.

Suggested Reading and Resources

Lillard, Montessori.

Montessori, Dr. Montessori’s Own Handbook.

Pitamic, Teach Me to Do It Myself.

Question to Consider

1. Research suggests that a Montessori environment at school is effective for promoting cognitive development in children. Is there any reason to leave that environment behind at school? Should children “live” in a Montessori environment?

Activities to Try

As early as age 3, make your child responsible for some chore around the house: feeding the family dog, folding and draping a blanket that stays on a sofa, or keeping a particular part of the house neat. It should be a simple task, and you may often need to help and to remind. Of course, don’t get angry if your child doesn’t act in fully adult-like fashion in this situation, but you may be surprised at how capable young children are. And your child may enjoy being an important, contributing member of the home community.
Montessori materials: There are many online resources for purchasing Montessori materials, such as http://www.montessorioutlet.com/. In many cases, just looking through the catalog will provide ideas for materials and activities that you can easily construct at home.
In this lecture, we’ll discuss the importance of small class size. Even better than placing your children in a small classroom, however, is getting them involved in a classroom that relies on a model of education based on the premise that children learn best when they are choosing what to study or a model of teaching that directs the material to the current level of understanding that each child possesses. An educational system that embodies all these elements is associated with Maria Montessori, whose methods tend work better than the more typical approach taken to educating children. The principles and structure that guide the Montessori approach mesh extremely well with how humans learn in general and particularly with how children learn.

Small Class Size

- As parents, you should seek to place your children in small classes. The more students an individual teacher needs to coordinate, the less individual attention any child will receive. The larger the class size, the greater the number of students who are not engaged in any given learning task.

- Some of the largest experiments ever conducted on human learning have been designed around this issue. Three state-sponsored studies—in Tennessee, California, and Wisconsin—each involved dozens of schools and thousands of students.

- Even more impressive, the studies were conducted using true randomization, with students assigned to class sizes ranging from 15 to 30 students. The learning achievement of the children was tracked for several years, both during and after the intervention phase of the study was completed.
The datasets produced by these studies were quite large and complex. In fact, there is a fair amount of research that continues to take place, based on secondary analyses of these data.

But the results all generally point to the same conclusion: Small class size is associated with better learning. What’s more, the benefits of being in small classes continue into future grades.

**Problems with the Typical Classroom**

- A typical school classroom has an underlying model of teaching and education. It doesn’t come from developmental scientists, however, but from the world of industrial manufacturing. The student is viewed as a product to be manufactured.

- Each year, teachers work with a list of facts and skills that are specified for the students in each grade. This list is used to plan lessons, which are presented according to a certain schedule. Tests are administered to assess the quality of the “products.”

- Although this model works well for cars, watches, and other things, there is a substantial body of research that suggests it does not work well for educating children. We can’t bring knowledge to the factory floor and download it into the minds of the students. Students need to actively seek the knowledge and actively consume it.

**Adapting Montessori for the Home**

- Whether or not enrollment in a Montessori school is available, many parents are now much more active in their children’s education than was true in Montessori’s day. And many of the principles that Montessori developed in her classrooms can be adapted for use at home.

- If you find your child struggling with math or reading at school, you will likely want to provide some extra help with it at home. Of course, the first step is to talk with the child’s teacher to get as much
detail about the situation as you can. If you are to be the tutor who
helps your child catch up, adopting a Montessori approach can be
an effective way to structure your work.

- Although some of Montessori’s methods are typically applied
with young children, parents can adapt these practices for helping
children between the ages of 5 and 18. The materials might look
different, but the basic underlying principles remain the same.

**Counting Chains**

- For younger children, “counting chains” can be used to reinforce
addition skills, while they enable older children to move into doing
multiplication, calculating squares, and even reasoning about
cubic exponents.

- Most Montessori classrooms make use of these chains, which vary
in color and length. For each of the colors, there are two chains,
one short and one long. As an example, the short-4 chain has four
segments, each with four beads. The long-4 chain has 16 segments,
each also with four beads. Squares and cubes constructed from the
same beads are used in conjunction with the counting chains. For
example, one square is made from a configuration of four beads by
four beads.

- As with all Montessori lessons, the materials are used simply at
first, but the complexity of the lessons gradually increases. The
simplest lesson with the bead chains is just to count the beads.
Later, the teacher introduces the square and cube that go with a
particular chain, as well as the method of “skip counting” (counting
by 2s, 4s, and so on). The teacher usually repeats this process with
the other chains.

- At some point, children begin to be able to generalize this template
onto the longer chains. When they finish this task, they know a
surprising number of math skills—more than even they realize.
• Children can be taught to memorize math facts using flash cards, without ever touching a counting chain. However, the counting chain provides a much deeper and more generalizable understanding.

• Even better than the ability to generate a correct answer to a multiplication problem, children who use counting chains internalize just what multiplication is. When the children move on to exponents—squares and cubes—these concepts come easily. The child’s mind already contains a direct physical analog on which to build that understanding.

• For such operations as division, other physical materials are used, including a “division board.” Here, children work with sets of beads, dividing them equally among the number of rows that correspond to the divisor. This system is similar to the counting chains. First, the child masters a concrete, physical process. Then, that concrete system is mapped onto the symbolic reasoning process. This approach arises repeatedly in Montessori educational systems.

• Maria Montessori believed that this independent type of learning was critical for good education. Children who are working just to hear an authority figure say, “Good job” aren’t focusing on the material to the extent that they should be. Ideally, learning should be driven by intrinsic reinforcement, not extrinsic rewards.

Further Explorations
• Typically by around age 9, children move beyond counting chains and other concrete model systems. They can now read and are symbolic thinkers who work with books, papers, and pencils, not blocks and beads. As they move into the next phase of development, we might think that they are leaving the Montessori approach behind, but they are not.

• Children of all ages—and, ideally, adults—continue to learn best when they are motivated by their own learning desires and when they engage in unconstrained exploration. Although there are
specific curricular goals for older children, there is still plenty of time to explore other topics. And even many of the required materials can be best learned by exploration.

- Imagine that you wanted to teach a group of 10-year-olds about stellar nucleosynthesis. In particular, you wanted the children to understand how different elements are distributed within the interior of a star and how that distribution changes over the course of a star’s life.
  - In a typical classroom, the teacher gives a lecture to the class, draws a diagram and labels it, sends the students home with study sheets, and then gives a quiz.
  - But in a Montessori classroom, the teacher facilitates independent learning of the material rather than just teaching it to passive listeners. The teacher might make some relevant books available and perhaps some worksheets with lists of questions to be mastered.

- In the Montessori class, the teacher sets an approximate timeline. It’s also common for students to make presentations to each other about topics and to talk among themselves. Organizing and presenting information can greatly enhance understanding of it. And by talking to each other, the students can fill in any gaps that they might have in their understanding.

- In a standard classroom, students take tests and quizzes for trades, and then the teacher moves on to the next topic. In the Montessori classroom, such extrinsic reinforcers as letter grades are steadfastly avoided. If a student takes a test and indicates a lack of understanding, it doesn’t mean that he or she has failed; rather, it means that the student hasn’t finished the work. The teacher will likely recommend additional study before the student moves on to another topic. The teacher also might have suggestions for how to improve that study process.
1. Seek to place your children in small classes. The more students assigned to any one teacher, the less individual attention any child will receive. A small student-to-teacher ratio is associated with better learning.

2. If you notice your child falling behind in his or her classes, act quickly to remediate the problem. Falling behind, particularly in a standard class, can mean that the child won’t fully understand future lessons, leading to even greater deficits. By solving any such problems early, you can avoid a vicious cycle.

3. Use counting chains to enhance children’s number sense and their ability to perform multiplication. Using physically instantiated mathematics in general will lead to enhanced math performance in children.

4. Throughout childhood, try to allow your children to learn independently and to learn about topics that they themselves have chosen.

Suggested Reading and Resources


Question to Consider

1. Make a list of the knowledge and skills you would like your child to learn over the next year. The list will likely get long quickly, so you will need to prioritize. Does your child’s school teach these things? Can you? Being an active part of your child’s educational process can be rewarding and valuable.

Activities to Try

Visit and observe a classroom for an hour. Ideally, you should visit several times, perhaps once a month for a year, to get a true sense of the learning that is taking place.
Pick a “fun” topic with your child and have him or her write a brief research report about it. Pick an activity that will lend itself to a real-world activity afterward: visiting an interesting location, building something, or undertaking a new activity. It can be very rewarding to give your children an experience in which an “academic” approach is taken to something that is self-selected and truly engaging.

**Recommended Equipment and Materials**

Counting chains, as described in the lecture: Counting chains can be used to instantiate counting and multiplication in a concrete fashion.
Physical health and mental ability are strongly correlated. What’s more, physical health in childhood is strongly associated with physical and mental health in adulthood. Although many schools, and even many parents, may give physical education low priority, physical activity is a critically important aspect of a child’s development. In this lecture, we will focus on how parents can foster physical development and activity in their children.

**Strategies for Weight Reduction**

- Childhood obesity is perhaps the single biggest problem facing children in developed countries. The most common procedure to determine weight problems is to calculate the body mass index (BMI), a simple formula that relates height to weight for children of different ages. In general, a child defined as obese exceeds the accepted 95th percentile for his or her age.

- There is no magic to getting rid of excess body fat; the laws of physics are inescapable here. If you burn more calories than you consume in any given day, your body will convert fat to energy to make up the difference. If your child is overweight, you need to get the child to decrease calorie consumption and/or increase physical activity.

- If you want to urge your child to burn a few hundred extra calories a day, you can try a number of different strategies. In general, you should talk with children who are overweight and urge them to engage in more physical activity. You can also reinforce them when they exercise more. This might be a good time to use a “points” system. When a child engages in more exercise on a particular day, he or she receives a point; enough points can be redeemed for a new toy or other reward but not a food reward.
There are two different approaches to consider here. You could reinforce your child for increasing the frequency of active exercise. Every day that the child exercises for 30 minutes, he or she gets a point. This is the exercise increase strategy.

Alternatively, you could reinforce your child for reducing the amount of time spent in sedentary behaviors. Maybe your child plays video games for 60 minutes per day. The child can receive one point by limiting game play to 30 minutes a day or two points by avoiding video games altogether for a day. This is the sedentary reduction strategy.

Sedentary Reduction

- Leonard Epstein of the State University of New York has studied childhood obesity and interventions aimed at reducing obesity for several decades. He has determined that the sedentary reduction strategy is the best intervention method.

- In one typical example of Epstein’s studies, families with obese children between 8 and 12 years of age were randomly assigned to either an exercise increase group or a sedentary reduction group. All families received nutritional counseling and information about obesity problems.

- Nearly all the children lost weight over the first six months of the study, regardless of the reinforcement method. As soon as the intervention ended, almost all the children started putting that lost weight back on. Over the subsequent year and a half, however, the children in the sedentary reduction group kept off significantly more of the weight.

- Small changes, such as reducing the amount of time the child spends sitting around the house inactive, can have important long-term benefits. Compounded over time, small changes can have a significant effect on fitness.
Benefits of Team Sports

- A good option for increasing physical activity in children is participation in team sports. Researchers have identified a long list of positive developmental outcomes associated with team sports. The obvious physical benefits include, for instance, increased cardiovascular fitness, better muscle tone, and improved skeletal strength.

- There are some less obvious psychological and cognitive benefits, as well. Children who participate in team sports tend to score better on a range of standardized tests, including academic achievement and IQ tests. Assessments of child social skills also suggest a positive impact for team sport participation.
• There is even circumstantial evidence that participating in regular exercise results in increased formation of new synapses in the brain. Most of that work is based on animal research, but in terms of the basic physiological processes at work, it seems likely that the finding generalizes to humans.

Team Sports and Self-Esteem

• One psychological benefit that seems to derive from team sports relates to self-esteem, particularly for girls as they enter the teen years. Self-esteem tends to vary in a systematic way across the life span. Small children tend to have very high self-esteem, but over the course of the first few years of life, this drops. It bottoms out in the teen years and then rises again through most of adulthood. The drop is especially significant for teen girls.

• Extreme lows in self-esteem are associated with negative behaviors: depression, eating disorders, withdrawal from everyday activities, dangerous experimentation with drugs and other illicit activities, and even suicide. Drops in self-esteem can even suppress immune function.

• Several methods for improving girls’ self-esteem have been studied over the course of many years. Girls’ self-esteem seems to be overly focused on body image and gender-specific roles associated with females. It’s a good idea to praise girls for their accomplishments and their work. In our society, we tend to praise girls for how they look, which exacerbates this problem.

• A number of studies have suggested that one of the best ways to deal with this problem is to get girls involved in team sports. Team sports involve physical activity, new challenges, and social interaction. As the child engages in the social interaction, she forms a network of friends who are focused on a particular set of goals. The central focus of the activity is not physical appearance.
• In addition to the increase in self-esteem, there are increases in performance in school and on standardized tests. Study results in this area apply to girls, as well as boys. There are also data that show associations between team sports and reductions in drug use and other high-risk behaviors.

• Research on the benefits of team sports does not recommend any particular team as superior. The same effects are likely to come from participation on a varsity, junior varsity, or non-school club team. Nor does the research point to any particular sport as better than others in this context. The important thing seems to be connecting with a group of peers and working intensely together to achieve some goal.

• Although the research has been on sports, there are non-sporting alternatives. A hiking club that plans and then completes a challenging trip up a local mountain seems likely to work well. A biking or running group might train for a certain race or a challenging ride together. Anything like this seems like a good choice if competitive sports don’t fit your particular situation—or your particular child’s interests.

Dangers of Concussion

• Parents should avoid having children involved in sports in which they experience repetitive impacts to the head. Even when there aren’t major concussion symptoms, there is good evidence that the cumulative effects of even mild head trauma can have significant negative effects on mental function.

• In football, some big hits can result in a concussion. This type of “closed head” injury occurs when the brain slams against the inside of the skull. No matter how good a helmet is, no matter how soft the pads inside, any time the head abruptly accelerates or decelerates, the soft, flexible brain presses against the inside of the hard, calcified skull. If a particular deceleration is extreme enough, the brain will bruise, like any other part of the body.
Symptoms of a concussion are disorientation, confusion, and headaches. In the normal course of mental function, tiny amounts of various neurotransmitters are released at the level of microscopic synapses. When there is a significant blow to the head, and the brain knocks against the skull, the first thing that happens is that there is a large, indiscriminate release of neurotransmitters. The brain’s pattern of activity is, quite literally, scrambled.

A cascade of neurophysiological events follows as the brain works to restore its equilibrium. It consumes a great deal of the available oxygen and energy as it pumps chemicals back where they should be. Inevitably, some neurons get “clogged up”—usually with calcium ions—and die. Near the site of impact itself, there will also be mechanical damage, as neurons that normally sit close to one another, at one of the synapses, are pulled apart. In essence, the neurons are indiscriminately “unplugged” from one another.

Although the brain is a remarkably robust system and can deal with impressively high levels of damage before any measurable functional or behavioral changes emerge, it can’t deal with an unlimited amount of damage. Eventually, there are consequences.

Several large-scale studies on college and high school football players have found that the amount of total impact experienced, just during practices, is already associated with measurable declines in cognitive performance—and the declines can last for as much as six months after a major impact.

What’s more, it takes a long time for the brain to return to its condition prior to the head trauma. During recovery time, the brain is especially susceptible to repeated injury. In fact, the best predictor of future concussions is prior concussions. With each successive injury, the functional effects are greater, especially if they are experienced relatively close to one another.
• There are significant benefits associated with team sports in general, but no data suggest that any greater benefits come from the sports associated with head injuries, such as tackle football. Soccer is another game with a feature that has the potential to negatively affect brain development: heading the ball. Some assessments have shown that heading drills may produce enough impact, over time, to affect brain function. Most children’s soccer leagues now avoid these drills.

• As a parent, you should make sure your child avoids any activity in which the head experiences repeated, forceful impact, whether in team sports, gymnastics, martial arts, or other pursuits.

Tips for Parents

1. Help your children shed excess body fat by helping them to increase their daily physical activity. To increase your child’s physical activity, target a reduction in sedentary behavior, not an increase in exercise.

2. Get your children involved in team sports activities. Such activities are especially beneficial for teen girls.

3. Avoid involving your children in sports that involve repeated impacts to the head.

4. Calculate your child’s body mass index, but don’t be concerned unless the child is in the 90th percentile or above.

5. Try to promote positive thinking in girls about their own bodies.

6. Talk with your children about how females are depicted by the media and about the relatively unrealistic, atypical situation that this popularizes.

7. Make a point of praising girls for their work, not just how they look.
There is a great deal of evidence that the best way to reinforce children to increase their daily calorie expenditures is to emphasize reductions in sedentary activity, as opposed to increases in explicit physical exercise. Could that work for adults, as well? If you want to lose weight, should you stop focusing on running every day and just stop watching television? What kind of experiment could test this idea?

Get your child involved in a sports team for a few months, then attend a professional- or college-level game in which that sport is played. Games look very different after you have some experience with the activity, and the combination will promote greater engagement in the team sport.

Track how long your child spends engaged in various sedentary and vigorous activities. (Try to be subtle about this or your child will become self-conscious.) After a few days, have a conversation with your child about his or her activity. You (and your child) are likely to be surprised by how the time is spent when looked at from this summary perspective. This is, of course, the first step in any program to improve levels of physical activity.

Basketball, soccer ball, Wiffle® ball set, and tennis balls: Allowing children to play in an independent, self-directed fashion is good for many reasons. Have a collection of sports equipment available to promote physical activity and make physical fitness fun.
In the past, research on parenting teens, like research on younger children, considered only how parents might mold children’s thoughts and behaviors. A more current perspective has been motivated by the realization that teens mold their parents’ behaviors and beliefs, as well. In retrospect, this is completely sensible. Adult peers influence each others’ thinking all the time. And as children move through adolescence, they are becoming adults. In a sense, this lecture is for both parents and their adolescent children. The tips focus on how to foster a positive group effort, in which parents and children work together toward development.

The Concept of Adolescence

- The concept of adolescence as a developmental stage is actually quite modern. As late as even a few hundred years ago, when a child was 13 years of age, he or she was treated very much like an adult. These young adults went to work; within a few years, they might be married and starting families of their own.

- There’s a reason this approach worked. In terms of many theories of cognitive development, all the major milestones seem to have passed by the time a child is about 12 years of age.

- In our modern society, after 12 years of age, children have at least an extra six years of supervised, supported development. If you count college and some postgraduate home living, adolescence has increasingly grown to span a decade—or more.

- In fact, recent research on adolescents and adolescent brain development suggests that their brains are not finished developing, even well after the onset of puberty. Adolescent thought and behaviors differ from those of mature adults in a variety of important ways. Adolescents are clearly not just young, inexperienced adults.
Four Goals of Adolescence

- A recent report from the U.S. National Research Council described four goals that characterize adolescence. These goals, which drive adolescents’ behavior and development as they traverse the teen years, establish a theoretical framework we can use to consider the research about adolescence.

- First, adolescents seek to “stand out”; they work to develop their own identity. Teens also pursue their own autonomy—their ability to make their own decisions and control their own actions, separate from the decisions and actions dictated by authority figures. The shift to an autonomous perspective represents a significant change for an adolescent.

- Second, teens seek to “fit in.” Although teens try to stand out from the family group, they also work to fit in to their peer groups. Teens are very focused on establishing comfortable, familiar affiliations with a network of peers.

- Third, teens are focused on “measuring up.” Children practice and improve at various skills from the time they are very young, but this quest for competence—for expertise—becomes a much more significant aspect of an individual’s sense of self during adolescence.

- Fourth, adolescents seek to “take hold.” Our own adult sense of who we are usually involves a list of beliefs and values to which we are committed. Younger children essentially inherit their parents’ choices in this regard; an adolescent, however, will typically begin to choose his or her own.

Maintaining Good Relationships with Adolescents

- As children enter their teen years, they exhibit a tendency to withdraw from the more complete disclosure and openness seen with younger children. They keep more information to themselves and become more deceptive. Parents should try maintain a trusting, open relationship that maximizes the likelihood that teens will be able to disclose important concerns and information.
A number of studies have found important associations between the amount of information teens disclose to parents and positive developmental outcomes. Teens who talk with their parents about their hopes and dreams—and, perhaps more important, their concerns and problems—tend to have a higher quality of life.

It’s also worth noting that parents can often provide useful advice. Not only were they once teens themselves, but they are more familiar with the child’s personality and context than almost anyone else.

The best strategy for getting teens to disclose information is simply to ask. Several researchers have conducted studies in which they have parents and children keep diaries of their interactions with each other. Researchers examined these pairs of diaries to determine what a parent did and how the child responded. The best predictor of when the child disclosed an important piece of information was that the parent asked if anything was wrong.
The child may say, “Nothing. Everything is fine” for several weeks. And then, one day, he or she will talk about a problem. When the child decides to talk, be ready and willing to participate in the conversation.

Analyses of these diary studies have shown that teens are significantly more likely to have such disclosure conversations with a mother than with a father. However, teens are far more likely to have disclosure conversations with their friends than with parents. In that respect, parents should maintain good connections with their adolescents’ social networks.

**Promoting Mastery**

- An important way that adolescents “stand out” and “measure up”—that is, establish an independent identity and build up skills and abilities—is by engaging in particular activities, such as sports, music, or theater. Teens may also develop an interest in pursuing academic goals but in ways that take them far beyond the standard curriculum.

- This in-depth experience with some activity, to the point that it becomes a part of a teen’s self-concept, is important. It’s associated with such positive outcomes as better achievement in school and lower rates of depression and low self-esteem. In order to achieve a level of mastery, a teen must put in many hours of work or practice over many months or years.

- Over the past several decades, teens have been given an amazingly wide array of possible opportunities, from extracurricular activities to social networking. This variety and wealth of opportunity can be a path to new learning.

- The problem that can arise, however, is that a little of a lot of little things can get in the way of mastery of one thing. As parents, it can be worthwhile to try to foster in-depth mastery to help teens reach a level where the activity becomes a part of self-identity.
Community Service

- Parents should also encourage their teens to participate in volunteer work or community service. Working for a good cause, such as gathering clothes for a shelter, working in a food pantry, or building homes with Habitat for Humanity, provides an important service for people in need. It’s also well established by many studies that volunteers reap numerous benefits from their work, including higher self-esteem and greater ability to focus on and enjoy other activities. Some research suggests that humans can get more of a lift from doing community service for a few hours than from paying for a few hours of clinical therapy.

- A number of high schools have begun to require community service work by students as a condition of graduation. The schools weren’t thinking of developmental science researchers when they instituted this policy, but it provides a natural experiment. Researchers can check to see if students at schools that require community service work tend to continue that work later in life, after high school, when it is no longer required.

- The short answer is that they do. Teens who experience the lift that can come from volunteer work when they are young seem to carry an affinity for helping others beyond high school, into college and even beyond.

Risk-Taking Behavior

- As we’ve said, teens are not just young, inexperienced adults; there are significant differences between adult and adolescent brains. Parents should be aware of these differences and be vigilant for potential problems associated with them.

- One of the most striking differences has to do with the relatively high frequency of teen risk-taking and sensation-seeking behaviors. Teens and young adults are significantly more likely to be involved in serious car accidents. Experimentation with drugs and unsafe sexual activities are also much more likely during this period.
• One reason that adolescents are inherently risk seeking and sensation seeking is that their undeveloped brains are wired to be less risk averse. The frontal lobes, like all the areas of the brain, are highly interconnected. When neurons become active, they do one of two things to the neurons with which they are connected: They either excite those post-synaptic neurons or they inhibit them.

• The frontal cortices of the human brain are dominated by those inhibitory connections. Adolescents have less effective frontal lobes. They are, in a strange way, sort of like patients with damage to the frontal cortices. They have much less ability to engage in self-control and self-inhibition than adults.

• When you are young and trying to find your place in the world, it can be healthy to take some risks. Parents, though, should work with their teens to manage those risks, to help teens see the risks through the eyes of someone who has more experience and, perhaps, a different perspective.

Tips for Parents

1. Parents of adolescents should maintain a trusting, communicative relationship that maximizes teen’s disclosure of information.

2. Encourage your adolescent child to become involved in at least one activity enough that it becomes a part of his or her self-concept.

3. Have your teen teens engage in volunteer or community service activities.

4. Be aware that the adolescent brain is not finished developing. Work with teens to moderate but not eliminate teen risk-seeking behaviors.

5. To encourage teens to disclose more information, ask questions frequently, but don’t grow frustrated if the answer is often—or even usually—a refusal to engage in in-depth discussion.
6. Because teens communicate most frequently with peers, it’s a good idea to maintain connections with an adolescent’s friends and make your home a place where those friends feel welcome.

**Suggested Reading and Resources**

Bronson and Merryman, *NurtureShock*.

Walsh, *Why Do They Act That Way?*

**Questions to Consider**

1. The adolescent years are often described as a time of tension between competing goals. Children seek independence, but they still benefit from parental involvement. What other competing aims come to mind?

2. Neuroscientists and cognitive scientists in general often presume that brain maturation and development drive changes in behavior. It is simply part of how we think about ourselves. Could the correlations between cortical myelination and self-control result from improved self-control causing the changes in brain organization? If so, what sorts of experiences could a teen be given to enhance these changes?

**Activities to Try**

Pick a regular time with your adolescent for one-on-one conversation. This could be a weekly or monthly lunch outing, tennis game, or even just a walk around a park. Most of the time, nothing earth-shattering will come of these meetings, but having the regular, relaxed time for communication is a good way to ensure that when there is something important to discuss, your teen has a way to make it happen.

Find a local volunteer organization and contribute some of your time if you can. After you have participated yourself a few times, begin to involve your child.
Throughout this course, we have described parenting and child development tips that are supported by scientific research. With only the rare exception, this research is backed by other studies that have produced similar results. Science can and should be used to make decisions about parenting and child development. However, there are many other sources of information that are not based on science, such as anecdotal information. What’s more, in some cases, there is no good published science on a particular issue. In those cases, parents must learn to conduct their own science, collecting data, analyzing trends, and developing theories.

The Grip Game

- In this course, we’ve talked about a number of experiments that researchers have run with children and their parents. Usually, those studies are conducted under carefully designed and controlled laboratory conditions. Often, they involve specialized equipment and software for conducting statistical analyses of data. All that said, you can try out many of these studies yourself, right in your own home.

- For example, here’s a study you can try with infants, between about 4 and 8 months of age. Around 4 months, most babies develop the ability to reach out and pick up a small object with their hands. A long, thin object, such as a wooden spoon or ruler, is good to use here. If you orient the object horizontally, your 4-month-old will make a very adult-looking reach for it, using an overhand grip. If you orient it vertically, however, the child will likely use that same grip—which won’t work very well.

- If you play this game every few days for a while, you will notice an important motor milestone, somewhere between 5 and 7 months of age. The child will start to orient the hand to match the target
axis prior to making the reach. Within a few more weeks, this hand adjustment will take place in a fluid manner during the reach itself.

**Tracking Eye Movements**

- Even before you see your child reach for things, you can watch your baby’s “smooth tracking” system come online. When we move our eyes around to scan a room, we don’t move them smoothly. For example, if you look to your left and then try to pan to the right with your eyes, you will notice that they shift from place to place abruptly, in discrete jumps, called “saccades.”

- The only time we don’t move our eyes in this saccadic fashion is when we follow a moving target. If there is some object moving across our field of view, we can lock on it and follow it very precisely. Our eyes stop moving in discrete jumps and smoothly track.

- Babies are able to control their eye movements from the moment they are born; they tend to look at things they find interesting. Although newborn infants can make saccadic eye movements, they can’t make smooth tracking movements. The brain systems that coordinate that movement—located in the medial temporal cortex—aren’t developed enough yet.

- You can test this with your baby. Hold a bright, interesting object, such as jingling keys, in front of an infant and get him or her to look at it. Once the infant has fixated on the object, move it slowly from side to side. If the baby is younger than about 6 weeks of age, you will see saccadic eye movements that follow the keys but lag behind them.

- As with the reaching game, you can try this with a baby every few days and notice that there is still no smooth tracking for a while. At some time between 6 and 8 weeks of age, however, there will be an abrupt shift. One day, you may see no hint of smooth tracking. On the next, the smooth tracking will be present.
Effects of Tai Chi on Math Scores

- In an earlier lecture, we discussed a study demonstrating that giving children experience with traditional tae kwon do improves their self-control and their performance on math tests. Imagine that you want to determine whether you can produce the same effects in your son. You may not have access to a traditional tae kwon do class, but a tai chi class is available in your community. You might run a mini-experiment to answer the empirical question: Will tai chi work to improve my son’s math scores?

- You can use the child’s grades on math tests over time as an indicator of math achievement. Start by recording his grades for about two weeks. (Use a notebook or computer spreadsheet; don’t rely on memory.) Then, enroll your son in the tai chi class and continue to collect his math performance data. If the tai chi classes help, his math grades should improve.

- An important question, though, is whether the tai chi class made the math grades improve or whether some other factor was involved. This is where developmental science often diverges from a parent research project.
  - From a developmental science perspective, there are some important alternative explanations for the change in math grades that don’t have anything to do with tai chi. Because your son got older and more mature during the time you conducted the study, it’s possible that he would have improved at math naturally. In a real-world experiment, you would have a control group of children who did not take tai chi to check for this, but as a parent, you don’t have that luxury.
  - It’s also very likely that you let your child know that this activity had the potential to help him improve his self-control and math performance and that you would be keeping track to see if it works. It could be that your child, based on this information and your encouragement, works harder at math. Or perhaps he will become more confident about math because he...
expects to accomplish more. If that’s the case, then his math performance might improve with any activity, not necessarily tai chi.

○ In a case study, an experimenter might employ an ABAB design, in which A corresponds to baseline or control-condition performance, and B corresponds to exposure to tai chi. Thus, ABAB would involve collecting baseline math performance, then math performance with tai chi for a few weeks. Then, you would stop the tai chi classes for a while and expect the math performance to decline, at which point you would restart the tai chi participation and expect to see it rise again.

○ Most parents, however, look at the improving math scores and just leave well enough alone. If the goal is to improve math performance, then that is an end unto itself.

**Cultivating Young Scientists**

- Parents can use similar techniques to assess any of the other tips described in this course. If you choose to reinforce reductions in sedentary activity to promote weight loss, for example, you should keep a careful journal of your child’s daily levels of activity, when reinforcements were delivered, and changes in weight and body mass index.

- If your daughter seems depressed, and you choose to get her involved in team sports, start a journal to keep track of her mood. At the same time, recruit your child to keep track, as well. Have her keep a record of the activities of the day. After a few weeks, go through that journal and look to see if your child’s mood changes as a function of particular activities.

○ For example, you may find that her mood becomes more negative after watching TV all day. Such discoveries give you a hypothesis to test. Using the ABAB design, try an intervention in which TV time is reduced.
In addition to dealing with the immediate problem, you will be teaching your child how to systematically explore and regulate herself for the rest of her life, whenever any problem like this arises. You will be teaching her how to be a young scientist.

**Reasoning by Anecdote**

- As a parent, you will find that many people are willing to tell you stories about their children and give you parenting advice based on those stories. You may find yourself convinced by these suggestions. Making parenting decisions based on the stories of others is called reasoning by anecdote, and it’s not much better than simply guessing. This point is underscored by the surprisingly common—and incorrect—belief that some vaccinations increase the likelihood of developing autism.

- Systematic vaccination for measles, mumps, and rubella has rendered these diseases virtually extinct in modern developed countries. If you hadn’t been vaccinated, however, you could be.

For the moment, measles remains rare, but as the rate of vaccination refusals has risen in recent years—based on reasoning by anecdote in place of science—the likelihood of devastating outbreaks has also continued to rise.
in for serious problems. Measles, in particular, can have long-term health consequences, including lifelong brain damage, deafness, and even death. All it takes to create immunity is a few injections of the measles-mumps-rubella (MMR) vaccine.

- There is a persistent belief, however, promoted by a committed group of parents, that the MMR vaccine can cause autism. The belief comes from reasoning by anecdote. In this case, scientific, evidence-based reasoning isn’t just a choice; it is the right choice. Children should receive the MMR vaccine.

- There are three main reasons that parents refuse the vaccine for their children.
  - First, a paper published in 1998 in *The Lancet* suggested the link. The paper was quickly refuted on many different grounds, and in 2010, the paper itself was retracted by the journal because of evidence that the original data were largely fabricated by its author. Unfortunately, the original reference is still quoted, and some people still give it a certain amount of credence.
  - Second, the primary symptoms of autism spectrum disorder don’t show up until shortly after the age that the MMR shot is typically given. This unfortunate coincidence leads many to believe that the shot causes the symptoms.
  - Third, many people find the reasoning by anecdote evidence compelling—even more compelling than logic-based reasoning based on careful experiments.

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<th>Tips for Parents</th>
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<td>1. Keep track of your children’s development, as well as any interventions you try. Being a “parent-scientist” can be useful for taking an evidence-based approach to parenting decisions.</td>
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<td>2. Involve older children in the recordkeeping and performance of “mini-experiments.” In addition to solving problems and enhancing well-</td>
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being, this activity can teach children a strategy for self-regulation that can be of lifelong value.

3. Always try to make parenting decisions based on systematic, scientific evidence. Strongly resist the urge to “reason by anecdote.”

4. Get your children vaccinated for measles, mumps, and rubella. There is strong evidence that vaccination is not linked to the development of autism.

Suggested Reading and Resources

Gallagher, *Experimenting with Babies*.
Karp, *The Happiest Baby on the Block*.
Mnookin, *The Panic Virus*.

Question to Consider

1. Science and scientific research progresses on the basic assumption that people are, in many important ways, identical. But everyone is different. Certainly every child is unique. Given this fact, how should we proceed in reasoning from scientific research about our own individual child and ourselves?

Activities to Try

When you track your child’s daily behaviors, track some of your own, as well. Socrates said, “The unexamined life is not worth living.” You may not completely agree with that statement, but most people find that some introspection leads to better self-understanding. It will also help you better appreciate the data collection and intervention processes that you undertake with your children.
Moleskine® or composition notebook: A good tool for any scientist is a nice notebook. Eventually, you will want to organize your data and your thoughts, but a notebook in which you keep dated entries can be useful for any research project. There’s no need to remove pages from an old-fashioned composition book—and, indeed, you should avoid doing so.
In this course, we have examined evidence-based tips to help with parenting decisions and child development. Much of developmental science is about how to make children better at such skills as reading, math, or creativity. Although it is good to encourage and enrich your child’s development, there is something lost if we push beyond “encouraging” to “hurrying.” In this lecture, we will consider the significant value of an “unhurried childhood.” That means a childhood in which children progress at their own pace, mastering things when they are ready. It means a childhood in which children have time for an activity that has enriched and promoted child development for as long as there have been children: playing.

New Focus in Developmental Science

- Some of the most basic questions that have formed the foundation of developmental research have had to do with figuring out nature versus nurture: what is built in based on our genetic encoding and what is acquired through our experience with the environment.

- A few decades ago, however, developmental scientists shifted their thinking about these issues. They realized that essentially every aspect of development is the result of both nature and nurture. Indeed, the truly interesting questions aren’t at all about whether something results from nature or nurture; they deal with situations in which those two different types of factors work together.

- Even as this change has taken place at the level of fundamental science, studies aimed at accelerating developmental processes have persisted. In large part, this is due to researchers’ hopes of having a positive impact on children’s education and development.
New Focus in Parenting

- Parents have an underlying value system. We want our children to develop better, and that often means we want them to develop faster. These two things are not necessarily the same, however. Faster is not better; sometimes, faster can be worse.

- We adults focus heavily on achievement in such areas as math and reading, which are taught and tested in school, but children can also accomplish a great deal of learning without looking at a single flash card or educational DVD. They accomplish this learning through play.

- In 1981, surveys of parents indicated that children had about 40 percent of the day available for unstructured play. By the late 1990s, this figure had dropped to about 25 percent of a child’s time. The amount of free play among most children today is fewer than 10 hours per week.

- As late as the 1980s, essentially every elementary school had a recess period during the day. By around 2010, about 40 percent of schools had removed recess from the schedule. There is a persistent belief among these school systems that unstructured time spent during recess can be better devoted to structured study.

- When children engage in play that is structured by themselves, they are explorers. They try new things. Some of those things, they won’t like so much. They will, however, from time to time, discover new activities that they love. Play is where children explore not only the world but also themselves. It’s not surprising that several studies have linked the amount of time children have for free play to happiness, high self-esteem, and development of self-concept.
Value of Unstructured Play

- Other studies have found links between free playtime and physical fitness. Children with relatively little time to play are more likely to be obese. Children who try many activities as they play are more likely to find some that they enjoy, and as they continue to pursue those activities in the future, their weight is more likely to remain within the healthy range.

- Of course, parents and children can enjoy playing together, but several studies have noted that such play should be child directed. If parents suggest a particular game to play, children will typically acquiesce to their direction, but this short-circuits the exploration aspects of play. If you join your children during their window of time for free play, be sure to let them take the lead.

- Some studies have found links between the frequency of free play and creativity. It has been observed that when young children play, they often make up new games with novel rules. Researchers have noted that a group of children engaged in this type of novel game play spend more time negotiating the rules than actually playing. According to one study, about 80 percent of total playtime in this situation is devoted to discussion of the rules.

- Given this attribute of free play, it’s not surprising that many studies have identified links between free playtime and creativity. It also makes sense that social skills would increase as a child has more time to engage in child-structured activities that are not dictated by adults.

- The best way for parents to encourage children to engage in free play is to make time for it. Tennis lessons, swim team, piano practice, and other enrichment activities are wonderful, but giving children a block of time, several days per week, to go out and engage in free play is also highly enriching.
When they first release their children to engage in free play, some parents may find that the children don’t know what to do or complain that they are bored. But that boredom will eventually pass and be replaced with some activity chosen by the children. Several researchers have noted that boredom often precedes large bursts of creativity.

Choosing the Right School

Some parents have numerous options for where to send their children to school, including different types of preschools and elementary schools. Historically, children have attended whatever school was closest to their homes, but that has been changing in recent years. Large school districts—for instance, school systems in large cities—increasingly are allowing parents to choose where their children will go to school.

There are many rationales for this new approach. It makes schools more diverse and provides motivation for parents and community leaders to make all schools better—not just those located in particular neighborhoods. When school funding is tied to the number of students who enroll, it also incentivizes the school to strive for excellence.

Some elementary schools have emphasized free choice and play as important to learning. These schools schedule time each day for play. And even when the children are in class, they are allowed to work on activities that they choose for a significant chunk of the day. The Montessori model that we discussed earlier is a good example of this type of school, but it’s not the only one.

Often, these less-structured schools don’t fare well when parents come to visit and consider them for their children. The parents see a classroom filled with children who are playing, not studying, working, and learning. The research described here, however, suggests that children who are playing are learning. Indeed, they are learning things that can’t be mastered while sitting quietly, following the moment-to-moment instructions of an adult teacher.
Necessary Knowledge and Skills

- Today, education is often driven by increasingly long inventories of skills and knowledge that children should possess by a particular age. The school day isn’t long enough to achieve all these goals. Part of the job of teachers and school administrators is to make choices about what to put at the top of those lists and what to omit.

- If children spend a significant amount of time playing, then the list will need to be shorter. But shortening the list of things children will learn so that they can have time for play is not something many adults are willing to do.

- Every child plays in a different way. Some play at math-related activities, while some read; some play at games that teach and promote social reasoning, or physical coordination, or artistic and spatial creativity. Many parents and teachers aren’t comfortable with leaving those choices up to the child.

- The research in this area, however, suggests that we should try to trust our children more. We learn best when we are pursuing answers to our own questions and when we are seeking knowledge and skills to achieve our own goals. That’s true for all humans, but especially true for children. If we choose our children’s activities for them, then closely supervise and control them, the children will learn more of what we want—but less overall.

- The science doesn’t provide a clear method for balancing this tradeoff. At one end of the spectrum, we have more control but less overall learning. At the other end, we have less control but more overall learning. Every parent and teacher must pick some balance between the two.
• We want our children to be good at reading, writing, and arithmetic, along with geography, chemistry, physics, and history. If our children don’t choose to work on those topics, then we will probably push them to do so anyway. Like many parents, you probably believe that skills and knowledge in these standard areas will lead to more success in the future.

• We all want our children to succeed in life, but it’s worth noting that we can’t really know exactly how they will define their own success. An important part of their individual journey—of their own unique childhood—is have the freedom to figure that out.

A scientific approach can help with the challenges of parenting without diminishing the rich and powerful experiences of raising children.
Support and encourage your children’s development, but be careful not to confuse “accelerating” development with “improving” development.

Your baby almost certainly can’t read, but he or she can learn a lot from spending time interacting with the environment in an age-appropriate way. Spend their efforts and the limited waking hours of an infant on age-appropriate, play-based learning.

Do your best to preserve at least some hours of unstructured, child-directed playtime throughout childhood.

If you join your children during free play times, let the children choose and guide the activities and avoid making specific suggestions that might short-circuit the creative, explorative aspects of unstructured play.

Let your child engage in self-directed learning in school, as you let the child engage in self-directed play at home.

Hirsh-Pasek, Golinkoff, and Eyer, *Einstein Never Used Flash Cards*.
Pellegrini, *Recess*.

If a child never went to school, he or she might still learn many things. What sorts of things would be harder to learn outside of school than in school? Think about how you can best use institutional school to meet the educational goals of you and your child.

The lecture on healthy nutrition for children argued that the human taste preference system is smart—that if you expose it to a wide range of different foods, the body and brain will learn to crave those that are needed to support a thriving child. Could the same thing apply to daily...
activities? If you expose your child to many options and provide at least some experiences with a variety of different activities, will he or she tend to figure out how to be active, stimulated, healthy, and even happy?

### Activities to Try

Schedule a time each week to play with your child. When you do, make a point of not communicating any idea about how to spend that time. Let the child pick the activity. Even if the child indicates that he or she doesn’t have any ideas, be as patient as you can and wait.

Take a walk outside and explore the natural surroundings. For a young child, a wooded park, a small stream, or even your backyard can be an exotic land of exploration.

In addition to doing classroom observation, if possible, also schedule a time to observe children at recess. The level of physical activity and mental engagement is surprising to many people when they see it.

### Recommended Equipment and Materials

Many lectures in this course recommend specific materials and equipment that might be useful in supporting child learning and development. For this lecture, the whole point is to let the child find things of interest; hence, the recommendation is not to buy materials that prescribe specific play activities. For instance, consider buying a large collection of LEGO® rather than a particular LEGO kit with instructions. (However, if a child expresses a strong interest in one of these kits, then think about getting just that.) In general, the recommendation here is to provide genuinely free time with materials that allow for child-directed play and exploration.
This course features a wide range of science-based advice for parents; thus, a large number of references to articles published in professional scientific journals are included in this section. You may be able to obtain these at a nearby library, particularly a university library. Even if the library doesn’t list a specific journal in its catalog, the librarians will likely be able to order copies of articles via an interlibrary loan service.

Even easier, using Google and other search engines, you may be able to find PDF copies of many papers and articles online, often for free. Try searching for the title with quotes around it, for instance, “Activities and programs that improve children’s executive functions.” Often, authors also post PDF versions of their papers on their university websites. Google Scholar (http://scholar.google.com/) is another great tool for finding academic papers.

If all else fails, you can buy a copy of a particular article or paper from the websites of most journals, but this option can get expensive, often $20 or more per paper.

**Lecture 1**
Diamond, A. (2012). Activities and programs that improve children’s executive functions. *Current Directions in Psychological Science, 21*, 335–341. This paper reviews studies that have identified relationships between certain types of activities and the development of executive function abilities.

Manjunath, N. K., & Telles, S. (2001). Improved performance in the Tower of London test following yoga. *Indian Journal of Physiological Pharmacology*, 45, 351–354. This paper reports on an experiment conducted to compare the influence of several weeks of yoga training with several weeks of non-yoga–based physical training. Children randomly assigned to the yoga condition performed better on a standard problem-solving test used to assess cognitive function.

Mischel, W., Shoda, Y., & Peake, P. K. (1988). The nature of adolescent competencies predicted by preschool delay of gratification. *Journal of Personality and Social Psychology*, 54, 687–696. This classic paper reports significant relations between performance on a delay of gratification test in preschool and several developmental outcomes in adolescence. Children who could wait longer as preschoolers were later found to be more socially competent, verbally fluent, rational, and attentive; capable of planning; and able to deal well with frustration.

**Lecture 2**


Lecture 3


Lecture 4


**Lecture 5**


Saffran, J. R., Aslin, R. N., & Newport, E. L. (1996). Statistical learning by 8-month-old infants. *Science*, 274(5294), 1926–1928. This paper presents a study demonstrating that even very young infants extract statistical regularities from the language they hear—at least several months before they even utter their first word.

Werker, J. F., Pegg, J. E., & McLeod, P. J. (1994). A cross-language investigation of infant preference for infant-directed communication. *Infant Behavior and Development*, 17(3), 323–333. This paper describes an excellent example of the procedure used to establish that infant-directed speech (i.e., motherese) is used and preferred by infants in many different cultural and linguistic contexts.

**Lecture 6**

Cheng, K. (1986). A purely geometric module in the rat’s spatial representation. *Cognition*, 23, 149–178. As described in the lecture, this study suggests that rats are very bad at making use of color information in guiding reorientation and search processes.
Hermer, L., & Spelke, E. S. (1996). Modularity and development: The case of spatial reorientation. *Cognition, 61*, 195–232. This study, described in the lecture, suggests that children make excellent use of geometric, spatial information to control their reorientation, but until they have words to describe it, this process cannot make use of color information.

### Lecture 7


Buri, J. R. (1991). Parental authority questionnaire. *Journal of Personality Assessment, 57*(1), 110–119. This simple, brief questionnaire has been used in many studies of parenting style and can be taken by a parent any time.


Zahavi, S., & Asher, S. R. (1978). The effect of verbal instructions on preschool children’s aggressive behavior. *Journal of School Psychology, 16*(2), 146–153. Explaining why it’s good to change behavior can be even more important than actual reinforcement for changing a child’s behavior. This paper describes a study conducted on that topic with preschool children.
Lecture 8
Chiong, C., & DeLoache, J. S. (2013). Learning the ABCs: What kinds of picture books facilitate young children’s learning? *Journal of Early Childhood Literacy*, 13(2), 225–241. Describes research by two leaders in this field on the importance of using simple, relatively plain books (without pop-up features, for instance) to maximize children’s learning of such information as their ABCs.

Sénéchal, M., & LeFevre, J. A. (2002). Parental involvement in the development of children’s reading skill: A five-year longitudinal study. *Child Development*, 73(2), 445–460. Early exposure to books, even before explicit teaching of reading has begun, seems critical to promoting good reading achievement. This paper describes one of many longitudinal studies that provide evidence for that claim.


Lecture 9


**Lecture 10**

Barr, R., Dowden, A., & Hayne, H. (1996). Developmental changes in deferred imitation by 6- to 24-month-old infants. *Infant Behavior and Development, 19*(2), 159–170. Deferred imitation of some behavior with a specific object is the earliest test of memory. You can watch that emerge by trying it with your own children. This paper describes the development of deferred imitation ability.

Fantz, R. L. (1964). Visual experience in infants: Decreased attention to familiar patterns relative to novel ones. *Science, 146*(3644), 668–670. This paper was the first to establish the presence of basic perceptual memory in young infants. The habituation technique developed here has been used in hundreds of other studies since then.

Klahr, D., Chase, W. G., & Lovelace, E. A. (1983). Structure and process in alphabetic retrieval. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 9*(3), 462. The lecture mentions that an old finding that the time to recall what letter comes next in the alphabet after a particular probe corresponds to the phrases of the alphabet song. This paper describes that finding and presents additional experiments that explored the nature of letter memory.


**Lecture 11**

**Lecture 12**

**Lecture 13**
Brito, N., & Barr, R. (2013). Flexible memory retrieval in bilingual 6-month-old infants. *Developmental Psychobiology*, doi: 10.1002/dev.21188. These researchers found that even 6-month-old infants who are raised in a bilingual environment exhibit memory advantages over children who are raised in a monolingual environment. This is striking considering that they are not yet speaking either language at 6 months!
Lecture 14


Lecture 15
Franceschini, S., Gori, S., Ruffino, M., Viola, S., Molteni, M., & Facoetti, A. (2013). Action video games make dyslexic children read better. *Current Biology*, 23(6), 462–466. Certain video game experiences seem to reduce the reading difficulties experienced by dyslexic children. This study describes a finding that supports this idea.


Subrahmanyam, K., & Greenfield, P. M. (1994). Effect of video game practice on spatial skills in girls and boys. *Journal of Applied Developmental Psychology, 15*(1), 13–32. This study is one of many that suggest some positive effects on perception and cognitive in children who play action video games.

**Lecture 16**
Fowler, J. W., & Peterson, P. L. (1981). Increasing reading persistence and altering attributional style of learned helpless children. *Journal of Educational Psychology, 73*(2), 251. Changing the words that children say after succeeding and failing at a reading task was shown to affect reading learning over the course of several weeks. This is one example of several studies that have obtained this type of effect.


**Lecture 17**
Greitemeyer, T., & Osswald, S. (2010). Effects of prosocial video games on prosocial behavior. *Journal of Personality and Social Psychology, 98*(2), 211–221. In this study, children who played a prosocial “helping” video game were more likely than other children to engage in real-world helping behaviors.


Warneken, F., & Tomasello, M. (2006). Altruistic helping in human infants and young chimpanzees. *Science, 311*, 1301–1303. These researchers have developed a large number of clever tasks that suggest young children are capable of understanding how to help others and that they have an ingrained desire to do so, even in the absence of instruction or reward.

———. (2008). Extrinsic rewards undermine altruistic tendencies in 20-month-olds. *Developmental Psychology, 44*(6), 1785. A recent study that provides evidence that parents should not explicitly reward children for engaging in prosocial behaviors. Doing so tends to reduce the frequency of such behaviors in the future.

**Lecture 18**
DeLoache, J. S. (2000). Dual representation and young children’s use of scale models. *Child Development, 71*(2), 329–338. Young children (around 24 to 30 months of age) are remarkably bad at reasoning about maps and scale models. This paper describes a classic study on that topic that you can try at home with your developing child.

**Lecture 19**
Lecture 20

Lecture 21
Agans, J. P., & Geldhof, G. J. (2012). Trajectories of participation in athletics and positive youth development: The influence of sport type. *Applied Developmental Science, 16*(3), 151–165. This study compared the benefits of participation in different types of sporting activities for children. Larger effects were found for adolescent girls. Positive outcomes were associated with all activities compared to no substantial activity participation.

Epstein, L. H., Paluch, R. A., Gordy, C. C., & Dorn, J. (2000). Decreasing sedentary behaviors in treating pediatric obesity. *Archives of Pediatrics & Adolescent Medicine, 154*(3), 220. Reinforcing children for reducing sedentary activity hours—rather than reinforcing them for increasing vigorous activity times—has consistently been found to work better for promoting fitness. This paper describes studies that have established that finding.


Lecture 22

Lejuez, C. W., Aklin, W. M., Zvolensky, M. J., & Pedulla, C. M. (2003). Evaluation of the Balloon Analogue Risk Task (BART) as a predictor of adolescent real-world risk-taking behaviours. *Journal of Adolescence, 26*(4), 475–479. Adolescents are, relative to other age groups, inherently more sensation seeking and less risk averse. That claim is supported by a range of research, including the clever balloon analogue risk task described in this paper.

Smetana, J. G., Metzger, A., Gettman, D. C., & Campione-Barr, N. (2006). Disclosure and secrecy in adolescent–parent relationships. *Child Development, 77*(1), 201–217. These authors, and others, have identified relations between adolescent disclosure to parents and a variety of positive developmental outcomes. This paper describes background research on that topic, as well providing a good example of one such study.

Lecture 24
Acredolo, L., and S. Goodwyn. *Baby Minds: Brain-Building Games Your Baby Will Love*. Random House Digital, 2000. Describes games you can play with an infant that are fun and may promote mental development. The authors have been active in studying sign language acquisition with infants; thus, it is no surprise that these activities are described in the book, as well.


Agassi, A. *Open: An Autobiography*. HarperCollins UK, 2009. Autobiographies almost always include extensive sections that describe the subject’s parents and their parenting style. This is especially true in Agassi’s case.

Anderson, J. R. *Learning and Memory*. Vol. 86. John Wiley, 2000. This book is not about homework per se, but it provides a rich and detailed understanding of the nature of human learning and memory. The enormous body of research that supports this understanding motivates most science-based teaching and homework practices.


Bauman, S., D. Cross, and J. L. Walker, eds. *Principles of Cyber Bullying Research: Definitions, Measures and Methodology*. Routledge, 2013. This book describes research, including some intervention work, on the nature of cyberbullying. Researchers have studied bullying, its consequences, and how to reduce it for years. This book considers how that knowledge applies, and how things are different, in our age of social media.

Bialystok, E. *Bilingualism in Development: Language, Literacy, and Cognition*. Cambridge University Press, 2001. This excellent book clearly summarizes a wide range of studies on bilingual development and its effects on cognition and the brain. It also translates those findings to information and suggestions that parents and educators can use.

Bloom, P. *Just Babies: The Origins of Good and Evil*. Random House, 2013. This thoughtful, philosophical book considers arguments about the nature of good and evil that have circulated for centuries. Findings from modern research allow us to make progress in resolving these age-old questions—or at least to better understand them.


Bodrova, Elena, and Deborah J. Leong. *Tools of the Mind: The Vygotskian Approach to Early Childhood Education*. Pearson, 2006. The text describes an approach to education that several studies have significantly associated with enhancement of self-control and executive function abilities.


Common Sense Media. Game Reviews, http://www.commonsensemedia.org/game-reviews. This organization provides parent-targeted reviews for various video games. In terms of making decisions and getting ideas for games to present to children, this website is an excellent resource.


Cooper, H. *The Battle over Homework: Common Ground for Administrators, Teachers, and Parents*. Corwin, 2007. Harris Cooper describes and integrates dozens of large-scale studies and associated theories on how homework can be used to enhance children’s learning of school material.
Dawson, Peg, and Richard Guare. *Executive Skills in Children and Adolescents, Second Edition: A Practical Guide to Assessment and Intervention*. The Guilford Press, 2010. This book provides a detailed description of how executive function (EF) abilities develop over the course of childhood, including characterization of how these mental skills play a role in academic and social function. The authors describe how EF is typically assessed and suggest a wide range of tasks that can be used to support EF development.

Dehaene, S. *The Number Sense: How the Mind Creates Mathematics*. Oxford University Press, 1997. The author describes his and other research on the importance of developing and using “number sense” in addition to learning the specific details of mathematical operations.

Dweck, C. *Mindset: The New Psychology of Success*. Random House Digital, 2006. Based on her decades of research, this Stanford psychologist describes work on attributional style and her associated theory about mindset. The book is targeted at adults, but the information is relevant for parenting, as well. The book also provides a detailed discussion of intelligence and intelligence testing and considers how they relate to the more specific goals of academic and professional “success.” Dweck argues that poor thinking about intelligence as a fixed trait can hinder mental development and achievement.

Empson, S. B., and L. Levi. *Extending Children’s Mathematics: Fractions and Decimals*. Heinemann, 2011. This book is targeted at math teachers, but it is accessible to a motivated parent who is interesting in being a part of his or her child’s math education team. It suggests a wide range of activities and problems to try with children at varying levels of achievement. It focuses on fractions, one of the most important math concepts for children to master.

Engelmann, S., P. Haddox, and E. Bruner. *Teach Your Child to Read in 100 Easy Lessons*. Simon and Schuster, 1983. To be honest, I don’t like the use of the word “easy” in this title. Depending on the child, some of the lessons might be quite hard! As Lecture 8 argues, the best way to teach your children to read is to practice reading with them. That said, this book breaks that process down into smaller, incremental steps that many parents will find manageable.

Finch, J., and A. Killion. *Throw Like a Girl: How to Dream Big and Believe in Yourself*. Triumph Books, 2011. This autobiography, written by a successful female pitcher, is aimed at adolescent girls, but it is also a good book for parents and children to read together, even if they aren’t specifically interested in softball.

Fisch, S. M., and R. E. Truglio, eds. *G Is for Growing: Thirty Years of Research on Children and Sesame Street*. Routledge, 2000. Summarizes and synthesizes an enormous body of research collected on the effectiveness of *Sesame Street* and children’s educational television in general. The book also tells the innovative and exciting story behind the creation of this program, which has become an international icon for generations.

Foer, J. *Moonwalking with Einstein: The Art and Science of Remembering Everything*. Penguin Books, 2011. This book is targeted to adults, but the lessons about memory are applicable to children, as well. The author covered a memory olympics competition as a reporter. In his conversations with memory experts there, he decided to take on the challenge of mastering their techniques and competing in the next competition. The story is entertaining and engaging, and the memory techniques that you will learn along the way are real.


Gladwell, M. *Outliers: The Story of Success*. Penguin Books, 2009. Sections of this book have been strongly critiqued by researchers in particular cognitive science domains. Many have expressed concern that Gladwell “cherry picks” certain studies that fit with his stories, while ignoring others. That said, his section on David Boies, noted attorney and dyslexic, is inspiring.
Goldberg, D. *The Organized Student: Teaching Children the Skills for Success in School and Beyond*. Simon and Schuster, 2005. This book, written for parents, suggests a range of strategies to use to help school-aged children become more organized about study habits, scheduling, planning, and even backpack planning. There isn’t any study that validates the effectiveness of these specific methods, but parents may find good ideas to try here.


Grosjean, F. *Bilingual: Life and Reality*. Harvard University Press, 2010. This book is entertaining and informative. It considers the nature of human development and language learning, embedding these topics in a wide range of lively stories about real people and their experiences.


Hyman, Irwin A. *The Case against Spanking: How to Discipline Your Child without Hitting*. Jossey-Bass, 1997. The author describes a wide range of research suggesting that corporal punishment is ineffective for changing behavior and that it is associated with a number of negative developmental outcomes.

Kazdin, A. E., and C. Rotella, C. *The Kazdin Method for Parenting the Defiant Child: With No Pills, No Therapy, No Contest of Wills.* Houghton Mifflin Harcourt, 2009. This book considers and describes many aspects of parenting as they relate to discipline and behavior modification. Specific advice for dealing with defiant children is provided, including the use of positive reinforcement, as opposed to punishment and spanking.

Kilpatrick, H., and W. Joiner, eds. *The Drama Years: Real Girls Talk about Surviving Middle School—Bullies, Brands, Body Image, and More.* Simon and Schuster, 2012. This book contains writing by girls and women about their middle school experiences and touches on team sports. The stories are compelling and may serve as jumping off points for important conversations with girls.


Lillard, A. S. *Montessori: The Science behind the Genius.* Oxford University Press, 2008. The author describes principles of Montessori education in a clear fashion, as well as research on education and child development that support their value.

Logue, Alexandra W. *The Psychology of Eating and Drinking.* Routledge, 2004. This book considers in more detail the notion, raised in Lecture 4, that the human taste and food-seeking systems are complex and “smart.”

Lorayne, H., & Lucas, J. *The Memory Book: The Classic Guide to Improving Your Memory at Work, at School, and at Play.* Random House Digital, 2012. Harry Lorayne describes himself as an “entertainer,” but he’s one of the world’s leading practitioners of rapid memorization. Like most other memory experts, he claims that his fundamental memory is no different from yours or mine, but he has developed techniques to make better use of those abilities. His writing and stage shows are both entertaining and informative.
Mackintosh, N. J. *IQ and Human Intelligence*. Oxford University Press, 1998. Provides a detailed overview of the history and practice of IQ testing. The author also considers a broad range of research on the nature of intelligence and how it is influenced by inherited and environmental factors.

Mnookin, S. *The Panic Virus: A True Story of Medicine, Science, and Fear*. Simon and Schuster, 2011. Hopefully you are already convinced that vaccination is important for your children (and yourself). The story, however, of how so many people have been swayed to incorrect beliefs about vaccination and autism is a fascinating one and told well in this book.

Montessori, M. *Dr. Montessori’s Own Handbook*. Random House Digital, 1965. Reading the original writing of Montessori—as opposed to the wealth of writing about her—can be interesting, and the information about child development and education is still valuable today.

Pellegrini, A. D. *Recess: Its Role in Education and Development*. Lawrence Erlbaum Associates, 2005. Recess is not wasted time during the school day, according to a wide range of research. This book makes that case very effectively.


Rawson, J., E. Marsh, M. Nathan, and D. Willingham. “What Works, What Doesn’t.” *Scientific American Mind*, 2013, 24(4), 46–53. This article summarizes the thinking of several researchers about how our understanding of human learning can be used to promote better teaching (and homework) practices by students, teachers, and parents. It is available for free online at http://archive-e.blogspot.com/2013/08/psychologists-identify-best-ways-to. html.


Seligman, M. E. *Learned Optimism: How to Change Your Mind and Your Life*. Random House Digital, 2011. Considers the history of research on attributional style and learned helplessness. The author suggests the idea that the opposite may be possible, as well, that is, learned optimism.

———. *The Optimistic Child: A Proven Program to Safeguard Children against Depression and Build Lifelong Resilience*. Mariner Books, 2007. Considers techniques that have been used to promote good attributional style in children and evidence of effectiveness for some methods.

Shaywitz, S. *Overcoming Dyslexia: A New and Complete Science-Based Program for Reading Problems at Any Level*. Random House Digital, 2008. Provides a good summary of recent research on dyslexia, including descriptions and assessments of various techniques for teaching children to overcome it.

Skinner, B. F. *Verbal Behavior*. Appleton-Century-Crofts, 1957. Lecture 6 argues that Skinner’s approach to human learning is flawed, in particular that equipotentiality and complex cognition cannot be explained using Skinner’s principles of operant conditioning. That said, Skinner was a fascinating thinker. This book unpacks a theory of how language might be explained based on reinforcement histories alone. Does the theory work? You be the judge.


Vishton, P. M. *What Babies Can Do: An Activity-Based Guide to Infant Development* (DVD). Power Babies and TNT Media, Inc., 2009. This DVD describes how to conduct in-home adaptations of classic developmental studies of infants. By repeating the tasks over the course of the first few years, a child’s development can be seen. Available at Amazon.com.

———. *Scientific Secrets for a Powerful Memory* (DVD). The Great Courses, 2012. This short course contains simple lessons that you can use to improve your own memory performance, as well as that of your children. The techniques are simple but powerful.


Zero to Three: National Center for Infants, Toddlers, and Families. http://www.zerotothree.org/. This nonprofit organization provides a wealth of information about infant research and parenting, most of it for free.