SELECT ARTICLES
FOR HANDOUTS
CREATIVITY AND PLAY

A workshop presented by Ranjana Bhatnagar

Contents

Curiosity, Pleasure and Play:

A Neurodevelopmental Perspective

Bruce D. Perry, M.D., Ph.D.

Lea Hogan, M.Ed.

Sarah J. Marlin

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www.ChildTrauma.org

Introduction

The human brain is an amazing organ. It mediates all of our thoughts, feelings and behaviors. It allows us to create, share and hope. It allows us to communicate and connect, to teach and to learn. The brain allows us our humanity.

In order to do all of these wonderful things, our brain must organize its 100 billion individual nerve cells (neurons) into efficient systems to sense, process, perceive, store and act on the continuous bath of sensations sights, sounds, tastes, smells and touch - in the environment. Furthermore, our brains do not just automatically pop into existence, capable of all these wonderful functions. The brain begins to develop in utero from just a few cells. And in within a few short years has grown to be 85% adult-size. The brain *grows* to become a dynamic ever-changing biological systems which gives us the capacity to love, create, communicate or think. Our brain becomes a product of our genetic potential and our history of experience.

Experiences - repetitive, consistent, predictable and nurturing experiences - are required to express the underlying genetic potential of each child. And it is becoming increasingly clear that it is the experiences of early childhood that play a key role in determining the foundational organization and capabilities of the brain (Schore, 1997; Perry, 1994).

The experiences, environments and opportunities we provide our children help determine their strengths and vulnerabilities. If the child's world is chaotic, violent and emotionally or cognitively impoverished, their potential will remain unexpressed. If the child's world is safe, nurturing and rich in social, emotional and cognitive opportunities, he or she will flourish. And central to a child's healthy development is the opportunity to act on their natural curiosity – to explore, to play and, thereby, to learn.

Play, more than any other activity, fuels healthy development of children – and, the continued healthy development of adults. This is a bold statement. To judge this statement, we must consider what play is and how the human brain develops and changes.

What is Play and Why is it Important?

Play takes many forms but the heart of all play is pleasure. If it isn't fun, it isn't play. We play from birth on – we play using our bodies (e.g., building with blocks) and our minds (e.g., fantasy play). We use words to play (e.g., jokes, wit, humor) and we use props (e.g., blocks, toys, games). While the exact nature of play evolves, becoming more complex as we grow, play at all ages brings pleasure. And with pleasure comes the powerful drive to repeat the pleasurable activity. And with repetition, comes mastery. Mastery brings a sense of accomplishment and confidence. The more comfortable a child feels with the world, the more likely she will explore, discover, master and learn. This cycle starts with curiosity.

Curiosity, a neurobiological feature of many primates, drives exploratory play. Play can satisfy curiosity as the child explores their environment, thereby, expanding their catalogue of experience. When the child explores, she discovers. A wonderful cycle of learning is driven by the pleasure in play. A child is curious; she explores and discovers. The discovery brings pleasure; the pleasure leads to repetition and practice. Practice brings mastery; mastery brings the pleasure and confidence to once again act on curiosity. All learning – emotional, social, motor and cognitive – is accelerated and facilitated by repetition fueled by the pleasure of play.

Simple principles of neurodevelopment match the observations related to play that have been made by academics, clinicians and parents over the years. Neurodevelopment, while very complex, has a number of core concepts and principles that can illustrate the central, crucial role of play in healthy development.

Neurodevelopment Principle One: Sequential Development. The brain, at birth, is undeveloped. During its development it organizes and grows in a sequential fashion, starting from the lowest, most regulatory regions of the brain and proceeding up through the more complex parts of the brain responsible for more complex functions. Healthy development of one region/capability is dependent upon the healthy development of lower brain regions that take place earlier in the process (see Figure 1).

Play during development, therefore, parallels this sequential neurodevelopmental process. In early childhood, when the brain is developing motor-vestibular capabilities, for example, there is much more large motor play than in adolescence. Play opportunities for the child must be provided in an appropriate sequence and matched to the child's level of neurodevelopment. In turn, this matching process is dependent upon adequate assessment of the child's development in the key areas of physical/motor, behavioral, emotional, social and cognitive domains.

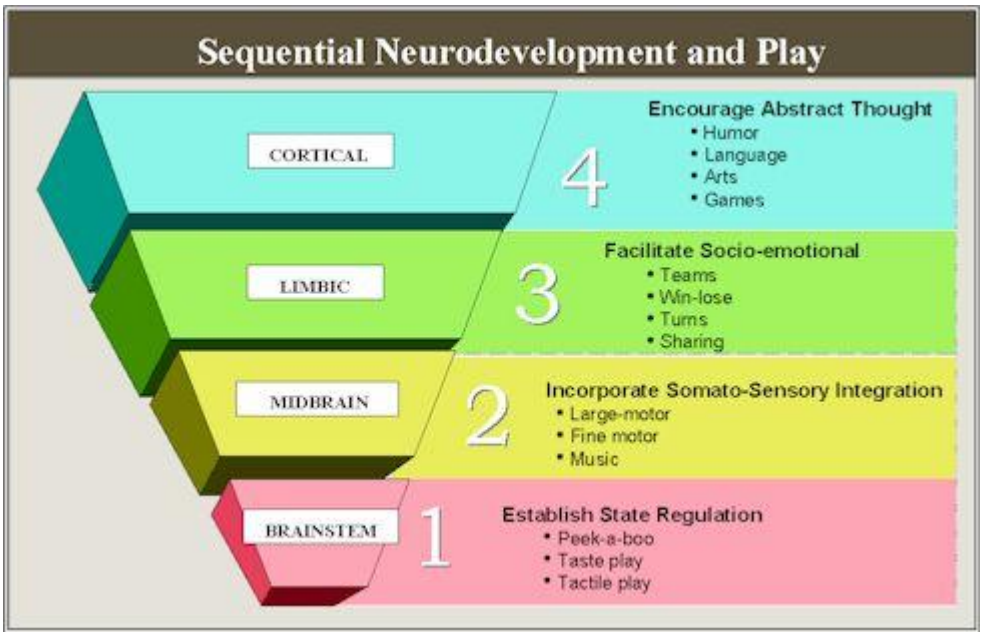

Figure 1: *The Hierarchical Structure of the Human Brain*: The human brain is organized and develops in a hierarchical fashion. The lowest and most simple areas develop first, followed in sequence by more complex areas that mediate more complex functions. Play activities of children mirror this process and facilitate healthy development of the brain. Babies play at the nipple, toddlers practice motor skills, and fantasy play encourages socio-emotional and cognitive development. As children grow, the complexity of play grows. Solitary, parallel, dyadic and then group play develops in sequence with the developing social capabilities of the child. At each stage of development, it is play and the repetitive elements of play that help organize neural systems which will ultimately mediate more complex motor, social, emotional and cognitive skills.

Neurodevelopment Principle Two: Use-dependent Development. The normal organization of any brain area or capability is 'use'-dependent. Neurodevelopment is dependent upon the presence, pattern, frequency and timing experiences during development. The more patterned activity (e.g., music, reading, conversation), the more the brain regions responsible for these tasks will organize and be functionally 'healthy'. The implications of this are profound. Patterned repetitive activity results in patterned neural activity that changes the brain. These experiences help build in the neural capacity to better perform those functions (i.e., hearing language helps develop speech and language capabilities; practicing piano develops fine motor and rhythm-reading capabilities and reading increases capacity for verbal comprehension and abstract reasoning). Children exposed to consistent, predictable, nurturing and enriched experiences will develop neurobiological capabilities that will increase the child's chance for health, happiness, productivity and creativity. Conversely this means that the child with neglect, chaotic, and terrorizing environments will have significant problems in all domains of functioning (see Perry 1995; 1997).

Play has a crucial role in providing the repetitive experiences that can improve and express the potentials in all areas of the human brain. Depending upon the nature of the play, growth and change in all parts of the brain can be facilitated. The more opportunities for enriched and complex play, the more repetition will take place. As we think about the importance of play we can never underestimate the need for consistent, predictable, patterned and frequent opportunities for play in a child's life. This means that the major providers of the experiences in the child's life - caregivers, teachers, and parents - must appreciate the role of play and pleasure in overall learning.

Conceptual Principle Three: Windows of Opportunity. Much of this sequential and use dependent development of the brain takes place in early childhood. This means that of all the experiences throughout the life of an individual, the organizing experiences of early childhood have the most powerful and enduring effects on brain organization and functioning! Society does not capitalize on this window of opportunity in early childhood. Indeed, we typically wait until a child is so impaired and dysfunctional, acting out and failing in school, before we initiate services. Those few resources that are dedicated to early childhood tend to be inefficient and unfocused.

With play, we have an inexpensive and efficient means to help children develop. Proactive is better than reactive. Simple music and movement activities provided early in life for high-risk children, for example, appears to have powerful and positive impact on young children. We must teach young mothers and caregivers how important it is to play with their young children. The best toy for a young child is the invested, caring adult - someone to pay attention, to engage and to play with the child using words, song, touch and smile.

Play and Exploration

Play and exploration are crucial activities for young children. They help the child's brain develop in optimal ways. Child sensitive spaces, semi-structured activities and opportunities for exploration are safe, nurturing and enriched in developmentally appropriate stimulation should be the core elements of all child-focused programs. Play and exploration grow the brain - healthy play and exploration grows healthy brains.

How does play help your child grow?

Through play, a child's sense of who she is can become more defined and integrated. As she learns about herself and the world, she acquires a wide range of important developmental, social, and cognitive skills, as well as positive inner traits, that help form the basis for happiness, productivity and a healthy future. Play-related skill building tracks with neurodevelopment. As described above, the brain organizes from the bottom to the top

Gross motor skills, such as walking, kicking, or skipping, can be enhanced when a toddler pushes a toy grocery cart or an older child jumps rope. When a young child kicks a ball across the room, she is practicing coordination by balancing on one foot to kick with the other. She is additionally developing larger muscle control, tone and flexibility, qualities that may help her score the winning goal when she is old enough to play soccer.

Children can develop advanced fine motor and manipulation skills while playing as they use their fingers to build and color a sign for a backyard tree house. When throwing and catching a ball, they are practicing hand-eye

coordination and their ability to grasp. They are even developing the muscle control and coordination needed to one day write a letter to a friend, as they scribble with a pencil on paper.

Children have opportunities to enhance their language skills through play by talking and singing with other children. A child's interactions with and repetition of his playmates help him master the semantics of language as he participates in spontaneous rhyming and word play. While having fun, he increases his play-related speech, his sentence length, and his vocabulary.

The child's cognitive, or mental, abilities can also be enhanced by play. A child's play often involves physical and mental trial and error, problem-solving tasks, and an ability to discriminate between relevant and irrelevant information. Play requires the child to make choices and direct activities and often involves strategizing, or planning, to reach a goal. Through pleasurable play, children often become motivated and perseverant, qualities that frequently may later translate into the classroom.

While enjoying their play, children can acquire a wide range of interpersonal/social skills, ranging from communication to cooperation. When children argue about who stepped "out of bounds" and agree upon a "do over," they are learning how to negotiate, compromise and work together. They are learning about teamwork when they huddle together and decide how they will position themselves for the next shot. The child gains an understanding about those around him and may become more empathetic and less egocentric. When playing with peers, children are developing a learning system of social rules, including ways to control themselves and tolerate their frustrations in a social setting.

Play Develops Skills

Creativity

Teamwork/cooperation

Communication/negotiation/compromise

Developmental skills

Goal setting

Following rules/directions

Self-reliance

Empathy

Social interaction

Problem solving

Self-expression

Self-confidence

Creating a healthy environment to optimize play and learning

A child will play when she feels safe. And to a child, feeling safe has little to do with outlet plugs and childproof cabinets. A child's sense of safety stems from a calm and ***predictable*** world – one in which she knows what will

happen next. This means her life is fairly consistent from one day to the next – and the adults in her world are predictable, consistent and, ideally, attentive, attuned and attached. She knows her caregiver is there for her to feed her, protect her and comfort her. You can make a child's world more predictable by keeping her on a daily schedule. For example, she wakes, eats meals and bathes roughly at the same time every day. Significant changes to her daily routine (for example, frequent home moves) are kept to a minimum. Predictability will help eliminate the element of surprise. In an unpredictable world with no routine, children may be anxious. Anxiety kills curiosity. A child that feels safe and is in familiar space will be curious and will seek novelty. A child that is anxious or in an unfamiliar setting will be unwilling to try new things.

A child's environment should also be rich in sights, sounds, smells, tastes and touch. Environments rich in sensory experiences stimulate the child's brain and give him/her new information about the world. For a child, a sensory-rich experience could be as simple as the smell of blueberry muffins baking in the kitchen or the touch of a velvet pillow to the face. It is important for caregivers to recognize the importance of sensory experiences to a child. Caregivers should also recognize that too much stimulation could overwhelm a child. For example, one toy with bells and whistles might be interesting to a child, but many noise-making toys might over stimulate him/her. Caregivers should note that television is not considered a sensory-enriched experience for a child.

In today's world we often underestimate the importance of play. We over schedule our children with educational or structured activities that often inhibit spontaneous, curiosity-driven exploration. In the end, if we want to help our children meet their potential, we must allow children to have free time, spontaneous play and safe and enriched play and learning environments.

For more information on this and related topics:

Visit http://www.ChildTrauma.org or http://Scholastic.com/bruceperrry

Videos

Dr. Perry has created two video series now available in VHS and DVD. **Series 1** - "Understanding Traumatized and Maltreated Children" and **Series 2** "The Six Core Strengths for Healthy Childhood Development." We also offer **Educator's Packages** for each video series that include a wealth of training material to be used in conjunction with the videos to train professionals or students. For more information, please visit www.ChildTrauma.org.

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About the Authors

Bruce D. Perry, M.D., Ph.D. is the Senior Fellow for The ChildTrauma Academy, a not-for-profit organization working to improve the lives of maltreated children. From 1992 to 2001, Dr. Perry served as the Thomas S. Trammell Research Professor of Child Psychiatry at Baylor College of Medicine and Chief of Psychiatry at Texas Children's Hospital in Houston, Texas. He has also served as the Medical Director for Provincial Programs in Children's Mental Health for the Alberta Mental Health Board.

Lea Hogan, M.Ed. served as a clinician at the ChildTrauma Academy where she was the project director of the Early Childhood and Neurodevelopment Curriculum Project. Ms. Hogan has extensive clinical experience working with maltreated children and has been active in the ChildTrauma Music and Movement projects.

Sarah J. Marlin graduated magna cum laude from Columbia University, New York, NY with a Bachelor of Arts in Biology. At the time of this piece, Ms. Marlin was a medical student at Baylor College of Medicine, Houston, TX.

The Importance of Pleasure in Play

By Bruce Duncan Perry, M.D., Ph.D.

Play takes many forms, but the heart of play is pleasure — an important component in learning.

Some people think of play as the opposite of work. They think of it with goofing off, being lazy, lack of achievement, or, at best, recreation. "Stop playing and get to work!" Yet, as many of you probably know, it is through play that we do much of our learning. We learn best when we are having fun. Play, more than any other activity, fuels healthy development of children — and the continued healthy development of adults.

Play takes many forms, but the heart of all play is pleasure. If it isn't fun, it isn't play. We play from birth on — we play using our bodies (building with blocks) and our minds (fantasy play). We use words to play (jokes, wit, humor) and we use props (blocks, toys, games). While the exact nature of play evolves, becoming more complex as we grow, play at all ages brings pleasure.

What Young Children Know

Play enhances every domain of a child's development. Gross-motor skills, such as walking, kicking, or skipping, can be strengthened when a toddler pushes a toy grocery cart or an older child jumps rope. When a young child kicks a ball across the room, she is practicing coordination by balancing on one foot to kick with the other.

Fine-motor and manipulation skills are developed while a child builds and colors a sign for a backyard tree house. When throwing and catching a ball, a child practices hand-eye coordination and the ability to grasp.

Children practice and develop language skills during play. A child's play with words, including singsong games and rhymes that accompany games of tag, can help him master semantics, practice spontaneous rhyming, and foster word play.

The child's cognitive capacity is enhanced in games by trial and error, problem solving, and practice discriminating between relevant and irrelevant information. Play requires the child to make choices and direct activities and often involves strategy, or planning, to reach a goal.

Interpersonal/social skills, ranging from communication to cooperation, develop in play. Children learn about teamwork when they huddle together and decide who plays each position in a pick-up soccer game. The child gains an understanding about those around him and may become more empathic and less egocentric. When playing with peers, children learn a system of social rules, including ways to control themselves and tolerate their frustrations in a social setting.

The Value of Boredom

Ironically, it is a lack of external stimulation and solitude that facilitates creative play. Often, a child will initially perceive this as "boredom." The child seeks structure and organization from parents or teachers — "I'm bored. I have nothing to do." And all too often we jump in too soon and make the mistake of creating the child's activities for him. We need to learn to let children become bored, because it is through this transient period of under-stimulation that their internal world can come alive. This process is facilitated by solitude — the opportunity to be alone and without too many external stimuli.

When a child cannot watch television, play video games, and is not participating in a scheduled "externally focused" activity, she will become more internally focused. Her imagination and creativity takes over. She will find and create "toys" from what is available — sticks become dolls, dolls become royalty, and these members of

"royalty" become actors in the child's play — rocks become blocks, blocks become walls, and walls create castles.

Playtime Inhibitors

The primary inhibitor of play for American children is television. Watching television is a passive, noncreative time. On average, our children watch 28 hours of television each week — all stealing time from social interactions, abstract thinking, creativity, and play. The use of this passive medium in the classroom should be very limited. An hour of "educational" television does not have the same power as an hour of creative play.

The second major inhibitors of play are adults. Our children are overtired and overscheduled. We wake them before the sun rises and often keep them scheduled in school, after-school programs and lessons, and sports well into the night. They have little time to themselves, and too few opportunities for nonstructured play.

Providing Solitude

One of the most important forms of play is playing with ideas. Abstract thinking is play. When a child fantasizes, he is playing. By taking images, ideas, and concepts from inside their own minds and re-organizing, sorting, and re-connecting in new ways, children create. They create play worlds, hopes, desires, and wishes. They imagine being a ball player, a dancer, a superhero, a teacher. In order to facilitate this, children need more moments of quiet. Children need more solitude. Children need less external, electronic, and structured adult-world stimulation.

Teacher Tips

- Bring more play into the classroom. You do it already, but keep being creative. Word games, number games, role-playing, singing, and dozens of other methods allow you to mix the emotional, social, or cognitive challenge with fun. The more you encourage creativity and tap into the child's sense of fun, the easier it will be to introduce even greater challenges. Sometimes we use recess or free time as currency in a reward system — "Your table will have no recess if all of these blocks are not cleaned up in five minutes." This punishment reflects a fundamental misunderstanding of the value of play in a child's development. We would never withhold a lesson in reading because a child had not managed to finish another assignment.

- Help educate parents about the power of fun. If you sense that parents are pushing their children too much and too early, pass this information along. Tell them about how important solitude and play are to creativity. Help a parent understand that if she provides a safe, nurturing, and enriched environment, her child will do just fine. The playful, creative child who comes to love learning is more likely to achieve and succeed than the anxious, pressured 5-year-old child who knows that "grades are important."

- Don't be afraid of unstructured time. Young children learning social skills need to learn to negotiate, compromise, persuade, and cooperate. When allowed to play, children will do all of these things with each other. When two 5-year-olds argue about how to divide an uneven number of blocks while building a "city," they are learning how to negotiate, compromise, and work together. If the teacher steps in and referees each conflict, they will not practice those skills.

This article originally appeared in Early Childhood Today magazine.

Curiosity: The Fuel of Development

Dr. Bruce Perry

By Bruce Duncan Perry, M.D., Ph.D.

"Whas'at? Whas'at?"
—A question from a 3-year-old boy asked of his mother over and over as they walked through the zoo.

Children are such curious creatures. They explore, question, and wonder, and by doing so, learn. From the moment of birth, likely even before, humans are drawn to new things. When we are curious about something new, we want to explore it. And while exploring we discover. By turning the light switch on and off over and over again, the toddler is learning about cause and effect. By pouring water into a dozen different-shaped containers and on the floor and over clothes, the 4-year-old is learning pre-concepts of mass and volume. A child discovers the sweetness of chocolate, the bitterness of lemon, the heat of the radiator, and the cold of ice.

The Cycle of Learning

If a child stays curious, he will continue to explore and discover. The 5-year-old finds tadpoles in a tiny pool of mud on the playground. This discovery gives him pleasure. When he experiences the joy of discovery, he will want to repeat his exploration of the pond. [Pleasure leads to repetition.] Each day, he and his classmates return. The tadpoles grow legs. [Repetition leads to mastery.] The children learn that tadpoles become frogs — a concrete example of a complex biological process. Mastery — in this case, understanding that tadpoles become frogs — leads to confidence. Confidence increases a willingness to act on curiosity — to explore, discover, and learn. "Can we bring tadpoles into the class? How do other baby animals grow up? Why don't dog babies lose their tails?" This positive cycle of learning is fueled by curiosity and the pleasure that comes from discovery and mastery.

Shared Discovery

What is most pleasurable about discovery and mastery is sharing it with someone else. ("Teacher, come look! Tadpoles!") We are social creatures. The most positive reinforcement — the greatest reward and the greatest pleasure — comes from the adoring and admiring gaze, comments and support from someone we love and respect. The teacher smiles, claps, and comments, " You are great. Look at all these tadpoles! You are our science expert!" This rewarding approval causes a surge of pleasure and pride that can sustain the child through new challenges and frustrations. Approval can generalize and help build confidence and self-esteem. So later in the day, when this boy is struggling with the introduction of simple math concepts, rather than eroding his esteem by thinking, "I'm stupid, I don't understand," he can think, "I don't get this, but I'm the one who knows about tadpoles."

Constrained Curiosity

For too many children, curiosity fades. Curiosity dimmed is a future denied. Our potential — emotional, social, and cognitive — is expressed through the quantity and quality of our experiences. And the less-curious child will make fewer new friends, join fewer social groups, read fewer books, and take fewer hikes. The less-curious child is harder to teach because he is harder to inspire, enthuse, and motivate.

There are three common ways adults constrain or even crush the enthusiastic exploration of the curious child: 1) fear, 2) disapproval and 3) absence.

Fear: Fear kills curiosity. When the child's world is chaotic or when he is afraid, he will not like novelty. He will seek the familiar, staying in his comfort zone, unwilling to leave and explore new things. Children

impacted by war, natural disasters, family distress, or violence all have their curiosity crushed.

Disapproval: "Don't touch. Don't climb. Don't yell. Don't take that apart. Don't get dirty. Don't. Don't. Don't." Children sense and respond to our fears, biases, and attitudes. If we convey a sense of disgust at the mud on their shoes and the slime on their hands, their discovery of tadpoles will be diminished.

Absence: The presence of a caring, invested adult provides two things essential for optimal exploration: 1) a sense of safety from which to set out to discover new things and 2) the capacity to share the discovery and, thereby, get the pleasure and reinforcement from that discovery.

Teacher Tips

- Recognize individual differences in children's styles of curiosity. Some want to explore with only their minds, others in more physical ways — touching, smelling, tasting, and climbing. To some degree these differences are related to temperamental differences in the exploratory drive. Some children are more timid; others are more comfortable with novelty and physical exploration. Yet even the timid child will be very curious; he may require more encouragement and reinforcement to leave safe and familiar situations.
- Try to redefine "failure." In truth, curiosity often leads to more mess than mastery, but it is how we handle the mess that helps encourage further exploration, and thereby, development. Redefine failure. When the 5-year-old is learning to jump rope and he trips a thousand times, this is not a thousand failures — it is determination.
- Use your attention and approval to reinforce the exploring child. When exploration in the classroom is disruptive or inappropriate, contain it by teaching the child when and where to do that kind of exploration: "Tommy, lets play with water outside."

If we let them, children can reintroduce us to the world. When we truly allow a child to share his discoveries with us, we experience the joys of rediscovery — and in doing so, learn ourselves.

Curiosity	results in	**Exploration**
Exploration	results in	**Discovery**
Discovery	results in	**Pleasure**
Pleasure	results in	**Repetition**
Repetition	results in	**Mastery**
Mastery	results in	**New Skills**
New Skills	results in	**Confidence**
Confidence	results in	**Self esteem**
Self esteem	results in	**Sense of Security**
Security	results in	**More Exploration**

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This article originally appeared in Early Childhood Today magazine.

SIDEBAR:

Dr. Bruce D. Perry, M.D., Ph.D., is an internationally recognized authority on brain development and children in crisis. Dr. Perry leads the ChildTrauma Academy, a pioneering center providing service, research and training in the area of child maltreatment (www.ChildTrauma.org). In addition he is the Medical Director for Provincial Programs in Children's Mental Health for Alberta, Canada. Dr. Perry served as consultant on many high-profile incidents involving traumatized children, including the Columbine High School shootings in Littleton, Colorado; the Oklahoma City Bombing; and the Branch Davidian siege. His clinical research and practice focuses on traumatized children-examining the long-term effects of trauma in children, adolescents and adults. Dr. Perry's work has been instrumental in describing how traumatic events in childhood change the biology of the brain. The author of more than 200 journal articles, book chapters, and scientific proceedings and is the recipient of a variety of professional awards.

How the Brain Learns Best

Dr. Bruce Perry

Easy ways to gain optimal learning in the classroom by activating different parts of the brain

By Bruce D. Perry, M.D., Ph.D.

Over the last 40 years we have learned more about the human brain than in the previous 400 years. Educators and neuroscientists have been trying to put this knowledge to work by transforming the information of basic and clinical neurosciences into practical insights for the classroom. In a series of special features, we will be looking at how the brain works and what this can tell us about your teaching.

First, however, it is important to remember that all learning is brain-based. Through the process of education, we are trying literally to change the brain — not the pancreas, spleen, or lungs. Indeed, education is practical neuroscience. That does not mean that every teacher needs to become a neuroscientist or memorize 100 neurotransmitters and 50 brain areas responsible for cognition. But it does mean that teachers can become more effective with some knowledge of how the brain senses, processes, stores, and retrieves information.

Neural System Fatigue

Learning requires attention. And attention is mediated by specific parts of the brain. Yet, neural systems fatigue quickly, actually within minutes. With three to five minutes of sustained activity, neurons become "less responsive"; they need a rest (not unlike your muscles when you lift weights). They can recover within minutes too, but when they are stimulated in a sustained way, they just are not as efficient. Think about the piano and the organ; if you put your finger on the organ key and hold it down it will keep making noise, but the piano key makes one short note, and keeping your finger there produces no more sound. Neurons are like pianos, not organs. They respond to patterned and repetitive, rather than to sustained, continuous stimulation. Why is this important for a teacher?

When a child listens as you say, "George Washington was 6'4" tall," she uses one neural system (call it A). When she is told about a concept related to that fact ("The average height of men during the Revolutionary War was only 5'4"," a slightly different, but functionally interconnected neural set (B) is used. When she listens to a vignette: "Washington, at the darkest moment in the Revolution, when his soldiers were deep in the despair of defeat, starving and freezing at Valley Forge, slowly rose to his full height and, using his dominant personality (in part conveyed by his physical dominance) and was able to motivate his discouraged soldiers to re-enlist and continue fighting," yet other related neural systems are active (C and D). These interrelated neural systems are all important in learning; indeed, our students will learn more completely if they make "changes" (create memory) in all of these neural systems (A, B, C, and D). Facts are empty without being linked to context and concepts.

When a child is in a familiar and safe situation, as in most of our classrooms, his or her brain will seek novelty. So, if this child hears only factual information, she will fatigue within minutes. Only four to eight minutes of pure factual lecture can be tolerated before the brain seeks other stimuli, either internal (e.g., daydreaming) or external (Who is that walking down the hall?). If the teacher is not providing that novelty, the brain will go elsewhere. Continuous presentation of facts or concepts in isolation or in a nonstop series of anecdotes will all have the same fatiguing effect — and the child will not learn as much, nor will she come to anticipate and enjoy learning.

The best presentation, the most engaging and effective teaching, has all three elements. And it is very important how the teacher puts these elements together.

The Bob-and-Weave Lecture

The most effective presentation must move back and forth through these interrelated neural systems, weaving them together. These areas are interconnected under usual circumstances, like a complete "workout" in the gym where we rotate from one station to another. Similarly, in teaching, it is most effective to work one neural area and then move on to

another. Engage your students with a story to provide the context. Make sure this vignette can touch the emotional parts of their brains. This will activate and prepare the cognitive parts of the brain for storing information. Information is easiest to digest when there is emotional "seasoning" — humor, empathy, sadness, and fear all make "dry" facts easier to swallow. Give a fact or two; link these facts into related concepts. Move back to the narrative to help them make the connection between this concept and the story. Go back to another fact. Reinforce the concepts. Reconnect with the original story. In and out, bob and weave, among facts, concept, and narrative.

Human beings are storytelling primates. We are curious, and we love to learn. The challenge for each teacher is to find ways to engage the child and take advantage of the novelty-seeking property of the human brain to facilitate learning.

*This article orginally appeared in *Instructor* magazine.

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Twelve Brain Rules

From
brain rules 12 principles for Surviving and Thriving at Work, Home, and School
by John Medina

EXERCISE | Rule #1:	Exercise boosts brain power.
SURVIVAL | Rule #2:	The human brain evolved, too.
WIRING | Rule #3:	Every brain is wired differently.
ATTENTION | Rule #4:	We don't pay attention to boring things.
SHORT-TERM MEMORY | Rule #5:	Repeat to remember.
LONG-TERM MEMORY | Rule #6:	Remember to repeat.
SLEEP | Rule #7:	Sleep well, think well.
STRESS | Rule #8:	Stressed brains don't learn the same way.
SENSORY INTEGRATION | Rule #9:	Stimulate more of the senses.
VISION | Rule #10:	Vision trumps all other senses.
GENDER | Rule #11:	Male and female brains are different.
EXPLORATION | Rule #12:	We are powerful and natural explorers.

Using Technology in the Early Childhood Classroom

By Kimberly Moore Kneas, Ph.D. and Bruce D. Perry, M.D., Ph.D.

Early Childhood Today: *Are young children's brains (ages three through six) well suited to the use of technology? (We define technology as children using cameras, computers, tape recorders and video cameras in classroom projects.) If so, how? Are some forms of technology better than others for these specific age levels?*

Dr. Perry: In order to answer that question we must consider some of the genetic biases of the human brain. For 99 percent of the time we have been on the planet, we lived in small hunter-gatherer groups of about 40 to 50 people. Our brains developed specialized capabilities for social affiliation, communication and various kinds of symbolic representation. Our cultures evolved through social interactions, initially without written language. The development of written language changed the way human beings developed, in large part by influencing brain development and expressed new brain-mediated capabilities that had previously been un-expressed.

I see technology doing the same things today. The brain clearly could not have a "genetics" specific for the use of a joystick. Nor could the brain have a genetics specific for continuous attention to a two-dimensional moving image such as those in the television. Yet external symbolic representation such as the written word, visual images on television, and complex three-dimensional videography are all sensed, processed, stored, and acted on by the human brain. Because the brain literally changes in response to experiences, these "new" (from a historical perspective) experiences (the written word or television) cause changes in brain development, brain organization, and brain function that were never expressed hundreds of generations ago.

Modern technologies are very powerful because they rely on one of the most powerful genetic biases we do have — the preference for visually presented information. The human brain has a tremendous bias for visually presented information. Television, movies, videos, and most computer programs are very visually oriented and therefore attract and maintain the attention of young children.

The problem with this is that many of the modern technologies are very passive. Because of this they do not provide children with the quality and quantity of crucial emotional, social, cognitive, or physical experiences they require when they are young. The developing child requires the right combination of these experiences *at the right times* during development in order to develop optimally. This cannot happen if the child is sitting for hours passively watching television.

Sitting young children in front of a television for hours also prevents that child from having hours of other developmental experiences. Children need real-time social interactions; technology such as television can prevent that from happening.

On the other hand there are many positive qualities to modern technologies. The technologies that benefit young children the greatest are those that are interactive and allow the child to develop their curiosity, problem solving and independent thinking skills.

ECT: *Do you see the use of specific things like computers as part of an early childhood curriculum as being powerful enough to change brain development the same way you've just described television?*

Dr. Perry: Absolutely. I think the difference between computers and television is that television tends to be quite passive. You sit and you are watching and things are happening in front of you but you don't do anything. Children are natural "manipulators" of the world — they learn through controlling the movement and interactions between objects in their world — dolls, blocks, toy cars, their own bodies. With television, they watch and do not control anything. Computers allow interaction. Children can control the pace and activity and make things happen on computers. They can also repeat an activity again and again if they choose.

ECT: *As you look at 3-, 4-, and 5-year-olds being offered opportunities like using cameras and tape recorders and video*

cameras in the classroom, do you think that based on your comments earlier on how children develop with real-time activities, do you think they have the capability of understanding and using those tools well?

Dr. Perry: That's actually a really good question. Preschool children are still having significant cognitive growth. In a very real sense, children think differently than adults. This is so because their brains have not yet completely developed. So to tape a conversation and replay it for an adult means something entirely different than when a three-year-old hears their voice on a tape. These experiences can be very positive and mind-expanding for a child — as long as they are done at the right time.

Children need real-life experiences with real people to truly benefit from available technologies. Technologies should be used to enhance curriculum and experiences for children. Children have to have an integrated and well-balanced set of experiences to help them grow into capable adults that can handle social-emotional interactions as well as develop their intellectual abilities.

I think that balance and timing are the keys to healthy development. Provide the right kinds of experiences at the right time. For example, if you take a newborn and do not hold that infant and put her in a seventh grade classroom and leave her for the afternoon, it's not a good experience. It can actually be abusive. But, if you take the 14-year-old child and rather than having them spend the afternoon in school, you hold and rock them all afternoon, that is not the right experience at the right time for that child. When a six-month-old child is strapped into a chair in front of a videotape designed to teach them a different language, that is a different experience than an eight-year-old child listening to the same tape. The infant's experience would be totally inappropriate, but the eight-year-old's may be great. What's important is when experience is provided and how it's mixed in with other crucial experiences.

ECT: *Your comments begin to address an issue that's important today. As we move into the 21st century with pressure to gain experiences in technology, specifically computers, would you address how parents and early childhood educators could specifically work together to create this balance for young children?*

Dr. Perry: While technology can help us teach children, in the end our children learn from us. Parents and teachers must act as facilitators in children's learning. For example, sitting down together and using playing cards is a very cognitive experience. They can learn how to add, they can learn how to predict, they can laugh, and they can learn how to win. In their interaction with a parent they're using this externalized object which is a playing card and a game. A very similar thing can happen with emerging technologies. I believe parents and teachers can take advantage of the interactive qualities of a computer to enhance the experiences available to children.

As parents think about the future they need to realize two things: technology is not going to go away and we are in the midst of a major sociocultural quantum shift. These technologies are revolutionizing the world our children will live in. So our task is to balance appropriate skill-development with technologies with the core principles and experiences necessary to raise healthy children.

We must keep the core principles of healthy development in mind as we incorporate these technology and tools. If we do that we'll be fine. And at the heart of any healthy child is the opportunity for enriching and nurturing interactions with other human beings. I think the key to making technologies healthy is to make sure that we use them to enhance or even expand our social interactions and our view of the world as opposed to using them to isolate and create an artificial world.

Unfortunately, technology is often used to replace social situations and I would rather see it used to enhance human interactions. And I think that can happen.

ECT: *Earlier you began to discuss some of the pitfalls that you see with respect to using technology with children. Do you have any other thoughts or anything you would specifically like to cover there?*

Dr. Perry: One of the obvious issues that all parents and even the people that develop multimedia material struggle with is controlling access to content that may not be developmentally appropriate. There are going to be computer programs and sites on the Internet and television shows that have content that may be appropriate for an 18-year-old, but very inappropriate for a preschool child. It means that in an environment where there is not parental control or the possibility for supervision, a child may have access to content that has extreme violence or presents inappropriate or destructive concepts such as racism,

misogyny, or age-inappropriate sexuality. In the end, as with all other tools, adults must protect children from misuse or inappropriate access.

As we begin to create more child-sensitive television, for example, we will have to recognize that young children will understand in different ways from adults. For example, a 4-year-old child seeing the Oklahoma bombing — or a plane crash coverage on the news multiple times may think that buildings are blowing up all over the place and many planes crashed — rather than understanding that these multiple stories are actually from single events. And so access to information that is developmentally appropriate is something that we need to be very concerned about.

ECT: *Would you address how you see specific opportunities for the use of technology to support children, say with special needs, are at-risk or who need assistance with language development?*

Dr. Perry: Yes, in fact we have seen the use of technology here work very well to help children. The use of specialized computer programs has really helped a lot of kids that we work with. Even on the simplest level, if a child has some sort of fine motor or large motor problem so that their handwriting is very immature and very slow and looks sloppy, their esteem about their work product or their homework is very low. So they may be very reluctant to work hard because they always get negative feedback. They hand in papers that are all messy. You put them on a word processor and they can hand in papers that are clean and neat and they can see how to spell words correctly. Just very simple, non-specialized, software can be very helpful if used in the right way.

In addition, there are a number of specialized programs that allow children with certain information-processing problems to get a multimedia presentation of content so that they can better understand and process the material. They are able to see the written words and see a visual image and hear the sounds — all at the same time. Combining these sensory-modalities helps a child to more efficiently internalize information about a topic. If they have, for example, an auditory processing difficulty or a reading disorder they may be very bright but they don't read very efficiently so if something is read to them on a CD-ROM with visual images they are better able to internalize the information. This helps these children feel better about themselves because they perform better. They're not as afraid of school anymore.

There are emerging technologies used in traditional video games (e.g., Sega, Nintendo) that our group is trying to get dedicated to alternative interactive games with more stimulating but non-violent themes. We are hoping to use a variety of game-like models to teach kids language, to teach children about self-esteem, to teach children about the impact of trauma and how it can be overcome, for example. I think that when these technologies are actually used for more than entertainment we're going to see tremendous positive benefits.

Even now there are a number of good software programs with a primary educational focus on mathematics or reading. These programs, which are very engaging, challenge children to read better and learn how to solve math problems. When information is presented in a fun and engaging way, it is a lot easier than looking at a single page that has a bunch of columns of numbers you're supposed to add up.