



The Other Difference Between Boys and Girls

Recent research on the brain establishes that boys' and girls' brains develop differently, which can affect their learning.

Boys think differently from girls. Recent research on brain behavior makes that conclusion inescapable, and it is unrealistic to keep denying it. I know how offensive that will sound to feminists and others committed to overcoming sexual stereotypes. As the father of three daughters, I am well aware of the discrimination girls suffer. But social equality for men and women really depends on recognizing these differences in brain behavior.

At present, schooling and testing discriminate against both boys and girls in different ways, ignoring differences that have been observed by parents and educators for years. Boys suffer in elementary school classrooms, which are ideally suited to the way girls think. Girls suffer later on, in crucial ways, taking scholarship tests that are geared for male performance.

Anyone who has spent time with children in a playground or school setting is aware of differences in the way boys and girls respond to similar situations. Think of the last time you supervised a birthday party attended by five-year-olds. It's not usually the girls who pull hair, throw punches, or smear each other with food.

Usually such differences are explained on a cultural basis. Boys are expected to be more aggressive and play rough games, while girls are presumably encouraged to be gentle, nonassertive, and passive. After several years of exposure to such expectations, the

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theory goes, men and women wind up with widely varying behavioral and intellectual repertoires. As a corollary to this, many people believe that if child-rearing practices could be equalized and sexual stereotypes eliminated, most of these differences would eventually disappear. As often happens, however, the true state of affairs is not that simple.

Undoubtedly, many of the differences traditionally believed to exist between the sexes are based on stereotypes. But despite this, evidence from recent brain research indicates that many behavioral differences between men and women are based on differences in brain functioning that are biologically inherent and unlikely to be modified by cultural factors alone.

Sound Sensitivity

The first clue to brain differences between the sexes came from observations of male and female infants. From birth, female infants are more sensitive to sounds, particularly to their mother's voice. In a laboratory, if the sound of the mother's voice is displaced to another part of the room, female babies will react while male babies usually seem oblivious to the displacement. Female babies are also more easily startled by loud noises. In fact, their enhanced hearing performance persists throughout life, with females experiencing a fall-off in hearing much later than males.

Tests involving girls old enough to cooperate show increased skin sensitivity, particularly in the finger-tips, which have a lower threshold for touch

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identification. Females are also more proficient at fine motor performance. Rapid tapping movements are carried out quickly and more efficiently by girls than by boys.

In addition, there are differences in what attracts a girl's attention. Generally, females are more attentive to social contexts—faces, speech patterns, and subtle vocal cues. By four months of age, a female infant is socially aware enough to distinguish photographs of familiar people, a task rarely performed well by boys of that age. Also at four months, girls will babble to a mother's face, seemingly recognizing her as a person, while boys fail to distinguish between a face and a dangling toy, babbling equally to both.

Female infants also speak sooner, have larger vocabularies, and rarely demonstrate speech defects. Stuttering, for instance, occurs almost exclusively among boys.

Girls can also sing in tune at an earlier age. In fact, if we think of the muscles of the throat as muscles of fine control—those in which girls excel—then it should come as no surprise that girls exceed boys in language abilities. This early linguistic bias often prevails throughout life. Girls read sooner, learn foreign languages more easily, and, as a result, are more likely to enter occupations involving language mastery.

Boys, in contrast, show an early visual superiority. They are also clumsier, performing poorly at something like arranging a row of beads, but excel at other activities calling on total body coordination. Their attentional mechanisms are also different. A boy will react to an inanimate object as quickly as he will to a person. A male baby will often ignore the mother and babble to a blinking light, fixate on a geometric figure and, at a later point, manipulate it and attempt to take it apart.

A study of nursery preschool children carried out by psychologist Diane McGuiness of Stanford University found boys more curious, especially in regard to exploring their environment. McGuiness' studies also confirm that males are better at manipulating three-dimensional space. When boys and girls are asked to mentally rotate or fold an object, boys overwhelmingly outperform the girls. "I folded it in my mind" is a typical male response. Girls, when explaining how they perform the same task, are likely to produce elaborate verbal descriptions which, because they are less appropriate to the task, result in frequent errors.

In an attempt to understand the sex differences in spatial ability, electroencephalogram (EEG) measurements have recently been made of the accompanying electrical events going on within the brain.

Ordinarily, the two brain hemispheres produce a similar electrical background that can be measured

by an EEG. When a person is involved in a mental task—say, subtracting 73 from 102—the hemisphere that is activated will demonstrate a change in its electrical background. When boys are involved in tasks employing spatial concepts, such as figuring out mentally which of three folded shapes can be made from a flat, irregular piece of paper, the right hemisphere is activated consistently. Girls, in contrast, are more likely to activate both hemispheres, indicating that spatial ability is more widely dispersed in the female brain.

Sex Bias in Tests

When it comes to psychological measurements of brain functioning between the sexes, unmistakable differences emerge. In 11 subtests of the most widely used test of general intelligence, only two subtests reveal similar mean scores for males and females. These sex differences have been substantiated across cultures and are so consistent that the standard battery of this intelligence test now contains a masculinity-femininity index.

Further support for sex differences in brain functioning comes from experience with subtests that eventually had to be omitted from the original test battery. A cube-analysis test, for example, was excluded because, after testing thousands of subjects, a large sex bias appeared to favor males. In all, over 30 tests eventually had to be eliminated because they discriminated in favor of one or the other sex. One test, involving mentally working oneself through a maze, favored boys so overwhelmingly that, for a while, some psychologists speculated that girls were totally lacking in a "spatial factor."

Most thought-provoking of all is a series of findings by Eleanor Maccoby and Carol Nagly Jacklin of Stanford on personality traits and intellectual achievement. They found that girls whose intellectual achievement is greatest tend to be unusually active, independent, competitive, and free of fear or anxiety, while intellectually outstanding boys are often timid, anxious, not overtly aggressive, and less active.

In essence, Maccoby and Jacklin's findings suggest that intellectual performance is incompatible with our stereotype of femininity in girls or masculinity in boys.

Research evidence within the last six months indicates that many of these brain sex differences persist over a person's lifetime. In a study at the University Hospital in Ontario that compared verbal and spatial abilities of men and women after a stroke, the women did better than men in key categories tested. After the stroke, women tended to be less disabled and recovered more quickly.

Research at the National Institute of Mental

Health is even uncovering biochemical differences in the brains of men and women. Women's brains, it seems, are more sensitive to experimentally administered lights and sounds. The investigator in charge of this research, Monte Buchsbaum, speculates that the enhanced response of the female brain depends on the effect of sex hormones on the formation of a key brain chemical. This increased sensibility to stimuli by the female brain may explain why women more often than men respond to loss and stress by developing depression.

It's important to remember that we're not talking about one sex being generally superior or inferior to another. Rather, psychobiological research is turning up important functional differences between male and female brains. The discoveries might possibly contribute to further resentments and divisions in our society. But must they? Why are sex differences in brain functioning disturbing to so many people? And why do women react so vehemently to findings that, if anything, indicate enhanced capabilities in the female brain?

Changing in the Schools

It seems to me that we can make two responses to these findings on brain-sex differences. First, we can use them to help bring about true social equity. One way of doing this might be to change such practices as nationwide competitive examinations. If boys, for instance, truly do excel in right-hemisphere tasks, then tests such as the National Merit Scholarship Examination should be radically redesigned to assure that both sexes have an equal chance. As things now stand, the tests are heavily weighted with items that virtually guarantee superior male performance.

Attitude changes are also needed in our approach to "hyperactive" or "learning disabled" children. The evidence for sex differences here is staggering: More than 95 percent of hyperactives are males. And why should this be surprising in light of the sex differences in brain function that we've just discussed?

The male brain learns by manipulating its environment, yet the typical student is forced to sit still for long hours in the classroom. The male brain is primarily visual, while classroom instruction demands attentive listening. Boys are clumsy in fine hand coordination, yet are forced at an early age to express themselves in writing. Finally, there is little opportunity in most schools, other than during recess, for gross motor movements or rapid muscular responses. In essence, the classrooms in most of our nation's primary grades are geared to skills that come

naturally to girls but develop very slowly in boys. The results shouldn't be surprising: a "learning disabled" child who is also frequently "hyperactive."

"He can't sit still, can't write legibly, is always trying to take things apart, won't follow instructions, is loud, and, oh yes, terribly clumsy" is a typical teacher description of male hyperactivity. We now have the opportunity, based on emerging evidence of sex differences in brain functioning, to restructure elementary grades so that boys find their initial educational contacts less stressful.

At more advanced levels of instruction, efforts must be made to develop teaching methods that incor-

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porate verbal and linguistic approaches to physics, engineering, and architecture (to mention only three fields where women are conspicuously underrepresented and, on competitive aptitude tests, score well below males).

The second alternative is, of course, to do nothing about brain differences and perhaps even deny them altogether. Certainly there is something to be said for this approach too. In the recent past, enhanced social benefit has usually resulted from stressing the similarities between people rather than their differences. We ignore brain-sex differences, however, at the risk of confusing biology with sociology, and wishful thinking with scientific facts.

The question is not, "Are there brain-sex differences?" but rather, "What is going to be our response to these differences?" Psychobiological research is slowly but surely inching toward scientific proof of a premise first articulated by the psychologist David Wechsler more than 20 years ago:

The findings suggest that women seemingly call upon different resources or different degrees of like abilities in exercising whatever it is we call intelligence. For the moment, one need not be concerned as to which approach is better or "superior." But our findings do confirm what poets and novelists have often asserted, and the average layman long believed, namely, that men not only behave, but "think" differently from women. *Et*

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