The brain's reaction to male odor shifts at puberty in children with gender dysphoria

28 May 2014

The brains of children with gender dysphoria react to androstadienone, a musky-smelling steroid produced by men, in a way typical of their biological sex, but after puberty according to their experienced gender, finds a study for the first time in the open-access journal *Frontiers in Endocrinology*.

Around puberty, the testes of men start to produce androstadienone, a breakdown product of testosterone. Men release it in their sweat, especially from the armpits. Its only known function is to work like a pheromone: when women smell androstadienone, their mood tends to improve, their blood pressure, heart rate, and breathing go up, and they may become aroused.

Previous studies have shown that, in heterosexual women, the brain region that responds most to androstadienone is the hypothalamus, which lies just above the brainstem and links the nervous system to the hormonal system. In men with gender dysphoria (formerly called gender identity disorder) – who are born as males, but behave as and identify with women, and want to change sex – the hypothalamus also reacts strongly to its odor. In contrast, the hypothalamus of heterosexual men hardly responds to it.

Girls without gender dysphoria before puberty already show a stronger reaction in the hypothalamus to androstadienone than boys, finds a new study by Sarah Burke and colleagues from the VU University Medical Center of Amsterdam, the Netherlands, and the University of Liège, Belgium.

The researchers used neuroimaging to also show for the first time that in prepubescent children with gender dysphoria, the hypothalamus reacts to the smell of androstadienone in a way typical of their biological sex. Around puberty, its response shifts, and becomes typical of their experienced gender.

The reaction to the smell of androstadienone in the hypothalamus of 154 children and adolescents, including girls and boys, both before (7 to 11-year-old) and after puberty (15 to 16-year-old), of whom 74 had been diagnosed with gender dysphoria.

Results showed that the hypothalamus was more responsive to androstadienone in 7 to 11-year-old girls than in boys, both without gender dysphoria, although not yet as much as in adolescent girls. This means that the greater receptiveness of women to its odor already exists before puberty, either as an inborn difference or one that arises during early childhood.

Before puberty, the hypothalamus of boys with gender dysphoria hardly reacted to the odor, just as in other boys. But this changed in the 15 to 16-year-olds: the hypothalamus of adolescent boys with gender dysphoria now lit up as much as in heterosexual women, while the other adolescent boys still did not show any reaction. Adolescent girls with gender dysphoria showed the same reaction to androstadienone in their hypothalamus as is typical for heterosexual men.

These results suggest that as children with gender dysphoria grow up, their brain naturally undergoes a partial rewiring, to become more similar to the brain of the opposite sex – so corresponding to their experienced gender.

More information: Hypothalamic response to the chemo-signal androstadienone in gender dysphoric children and adolescents, *Frontiers in Endocrinology*, journal.frontiersin.org/Journa … .2014.00060/abstract

Provided by Frontiers