

# 19 Essentially a Lie

## Challenging Biological Essentialist Interpretations of Transgender Neurology

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Claims about intrinsic and permanent brain differences have long been used to perpetuate power and status disparities between social groups, including between women and men (Rippon, introduction). While assertions of women's neural inferiority to men are now widely rejected, the concept of the gendered brain has persisted in public thought. This assumption has come under recent debate, as some studies suggest that every brain consists of a unique 'mosaic' of feminine, masculine and shared brain qualities (Joel et al. 2015), and others counter that individual mosaics nonetheless follow predictable patterns corresponding to gender and/or sex (Chekroud et al. 2016). As a result, many unanswered questions remain surrounding the infallibility of interpreting the brain along monolithic sex or gender lines.

Ambiguities notwithstanding, the brain is an intriguing frontier of study for transgender and nonbinary communities who hope that its patterns will help them prove and affirm their own gender identities to medical and legal authorities that act as gatekeepers to their accessing basic rights. Even though trans people have been documented for millennia,<sup>1</sup> their modern existence is often plagued by continued demand for proof of their genders' legitimacy. On the line are access to housing, jobs, public accommodations, bathrooms, healthcare, identity documents accurately reflecting gender identity and safety from violence, among other concerns.<sup>2</sup> As the visibility and voice of trans communities have soared through globalisation and social media networking, the struggle for trans rights has faced an additional challenge in a retaliatory wave of far-right politics. Amid a surge of visibility of conservative factions such as the so-called Alt-Right and their public support by top public officials including the 45th president of the United States,<sup>3</sup> anti-LGBTQ hate crimes have increased while trans rights and legal protections have been stripped.<sup>4</sup>

Neuroscience evidence that trans people are who they say they are, therefore, is promising ammunition for trans people's struggle to exist and be recognised in a society and medical arena that can be overtly hostile to their survival. However, this information can also be recast to reinforce power imbalances and prevent trans people from accessing basic rights such as medical care. One recent review selectively cited trans

neuroscience research and proposed new treatments for gender dysphoria to ‘restore’ trans people to their sex assigned at birth (Gliske 2019). While the article was later corrected and the treatment recommendations were removed by the publisher<sup>5</sup>, the need for improved education surrounding trans neuroscience research remains. In order to prepare people to take down hate and bigotry, it pays to be informed—not only about the state of neuroscience studies containing trans people, but on how conservative factions respond to those studies, and how to respond to those conservative messages. It is through this lens, and for these causes, that this chapter is written.

### **Tools for Interpreting Trans Neuroscience Articles**

An overarching question shapes every study, and in studies of trans neuroscience, these questions often focus on the extent to which trans people’s brains reflect their gender identity or their sex assigned at birth. To this purpose, these studies frequently compare trans brains with those of cis people sharing their gender identity and/or sex assigned at birth. By contrast, other studies recruit trans populations to uncover how hormones influence the brain across sex and gender. Importantly, whatever question drives a research project determines participants’ recruitment across scales of age, sex assigned at birth, gender identity and sexual orientation. Diverse cross-sections of these variables between studies often prevent one-to-one comparisons of their results. For instance, a study investigating how gender identity relates to brain activation might contain both cis and trans adult women and men as comparison groups, while a study on the structural impact of hormones during brain development might exclusively track kids who identify as trans before and after they hit puberty or start hormones; in turn, both might include or neglect to account for sexual orientation as a variable. Although they would both generate new knowledge for the field of trans neuroscience, the applicability of each study’s results would be limited to the populations they contain.

Sociocultural biases are inherent to time and place of research, and pose further challenges for interpreting trans neuroscience research. Besides influencing which questions and tools researchers employ, these biases can complicate participant recruitment and data collection. As a minority population, the pool of trans participants available to researchers is shallow compared to cis-exclusive studies, and this selection problem is compounded by the process of controlling for variables—e.g. binary gender identity, sexual orientation, sex assigned at birth, hormonal status, age, handedness, family structure, education—within the population. Similarly, most studies implicitly or explicitly exclude those whose gender does not conform to a woman/man binary. Additionally, considering how a history of gatekeeping resources by the medical and research professionals may influence how trans people answer their

questions, it becomes clear that even the best-designed study is vulnerable to profound challenges to its generalisability.

Thus, when interpreting trans neuroscience studies, please resist the temptation to claim a single study's results prove any broad fact about the trans brain. The media loves sensationalising results, but that approach is not true to the science. Instead, consider individual studies in the context of previous studies' findings: did they ask the same questions? How might their differences between populations, techniques, timepoints and parts of the brain studied affect the congruence of their findings? No data exist in a vacuum—that is to say, only through consideration of the field as a whole can we begin to piece together the most likely story for what is truly going on in trans brains.

### **Common Words and Phrases**

For ease of comprehension and continuity, I normalise language between studies throughout this chapter. I refer to individuals whose gender identity differs from the sex they were assigned at birth as 'transgender' or 'trans' and 'nonbinary', and to individuals whose gender identity aligns with the sex they were assigned at birth as 'cisgender' or 'cis'. I assign 'woman/girl' or 'man/boy' in conjunction with trans or cis labels based on the reported gender identity of individuals or groups, and use 'male' and 'female' to reference assigned sex, e.g. I translate 'a male-to-female transsexual' to 'trans woman'. I interpret sexuality through gender identity rather than assigned sex, e.g. a trans man described exclusively attracted to women is heterosexual. I call the medications trans people take to suppress their hormone production 'hormone blockers' and 'hormone suppressors', and refer to those who have never undergone hormone therapy as 'hormone therapy-naïve'.

Because gender has never been reliably identified in an animal model, its study relies on two methods that can be reliably used in humans: examining post-mortem brains, and peering into living brains with neuroimaging. Common to the latter is magnetic resonance imaging (MRI), a noninvasive brain scan technique. Researchers can query brain activity with functional MRI (fMRI), or examine brain structure through techniques that identify grey and white matter. Grey matter consists of neurons' cell bodies and synapses, the points of communication between neurons, while white matter consists of neurons' insulated axonal channels that transmit information between regions of grey matter. If the brain were a complex telephone system, the grey matter would be the mouthpieces and receivers where the conversation between neurons is spoken and then heard, while the white matter would be the long telephone lines carrying messages from one neuron to another. The MRI variant used to investigate white matter structure is called diffusion tensor imaging (DTI).

## Major Hypotheses on the Neuroscientific Origins of Gender Identity

To understand transgender neuroscience research, it is helpful to become familiar with common hypotheses that have helped drive and shape the research over decades. The first hypothesis posits that trans-spectrum genders emerge because trans people are born with the right brain in the wrong body. The ‘right brain, wrong body’ hypothesis, as I refer to this perspective, is in line with popular discourse and may have been shaped by trans people’s need to convince authorities that they are valid to gain access to rights and resources. This hypothesis has also been influenced by findings that sexual differentiation of the brain and body occurs in utero at distinct time points. However, this hypothesis fails to account for the environmental interactions with the brain, including through lived gender experiences, and applies most directly to people whose non-cis identities become apparent to them in early life.

An alternative hypothesis, and one that attempts to account for a role of the environment in gender development, is the ‘body self-perception’ hypothesis. The ‘body self-perception’ hypothesis of gender identity proposes that gender identity emerges as an interaction between developmental neurology in brain areas processing one’s relationship with one’s body, and environmental influences including lived experiences in and of one’s body. In this model, gender is a dynamic expression of the interaction between these elements. Accordingly, those who experience a trans-spectrum gender may find their differential relationship with their body represented within their brain.

## Structural Studies

### *Structural Differences in Postmortem Tissue*

In the 1990s, researchers turned to the brain for answers after ‘the genetics, gonads, genitalia, or hormone level of transsexuals ha[d] not, so far, produced any results that explain their status’ (Zhou et al. 1995). Studies had suggested that the brain and body might experience sexual differentiation at distinct time points in utero, revealing the hypothesis that a person’s body could develop as one sex while their brain developed as another. Researchers tested this hypothesis in two areas of the brain previously shown to be bigger in cis men than cis women: the core of the bed nucleus of the stria terminalis (BSTc) and the third interstitial nucleus of the anterior hypothalamus (INAH3). They found that in a small cohort (fewer than a dozen participants), trans women’s brains had cell counts and volumes similar to cis women and distinct from cis men, and one trans man’s values fell in the ranges of cis men (Zhou et al. 1995; Kruijver et al. 2000;

Garcia-Falgueras and Swaab 2008). When hormonal status and sexuality were not found to be driving factors of the effects they saw, it was concluded that these studies supported the ‘right brain, wrong body’ hypothesis of trans gender identities.

### *Grey Matter Differences*

#### *Studies of Hormone Therapy-Naïve Trans People*

When MRI techniques bloomed around the turn of the twenty-first century, trans neuroscience studies adopted the technique to answer how the grey matter of trans and cis people compares across genders and sexes—although the extent of grey matter differences between cis women and men remains a point of controversy to this day (Sanchis-Segura et al. 2019). Researchers who compared brain grey matter volumes between cis teenagers and trans teens who were either hormone therapy-naïve, on hormone blockers, or undergoing hormone therapy found that independent of hormonal status, trans brains only resembled cis brains sharing their gender identity in regions shown to differ between cis boys and girls (Hoekzema et al. 2015). Studies in hormone-naïve trans adults also found that grey matter volumes of trans women and men aligned with cis women and men, respectively, in regions demonstrating differences between cis groups (Zubiaurre-Elorza et al. 2013). Moreover, cisgender identity- and sex-aligning regions clustered separately in trans people when differences between cis groups weren’t accounted for (Simon et al. 2013). These results suggest that grey matter structure may be developmentally organised in trans people along the lines of cis people sharing their gender, giving some support for the ‘right brain, wrong body’ hypothesis.

Giving support to the ‘body self-perception’ hypothesis, grey matter in hormone therapy-naïve trans men aligned with cis women except in body self-perception areas, where their values were greater than both cis women and men (Manzouri et al. 2017). In a followup study including trans women and accounting for sexual orientation, trans brains’ elevated cortical thickness in regions related to body self-perception persisted (Manzouri and Savic 2018). These results suggest that a distinct and nuanced course of neural development in trans individuals may underlie some of the differences in relating to one’s body common to trans experiences.

#### *Longitudinal Grey Matter Changes throughout Hormone Therapy*

Trans participants who pursue hormonal means of gender affirmation are sometimes recruited to study the organisational-activational hypothesis, which proposes that sex hormones set up or organise the brain in

uterus and early life, and then activate the brain during and after puberty along these developmental patterns. However, some of these studies assume that trans brains are identical to cis brains at baseline, and do not compare trans groups to cis groups or track all groups over multiple timepoints. This limits their applicability to questions of gender identity development.

Limitations notwithstanding, studies have found that grey matter in trans people fluctuates with hormone therapy. Global cortical thickness increased in trans men and decreased in trans women (Zubiaurre-Elorza et al. 2014), while on the regional level, hormones decreased grey matter in trans men's Broca's and Wernicke's language areas (Hahn et al. 2016) and trans women's hippocampus—a structure important for learning and memory (Seiger et al. 2016). In addition, grey matter structure changed with hormone therapy in areas related to body perception in trans men (Mueller et al. 2016; Burke et al. 2017) and trans women (Spizzirri et al. 2018). Single timepoint comparisons, however, showed grey matter aligned with cis brains sharing assigned sex in regions related to emotional processing and reinforcement learning areas in trans women, and a region of motivation and reward processing in trans men (Mueller et al. 2016). Similar to studies of grey matter organisation, these results reveal that activation changes in grey matter in trans brains sometimes follow cis people along gender or sex lines, but other times follow a path that is entirely their own.

## *White Matter*

### *In Hormone Therapy-Naïve Trans People*

The state of white matter organisation relative to gender and sex in trans people naïve to hormone therapy is contested. While one study showed comparable white matter structure in trans and cis men across the brain (Rametti et al. 2011), others found white matter aligned according to gender in trans and cis people exclusively in a tract connecting brain regions important to body self-perception (Burke, Manzouri, and Savic 2017; Manzouri and Savic 2018). Yet another study found comparable white matter measurements across both gender and sex (Spizzirri et al. 2018), contrasting a study that found unique interhemispheric connectivity signatures indicating distinct white matter patterns in trans women and trans men (Hahn et al. 2015). While methodological differences like inclusion of homosexual participants (Rametti et al. 2011; Spizzirri et al. 2018) may explain some of the conflict between studies' findings, the current lack of a clear story in the literature precludes any conclusions about the impact of gender or sex in white matter of hormone-naïve trans people.

### *White Matter Microstructure before and during Hormone Therapy*

Trans women and men appear to exhibit distinct activational effects of hormone therapy on white matter ultrastructure, but this conclusion is confounded by studies' methodological diversity. With hormone therapy, trans men demonstrated increased white matter coherence in regions related to spatial awareness and fine motor skills (Rametti et al. 2012), higher order language function (Hahn et al. 2016), visual processing (Burke et al. 2017) and body perception (Case et al. 2017). White matter structural correlations with hormone levels were also reported in trans men (Kranz et al. 2017). Yet, while trans women with at least two years of hormone therapy aligned with cis groups per sex and not gender in volume of their corpus callosum (Mueller et al. 2016), a communications hub between right and left lobes of the brain, changes in the corpus callosum's structure were nonetheless evident in trans women over their first few months of hormone therapy (Kranz et al. 2017). In turn, another study found no white matter differences between cis women and men and trans women who averaged three years on hormone therapy (Spizzirri et al. 2018). The lack of coherence in findings between these studies is confounded by dissimilarities in their study design. Disparities in use of cis men and women as comparison groups, longitudinal measurements and consideration of white matter fluctuations that occur in cis women and men (Kranz et al. 2017) prevent any unified conclusions from being drawn, while underscoring the field's need for more research.

### **Functional Studies**

#### *In Children and Adolescents*

Brain activity of trans adolescents on hormone blockers typically followed patterns of cis youth sharing their gender and departed from cis youth sharing their assigned sex. This pattern was observed in frontal activation of trans boys during a mental rotation task (Burke et al. 2016), in trans girls' and boys' hypothalamic response to smelling the steroid hormone androstenedione (Burke et al. 2014), in trans teens' activation trends in a speech production region during a verbal fluency task (Soleman et al. 2013) and even at rest in trans girls' and boys' sensorimotor and 'mind wandering' networks (Nota et al. 2017). At odds with this tendency were studies that found distinctive activation of a resting state visual network in trans girls (Nota et al. 2017) and sex-congruent activity in trans teens during an executive functioning task (Staphorsius et al. 2015). By contrast, prepubertal trans boys and girls showed, respectively, intermediate and sex-consistent hypothalamic responses to androstenedione (Burke et al. 2014), while hormone

blocker-naïve trans youth showed activity patterns intermediate to cis boys and girls during an executive functioning task (Staphorsius et al. 2015). These results imply that gender-congruent organisation of the trans brain may be ongoing, even up to the point of puberty, when it may be masked by activational effects of a gender-incongruent hormonal balance.

### *In Adults*

#### *Trans Individuals Naïve to Hormone Therapy*

Functional neuroscience studies in hormone therapy-naïve trans adults demonstrate that trans people process their bodies and voices differently than cis adults independent of hormone therapy's activational effects. Following a study showing that trans men think about—rather than perceive—their bodies differently than cis men and women do (Feusner et al. 2016), trans men showed weaker connectivity in resting-state self-body identification networks than cis men and women (Feusner et al. 2017), including between brain areas moderating body perception and ownership (Manzouri et al. 2017). This pattern was recapitulated in trans women and men even when considering sexual orientation as a covariate (Manzouri and Savic 2018). Then, trans women exhibited distinct activation patterns compared to cis men and women in regions associated with vocal identity and emotional processing during a vocal processing task (Junger et al. 2014), while trans men showed activational differences from cis women in a region related to higher order language processing and internal body awareness (Smith et al. 2018). These results suggest that environmental elements of gender, including a person's embodied experiences, may work together with neurological substrates of gender differently in trans and cis populations.

#### *Trans Individuals during Hormone Therapy*

Neurological changes have been linked to hormonal shifts in trans adults across diverse functions. Hormone level changes correlate with molecular signalling changes in trans men and women, shown by altered serotonin receptor binding (Kranz et al. 2014), and with language-related changes in trans men, shown by enhanced resting state functional connectivity in Broca's and Wernicke's language areas (Hahn et al. 2016). Yet, in the face of evidence that resting state brain activity correlated with hormone levels trans men (Mueller et al. 2016a), hormone levels failed to correlate with trans men's reduced brain activation compared to cis women while viewing pictures of positive affect (Soleman et al. 2016). It is clear that hormones are only one aspect of the activational story.

Similarly, trans women showed decreased connectivity compared to cis people at baseline, but longitudinal hormone therapy led to rescue of connectivity in areas important to emotional processing (Spies et al. 2016). The emerging relationship between hormone therapy and brain plasticity is thus revealed to be a complex play of direct effects and indirect influencing.

Functional studies in adults on hormone therapy also added to the evidence of neural distinctions in body self-processing networks between trans and cis people. Trans men had weaker resting state connectivity in body awareness-related regions than cis women and men before hormone therapy, and showed strengthened connectivity in these regions with hormone therapy (Burke et al. 2017). Relatedly, trans men showed altered activation compared to cis women in regions of sensory and emotional processing during chest stimulation, and these effects were independent of hormone therapy status (Case et al. 2017). Together, these results indicate that trans people relate to their bodies differently than cis people, both in sensory and reflective capacities.

Following this evidence, it is clear that the complex relationship between gender, the brain and the environment is not sufficiently described by the 'right brain, wrong body' hypothesis. In turn, the 'body self-perception' hypothesis has some traction within the literature, and reflects gender may be based on a nuanced interplay brain and environment. However, the complexity of that model may produce interpretive ambiguity, and thus is low hanging fruit for rejection by conservative people and those already in doubt regarding the validity of trans experiences.

### **The Response by Conservative Factions**

One doctor who responded to studies of the neuroscience of trans people and is heavily cited among Alt-Right communities is Paul R. McHugh. McHugh was the director of the Department of Psychiatry and Behavioral Science and Henry Phipps Professor of Psychiatry at Johns Hopkins University from 1975 to 2001. Importantly, he headed the decision to shut down the transgender health centre at Johns Hopkins in 1979 based on his belief that medically treating transgender communities was doing more harm than good. In 2016 McHugh published a 143-page, non peer-reviewed self-described 'opinion piece for the general public' ('Anti-LGBT Doc Paul McHugh: I Will Not Be Silenced' Daily Beast) that included 35 pages of his interpretation of sex, gender and neuroscience of both (Mayer and McHugh 2016). Within this text, McHugh denied the neurological basis of gender and transgender identities, instead suggesting their exclusively environmental origins. The reaction to this article was swift and widespread. Medical communities petitioned Johns Hopkins to distance itself from the piece, while conservative audiences lauded its conclusions. While there are numerous

tools and fallacies used to advance the article's contents, the three discussed here are favouring simplicity over complexity, biological essentialism and misrepresentation of scientific methodology.

### *Simple versus Complex: The Hook*

Social psychology studies have revealed an ideological divide related to simplicity and complexity between politically conservative and liberal people. Compared to people with liberal viewpoints, conservative people favour simplicity (Wilson 1973) and cognitive closure (Wilson 1990), are intolerant of uncertainty and ambiguity (Jost et al. 2003) and are more likely to perceive and react strongly to negative stimuli (Hibbing et al. 2014). McHugh's article caters to conservative readers by providing simple explanations for gender, and capitalises on their emotional response by painting gender complexity as a threat to the gender binary status quo.

McHugh's complicity with simplification emerges in his introduction, long before he touches any neuroscience. When McHugh describes the growing cultural understanding of gender's nuances—including transgender and nonbinary identities—as 'fluid and plastic', he links it to the 'overthrowing of traditional gender roles' that he opines leads us to 'lose any common set of criteria for defining what gender distinctions mean' (Mayer and McHugh, 88). By focusing on destabilisation, McHugh paints trans people's mere existence as threatening his readers' genders. Realistically, genders beyond a strict natal binary are widely recognised across time and cultures (Evolution's Rainbow), and do not eclipse people with binary genders, who are free to retain their gender identities. Instead, the issue at hand remains

how to create a world in which those who understand their gender and their desire to be nonnormative can live and thrive not only without the threat of violence from the outside but without the pervasive sense of their own unreality.

(Butler 219)

Far from cultural collapse, the aim of reconstructing—or deconstructing—gender is to shape gender cultural norms to reflect reality and support trans people's survival rather than fight it.

Yet, by founding his chapter on a fight to save traditional interpretations of gender, McHugh invites his conservative readers to champion gender from the narrow lens of who impregnates and who gestates offspring. Even as McHugh employs examples from 'the diversity of the animal kingdom' and 'the diversity of human behavior', he boils down extensively documented (Evolution's Rainbow) variations in animal and human biology and gender to sexual reproduction: 'the scientific definition of

biological sex is, for almost all human beings, clear, binary, and stable, reflecting an underlying biological reality that is not contradicted by exceptions to sex-typical behavior, and cannot be altered by surgery or social conditioning' (Mayer and McHugh, 93). By evoking the authority of science and biology and the absolutism of terms like 'clear, binary, and stable', McHugh is able to sidestep the admission that 'almost all' people does not mean everyone. This gives him space to ignore trans and nonbinary populations, as well as natural spectra of sex and gender, that exist outside of his narrow definition, and establishes the hierarchical authority of the body for use during later discussions of gender in the brain.

McHugh also emphasises that compared to his definition of sex, '*gender identity* is a more subjective attribute' (93). While this interpretation agrees with individuals' unique experiences of gender, McHugh unfortunately conflates subjectivity with choice. McHugh claims that transgender people 'choose to identify as a gender different from their biological sex' (93) and that 'gender identity can be a complex and burdensome issue for those who choose (or have others choose for them) a gender identity opposite their biological sex' (94). In these claims, he throws the burden of blame for societal issues on trans people, and undermines trans people's authority on their own genders.

Once this power dynamic is established, McHugh switches tack to another philosophy: biological essentialism.

### ***Biological Essentialism: The Twist***

As an update to Plato's classical essentialism in which categories such as 'man' and 'woman' have conceptual, 'essential', true forms that the physical world imperfectly aspires to, modern essentialism incorporates advancements in scientific understanding. Essentialism is currently used to indicate 'a belief that certain phenomena', including sex and sexual determination, 'are natural, inevitable, universal, and biologically determined' (DeLamater and Hyde 1998), and are indelibly linked with the binary sex assignment made as early as conception. Via essentialism, a person's sex has 'a specific essence that outlives all changes and which defines its true nature' (Voell 2013). However, the staidness of essentialist philosophy and its rejection of categorical fluidity are shortcomings explored through developmental psychology.

Essentialism in psychology manifests in childhood as 'a 'placeholder' notion' whereby 'one can believe that a category possesses an essence without knowing what the essence is' (Gelman 2005). Children will perceive traits of one member of a category to apply to other members of a category, and to be innately driven. For instance, a child may see a superficial trait of a person categorised as a girl, such as wearing a dress, as innate to the category of 'girl'. They may then use essentialist reasoning to conclude that all girls wear dresses, and 'assume that a boy that

wears a dress will become a girl' (Heyman and Giles 2006). However, by nature, 'many essentialist explanations provide little in the way of concrete mechanisms', and in fact are 'not much of an explanation at all' (Heyman and Giles 2006). It is perhaps in light of these shortcomings that use of the term 'essentialism' is rarely self-championed, and instead is 'generally used by those who are opposed to it, not by those who practice it' (DeLamater and Hyde 1998). Despite the stigma, essentialist practices remain prevalent across ages and society, and are frequent within McHugh's texts.

McHugh's essentialism operates on three central tenets: '(a) a belief in underlying true forms or essences; (b) a discontinuity between different forms rather than continuous variation; and (c) constancy, that is, the absence of change over time' (DeLamater and Hyde 1998).

### *True Forms and Essences*

A sexual binary rooted in reproductive biology and dominant to other gender identification systems is at the core of McHugh's essentialism. McHugh states that 'universally, the male of the species fertilizes the egg cells provided by the female of the species', and thereby crafts a 'conceptual basis for sex roles [that] is binary and stable' (Mayer and McHugh, 89)—even though arguably this concept's stability derives from ignoring evidence of more complex spectra of sex and gender. Yet, dismissing evidence of complexity is necessary for McHugh to promote his essentialist concept. When McHugh states that 'the ability to recognize exceptions to sex-typical behavior relies on an understanding of maleness and femaleness that is independent of these stereotypical sex-appropriate behaviors' (89), he invokes ideals of male and female 'true forms' independent of real-life conditions. McHugh maintains that his sex role binary supersedes reproductive system variations, behavioural designations and other observable manifestations of gender and sex, implying that 'understanding the reproductive system and the reproduction process' has more value than 'arbitrary' scientific evidence (90). Forget data; through essentialism, interpretations of a given reproductive system's 'intended purpose' are enough to cement an individual into a male or female category that designates their gender for them.

The same supremacist conceptualisation of reproductive system and sexual roles holds when McHugh appraises neuroscience data, especially when the data support a complex reading of sex and gender and allow for gender self-designation. McHugh's first direct reference to the brain establishes its inferiority to sexual anatomy while hypothesising about gender dysphoria's origins: 'primary sex characteristics such as genitalia develop normally while secondary sex characteristics associated with the brain develop along the lines of the opposite sex' (97). McHugh blocks arguments of gender supported by neuroscience data by downgrading

the brain and favouring sex organs—upon which reproductive intention, and thus sex assignment, can be written. This serves as another step in preserving McHugh’s ‘your sex is your gender’ status quo—a standpoint which previously fed McHugh’s decision to shut down Johns Hopkins’ gender affirming surgeries in 1979 (McHugh, ‘Surgical Sex’).

### *Discontinuity over Continuous Variation*

Through his insistence on a binary reading of reproductive biology, McHugh actively ignores naturally occurring spectra of other biological systems even as he references them. As an example, within genetics, McHugh declares that human ‘males have XY chromosomes and females have XX chromosomes’ (Mayer and McHugh, 89) and he dismisses ‘genetic abnormalities’ as ‘rare phenomena’ (97). Not only does McHugh fail here in capturing the wide array of viable XY permutations that exist in humans (Fausto-Hubbard), but he falls prey to classifying X and Y as female and male ‘sex chromosomes’—itself a social construct rather than an objective truth dictating sex or gender (Richardson 201).

When McHugh assigns gender based on a presumed genetic binary, he follows a centuries-old essentialist tradition: ‘throughout the twentieth century, and now in the twenty-first, geneticists have used sex chromosome studies to argue that there are new, additional, or “deeper” differences between males and females than once thought’ (Richardson 202). The hidden truths of gender that essentialists promise lie in genetics are also based on missing data. Chromosomal karyotyping remains rare, and most individuals’ assignment of XX or XY makeups derives from assumptions based on other cues— even superficial traits like ‘large hands, prominent Adam’s apples, and thick facial features’ (McHugh, ‘Surgical Sex’). This essentialist reading of genetics also denies the environment’s powerful role in modulating gene expression via epigenetic actions. By omitting evidence of the nuanced interplay between genes and the environment, McHugh preserves his ‘biology is destiny’ myth.

The historical and social trails behind assigning binary sex to physiology have been traced at length through multifold contexts, of which genetics (Richardson), anatomy and hormones (Fausto-Hubbard), neuroscience (Rippon, Jordan-Young) and intersex conditions (Davis) are a few examples. McHugh blindly carves forward when he forces a binary onto people with intersex conditions, describing people who ‘possess both male and female gonads and sex organs’ (Mayer and McHugh, 97), or lack ‘receptors for male sex hormones, leading them to develop the secondary sex characteristics of females, rather than males’ (96). Through perseverating on a male/female binary, McHugh ignores research that ‘approximately 1.7% of all live births do not conform to a

Platonic ideal of absolute sex chromosome, gonadal, genital, and hormonal dimorphism' (Blackless et al. 2000). This erasure of the ranges of human sex and gender in favour of a female/male binary is statistically akin to dismissing the existence of redheaded people in favour of blonde and brunette people—and equally as absurd. Yet, perpetuating an idealistic binary, even when it is divorced from reality, is a step McHugh must take for his essentialist views to survive.

### *Constancy over Time*

As the final cornerstone of his essentialism, McHugh portrays his female and male true forms as eternal and irrefutable, first by refusing to validate gender transitions. McHugh's language concerning real and imagined transgender people tethers them to their sex assigned at birth, whether he is inventing 'a biological male who identifies himself as a female' (Mayer and McHugh, 95), or describing an 'FtM twin [who] exhibited gender-nonconforming behavior early' and was attracted 'to other girls' (99). McHugh construes transitioning as a choice, and therefore temporary, with language like 'identifies himself' and 'exhibited gender-nonconforming behavior'. The implied spontaneity of these phrases demonstrates McHugh's devaluation of gender self-proclamations, and contrasts the worth that he assigns reproductive biology. McHugh highlights that valuation by emphasising that the latter individual's 'twin sister was married and the mother of seven children' (99)—implying that that individual's 'true form' persists despite their transition. By later staking transgender people's 'biological gender' against their 'preferred gender' (101) while discussing neuroscience results, McHugh further signals his view that gender identities are temporary creations secondary to steadfast reproductive biology.

McHugh's description of gender notably stands in direct opposition to language used by the American Psychiatric Association (APA), the largest association of scientists and psychologists in the United States and a widely respected authority in psychiatry. The APA accepts the distinction of a person's gender identity from their 'initial assignment as male or female at birth' (What Is Gender Identity?), contradicting McHugh's essentialist argument that binary sex as assigned at birth is the first and ultimate authority on a person's gender. In turn, McHugh can only imagine the divergence of a person's sex and gender following extreme environmental interventions like childhood abuse (Mayer and McHugh, 99), maladaptive psycho-social traits (102), family dynamics (107) or developmental issues (108)—arguments also historically used to pathologise homosexuality as a mental disorder. The discussion of these factors indicates the lengths McHugh is willing to go to defame gender identity when it shifts beyond his constructed constant of reproductive biology as sex.

In all, the biological essentialism that McHugh wields is myopic by design. Even as he cites researchers stating that transgender identities are ‘likely to be associated with multiple genetic, epigenetic, developmental and experiential influences’ (99), McHugh rejects views of gender identity that contradict its establishment by the reproductive biology that he infers from sex assigned at birth and a collection of other physiological traits. However, McHugh’s painstaking argument outlining exactly what concepts reproductive biology consists of (sperm and eggs), signifies (impregnation and gestation) and intends (producing offspring) regardless of the presence and experience of these traits in people’s actual lived lives remains, ironically, as constructed as the brain-based methods of determining gender that he aims to undermine.

### *Spin and Procedural Criticism: Attacking the Scientific Method*

After staring down the long barrel of evidence of differences between trans and cis people’s brains, McHugh performs a series of rhetorical gymnastics to manoeuvre and misconstrue those findings. Tactics he uses to cast doubt on research he cites are downplaying the evidence through research method double standards, discrediting studies through selective statistical interpretations and dismissing conclusions through the perfectionist fallacy.

### *Research Method Double Standards*

As he resists validating studies showing the confluence of neuroscience and gender identity, McHugh repeatedly appeals to study size. Notwithstanding his own use of case studies (92), McHugh describes a study as ‘limited by its small sample size’ (98), downplays another because ‘with a sample size of one, this study’s statistical power is virtually zero’ (101) and claims the whole field of gender identity neuroscience is ‘many small studies’ (98) despite citing a study with participants numbering hundreds. If the field consisted of the scant four studies that McHugh cites, the numbers might actually be a problem. However, with more than two decades of research history and dozens of trans neuroscience research papers illustrating the complex structural and functional coding of gender in trans brains, the ‘many small studies’ begin to add up to highlight the tiredness of this argument.

McHugh also chastises control group limitations to degrade study findings and advance his ideals. He bemoans one study’s omission of ‘a control group of transgender persons who desired to have sex-reassignment surgery but did not receive it’ (110), with the ethically alarming implication that denying people potentially lifesaving medical interventions is justifiable for the sake of experimental design. By offhandedly ignoring

the stakes of healthcare decisions, McHugh endorses upholding the status quo of trans oppression in the name of science as not a big concern. McHugh's advocacy for trans erasure via control groups also surfaces when he cites a study that relies on 'matched heterosexual controls' (101)—when the sexuality of the transgender individuals is not considered as a variable at all. Peering through McHugh's smokescreen of caring for scientific design reveals that he only truly cares about smart design when it favours cis people—regardless of the fallout for trans people.

Another point of duplicity is McHugh's support for longitudinal studies. In theory, McHugh champions gold-standard study design: 'The only definitive way to establish epidemiological causality between a brain feature and a trait (especially one as complex as gender identity) is to conduct prospective, longitudinal, preferably randomly sampled and population-based studies' (103). He continues that to not do so 'severely limits our ability to understand causal relationships' (102) of gender identity. Yet, when a study using 30 years of trans population data violates McHugh's expectations by failing to indicate adverse outcomes of transitioning that would validate his and others' refusing trans populations medical care, McHugh blames timelines. To annul the negative results, McHugh declares that 'there were of course fewer years of data available at the time the study was conducted' for the dataset and suggests, on no evidence, that 'the later group may in time come to resemble the elevated risks of the earlier group' (111). However, McHugh's conclusion that 'sex-reassignment surgery may not rectify the comparatively poor health outcomes associated with transgender populations in general'—despite the negative results and in direct contradiction of the study's conclusion that without transitioning, 'things might have been even worse' (111)—indicates that he only accepts findings that enforce his bias. Calling for research design improvements turns out to be another feint masking McHugh's refusal to recognise the validity of transgender people's identities.

### *Selective Statistical Interpretations*

McHugh uses a selective reading of statistics as another way to promote his biases. He rejects significant results supporting neural representation of gender identity, suggesting they 'do not sufficiently support the notion that transgender individuals have brains more similar to their preferred gender' (101) and are 'insufficient to demonstrate that brain structure is a cause, rather than an effect' (104) of gender identity. The latter point, of course, is only a concern for gatekeepers like McHugh who do not accept trans people's authority on their genders, instead demanding—in true biological essentialist fashion—that they provide physiological proof of gender before he treats them with humanity. By contrast, McHugh has no problem inventing significance for results

he likes, i.e. results that group trans people with their sex assigned at birth. He attempts to overwrite null findings contradicting his beliefs by declaring that ‘the values, however, were typically closer to the males (that is, to those that shared their biological sex)’ (100). These rhetorical tricks show that McHugh does not actually value the scientific method as a tool for understanding the world, and that his true interests lie in appropriating science to spread his anti-trans dogma. Unfortunately, by doing so McHugh telegraphs to his followers that science is a tool best used to confirm ideas rather than uncover new knowledge about how the world works.

### *The Perfectionist Fallacy*

When McHugh can no longer minimise neuroscience findings supporting gender identity in the brain, he submits them to an impossibly high value threshold via the perfectionist fallacy: a logical flaw that any proposal or claim failing to perfectly meet acceptance criteria must be discarded. For example, by describing needing ‘prohibitively large’ sample sizes or current studies’ ‘inherent and ineradicable methodological limitations’ (103), McHugh employs fatalistic language to communicate that he views any research attempts to characterise gender in the trans brain as futile.

Applying his absolutist metric to evaluating gender identity as a whole, McHugh also posits that ‘biology only helps in predicting whether the individual is transgender if it can improve on the original guess that the person is not transgender’ (104). From this reasoning, McHugh deduces that moving the dial on the prediction that trans people’s neuroscience differs from cis people is ‘very difficult for a rare trait such as being transgender, because the probability of that prediction being correct is already very high’ (105). This suggests that McHugh would only believe in traits with a high population frequency or clear-cut etiology.

Imagine if McHugh applied this philosophy to a condition like depression. Only about 7% of adults in the United States experience a major depressive episode in a given year (NIMH, Major Depression), meaning that the best prediction for a single adult is that they are not depressed. Moreover, the traits that people exhibit when depressed are multifold, and depression’s etiology is also understood to be multifactorial—leaving healthcare professionals without a single-factor litmus test for depression. By McHugh’s idealist criteria, then, it may be nigh impossible to establish that a person is experiencing depression, and this lack of clarity would be enough to warrant refusing the patient access to medical treatments for their depression. McHugh might subsequently focus on treating the ‘psychological and social causes’ (Mayer and McHugh, 105) of the depression, even though many patients respond best to medication or a combination of medication and psychotherapy.

Contrary to McHugh's faulty beliefs, we know that trans people's gender identity is not a manifestation of mental illness, but a facet of human biological variation exhibiting historical and statistical regularity. What McHugh fails to grasp through his absolutist perspectives on gender is that even though the messy nature of biology can lead even the best designed studies to complex results, these results nonetheless collectively offer us a chance to start to understand how the brain and our lived experiences interact—and we would be quite closeminded to let that opportunity pass us by.

### **How to Respond to McHugh and Alt-Right Interpretations: Handling Complexity**

A main challenge to expressing the state of transgender neuroscience research is encapsulating the complexity of the findings into a deliverable message, especially given some of your audience's likely tendency and need to simplify. As is also present in McHugh's discourse, a common response to the literature is to dismiss findings from studies on trans neuroscience for a lack of clarity and consensus. One interpretation may be that without definitive evidence that transgender people's brains match the brains of cis people who share their gender identities, there is no reason to treat transgender identities as valid. The flip side of that message is that without definitive evidence that transgender people's brains lock to the neurological patterns of the sex they were assigned at birth, there is no reason to treat transgender identities as invalid. It may suffice to say that brains are a complex organ, that influences on brain development are numerous and that it is unrealistic to use individual variables like genes or external anatomy as means for classifying people's genders.

Another oversimplified rallying point is casting nature and nurture as a debate. Not even in laboratories do the two work in isolation from each other. Advancements in scientific understanding in human epigenetics, microbiome research and other fields continue to show the indisputable interplay of how environment and biology mutually shape each other. Likewise oversold is the likelihood that one individual experience or genetic component independently has a significant, profound impact on a human's brain and behaviour. There is no magic gene, hormone, life experience or other individual factor shown to determine sex or gender, and it seems unlikely that additional research will uncover a single factor as the exclusive determinant. Instead, as the story tends to go, a compendium of diverse factors can each have a say in the makeup of a person's sex and gender—factors that may be hormonal, genetic, epigenetic, social, linguistic. When someone references nature and nurture as distinctly categorical or hierarchical, you may therefore kindly correct their point of view since these factors are at a constant interplay, even before conception.

Teaching complexity when simplicity is both favoured and highly instilled requires creativity, patience and grace. To avoid blocking out new information in favour of the stability of former—albeit outdated—knowledge, one approach that could be tried is borrowed from improvisational comedy: the ‘yes, and’ maxim. Using this process, establish a point of commonality, such as the need for more research, and derive your arguments tangentially from that line of thought—for example, leading into the research findings that are currently available. Another possible point of approach derives from hostage negotiations: people in a defensive position find it easier to say yes after they have already said no.<sup>6</sup> Get the other party to say no first by posing a question that you know they will disagree with, and they may be more receptive to your points later on.

Another useful tool may be to distil your message down into a single sentence or small paragraph. In most cases, concise messages are most desirable and easiest to digest. For example, you could say ‘the field of transgender neuroscience as a whole supports trans people’s brains as distinct from the cisgender sex they were assigned at birth, and as aligning with cisgender brains with which they identify’. Preparing similar messages using concise language may help your audience digest your points, especially those who favour simplicity over complexity. By focusing on conclusions and consensus across studies, you may also avoid providing contrarians with tools for demanding justifications of individual studies’ minute details. For those conversants desiring direct evidence, consider providing an index of resources to which you can direct them. Many people may not know to reference more than a few articles. Giving them the tools and the onus of research may help you stay focused on your own messaging.

Finally, considering the breadth of research methods in this field of study, you may encounter proper and improper opportunities to discuss the caveats of the research. This may include the continued complexity of the findings, the importance of hypothesis-driven research and responsible statistical analysis. However, note that your engagement with the Alt-Right may not be rooted in logic or measured discussion, and you may not find a fair audience for reception and interpretation of your points. The more discrete you can keep your points, therefore, the more productive you may find your conversations.

## Notes

- 1 While there have been numerous studies on the histories of trans people, much more is still needed. Some studies include: John Boswell, *Same-Sex Unions in Premodern Europe* (New York: Vintage Books, 1995); Vern L. Bullough and Bonnie Bullough, *Cross Dressing, Sex, and Gender* (Philadelphia: University of Pennsylvania Press, 1993); Leslie Feinberg, *Transgender Warriors: Making History from Joan of Arc to Dennis Rodman* (Boston,

- MA: Beacon Press, 1996); Patrick Califia-Rice, *Sex Changes: The Politics of Transgenderism* (San Francisco, CA: Cleis Press, 1997); Judith Halberstam, *Female Masculinity* (Durham: Duke University Press, 1998); Josiah Blackmore and Gregory S. Hutcheson, eds., *Queer Iberia: Sexualities, Cultures, and Crossings from the Middle Ages to the Renaissance* (Durham, NC: Duke University Press, 1999); Sherry M. Velasco, *The Lieutenant Nun: Transgenderism, Lesbian Desire and Catalina de Erauso*, 1st ed. (Austin: University of Texas Press, 2000); Paul Julian Smith, *The Body Hispanic: Gender and Sexuality in Spanish and Spanish American Literature*, Clarendon Paperbacks (Oxford: Clarendon Press, 2001); Thomas Alan Abercrombie, *Passing to América: Antonio (Née María) Yta's Transgressive, Transatlantic Life in the Twilight of the Spanish Empire* (University Park: The Pennsylvania State University Press, 2018); C. Riley Snorton, *Black on Both Sides: A Racial History of Trans Identity* (Minneapolis: University of Minnesota Press, 2017); Susan Stryker, *Transgender History: The Roots of Today's Revolution* (Berkeley, CA: Seal Press, 2017).
- 2 HRC <https://web.archive.org/web/20190727011222/https://www.hrc.org/resources/understanding-the-transgender-community>.
  - 3 <https://slate.com/news-and-politics/2017/08/donald-trumps-ties-to-alt-right-white-supremacists-are-extensive.html>.
  - 4 See: <https://web.archive.org/blog/web/20190913145959/https://www.hrc.org/blog/new-fbi-data-shows-increased-reported-incidents-of-anti-lgbtq-hate-crimes-i> and <https://transequality.org/the-discrimination-administration>.
  - 5 <https://web.archive.org/web/20191217042844/https://www.eneuro.org/content/6/6/ENEURO.0513-19.2019>
  - 6 <https://web.archive.org/web/20171004151745/https://www.inc.com/will-yakowicz/3-keys-to-bargaining-with-anyone-according-to-an-fbi-hostage-negotiator.html>, Freakonomics episode with Chris Voss.

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