Definition & Synopsis of the Etiology of Gender Variance

Gender Identity Research and Education Society

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1. Gender variance (still sometimes referred to as gender identity disorder) describes an inconsistency between the physical phenotype and the gender identity[1], that is, the self identification as a man or as a woman. When this is experienced in a very extreme form, known as transsexualism[2], individuals may need to adapt their phenotype through hormones and surgery to make it congruent with their gender identity. Individuals experiencing this condition are referred to as trans people, that is, trans men (those who transition from living as women to living as men) and trans women (those who transition from living as men to living as women).

2. Transsexualism can be considered to be a neuro-developmental condition of the brain[3]. Several sex dimorphic nuclei have been found in the hypothalamic area of the brain (Allen & Gorski, 1990; Swaab *et. al.*, 2001). Of particular interest is the sex dimorphic limbic nucleus called the central subdivision of the bed nucleus of the stria terminalis (BSTc) which appears to become fully volumetrically sex differentiated in the human brain by early adulthood. This nucleus has also been found to be sex dimorphic in other mammalian and avian species (Miller *et. al.*, 1989; Grossmann *et. al.*, 2002). In human males the volume of this nucleus is almost twice as large as in females and its number of neurons is almost double ($P < 0.006$) (Zhou *et. al.*, 1995; Kruijver *et. al.*, 2000; Chung *et. al.*, 2002).

3. The Kruijver *et. al.* study, cited above, indicates that in the case of transsexualism this nucleus has a sex-reversed structure. This means that in the case of trans women ($n = 7$), the size of this nucleus and its neuron count was found to be in the same range as that of the female controls ($n = 13$) and, therefore, women in the general population. In the only available brain of a trans man, the

[1] The term gender identity is used in the UK to indicate the self-identification as a man or as a woman.

[2] The transsexual condition is also referred to in various ways (Diamond M, 2002) "Whats In a Name? Some terms used in the discussion of Sex and Gender". Transgender Tapestry.

[3] The UK government recognises that transsexualism is not a mental illness. See Lord Chancellors Department (now renamed Department of Constitutional Affairs)— government policy concerning transsexual people

volume and structure of this nucleus was found to be in the range of the male controls ($n = 21$) and, therefore, men in the general population. It is hypothesised that this male-like BSTc will be present in other trans men as well. These findings were independent of sexual orientation and of the use of exogenous sex hormones. In the 42 human brains collected for this study, the BSTc was found to have a structure concordant with the identification as man or woman. It is inferred that the BSTc is an important part of a sex dimorphic neural circuit, and that it is involved in the development of gender identity (Kruijver *et. al.*, 2000).

4. Sexual differentiation of the mammalian brain starts during fetal development and continues after birth (Kawata, 1995; Swaab *et. al.*, 2001). It is hypothesised that in humans, in common with all other mammals studied, hormones significantly influence this dimorphic development although, at present, the exact mechanism is incompletely understood. It is also postulated that these hormonal effects occur at several critical periods of development of the sexual differentiation of the brain during which gender identity is established, initially during the fetal period, then around the time of birth; and also post-natally. Factors which may contribute to an altered hormone environment in the brain at the critical moments in its early development might include genetic influences (Landn, 1999; Coolidge *et. al*, 2002) and/or medication, environmental influences (Diamond *et. al.*, 1996; Whitten *et. al.*, 2002), stress or trauma to the mother during pregnancy (Ward *et. al.*, 2002; Swaab et. al., 2002).

5. Gender identity usually continues along lines which are consistent with the individual's phenotype, however, a very small number of children experience their gender identity as being incongruent with their phenotype. Adult outcomes in such cases are varied and cannot be predicted with certainty. It is only in a minority of these children that, regardless of phenotypical socialisation and nurture, this incongruence will persist into adulthood and manifest as transsexualism (Green, 1987; Ekins, 1997; Prosser, 1998; Di Ceglie, 2000; Ekins & King, 2001; Bates, 2002).

6. As stated, in trans people, a sex-reversed BSTc has been found. The findings of a specific sex-reversed brain organisation in trans people provides evidence consistent with the concept of a biological element in the etiology of transsexualism. The evidence for an innate biological predisposition is supported by other studies, one

example of which, indicates a higher than average correlation with left-handedness (Green & Young, 2001). Where the predisposition for transsexualism exists, psycho-social and other factors may subsequently play a role in the outcome, however, there is no evidence that nurturing and socialisation in contradiction to the phenotype can cause transsexualism, nor that nurture which is entirely consistent with the phenotype can prevent it (Diamond, 1996). There is further clear evidence from the histories of conditions involving anomalies of genitalia, that gender identity may resolve independently of genital appearance, even when that appearance and the assigned identity are enhanced by medical and social interventions (Imperato-McGinley *et. al.*, 1974; Imperato-McGinley *et. al.*, 1979a; Imperato-McGinley *et. al.*, 1979b; Rsler & Kohn, 1983; Meyer-Bahlburg *et al.*, 1996; Diamond, 1997; Diamond &Sigmundson, 1997; Kipnis & Diamond, 1998; Reiner, 1999; Reiner, 2000). It is not possible to identify one single cause for transsexualism: rather, its causality is highly complex and multifactorial. The condition requires a careful diagnostic process, based largely on self-assessment, facilitated by a specialist professional.

7. In conclusion, transsexualism is strongly associated with the neurodevelopment of the brain. (Zhou *et. al.*, 1995; Kruijver *et. al.*, 2000). The condition has not been found to be overcome by contrary socialisation, nor by psychological or psychiatric treatments alone (Green, 1999). Individuals may benefit from an approach that includes a programme of hormones and corrective surgery to achieve realignment of the phenotype with the gender identity, accompanied by well-integrated psychosocial interventions to support the individual and to assist in the adaptation to the appropriate social role (Green and Fleming, 2000). Treatments may vary, and should be commensurate with each individuals particular needs and circumstances.

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