Resting state functional connectivity is affected by testosterone treatment in female-to-male transgender persons

Nienke Nota¹, Sarah Burke², Martin den Heijer¹, Remi Soleman³, Cornelis Lambalk², Dick Veltman³, Peggy Cohen-Kettenis¹, Baudewijnthe Keukels²

¹Department of Internal Medicine, Division of Endocrinology, VU University Medical Center, the Netherlands
²Department of Medical Psychology, Neuroscience Campus Amsterdam, VU University Medical Center, the Netherlands
³Department of Psychiatry, Neuroscience Campus Amsterdam, VU University Medical Center, the Netherlands

Background

Several resting state networks have been described in literature. Today, it is still unclear whether these networks are stable or can be influenced by sex hormones. Transgender persons offer a unique opportunity to study these hormonal influences.

Aim

To examine the effects of cross-sex hormone treatment in transgender persons on two resting state networks involved in cognition and emotion, the default mode network and the executive control network.

Methods

Resting state functional magnetic resonance imaging and sex hormone levels were analyzed in 21 female-to-males, 13 male-to-females, 17 untreated control men and 12 untreated control women (all participants were aged ≥ 17). Measurements were done at baseline, when endogenous gonadal stimulation in the transgender participants was suppressed by a gonadotropin-releasing hormone analogue, and four months after the start of cross-sex hormone treatment (testosterone in female-to-males and estradiol in male-to-females). Independent component analysis was used to evaluate the effect of cross-sex hormones.

Results

For the default mode network, the female-to-males showed increased functional connectivity between the right postcentral gyrus and other parts of this network four months after start of cross-sex hormone treatment (peak t-value = 5.9, KE = 19, p < 0.001; see Figure 3) as compared to baseline. In contrast to the default mode network, functional connectivity in the executive control network did not change. In the other study groups (male-to-females and controls) functional connectivity in both the default mode network and executive control network remained stable between the two scan sessions.

Conclusion

Functional connectivity within the default mode network appears to be affected by testosterone treatment in female-to-male transgender persons.