



Resiliency, Inc. News

August 2008

www.resiliencyinc.com

Issue Focus: The Male and Female Brain

The Male and Female Brain

By Horacio Sanchez

In This Issue

- The Male and Female Brain
- Sex, Math and Scientific Achievement
- Sex Facts
- New Exciting Training & Consultation Services
- Resiliency Reminders

Up-coming Events

Resiliency, Inc. CEO will be speaking at:

*Intermediate Unit 1 Opening Day
August 15, 2008
Coal Center, PA*

*Plymouth-Canton Community Schools
Opening Day
August 26, 2008
Plymouth-Canton, MI*

*Melvindale Northern Allen Park Public Schools Opening Day
August 27, 2008
Melvindale, MI*

*Delaware County Intermediate Opening Day
August 28, 2008
Morton, PA*

*NAACP Springfield Chapter Youth Conference
October 2, 2008
Springfield, MO*

*Healthy Brain Conference
October 22-24, 2008
Valley River Inn
Eugene, Oregon*

This is a timely topic since so many education experts are promoting the idea of separating boys and girls to better design instruction to be more compatible with their distinct brain functions. It is important to first know what the distinctions between the male and female brain are and then what conclusions can be drawn from them.

Until eight weeks of life every brain is female. A hormonal surge of either estrogen or testosterone makes the female and male brain respectively. The surge of estrogen allows the brain to develop symmetrically. This is significant because language development requires the entire brain to act in concert. In addition, girls have a larger corpus callosum which allows more efficient communication between the left and right brain. Not only is the female brain more efficient going from left to right brain but it is also blessed with specific glutamate receptors which allows for faster communication between neurons. These glutamate receptors are found within the region of the brain responsible for learning, enhancing focus, memory, and the ability to notice details (Mermelstein 2005). This gives girls some distinct advantages in traditional classrooms that dispense information verbally and demand recall.

In addition, estrogen impacts social behaviors. Females are better able to read nonverbal cues because they are wired to make better eye contact, gaze at faces, and interpret what the other person is feeling. Girls also have significant larger orbitofrontal-to-amygdala ration. The amygdala governs emotions. By having the thinking part of the brain more connected to the emotional center of the brain, girls are better able to process through their emotions without becoming impulsive. This is why females can seem more indecisive, but in reality they are processing problems from all sides. Girls advanced communication skills are even reinforced chemically through a hormone called oxytocin. Oxytocin is the social bonding hormone that enables the building of trust and helps regulate stress. Girls get oxytocin released during conversations with close friends. That is why they can talk on the phone for hours; they are getting a chemical payoff. All of this makes girls more socially advanced earlier, able to demonstrate empathy, and more prone to talking out problems.

On the other hand testosterone causes shrinkage of cells involved in communication, observation, and the control of emotions. Testosterone causes asymmetrical brain development, resulting in more activity in the left hemisphere. The male brain structure is better able to do spatial reasoning which aligns with math and science skills. Boys have the ability to focus long-term on a single problem or challenge. Learning is best processed through integrating information during action.

Testosterone like estrogen also impacts social behavior. It can lower the ability to read nonverbal cues, feel empathy, and communicate. Several studies have shown that the higher the testosterone levels in utero between 12 to 18 weeks, the lower the ability to focus on nonverbal cues, bond, and socially interact

Agency Information:

Resiliency Inc. provides a revolutionary paradigm that trains individuals on how to successfully educate and treat the most difficult to serve children and their families.



Contact Us

919-544-0616

www.resiliencyinc.com

Over the first three months of life, a baby girl's skills in eye contact and mutual facial gazing will increase by over 400 percent, whereas facial gazing skills in a boy during this time will not increase at all.

- Louann Brizendine, M.D.

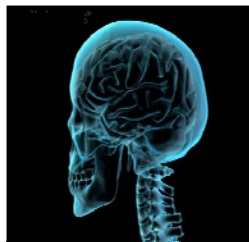
appropriately. A common test conducted found that children with the highest testosterone levels at 12 to 18 weeks tended to focus on objects rather than the face of their caretaker. In addition, these same children showed poor social skills at age four. Boys also have larger amygdalae accounting for increased aggression and sex drive. While girls have a higher level of involvement of the cerebral cortex during times of emotions, boys do not. This means that their responses will be more active rather than verbal.

What conclusions should education draw from what we now know about the male and female brain? The first is that education should seek to be more interactive. It has been proven that both sexes learn faster through multi-sensory instruction. Girls are better able to develop spatial reasoning and boys language skills with faster recall.

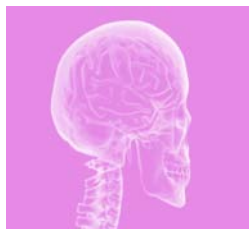
School discipline should also focus on the demonstration of what you want students to do rather than verbal directives. Girls are very capable of learning through observation and boys require it. In addition, during times of arousal, the female voice causes a higher level of chemical activity in the human brain than the male voice. This means that talking through some incidents might trigger more impulsive behaviors by students who are more at-risk. By adopting a discipline model that demonstrates desired behaviors, some incidents will be avoided and desired practices will be internalized quicker.

The current movement to separate males and female education is being promoted primarily by educational institutions offering separate education programs. These institutions have a vested interest in manipulating the new research to support separate male and female education. Also, it is important to note that some males have female structured brains, and some females have male structured brains. This means that making distinctions based on the gender of the student does not guarantee compatibility with an instructional model. The human brain learns new information by relating it to what it already knows and has been exposed to. The hope of better male and female social relationships requires early and constant exposure to one another. Many of the academic and behavioral distinctions between the male and female brain can be addressed through good instruction and sound discipline. Separation and exclusion models have and will always prove problematic at the point of reintegration.

Brain Fact



Girls mature more quickly in areas of the brain involving language and fine motor skills. While girls are six years ahead of boys in those areas, boys are four years ahead of girls in areas of the brain that involve targeting and spatial memory.



Two-year-old boys are much more likely to be able to build a bridge from blocks. However, three-year-old girls can understand facial expressions better than five-year-old boys.

Harriet Hanlon Professor Virginia Tech

Brain Nugget

When it comes to dealing with people, males rely on authority and discipline, functions of the left brain. Females integrate emotional appeal, a right brain function into their communication. No wonder, females are able to get along with people better, when compared to males.

Sex, Math and Scientific Achievement

By Halpern, Benbow, Geary, Gur, Hyde, and Grensbacher

For years, blue-ribbon panels of experts have sounded the alarm about a looming shortage of scientists, mathematicians and engineers in the U.S.—making dire predictions of damage to the national economy, threats to security and loss of status in the world. There also seemed to be an attractive solution: coax more women to these traditionally male fields. But there was not much public discussion about the reasons more women are not pursuing careers in these fields until 2005, when then Harvard University president Lawrence Summers offered his personal observations.

He suggested to an audience at a small economics conference near Boston that one of the major reasons women are less likely than men to achieve at the highest levels of scientific work is because fewer females have “innate ability” in these fields. In the wake of reactions to Summers’s provocative statement, a national debate erupted over whether intrinsic differences between the sexes were responsible for the underrepresentation of women in mathematical and scientific disciplines.

As a group of experts with diverse backgrounds in the area of sex differences, we welcome these ongoing discussions because they are drawing the public’s attention to this important issue. In this article, we present an analysis of the large body of research literature pertaining to the question of female participation in these fields, information that is central to understanding sex differences and any proposal designed to attract more women to the science and mathematics workforces. Contrary to the implications drawn from Summers’s remarks, there is no single or simple answer for why there are substantially fewer women than men in some areas of science and math. Instead a wide variety of factors that influence career choices can be identified, including cognitive sex differences, education, biological influences, stereotyping, discrimination and societal sex roles.

It does not take a Ph.D. to see how making fuller use of female talent would go a long way toward increasing the number of scientific workers. In the U.S., for example, women made up 46 percent of the workforce in 2003 but represented only 27 percent of those employed in science and engineering. One reason Summers’s comment upset many people was its implication that any attempt to close this gap was futile.

If most women are naturally deficient in scientific ability, then what could be done? But this seemingly simple interpretation contains two misconceptions.

First, there is no single intellectual capacity that can be called “scientific ability.” (For simplicity, we will often use the term “scientific” to refer to skills important to work in the fields of science, technology, engineering and mathematics.) The tools needed for scientific achievement include verbal abilities such as those required to write complex journal articles and communicate well with colleagues; memory skills such as the ability to understand and recall events and complex information; and quantitative abilities in mathematical modeling, statistics, and visualization of objects, data and concepts.

Second, if women and men did demonstrate differences in these talents, this fact would not mean these differences were immutable. Indeed, if training and experience did not make a difference in the development of our academic skills, universities such as Harvard would be accepting tuition from students under false

Brain Nugget

By the end of grade school and beyond, females perform better on most assessments of verbal abilities. In a 1995 review of the vast literature on writing skills, University of Chicago researchers Larry Hedges and Amy Nowell put it this way: "The large sex differences in writing ... are alarming. The data imply that males are, on average, at a rather profound disadvantage in the performance of this basic skill."

pretenses.

One of the confusing things about the field of sex differences is that you can arrive at very different conclusions depending on how you decide to assess abilities. Women clearly have the right stuff to cut it academically. They have constituted the majority of college enrollments in the U.S. since 1982, with the attendance gap widening every year since then. Similar trends are occurring in many other countries. Furthermore, women receive higher average grades in school in every subject—including mathematics and science.

Despite their success in the classroom, however, women score significantly lower on many standardized tests used for admissions to college and graduate school. The disparity in male-female enrollment in science and related fields grows larger at advanced levels of the education system. For example, in the late 1990s women represented 40 percent of undergraduates in science at the Massachusetts Institute of Technology but only 8 percent of the faculty.

Defining Sex Differences

Because grades and overall test scores depend on many factors, psychologists have turned to assessing better-defined cognitive skills to understand these sex differences. Preschool children seem to start out more or less even, because girls and boys, on average, perform equally well in early cognitive skills that relate to quantitative thinking and knowledge of objects in the surrounding environment.

Around the time school begins, however, the sexes start to diverge. By the end of grade school and beyond, females perform better on most assessments of verbal abilities. In a 1995 review of the vast literature on writing skills, University of Chicago researchers Larry Hedges (now at Northwestern University) and Amy Nowell put it this way: "The large sex differences in writing ... are alarming. The data imply that males are, on average, at a rather profound disadvantage in the performance of this basic skill." There is also a female advantage in memory of faces and in episodic memory—memory for events that are personally experienced and are recalled along with information about each event's time and place.

There is another type of ability, however, in which boys have the upper hand, a skill set referred to as visuospatial: an ability to mentally navigate and model movement of objects in three dimensions. Between the ages of four and five, boys are measurably better at solving mazes on standardized tests. Another manifestation of visuospatial skill in which boys excel involves "mental rotation," holding a three-dimensional object in memory while simultaneously transforming it. As might be expected, these capabilities also give boys an edge in solving math problems that rely on creating a mental image.

Indeed, of all the sex differences in cognitive abilities, variation in quantitative aptitude has received the most media attention. This popular fascination is, in part, because mastery of these skills is a prerequisite for mathematically intensive disciplines such as physics and engineering. And, as Summers suggested, if women were disadvantaged in these skills, it would go a long way to explaining why women are typically underrepresented in these fields. But the data are much less clear-cut.

As we said before, females get higher grades in math classes at all grade levels and also do slightly better on international assessments in algebra, perhaps because of its language like structure. But boys shine on the math part of the Scholastic Aptitude Test (SAT)—resulting in a difference of about 40 points that has been maintained for over 35 years. When all the data on quantitative ability are assessed together, however, the difference in average quantitative ability between girls and boys is actually quite small. What sets boys apart is that many more of

*Behavioral Solutions through
Brain Based Science*

them are mathematically gifted.

At first, this statement seems almost paradoxical. If boys and girls are, on average, equally skilled at math, how could there be greater numbers of gifted boys? For reasons that are not yet fully understood, it turns out that males are much more variable in their mathematical ability, meaning that females of any age are more clustered toward the center of the distribution of skills and males are spread out toward the ends. As a result, men outnumber women at the very high—and very low—ends of the distribution. Data from the Study of Mathematically Precocious Youth exemplify this phenomenon. In the 1980s one of us (Benbow), along with the late psychologist Julian C. Stanley, who founded this study at the John Hopkins University Center for Talented Youth, observed sex differences in mathematical reasoning ability among tens of thousands of intellectually talented 12- to 14-year-olds who had taken the SAT several years before the typical age.

Among this elite group, no significant differences were found on the verbal part of the SAT, but the math part revealed sex differences favoring boys. There were twice as many boys as girls with math scores of 500 or higher (out of a possible score of 800), four times as many boys with scores of at least 600, and 13 times as many boys with scores of at least 700 (putting these test takers in the top 0.01 percent of 12- to 14-year-olds nationwide).

Although it has drawn little media coverage, dramatic changes have been occurring among these junior math wizards: the relative number of girls among them has been soaring. The ratio of boys to girls, first observed at 13 to 1 in the 1980s, has been dropping steadily and is now only about 3 to 1. During the same period the number of women in a few other scientific fields has surged. In the U.S., women now make up half of new medical school graduates and 75 percent of recent veterinary school graduates. We cannot identify any single cause for the increase in the number of women entering these formerly male-dominated fields, because multiple changes have occurred in society over the past several decades.

This period coincides with a trend of special programs and mentoring to encourage girls to take higher-level math and science courses. And direct evidence exists that specifically targeted training could boost female performance even further. A special course created by engineering professor Sheryl A. Sorby and mathematics education specialist Beverly J. Baartmans at Michigan Technological University, for example, targeted improvement in visuospatial skills. All first-year engineering students with low scores on a test of this ability were encouraged to enroll in the course. This enrollment resulted in improved performance in subsequent graphics courses by these students and better retention in engineering programs, which suggests that the effects persisted over time and were of at least some practical significance for both women and men.

The Role of Biology

Decades of data from studies of different animal species show that hormones can play a role in determining the cognitive abilities that males and females develop. For example, during typical prenatal male development, high levels of hormones such as testosterone masculinize the developing brain and result in male-typical behaviors and probably male patterns of cognitive performance.

More recent studies have shown that hormones continue to play a role in cognitive development throughout life. Such changes have been observed in individuals receiving large quantities of male or female hormones in preparation for sex-change surgery. Researchers found, for example, that people undergoing female-to-male hormone treatment show “masculine” changes in their cognitive patterns: improvements in visuospatial processing and decrements in verbal skills.

The human brain is shaped by these hormones, as well as by our genetic

inheritance and a lifetime of experiences, so it should not be surprising that numerous differences appear in female and male brains. In general, females have a higher percentage of gray matter brain tissue, areas with closely packed neurons and fast blood flow, whereas males have a higher volume of connecting white matter tissue, nerve fibers that are insulated by a white fatty protein called myelin. Furthermore, men tend to have a higher percentage of gray matter in the left hemisphere, whereas no such asymmetries are significant in females.

Imaging studies assessing brain function support the notion that females perform better on tasks such as language processing that call on more symmetric activation of brain hemispheres, whereas males excel in tasks requiring activation of the visual cortex. Even when men and women perform the same task equally well, studies suggest they sometimes use different parts of their brain to accomplish it.

It is important to emphasize, though, that finding sex differences in brain structures and functions does not suggest these are the sole cause of observed cognitive differences between males and females. Because the brain reflects learning and other experiences, it is possible that sex differences in the brain are influenced by the differences in life experiences that are typical for women and men.

Excerpt from: Halpern, Diane; Benbow, Camilla; Geary, David; Gur, Ruben; Shibley- Hyde, Janet; Gernsbacher, Morton; (2008) "Sex, Math and Scientific Achievement", *Scientific American Mind*, Volume 18 Number 6, December/January

Further Reading: "The Science of Sex Differences in Science and Mathematics". Diane F. Halpern, Camillia P. Benbo, David C. Geary, Ruben C. Gur, Janet Shibley Hyde and Morton Ann Gernsbacher in *Psychological Science in the Public Interest*, Vol. 8, No, 1 pages 1-51; August 2007.

Sex Differences in Cognitive Abilities, Diane F. Halpern

Male & Female Brain Facts

- Women on average have stronger verbal skills and better memory of events, words, objects and activities.
- Men generally are better at mentally manipulating objects and at performing certain quantitative tasks that rely on visual representations.

What are they saying?

"I found myself hanging on every word"



Comments on Keynote entitled:
"Applying Brain Science to Learning"

"Fabulous – Horacio Sanchez presented the information in such a way that it was impossible NOT to listen. I expected a somewhat dry discussion or presentation, given the title and subject matter. Instead I found myself hanging on every word. In a short period of time, I gained a great deal of insight and definitely plan to investigate further. Thank you for making this a worthwhile trip."

Teacher, Pennsylvania Association of Student
Assistance Professionals
Hershey, PA

New Exciting Training and
Consultation Services
Being Offered by
Resiliency Inc.

Promote Protective
Factors

You can make a difference!

New Training and Consultation Services

Trainings

The Male & Female Brain – Unique differences in the structure and functioning of the male and female brain have strong implications on how to best educate boys and girls. These findings have caused some to conclude that boys and girls should be educated separately because their brains process differently. These distinctions not only impact learning, but also how we should best discipline and develop relationships with the male and the female student.

This training will help educators separate the science from myth and will provide clear strategies as to how schools can effectively educate, discipline, and develop relationships with both the male and female student.

Consultation

Assisting schools struggling with the effective implementation of PBS.

Offering consultation and training to Juvenile Justice Systems seeking to institute a Resiliency based model for rehabilitation.

Featured Educator



DIANE F. HALPERN Professor of Psychology and Director of the Berger Institute for Work, Family, and Children at Claremont McKenna College. She is the past-president (2005) of the American Psychological Association. She is the author of many books including this month's featured book: *Sex Differences in Cognitive Abilities*.

Resiliency Reminders

Protective factors are the key to providing resiliency to those at risk for negative life outcomes. The beginning of the school year offers new opportunities for children and adolescents to gain much needed protective factors. Protective factors schools and parents can begin to facilitate include:

- Skills to help students with problem solving
- Opportunities to help students with social skills toward peers and adults
- Opportunities to develop skills so that they feel competent at some activity
- Improve reading skills
- Improve study skills to help the child experience success in school
- Involvement in extracurricular activities
- Developing a nurturing relationship with the child and offering extra support

You can make a difference!!!
