

Brain Chemistry and Sex Differences: Are Male and Female Brains Really Varied?

Md Sahab Uddin*

Department of Pharmacy, Southeast University, Dhaka, Bangladesh

*Corresponding author: Md Sahab Uddin, Department of Pharmacy, Southeast University, Dhaka, Bangladesh, Tel: +880 1710220110; E-mail: msu-neuropharma@hotmail.com

Rec date: August 21, 2017; Acc date: September 29, 2017; Pub date: March 12, 2018

Copyright: © 2017 Uddin MdS, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Editorial

There are a number of factors that play role in terms of sex differences, such as, mental processes and behaviors of the genders and also due to a complicated relationship of biological, developmental and cultural factors. Cognitive abilities, aggressiveness, personality and mental health are the areas where differences in terms of gender have been found. These variations are may possibly be either inherent or learned and often these variations are very difficult to differentiate. Current research attempts to differentiate and analyze these dynamic variations and raised ethical issues. Although scientists are interested in scrutinizing the interplay of biology and environment and their roles in such differences, often this appears impossible [1].

The cerebrum comprises of an outer cerebral cortex, contains 2 to 4 mm of gray matter and also underlying white matter [2]. It has been found that for activity, female brains use virtually 10 times more white matter, whereas male brains use their approximately 7 times more gray matter. These findings suggest the localized areas of the gray matter in the brain. Furthermore, in a definite area of the brain, they play role as processing centers of information and action. This can also interpret the close-mindedness when they are involved in an activity. While doing a task or playing a game, they may not pay attention to their surroundings including people. White matter is considered as the networking grid that connects the gray matter of the brain with other processing centers. This intense difference in brain-processing system justify why girls have a tendency to change tasks more rapidly than boys. On the other hand, difference in gray-matter possibly explains why adult females are considered as great multi-taskers, while adult males excel in projects which require extreme focus.

The study of DeLacoste-Utamsing and Holloway suggested that corpus callosum (i.e. splenium), that allows communication between the two hemispheres, is comparably larger in women than in men [3]. This was extensively stated to mean that women are superior at multitasking, albeit successive work has futile to reproduce the outcomes. Ikezawa et al. examined gender differences in lateralization of mismatch negativity in dichotic listening tasks [4]. Denouements suggested that women are faintly better with respect to men at giving attention to sounds accessible to both ears at the same time. Witelson et al. inspected the brains of postmortem men and women and found that weight of the men brain was higher than women brain [5]. These variances fairly reveal the statement that men are usually greater and taller than women, but it is not linked to intelligence.

The corpus callosum is inimitable to placental mammals and encompassed of nearly 190 million axons that link the left hemisphere and right hemisphere [6]. Girl fetuses usually start developing a denser corpus callosum, a region of the brain that joins the left and right hemispheres than boy fetuses at about the 26 week stage. This may

further explain why females are most likely to utilize both hemispheres of the brain while males are most likely to utilize left hemisphere. Moreover, studies have found that to process information, males tend to use their left hemisphere of the brains, while females are more capable at using both the hemispheres. This would exactly indicate that females are the only ones in their right minds.

Men tend to have larger inferior-parietal lobule that is believed to influence mathematical ability than females [7]. The areas of the brain that regulate math and geometry skills tend to be mature in boys four years earlier than in girls. On the other hand, females have larger frontal and temporal areas of the cortex than males [8]. These areas of the brain are believed to control language skills and tend to mature in girls around 6 years earlier as compare to boys. Brains of women have a deeper limbic system and a larger hippocampus than men. These brain's features make women far more efficient to appreciate the complete range and deepness of the emotional spectrum as compare to diligent men.

Interestingly, when exposed to pain, females' right amygdala is stimulated, while left amygdala is activated in case of males. It is well known that left amygdala is very closely linked with internal functions and this association further explains why females have more acute sensation towards pain than males. Goldstein et al. revealed that hippocampus (i.e. responsible for memory creation) is on typical larger in men compared to women, as is the amygdala that is also accountable in memory and emotions [9]. Nevertheless, when it comes to visualizing rotating 3D objects, males are more efficient than females due to the comparatively thinner brain's parietal region. In Figure 1, few differences in brains of men and women thinking and doing are presented.

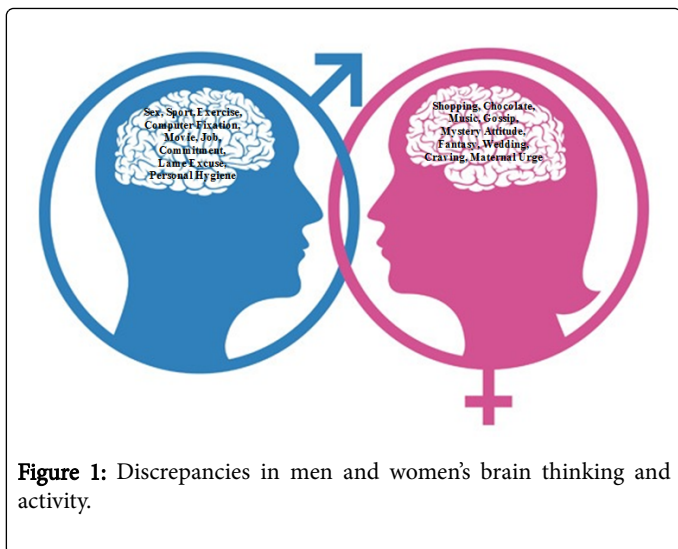


Figure 1: Discrepancies in men and women's brain thinking and activity.

Brains of males and females tend to process same neurochemicals in different ways. However, females' brains synthesize serotonin far more slowly than makes; this phenomenon explains why females suffer more from depression than males [10]. Subsequently a traumatizing event, females are also more prone towards posttraumatic stress disorder than males. During stressful events both males and females secrete oxytocin [11]. Females process far more oxytocin than males do. However, while female estrogen interacts with oxytocin to exert a relaxing effect, interaction of oxytocin and testosterone makes males even more aggressive. The areas of the brains that regulate aggression and anger are found to be larger in females than males and further partially explain the increased rate of violence caused by males.

Some brain's structural elements differ considerably between men and women. Women tend to have bigger hippocampus (i.e. memory center of humans) than men [12]. Neural connections are found to be incredibly denser in men than women and this characteristic explain the more absorptive and sensitive behavior of women than men towards information. If we do a study involving observations of boys and girls and males and females over the next couple of months. We are likely to see that throughout the day females are more aware and identifying more details and retaining more sensorial information than males regarding their surroundings.

The features of left and right hemispheres vary considerably in men and women [13]. One significant example is men have verbal centers on only the left hemisphere, while women have verbal centers on both sides of the hemispheres. When conversing or explaining feeling, person, place, story, incidence, or any object, females are found to be using more words. In case of males, they have less verbal centers and less connection between their feelings or memories and their word centers. It has additionally been found that women take more interest and have advantages of expressing their emotions and feelings than men.

The aforementioned natural design differences are just a sample of differences in male and female thinking processes. Over the period, in terms of gender, researchers have found nearly copious differences in the brain and the significance of these discoveries are extremely important. From the neurological perspective, understanding these sex variances is crucial to appreciate different genders. Furthermore, this understanding is also essential to evaluate the ways parents' support and educate their young children.

Acknowledgements

The authors wish to thank the anonymous reviewer(s)/editor(s) of this article for their constructive reviews.

Competing Interests

The authors proclaim no competing interests.

References

- Halpern DF (2011) Sex differences in cognitive abilities (4th Edn) New York.
- Guyton AC, Hall, JE (2006) Textbook of medical physiology. China.
- DeLacoste-Utamsing C, Holloway RL (1992) Sexual dimorphism in the human corpus callosum. *Science* 216: 1431-1432.
- Ikezawa S, Nakagome K, Mimura M, Shinoda J, Itoh K, et al. (2008) Gender differences in lateralization of mismatch negativity in dichotic listening tasks. *Int J Psychophysio* 68: 41-50.
- Witelson SF, Beresh H, Kigar DL (2005) Intelligence and brain size in 100 postmortem brains: sex, lateralization and age factors. *Brain* 129: 386-398.
- Paul LK (2011) Developmental malformation of the corpus callosum: a review of typical callosal development and examples of developmental disorders with callosal involvement. *J Neuro Dev Dis* 3: 3-27.
- Weyandt L, Weyandt LL (2005) The physiological bases of cognitive and behavioral disorders. 1st Edn. New York.
- Alonso-Nanclares L, Gonzalez-Soriano J, Rodriguez JR, DeFelipe J (2008) Gender differences in human cortical synaptic density. *Proceed Natl Acad Sci* 105: 14615-14619.
- Goldstein JM, Seidman LJ, Horton NJ, Makris N, Kennedy DN, et al. (2001) Normal sexual dimorphism of the adult human brain assessed by *in vivo* magnetic resonance imaging. *Cer Cor* 11: 490-497.
- Luders E, Narr KL, Thompson PM, Rex DE, Woods RP, et al. (2006) Gender effects on cortical thickness and the influence of scaling. *Hum Brain Map* 27: 314-324.
- Olf M, Frijling JL, Kubzansky LD, Bradley B, Ellenbogen MA, et al. (2013) The role of oxytocin in social bonding, stress regulation and mental health: an update on the moderating effects of context and interindividual differences. *Psychoneuroendocrino* 38: 1883-1894.
- Daly J (2016) The caregiving season: finding grace to honor your aging parents. New York.
- Saladin KS (2014) Anatomy & physiology: the unity of form and function (7th Edn) New York.