

## What Do You Know About

# Male Brains and Female Brains

Put an “A” in the blank if you agree with a statement.

Put a “D” in the blank if you disagree with a statement.

- \_\_\_ 1. The scientific study of “essentialism” has identified clear biological, neurological, and other innate differences in the brains of males and females.
- \_\_\_ 2. Evolutionary scientists, including Darwin, argued that women had evolved with inferior brains and were designed for nurturing and supporting men.
- \_\_\_ 3. Men are more likely than women to demonstrate intelligence at the extremes—more men are found 4 standard deviations above and below the mean intelligence for all adults.
- \_\_\_ 4. There are no innate gender differences in children’s preference for colors, toys, or people versus things.
- \_\_\_ 5. Scientists can detect from brain scans whether a brain belongs to a male or a female because of innate differences in how people of each gender use their brains
- \_\_\_ 6. Girls are naturally more empathetic than boys.
- \_\_\_ 7. Spatial reasoning ability, as measured by mental rotation tasks, shows neural plasticity. As little as four hours of playing Tetris improves subject scores on mental rotation tasks.
- \_\_\_ 8. Children whose parents espouse gender neutrality in choices of activities and toys are comfortable playing with “boy” and “girl” toys, as well as with gendered activities such as playing “house”, taking ballet lessons, or engaging in yardwork or housework.
- \_\_\_ 9. Girls as young as seven begin to believe that boys are smarter than girls.
- \_\_\_ 10. Most people show a “mosaic” pattern in their brains, rather than “pink” or “blue.”

## Anticipation Guide Set-Up

This protocol helps students and adults access prior knowledge, work as a group to pool knowledge, justify conclusions, and generate hypotheses.

### Instructions for creating Anticipation Guides

1. For a given text excerpt, article or short story, generate several declarative statements. For middle grades through adults, 8-10 statements is a good number. You might use less for the primary grades.
2. Participants read through the statements individually, marking whether they agree or disagree.
3. In groups, participants share their ratings of each statement. They provide information and debate ideas to come to consensus on each statement. The facilitator can moderate but should not give hints.
4. Participants then read the text to get more information.
5. Participants review the statements, revise, and discuss how their thinking has changed.

### Personality Type Connections

**Thinking students**, who approach decisions through logic and objectivity, love to debate and provide support for their views. The exercise also provides important practice in these skills for **Feeling Students**, who approach decisions by stepping into the shoes of those involved and analyzing potential outcomes with an eye to crucial values.

This exercise also gives **Extraverted students** a chance to process out loud before and after they read, , making it easier for them to engage in the more introverted activity of reading.

**Sensing students, who tend to first see details**, and **Intuitive students, who tend to first see the big picture**, will probably bring different kinds of prior knowledge to bear on the statements. Intuitives may go more with hunches and connections to things they remember hearing about. Sensing students may hesitate to take a position without clear facts. Using the language of Sensing and Intuition could be helpful as students discuss and compare their ideas.

1 **Neurosexism, or**  
2 **How Certain Neuroscience Practices are Reinforcing Gender Stereotype**

3 (Main Source: *The Gendered Brain* by Gina Rippon. London: Bodley Head)

4 “Explosion sound effects. That’s the only hard-wired difference I’ve seen between  
5 boys and girls,” a colleague once quipped. He was closer to the truth than much of what the  
6 popular press, including bestselling books, has written about “pink” and “blue” brains,  
7 seeking to answer the age-old question of whether male and female brains are different.

8 For centuries, scientists have sought proof for “essentialism”, that these differences  
9 are innate and fixed. Suggesting otherwise was seen as going against the natural order of  
10 things. Charles Darwin (1871) wrote that women were less highly evolved.

11 *The chief distinction in the intellectual powers of the two sexes is shewn [sic] by man attaining to a*  
12 *higher eminence, in whatever he takes up, than women can attain—whether requiring deep thought,*  
13 *reason, or imagination, or merely the use of the senses and hands (p. 361).*

14 With the status quo of the field of science thus entrenched in this belief, experiments  
15 focused on explaining these differences. Especially popular was measuring the brain; filling  
16 skulls with bird seed or measuring bone angles or the weight and size of parts of the brain  
17 during autopsy all showed that men had bigger brains. The conclusion? Men thus were  
18 naturally smarter. Anthropologist Gustav Le Bon (1879) was kind to acknowledge  
19 exceptions.

20 *Without a doubt there exist some distinguished women, very superior to the average man but they*  
21 *are as exceptional as the birth of any monstrosity, as, for example, of a gorilla with two heads;*  
22 *consequently, we may neglect them entirely.*

23 The scientific thinking of the day reinforced the roles of men in business and politics  
24 and of women in the home. Educating women would put them at risk for “anorexia  
25 scholastica,” defined as becoming sexless and unmarriageable. Scientists ignored that brain  
26 size and weight differences disappear when ratios are applied that account for the average  
27 overall larger bodies of men. They also ignored that even just among men, brain size doesn’t  
28 predict intelligence. Scientists, still almost all male, attributed the lack of women scientists,  
29 mathematicians, business leaders, and government heads to women’s natural lack of abilities  
30 in these fields.

31 With all of the advances in psychology and neuroscience—experiments in behavioral  
32 psychology, neuro imaging, increased sophistication in using the scientific method—have  
33 these views of women changed? Not really, because science is still fixated on documenting  
34 differences between genders that explain the different male and female roles that exist in  
35 society, rather than changing the question. As we’ll see, what brain differences exist seem to  
36 be so small that they’re the equivalent of finding that the average difference in the height of  
37 men and women is about an inch, i.e., not big enough to explain gender gaps.

38 Yet in 2005, at a conference on women and minorities in science and engineering,  
39 Harvard president Larry Summers (2005) put forth that the low numbers of women in  
40 science and mathematics reflected their hesitancy to work long hours on top of family  
41 responsibilities, that fewer girls than boys had top mathematics scores in high school, and  
42 that some discrimination in hiring practices might exist (although he suggested that the small  
43 talent pool of women was a bigger factor). After discussing the higher pool of “genius” men

44 shown by more men scoring three or four standard deviations above the mean on IQ tests,  
45 he concluded that in "...the special case of science and engineering, there are issues of  
46 intrinsic aptitude, and particularly of the variability of aptitude [referring to his analysis of  
47 IQ], and that those considerations are reinforced by what are in fact lesser factors involving  
48 socialization and continuing discrimination."

49 Summers believed his remarks were supported by research. However, if research is  
50 working to identify differences instead of understanding why there *are* differences, it can  
51 easily go astray. Yes, more men show an interest in STEM careers, but why? Yes, women  
52 seem to pay more attention to faces from an early age, but why? Yes, there are differences in  
53 how men and women use their brains, but why and what difference do they make? Let's  
54 look at the research claims supporting "pink" and "blue" brains one by one.

55

### 56 **Male Systemizers and Female Empathizers?**

57 Popular wisdom and several research studies conclude that men from an early age  
58 show more interest and ability in analyzing and constructing systems and women in stepping  
59 into the shoes of others and knowing how to respond. Influential studies conducted by  
60 Simon Baron-Cohen's lab at the University of Cambridge (2004) declare, "The female brain  
61 is predominantly hard-wired for empathy. The male brain is predominantly hard-wired for  
62 understanding and building systems" (p. 185). While he goes on to say, "...your sex does not  
63 dictate your brain type...not all men have the male brain, and not all women have the female  
64 brain" (p. 185), the latter message was lost in the trumpeting of the male-female difference.

65 So how big is this difference? Researcher Angela Sairi interviewed Neuroscientist  
66 Melissa Hines for her book *Inferior: How Science Got Women Wrong and the New Research that's*  
67 *Rewriting the Story* and summarizes Hines' findings

68 *Hines believes that the "sex difference in empathizing and systemizing is about half a standard*  
69 *deviation." This would be equivalent to a gap of about an inch between the average heights of men*  
70 *and women. It's small. "That's typical," she adds. "Most sex differences are in that range, And for*  
71 *a lot of things, we don't show any sex differences."* (p. 81)

72 In *The Gendered Brain* (2019), British neuroscientist Gina Rippon summarizes more  
73 recent studies that show *no* differences between the genders regarding these skills in infants  
74 under the age of two. She acknowledges that differences in scores on self-reporting and  
75 parental surveys of empathy skills appear after the age of four, but includes brain scan data  
76 showing no differences between the genders in use of areas of the brain associated with  
77 empathy. The question thus comes back to not, are there differences, but what causes the  
78 differences? Social expectations—"gender construction"—seem to be more of a root cause  
79 than innate tendencies.

80 Why does this stereotype matter? Baron-Cohen developed a survey to rate  
81 Systemizing and Empathizing styles and there is a strong correlation between high  
82 Systemizing scores and interest in STEM careers. However, while gender does not correlate  
83 with Systemizing and Empathizing styles, it *does* correlate with STEM career interests. One  
84 might say that this "essentialist" language around these skills continues to reinforce that girls  
85 don't do science when in fact gender is not a factor.

86

87

88 **Male Spatial Skills and Female Verbal Skills?**

89 Another oft-repeated “pink” and “blue” brain difference is that men score better on  
90 spatial reasoning skills and women on verbal skills. Strictly speaking, research shows  
91 statistically significant differences.

92 Before looking at studies, let’s remember that “statistically significant” (as indicated  
93 by the \*\*\* after a reported result) means that the chance the results occurred randomly are  
94 less than one in a thousand. And, measuring “effect size” tells you how meaningful the  
95 differences are.

96 So, the effect sizes in many recent studies into this area are small, .2 or .3. This  
97 means while there are sex differences, the overlap between the sexes is as high as 90 percent.  
98 That makes the differences of little use for any predictions about what any individual’s skills  
99 at map-reading or verbal expression might be.

100 More significantly, reporting the differences without considering the source becomes  
101 especially fraught with danger when neuroplasticity—the study of how training, experience  
102 and other factors actually change our brain, which has overturned the notion of fixed brain  
103 capacity and intelligence—is considered. Studies show, for example

- 104 • After four hours of playing a Tetris-like game, subjects’ scores on mental rotation  
105 tasks (MRT) for both genders improved, but women showed significantly more  
106 improvement than men (Cherney, 2008)
- 107 • When performance on MRT tasks was examined for experience in playing video  
108 games, gender differences disappeared. This finding was backed up by giving  
109 participants 10 hours of training in video gaming and then having them perform  
110 MRT tasks. (Feng, Spence and Pratt, 2007)
- 111 • The long-held assumption of more males scoring in the top echelons of  
112 mathematics was debunked in a meta analysis of international studies in 2010  
113 (Else-Quest, Hyde, and Lynn). Some countries showed no gap between male and  
114 female top-scorers. The gap had almost closed in the United States. And, in the  
115 United Kingdom, Thailand and Iceland, there were more females than males  
116 among the top scorers. Are there more opportunities for women in mathematics  
117 than in the past, perhaps?
- 118 • While variability in verbal reasoning skills were explained previously by  
119 differences, on average, in the size of various areas in male and female infant  
120 brains at birth, a survey of 21,465 studies showed that only 394 reported any sex  
121 differences. And, those effect sizes were very small (Rippon, 2019). In other  
122 words, are there differences? Yes. Are they numerous and large? No.

123

124 **Men Pay Attention to Things and Women to People?**

125 What about the “fact” that boys reach for trucks and girls for dolls? The most  
126 famous study (Connellan, 2000) comes from Baron-Cohen’s lab, and it does show a gender  
127 difference in preferences for people and things.

- 128 • Of the 58 newborn girls tested by showing mobiles of a flat face and mobiles  
129 with scrambled photos of a face, 27 (almost half) showed no preference. 21  
130 looked longer at the face and 10 at the “mechanical” mobile.
- 131 • Of the 44 boys tested, 14 showed no preference, 11 preferred the face and 19 the  
132 mechanical mobile.

- 133                   • Thus, 40 percent showed no preference. Only 36 percent of the girl newborns  
134 showed a preference for faces, as defined by the study, and 43 percent of the  
135 boys a preference for the “psysiocomechanical motion”.
- 136                   • The study’s conclusion? Clear evidence for male preference for things, which,  
137 because it was demonstrated in infants, provided evidence that this difference is  
138 innate and essential.

139 Debates about whether interactions by researchers who knew the babies’ genders  
140 affected results aside, the results hardly support a person’s gender predicting preference for  
141 people or things. Multiple studies purported to support gendered toy preferences show  
142 design problems. Rippon (2019) cites several examples, as well as evidence of socialization  
143 and parental influence. For example, parents answered surveys agreeing that boys should  
144 have dolls and take ballet lessons if they wished, but only nine percent of five-year-old boys  
145 of these same parents thought that their father would approve if they chose to play with a  
146 doll or tea set (Freeman, 2007). Add the fact that girls and boys show no differences in  
147 preferring pink until after the age of two (LoBue and DeLoche, 2011) and what toy to  
148 purchase for a child becomes a much weightier decision, doesn’t it?  
149

### 150 **Closing the Gaps Through Understanding**

151 We’ve looked at how the continuing stereotypes may continue to discourage women  
152 from seeking STEM careers, but let’s dig a little deeper. What do the stereotypes do to  
153 student confidence?

154 The STEM gap seems to appear at about the age of six. At age five, girls think they  
155 are just as smart as boys, but by the age of seven, girls begin thinking that boys are smarter  
156 than girls (Bian, Leslie, and Cimpian, 2017). They show less interest in sciences from that  
157 point on.

158 Further, the “gatekeeper” adults for STEM careers show gender bias. Two STEM  
159 faculty groups at top universities were given identical résumés for the position of laboratory  
160 manager, with only the gender of the applicants changing; i.e., the resumes one group saw  
161 with male names and details appeared as female for the other group, and visa versa. Both  
162 male and female faculty were significantly more likely to say they would make job offers to  
163 the males, at higher salaries, and rated the men as more competent (Moss-Racusin, et. al.  
164 2012).

165 Is there any wonder that girls show a confidence gap in STEM pursuits? A study  
166 (Pavlova et. al., 2014) shows how “stereotype threat” affects girls more than boys. When told  
167 that tasks were harder for women, males did better and females did worse. When told that  
168 tasks were harder for men, men did somewhat worse, but so did women. Consistent with  
169 other studies, women seemed to be sensitive to potential for failure, whereas men assumed  
170 they could succeed.

171 Note that a thorough review of performance of boys and girls in science and  
172 mathematics (Stoet and Geary, 2018) revealed almost no gender differences (effect size of -.1  
173 on average). However, as Rippon (2019) summarizes, “If you and your teachers think you  
174 can’t, then there is a strong possibility that you won’t” (p. 249).  
175

### 176 **So What?**

177 So why become familiar with what brain research is and isn’t saying about gender  
178 differences? Because the “psychobabble” in the popular press is continuing to reinforce

179 stereotypes that perpetuate barriers, both external and self-created, for women\*. Here are  
180 five talking points you might use to change the conversations:  
181 1. Where gender differences exist, they are so small that gender cannot be used to  
182 predict individual interests, abilities, or traits. Rather than “male” and “female”  
183 brains, research better supports a “mosaic” brain—one that shows a blend of  
184 traits associated with both genders. A 2017 study led by Daphne Joel of Tel Aviv  
185 University reviewed over 1,400 brain scans from four labs. out of the 116  
186 features they examined, 10 showed differences between male and female brains.  
187 Only 6-8 percent of the sample scans were consistently on the “male” or  
188 “female” ends of the spectrum for these 10 features. The rest show tendencies of  
189 some, but not others. Great variation exists within each gender, and there is a  
190 huge overlap between the genders. Who knows, with training, girls might even  
191 close the gap on explosion sound effects!  
192 2. Asking, “Are there differences?” is now the wrong question unless researchers  
193 also ask 1) Are they consistent across our lifespans? 2) Are they universal or do  
194 they vary with context? 3) Are they either male or female or on the “mosaic  
195 brain” continuum? 4) Does biological sex directly predict them or are they  
196 influenced by cultural norms, gender expectations, training and so on?  
197 3. The incorrect reporting on “pink” and “blue” brain differences influences career  
198 choices, school success, self-esteem, and more—boys and girls are limited to  
199 what society declares as gender-appropriate no matter the actual “mosaic brain”  
200 pattern of a given individual. Gender equity benefits everyone!  
201 4. Moving away from “essentialism” to “influences” is a key way to begin  
202 dismantling the barriers that gender stereotypes perpetuate. No, gender does not  
203 predict who is born to nurturing and who is born to engineering.  
204 5. A better explanation of these “mosaic” brain differences than gender may be  
205 found in Carl Jung’s framework of two different styles of decision making:  
206 Thinking types begin with logic, objectivity, and if/then-pro/con analyses.  
207 Feeling types begin with considering the impact on values and on the people  
208 involved. Research shows that while about 60 percent of men prefer Thinking  
209 and 60 percent of women prefer Feeling, there is wide overlap between the  
210 genders and variation within gender. Sound familiar?

211  
212 Perhaps most important is the role that neuroscience could be playing in supporting  
213 the elimination of harmful gender stereotyping. Rippon (2019) summarizes,

214 *Neuroscientists can lead people away from the fixed mindset that you are stuck with the biology that*  
215 *nature has dealt you. We can ensure that brain owners are aware of just how flexible and malleable*  
216 *an asset they have in their heads, but also make our society aware of the brain-changing nature of*  
217 *negative stereotypes (of any kind), which can lead to self-silencing, self-blame, self-criticism, and*  
218 *plummeting self-esteem. (p. 356)*

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\* And barriers for men as well. Consider how men who contemplate primary grade teaching careers or nursing or even teaching English instead of mathematics or biology might be hindered by gender stereotypes. Feminism is for everyone!

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