

MASTER THESIS

Enacting neurogenders:

**a critical analysis of sex/gender within neuroscientific studies of
transgender and gender non-conforming (TGNC) people**

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Abstract

Trans and gender non-conforming (TGNC) people's autonomy and lived experiences are consistently under fire by the broader public and media. Neuroscientific work that seeks to better understand TGNC people, regardless of intention, has historically contributed to their pathologization. In response, neurofeminism has addressed the unjust way sex/gender differences are engaged with in neuroscience and its wider implications. Utilizing a neurofeminist lens derived from critical neuroscience, and science and technology studies (STS), the present work analyzes how sex/gender is enacted within contemporary neuroscience studying TGNC people and the implications thereof for their bodily integrity and subjectivity. A critical discourse analysis (CDA) of neuroscientific studies published between 2018-2023 ($n = 20$) was conducted. This analysis accounts for how terms relating to sex/gender are (i). defined, (ii). operationalized, and (iii). interpreted, and what ideological assumptions, unresolved tensions, and discourses are embedded therein. Data was inductively coded using ATLAS.ti to analyze instances of engaging with sex/gender and to account for new ideas (or absences) implicit within neuroscience. On the basis of this analysis, this paper contributes to theorizing on the role of the biological sciences, specifically brain imagery, in shaping the sexed and gendered self. Ultimately, it appears neuroscience (in)directly contributes to the governance of TGNC people's bodily integrity and subjectivity by delineating whose bodies are 'normative/ordered' and whose subjective experience of sex/gender is legitimate, thus, obstructing enactments of sex/gender that fall outside of dominant hetero-cis-normative frameworks.

Keywords: neuroscience, sex/gender, trans and gender non-conforming (TGNC), neurofeminism, STS

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Introduction

“Gender is not a choice, is it?” sounds an outraged woman’s voice in a radio advert broadcasted in February of this year on *NPO Radio 1*, a Dutch public-service radio channel (ANP, 2023). The radio advert comes from the organization, *Gendertwijfel* (Genderdoubts), which in September of last year, displayed hundreds of posters on billboards promoting a manifesto against the passing of a new transgender law in the Netherlands (NOS, 2022). Their transphobic posters illustrate the words “WOMAN” in a blue font under the silhouette of a male figure, insinuating that trans women are men, and the word “MAN” in a pink font under the silhouette of a female figure, insinuating that trans men are women (Gendertwijfel, 2023). The law in question would drop the condition in which an expert’s opinion is mandatory before a person’s gender may be changed on their birth certificate. In response to the radio advert, many complaints were received by the party responsible for its broadcast, claiming the advert was not only “needlessly offensive”, with the mocking tone of the woman’s voice ridiculing trans gender identity, but that it also provided factually incorrect regarding information about the proposed transgender law (TNN & WOMEN Inc., 2023). Despite the counter-response to Gendertwijfel, the promotion of their manifesto nationwide and the green-lighting of a transphobic advert by a public-service radio reflects a state of anti-trans sentiment among conservatives and, more worryingly so, the broader public in the Netherlands. In fact,

according to survey research, only 60% of the Dutch population has positive views regarding transgender people, demonstrating a stagnation in their acceptance relative to LGB groups, who, in contrast, are viewed positively by 76% of the Netherlands (NU.nl, 2022). Some conservatives within the Dutch House of Representatives have responded to the proposed transgender law with: “...there are men, there are women, and that’s it.” (Bakker, 2022). Motivated by these ‘major societal debates’, a news piece in *de Volkskrant*, a left-progressive Dutch newspaper of renown, sought to shed light on whether *biological* research could answer the question of if “there is much more between man and woman...” (Bakker, 2022).

The news article in question, written by Bakker (2022), an award-winning science journalist and biology graduate, briefly acknowledges the existence of social constructivist notions of sex and gender but then rather profoundly emphasizes biological notions hereof in relation to the brain (e.g., “gender identity is ‘purely biological’...everything starts with biology”). Neuroscientists researching *trans* and *gender non-conforming* (henceforth: TGNC) people often justify that such bioessentialist work will further the acceptance of these communities and decrease stigmatization: “If gender identity is something biological, then it can contribute to recognition...if we know that transgender people and non-binary people are just born that way, it will hopefully contribute to acceptance.” (Bakker, 2022). And in doing so, lend themselves to the idea that they are combatting conservative or religious organizations who perceive transness to be a “sinful choice” (Mulkey, 2021); rhetoric that unfortunately when taken to the extreme is utilized to justify harmful practices such as conversion therapy. However, Mulkey (2021), a trans non-binary writer and medical doctor (M.D.), in an article published in the *Scientific American*, a popular science magazine in the USA, notes how this same stream-of-thought, bioessentialism, may likewise lead to negative attitudes regarding TGNC people. In turn, highlighting how this framework may lend

itself to the notion that “...there is something broken or fixable about transgender individuals” (Mulkey, 2021) raises the question of whether neuroscientific work and the bioessentialist notions engaged actually promote the acceptance and destigmatization of TGNC people.

Problem statement and research question

Therefore, the present thesis conducts a *critical discourse analysis* to understand how sex/gender is enacted within contemporary neuroscientific studies of TGNC people and the implications thereof for their bodily integrity and subjectivity. I will draw on earlier work by *neurofeminist* scholars addressing *neurosexism* embedded in brain studies of sex/gender. Such work, operating at the interstice of feminist scholarship and critical neuroscience, addresses the biased way differences between cisgender male and female brains are interpreted and utilized within neuroscience and public discourse on sex/gender norms. Thus, in light of earlier neurofeminist work, predominantly on cisgender men and women, I apply such critique to brain studies of sex/gender within TGNC people. Specifically, the present thesis focuses on identifying ideological assumptions, unresolved tensions, and discourses embedded within (1). definitions, (2). operationalizations, (3). interpretations of sex/gender.

Moreover, in the present study, the umbrella term of *trans and gender non-conforming* (TGNC), often used in empirical research, will be utilized as a placeholder definition. Bettcher (2009) outlines several variations of how *trans* has been or is defined. The term “trans*” (p. 3) appears to encapsulate the experiences of gender non-conforming (GNC) trans people who experience gender outside the male/female or man/woman binary. However, some people are trans and feel they fit within this binary. As not to exclude such persons, using the term *trans and gender non-conforming* (TGNC), despite not being mutually exclusive categories, may most accurately

capture the full scope of the present study. This disclaimer is essential given that brain studies of sex/gender involving TGNC people mostly employ a medical or binary model of gender. Such frameworks, thus, tend only to include trans persons who place themselves within the gender binary or, instead, are merely categorized as one or the other category by researchers, thus, invisibilizing GNC trans people who do not conform to the binary. Therefore, the present research, when and if possible¹, aims to attend to the contrasts and distinctions between these groups.

My primary research question (RQ) is thus as follows:

How is sex/gender enacted within contemporary neuroscience on transgender and gender non-conforming (TGNC) people, and what may be the implications thereof for their bodily integrity and subjectivity?

To answer the question above, this research will attempt to answer the following sub-questions:

1. How is sex/gender *defined* within neuroscientific studies conducted on TGNC people, and what (ideological) assumptions underlie the theory informing definitions (SQ1)?
2. How is sex/gender *operationalized* within neuroscientific studies conducted on TGNC people, and what (ideological) assumptions underlie the methodology employed (SQ2)?
3. How are the results of neuroscientific studies on TGNC people *interpreted*, and what (ideological) assumptions underlie conclusions drawn about sex/gender (SQ3)?

The division into sub-questions above demonstrates how an object such as sex/gender is not a singular manifestation but rather an amalgamation of enactments (Mol, 2002), decentering the ontology of sex/gender into the multitude of practices described above (i.e., definitions, operationalizations, interpretations). As an example, sex/gender within neuroscience may be

¹ Given the limited scope of research on GNC trans people.

defined in a manner that acknowledges how social or cultural notions thereof, such as gendered language, expression, stereotypes or roles, may manifest into one's subjective experience of gender; yet, within the same field, sex/gender may be operationalized and engaged with in a manner that delimits its enactment as pertaining solely to the body (e.g., 3G-sex). Thus, investigating how sex/gender is (differentially) enacted within these subdivisions of empirical neuroscience may aid us in uncovering a more nuanced and expansive answer to the question of how sex/gender is enacted in relation to TGNC people within contemporary neuroscience.

Theoretical framework

Neurofeminism

Despite the wider commitment to undoing past wrongs concerning TGNC communities, feminist scholarship and critical neuroscience argue that present-day psychologists and neuroscientists continue to perpetuate unjust or biased norms and beliefs regarding sex and gender, albeit implicit or by simply operating under methodological assumptions that are never scrutinized (Perlson et al., 2021). Neurosexism is the term for biased research and perceptions on the “facts of the sexed brain” (p. 1, Schmitz & Höppner, 2014), the construction of which is gendered, devaluing traits considered to be feminine or female (Hoffman & Bluhm, 2016), and further reinforcing sexism by apolitically handling neuroscientific studies of sex/gender (Duchesne & Trujillo, 2021). In contrast, neurofeminism works against neurosexism by evaluating such gendered assumptions within neuroscience and the impact and societal significance of such work on the broader public and contemporary gender discourse. Hoffman & Bluhm (2016) claim that the gap between data and theory is one in which neuroscientists’ biased values “can and do seep in” (p. 723), ultimately lending themselves to perpetuating harmful sex/gender stereotypes rather than scrutinizing them.

Therefore, neurofeminists combine critical neuroscience with (trans)gender and feminist studies to explain the relation between sex/gender and the brain whilst criticizing biologically essentialist notions of this relationship, nevertheless accounting for the body's materiality. Critically engaging with conceptualizations of sex and gender identity has been central to trans and gender studies, which tend to favor sociocultural constructions of such concepts. Neuroscience, in contrast, favors an essentialist view of these concepts, with sex being understood as purely biological and defined within one's genitalia, genetics, and gonads (3G-sex) (Joel, 2012). Likewise, gender identity within neuroscience is often understood as pertaining solely to brain structure and neural activity, but unlike sex, it is occasionally accompanied by an acknowledgement of environmental factors playing a role. The term sex/gender used above, in contrast, does not attempt to "define where one ends and the other begins" (Kaiser [2012] as cited in Caselles [2018], p.144). Critical of this separation and recognizing the difficulty in being able to define either sex and gender identity as completely biological or social, neurofeminist work prefers this term, given "sex is not a purely physical or material fact but is deeply interwoven with social and cultural constructions" (Fausto-Sterling [2012] as cited in Schmitz & Höppner [2014]).

Points of neurofeminist critique often include how the terms sex and gender are (i) uncritically defined and operationalized within neuroscientific work (e.g., sex is defined in terms of solely the body and gender in terms of solely the mind), (ii) how research is often problematically used to emphasize differences rather than similarities in sex/gender (e.g., analyses stress finding differences between groups), (iii) and how the field interprets or calculates brain data in manners that reinforce gendered notions of the body and social norms (e.g., exclusively providing bioessentialist or 'hard-wired' explanations for brain data) (Hoffman & Bluhm, 2016). Applying neurofeminist critique within the context of TGNC groups, often the gender identity of

TGNC people is screened, whilst cisgender participants' gender identity is taken for granted under the assumption of appearing as or self-identifying as a 'normative' body (Caselles, 2021). Furthermore, analyses often compare transgender participants' data (e.g., behavior, cognition or brain activation) against that of cisgender participants, utilizing language which implicates the former as 'disordered' or 'non-normative' (Caselles, 2018).

Another central argument of neurofeminism is that "gendered social experiences and power relations impact the forming of the gendered brain's structure and function more than vice versa" (p.5, Schmitz & Höppner, 2014). The former stresses how bioessentialist notions have a more pronounced impact on brain gender discourse, contrary to social constructivist notions. The brain is not "hard-wired" but malleable to influences of culture and society by means of *neuroplasticity*, the lifelong process and ability of the brain to adapt to environmental influences (Hoffman & Bluhm, 2016). Whilst bioessentialist neuroscientists do include this concept in their work and acknowledge that one's environment and social development influence one's brain structure and function, neuroplasticity has often failed to be included when drawing gendered conclusions about neuroscientific data. Simply put, the brain is malleable to society and cultures' influences until the moment of determining behavior in the future (i.e., the key endeavor of biological determinism). At that moment, brains are then in a "snap-shot" (p.5, Schmitz & Höppner, 2014) sorted into binary categories (e.g., male/female, trans/non-trans, normal/abnormal), thus maintaining hard-wired and gendered implications for the body and social norms. Although neurofeminist work has predominantly engaged with comparisons drawn between cisgender groups, such work has been a key point of departure for newer critiques involving TGNC groups. It provides an essential framework from which to analyze neuroscientific studies of sex and gender involving TGNC people and the implications thereof for their bodily integrity and subjectivity.

Critical neuroscience and STS

Although historically, neuroscience may have engaged with enactments of sex/gender in a biased and unjust manner; there is a body of work in critical neuroscience and science and technology studies (STS) which enable researchers to critically interrogate their methods, entanglements and the broader societal contexts from which they operate. Such work demonstrates, for instance, that when knowledge resonates with present societal concerns (as highlighted in the Introduction), it is selectively taken up in public discourse. Knowledge of the brain retains symbolic power, given it holds implications for how people make sense of themselves and other human beings, conferring neuroscientific arguments with “authoritative, scientific credibility” (p. 220, O’Connor et al., 2012). Concerning sex/gender, notions of *neurorealism*, the use of neuroscience to bestow objectivity to social phenomena utilizing brain data, and *neuroessentialism*, the equation of the brain to notions of personhood and the self, seem to permeate public discourse regarding the lived experiences of TGNC people. With recent developments in neuroscience, our ways of thinking about ourselves are being reshaped and grounded in one sole organ within our bodies, the brain, reflecting an increase in materialist beliefs and reductionist simplifications within biology. Whereas in the past, our identity may have been mapped onto our psyche, now, the brain is central to our understanding of the *self* (Rose & Abi-Rached, 2013). Neurorealism and neuroessentialism negate the subjectivities of marginalized groups when brain data or neuroscientists’ interpretation does not align with such groups’ accounts of identity; in the context of this research, the perceptions of TGNC people regarding their sex/gender. Such concepts are problematic, given how they help to maintain existing stereotypes when employed under population-based neuroscience, which inevitably portrays “a single brain type” (p. 223, O’Connor et al., 2012) in attempting to study phenomena within specific populations. When researching TGNC people,

often, their brains are contrasted with that of non-trans people in ways that imply the latter is a normal/ordered group, whereas the former is ‘abnormal/disordered’ (Caselles, 2021). The object of study (TGNC people’s brains) is deemed a ‘pathological’ phenomenon in need of study and intervention, thus, rhetorically furthering the distance from the ‘normal/ordered’ majority. Neuroessentialism reduces TGNC people to a ‘single trans brain’, a natural but “unalterable” essence, that which is “homogenous and strictly bounded” (p. 225, O’Connor et al., 2012), a representation that ultimately ends up perpetuating the stigmatization of TGNC people.

Fortunately, the field of neuroethics utilizes critical analysis to investigate concerns within neuroscience that the field may have negative societal consequences (Rose & Abi-Rached, 2013). Applying critical theory to neuroscience allows researchers to interrogate their methods, entanglements, and broader societal contexts from which they operate, which leads to the emergence of “brain facts” (p. 64, Choudhury, 2009). Concerning what may be considered ‘factual’, Mol’s (1999) concept of ontological politics refers to the open and contested process of shaping what belongs to the *real*, ergo the conditions of possibility we live with and enact. A single object or phenomenon, in the context of this thesis, sex/gender, may consist of multiple enactments (e.g., the social, the biological, the clinical, etc.), which may all to varying extents shift the *site of decision* as to how sex/gender is *made real* to somewhere else. This decision is displaced and moved along to sites in which sex/gender is no longer in need of being ‘decided on’ but where it is simply a fact (e.g., the gender clinic, the policy brief, the research lab, etc.). In doing so, the conditions of possibility for sex/gender are not the outcomes of a singular ‘decision’ but rather they “happen to be the way they are – or they derive from facts imported from elsewhere” (p. 80, Mol, 1999). In relation to such ontological politics, Pickersgill (2013) describes how “Diverse forms of responsibilization are thus occurring within neuroscience” (p. 326), making ambiguous

who is responsible for neuroscientific ‘facts’ on sex/gender as well as the legitimacy of individuals or institutions exerting influence over the research process and TGNC participants.

Furthermore, Pickersgill (2013) describes the importance of sociological inquiry into neuroscience and the “social life of the brain” (p. 323) in response to how the field creates new knowledge on the *self* and society at large. This inquiry and those reconciling these two fields draw attention to how neuroscientists are entangled in embedding their own “ontological imaginaries” (p. 325) within their work. It would be naïve to assume everyone working within the field of neuroscience may be operating under a biological essentialist framework. As stated by Rose & Abi-Rached (2013), neuroscientific explanations of the *self* are not erasing other constructions of identity and self (e.g., sociocultural frameworks). Instead, they have intertwined and transformed such constructions significantly. Neuroscience does not simply impose values and norms onto us as a society; instead, “our sense of how we ought to organize and govern ourselves profoundly influences” (p. 4, Jasanoff, 2015) how we make sense of the gendered self. Jasanoff’s idiom of co-production (2015) can be used to describe how both neuroscientific knowledge and technology embed and are embedded in the social “building blocks” (p. 4) of sex/gender, including the construction of gendered identities, norms, and discourses. This lens enables us to analyze how neuroscientists think sex/gender is constructed and what they think ‘normal’ or ‘ordered’ sex/gender ought to be (i.e., cisgendered). And at the same time, it allows one to examine how neuroscientific work must inevitably respond to developments of “human subjectivity” (p. 21) regarding sex/gender, which is accompanied by new representations, discourses, and social practices emerging from TGNC communities.

However, despite this entanglement and co-production, neuroscientific work still often ascribes “ontogenetic privilege” (p. 325, Pickersgill, 2013) to the brain and thus favors

bioessentialist explanations of the *self* more so than other ontological streams of thought. Moreover, neuroimaging has become a most salient facet of neuroscience within the broader public, conferring the brain scan as the field's most powerful influence on public discourse (Pickersgill, 2013). Within the context of this thesis, neuroimages thus embed biological narratives regarding TGNC people at many relevant sites, such as within popular media, policy documents, and scientific literature (p. 329). Enacting powerful rhetorical work, neuroimaging becomes a central actor around which ontological narratives rule, reifying and reconfiguring sex/gender identities of both cisgender and TGNC people and thus reinforcing the hegemonic narratives entangled with their respective identities relative to one another (e.g., normal/abnormal, ordered/disordered). Applying such theory in light of our research question allows us to understand how these robust ontologies may affect TGNC people's subjectivity and bodily integrity. The latter is articulated by Loeb (2008) as "a right against invasion by the state or medical regime into one's "own" body"² (p. 50). Such critical analysis and theory have inspired and laid the groundwork for neurofeminist thought that may aid in conducting an in-depth assessment of how sex/gender is enacted within neuroscientific studies conducted on TGNC people.

Methods

Sample selection

The present study conducts a critical discourse analysis (henceforth: CDA) inspired by the work of Caselles (2021), whose research addresses epistemic injustice within brain studies of gender

² It should be noted that within the present thesis, the brain (ergo the *mind*) is included within definitions of the *body*, including bodily integrity. However, for the sake of this thesis' brevity, debates on mind/body dualism, implicit in work on sex/gender, will be omitted.

identity involving transgender people. Building on this work, the present thesis focuses on identifying ideology embedded within definitions, operationalizations, and interpretations of sex/gender within neuroscientific studies conducted on TGNC people. Caselles' (2021) analysis focused on ten studies, four published in 2011-2014 (categorized as early) and six published in 2016-2018 (categorized as late), to account for broader theoretical shifts regarding gender identity over time. In the present thesis, study samples, our secondary data, were selected by publication date, selecting studies published between 2018-2023. This is done to provide a continuation for the final publication year (2018) in the previous studies' sample (Caselles, 2021) and similarly to account for possible shifts in contemporary sex/gender discourse within the last five years. Given, despite the marked increase in societal attention to TGNC people, research has not kept pace with such advances, continuing to, for example, reify a strict sex/gender binary, regardless of an increased public endorsement of identities outside this traditional binary (i.e., GNC people) (Fiani & Han, 2019).

To determine the potential impact of the studies selected for TGNC communities, the selection criteria involved: (i). the inclusion and diversity of TGNC people within a study's participant pool, prioritizing a more active inclusion of GNC groups, and (ii). the extent to which neuroscientific methods involving neuroimaging techniques (e.g., fMRI, EEG, etc.³) were utilized within a study, given the relevance of brain imagery for arguments operating under neurorealism. Unlike Caselles (2021), the availability of researchers for interviews (p. 4) was not deemed part of our selection criteria, thus inevitably resulting in a higher sample of studies within the present research. Furthermore, to broaden the scope of inquiry, I expand on Caselles' (2021) approach by

³ Both examples mentioned are brain visualization techniques. fMRI = functional magnetic resonance imaging, EEG = electroencephalography

also including studies in which sex/gender itself may not be the primary object of research but rather informs the rationale of said work (e.g., hormone effects, 'sexually dimorphic' behaviors, sexuality, etc.).

An initial search using such selection criteria led us to consult the journals *Cerebral Cortex*, *Psychoneuroendocrinology*, and *NeuroImage* as sources to sample studies from. However, neuroscientific studies of sex/gender in TGNC people are still relatively small in number. Thus, results from web search engines and databases such as Google Scholar, APA PsycINFO, SCOPUS, and PubMed have supplemented the sample selection. Search terms utilized were "sex", "gender*", "trans*", "neuro*", "transgender", "gender non-conforming", and "neuroscience". Applying the aforementioned selection criteria, this search provided a sample size of $n = 20$ empirical research articles employing neuroscientific methods (i.e., neuroimaging). Despite also encountering literature reviews and meta-analyses within our search, these studies were left out of our sample due to time constraints and given how sex/gender discourse embedded within such studies is likely to differ significantly in comparison to studies directly employing neuroimaging techniques. An analysis of such work or even a comparison with the present studies sampled may be of great interest for future research. Regardless, as a CDA was conducted, $n = 20$ provides us with a more than sufficient sample size given CDA's emphasis on the multitude of ways language is utilized and the wealth and variety of results that can emerge from even a small sample (p. 8, Bondarouk & Ruel, 2004), granted a single document may contain many relevant terms.

Critical discourse analysis (CDA)

CDA takes an explicit position against social inequalities by conducting discursive analytical research on the way "social power abuse, dominance and inequality are enacted, reproduced and

resisted by *text* and talk in the social and political context" (p. 466, van Dijk, 2015). In the present work, CDA focuses on the way neuroscientific sex/gender discourse *enacts* relations of hetero-cis-normative "power" and "dominance" (p. 467) relative to TGNC communities; specifically, whether it legitimizes, reproduces, or challenges such power relations. Such analysis uncovers not only the ideologies of knowledge production embedded within the sample studied but also the more latent silences, ontologies, and infrastructures present within such work. The present CDA begins with evaluating terms relating to sex/gender, including but not limited to: "sex", "transsexual", "intersex", "trans*", "transgender", "gender*", "gender identity", "gender non-conforming", "gender diverse", "gender incongruent", "non-binary", "woman/women", "female", "man/men", "female". Employing inductive (i.e., *in vivo*) coding, this analysis attempts to account for how explicit (or implicit) such terms are (i). defined or theorized, (ii). operationalized within the methodology, and (iii). utilized in the interpretation and discussion of study results. Quotations within our sample selection that address the terms above or their underlying ideological assumptions were conceptually coded into a code tree using ATLAS.ti Windows (Version 23.0.6) (2023). These codes and the resulting code tree were utilized to identify emerging or unresolved patterns, tensions, and discourses regarding sex/gender within neuroscience. It is important to note, however, that CDA is most often employed in analyses of *interactive* text or talk or representations within media, and therefore, its use to study discourse within scientific work may grant us unconventional but innovative insights (Van Dijk, 2015).

In the following section, I will address expectations relative to our research question that aid in highlighting the advantages of the selected methodology. The resulting code tree is expected to range in theme from bioessentialist notions (i.e., hard-wired brain paradigm) to socially constructed notions of sex/gender; however, in using an inductive method, we do not limit

ourselves to a predefined hypothesis or notions on how sex/gender is enacted. Instead, the overarching theoretical framework guides the coding process (Bowen, 2015), unearthing underlying ideological assumptions, unresolved tensions, and discourses within (1). definitions, (2). operationalizations, (3). interpretations of sex/gender, or on the contrary, absences thereof. To account for such implicit language that highlights a paper's underlying ideology regarding sex/gender (i.e., without explicit term usage), it was important to employ a code tree rather than a code book, which may neglect forms of enacting sex/gender that are silenced. For instance, a deductive method will not be able to account for discourse on gender non-conforming (GNC) people when such a classification is absent, given how non-binary forms of embodiment have been invisibilized or erased within empirical sciences (see Introduction). Thus, with such theory guiding the coding process, it is expected that GNC people will be underrepresented in comparison to transgender people who are placed within the sex/gender binary, and yet, the coding process allows us to also explicitly account for how GNC sex/gender is enacted when it eventually does so.

The use of an inductive approach and code tree within ATLAS.ti boosts validity and reliability by performing a systematic analysis of sample study text into codes whilst being guided by the theoretical framework established prior. Yet as with any inductive method, this is not free from researcher bias. However, I believe that my position as an insider within many of the present works' interstices, being a *genderqueer neuroscientist and social sciences student*, enriches rather than hampers my analysis as it enables the engagement of *feminist objectivity*, making my analysis one that is "answerable for what we [I] have learned how to see" (p. 583, Haraway, 1988). In other words, this allows for the analysis to be reflexive rather than oblivious to how my positionality influences my understanding and knowledge production in regard to neuroscience, the social sciences, and the ever-so-complex and personal phenomena that is sex/gender. In addition, the

present analysis' validity may have benefited from being supplemented by interviews with neuroscientists conducting research on sex/gender in TGNC people. However, due to time constraints and feasibility, the scope is limited to a CDA from which productive theoretical insights and further questions may still arise.

In summary, the present thesis conducts a CDA on neuroscientific studies of sex/gender conducted on TGNC people, situating itself within a framework of neurofeminist thought, combining (trans)gender and feminist studies and critical neuroscience. The analysis will account for how the terms sex/gender are explicitly or implicitly: (i). defined or theorized, (ii). operationalized in the methodology, and (iii). used in the interpretation and discussion of study results. Ideological assumptions, unresolved patterns, and discourses underlying term usage will be analyzed and conceptually coded into a code tree from which bioessentialist notions, social constructivist notions, tensions between these categories, or other themes may emerge. Additionally, the thesis attends to the absences or erasure of GNC groups within neuroscientific studies. To conclude, the thesis raises the urgent political question of to what extent and how these contemporary enactments of sex/gender within neuroscience may shape and coproduce broader sex/gender discourse and norms, ultimately influencing the bodily integrity and subjectivity of TGNC communities.

Results and analyses

There can be no direct or one-to-one answer to the research question (RQ) posed above. Thus, the following section will highlight *six* key findings from the CDA conducted. And when arriving at

the Discussion section, each sub-question (SQ1, SQ2, SQ3) will be utilized as a framework for understanding how sex/gender is being enacted within the neuroscientific studies sampled.

Construction of TGNC as disordered

Essentially, those studying sex/gender within neuroscience have inevitably been forced to respond to shifts in gender discourse because of significant changes in diagnostic labels for TGNC people within the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) and the *International Classification of Diseases (ICD)*. Specifically, there has been a change in label from DSM-IV's "gender identity disorder" to the DSM-V's "gender dysphoria" (APA, 2013), as well as a change in diagnostic label from ICD-10's "transsexualism" to the ICD-11's "gender incongruence" (WHO, 2019). These shifts in diagnostic labels were carried out to reduce the stigma and pathologization of TGNC identities in response to a renewed understanding that being TGNC does not equal a mental disorder, nor that gender dysphoria is a necessary condition for being TGNC (Drescher, 2015). Both new diagnostic labels aim to acknowledge that distress experienced by TGNC people arises from societal norms regarding sex/gender and how deviations from those norms subject one to stigmatization rather than 'dysfunction' being inherent to one's sex/gender identity. Maintaining such categories within a manual of *disorders* or classification of *diseases* to describe TGNC persons must be done carefully and engaged with critically, given "...diagnostic categories impact the social opinions of people with little knowledge or investment of the inner workings of psychological institutions that determine and define pathologies." (p. 292, Lev, 2013), and therefore, if dealt with incorrectly, may only further perpetuate stigmatization against TGNC people. Unfortunately, much of the language employed within our sample is still suggestive of cisgender bodies as 'normative' and transgender bodies as 'abnormal, a most striking example

being a description of trans men as “suffering from aberrations or deficiencies of testosterone” (p. 12, Burke et al., 2018), language use which unmistakably implies TGNC people’s bodies as disordered, relative to the ‘healthy’ cisgender control group.

Furthermore, the response to these diagnostic changes is evident within the present studies sampled, in which definitions of transgender are almost always accompanied by a DSM or ICD diagnosis. Including DSM and ICD definitions may simply be ‘standard practice’ within the field, given that TGNC participants are typically recruited from a clinical context in which a diagnosis is a necessary requirement for accessing gender-affirming healthcare (e.g., having costs covered by health insurance). Regardless, much of the neuroscientific work sampled often referred to gender dysphoria (GD) or gender incongruence (GI) as a “condition” and transgender participants as “Patients affected by GI/GD...” (p. 2, Clemens et al., 2021) or as persons who “suffer from GI” (p. 1, Moody et al., 2021). Thus, despite the clarification of diagnostic criteria which attempt to depathologize TGNC sex/gender identities, such as in Uribe et al. (2020): “Because gender incongruence is no longer classified as a mental disorder...we chose this term to characterize our transgender sample in the present study.” (p. 2); language use within the samples studied still clearly demonstrates an abnormal or disordered view of TGNC persons’ subjectivity. In sharp contrast, being cisgender would never be referred to as a ‘condition’ or as an embodiment that “can have a rather early onset in many patients” (p. 10, Clemens et al., 2021) as it is seen as a ‘normal’ embodiment of sex/gender within a cisgenderist society (Ansara & Hegarty, 2014).

Furthermore, it is unclear whether the mention of a trans persons’ diagnosis is even necessary for the aim of the neuroscientific research being undertaken, whilst, for cisgender participants, self-report of one’s sex/gender is deemed adequate. Thus, there may be implicit assumptions or criteria within the field that self-report regarding sex/gender is insufficient for

transgender participants and that without a formal diagnosis, one cannot confirm participants studied were indeed TGNC. In fact, Clemens et al. (2020) illustrate that studying sex/gender using neuroscience may be able to provide clinicians with an 'objective' measure of sex/gender free from bias: "...the classification of gender identity is to provide additional, neurobiologically validated information, which is not influenced by societal pressure or social desirability, for both clinicians and patients." (p. 9), further disregarding TGNC people's subjective experience of sex/gender.

Terminology for sex/gender

Many articles within our sample explicitly describe ongoing changes and sociopolitical debates regarding the terminology surrounding sex/gender, given its societal relevance for the TGNC communities being studied (Flint et al., 2020). One example, for instance, states:

Recent media attention to transgender and GI has increased substantially, with changes in laws and attempts to reduce societal discrimination allowing more people to openly identify as gender incongruent and seek treatments such as gender-affirming hormone therapy (GAHT) and gender-affirming surgery (p. 2, Clemens et al., 2021).

However, other articles are less explicit in reinforcing a particular discourse by refraining from addressing societal claims relevant to the conducted research. Despite this, much of the neuroscientific work studied implicitly addresses contemporary gender discourse in their language use, for example, stating: "...formerly called female-to-male..." (p. 1, Burke et al., 2018), "...note, this term is currently outdated." (p. 2, Moody et al., 2021), "...this fundamental rethinking..." (p. 2, Baldinger-Melich et al., 2020) when describing definitions or term usage regarding sex/gender.

Thus, such work inevitably reifies that societal and academic perceptions of the relevant discourse have shifted and, albeit implicitly, said work takes up a position within the discourse.

Despite how TGNC people are defined within the studies sampled in regard to diagnostic categories, actual term usage varies greatly between studies in how sex/gender are referred to. Many refer to sex as explicitly belonging only to one's genotype or internal/external genitalia or what Joel (2012) refers to as 3G-sex (genetic-gonadal-genital sex). Male and female were used interchangeably to describe sex or gender identity, whereas the terms assigned-male/female-at-birth are almost exclusively used to denote sex in TGNC participants. Intersex participants were not included in any of the studies in our sample, and intersex was thus almost never stated as a possible sex/gender category, except for one article (Clemens et al., 2021) that describes several other sex/gender identities (including intersex) not included within their sample as a limitation of their study.

Gender is more frequently described with a richer definition as opposed to definitions of sex. For instance, the most recent study in our sample utilizes a definition of gender that considers multiple dimensions of sex/gender: "Gender is multifaceted and includes how someone identifies, expresses, and feels about their gender. Gender is not just a categorical identity (e.g., cisgender/transgender or boy/girl/non-binary/agender etc.), but rather a constellation of dimensional constructs." (p. 2, Loso et al., 2023). Within our sample, the terms man and woman were exclusively used to refer to cisgender men and women and were also interchangeably used to refer to sex or gender identity, whereas the term trans (man/woman) was used to refer exclusively to TGNC people's gender identity. The terms masculine or feminine were occasionally used to describe gender identity, most often when referring to sex/gender as belonging to a 'male-femaleness' or 'masculine-feminine' continuum. Gender non-conforming identities were

occasionally mentioned, albeit using non-explicit or umbrella terms such as “third gender” (p. 2, Baldinger-Melich et al., 2020), “another gender” (p. 1, Majid et al., 2020), “different gender variants” (p. 3, Uribe et al., 2020). Gender non-conforming terms such as non-binary or genderqueer were seldom used explicitly. The most extensive list of sex/gender identities, despite being only a remark rather than a point to build from, comes from a study by Clemens et al. (2021): which states: “...there are different gender identities, including, among others, female, male, nonbinary, agender, gender nonconforming, gender fluid, intersex, pangender, genderqueer, or androgynous...” (p. 1). Overall, however, there is almost no actual interrogation of what terms such as sex or gender mean or how their ontological meaning is constructed (see Discussion section).

Gender non-conforming (GNC) identities

Whilst more prominent in studies conducted from 2020 and onwards: gender non-conforming (GNC) identities are seldom mentioned or addressed within the sample studied. As described above, when addressed, this is done indirectly: “male, female, neither, or a combination of both” (p. 2, Clemens et al., 2020), and “additional gender identity subtypes might exist” (p. 9 Clemens et al., 2020); the last quote evidently embedded with doubt and skepticism over the validity of GNC identities. Such skepticism may be reflective of wider “ridicule and backlash” (p. 170, Nicholas, 2019) within the media and broader society in response to the increased representation of GNC people, who, according to Faye (2021), “unsettle mainstream society more than trans men and women” and thus are often “...accused of making up their experience out of a need for attention or desire to feel special...” (p. 15). This response may be the inevitable result of hetero-cis-normativity (Worthen, 2016), an ideological framework that privileges heterosexuality and being cisgender as normative, proclaiming that one’s gender should equal their sex and that there

are only two genders, perpetuating cisgenderism and deeming GNC people's experiences of sex/gender as illegitimate.

The majority of the studies in our sample have exclusively studied transgender participants who must not only meet criteria for identifying with the gender opposite to that which they were assigned at birth but also identify with a strict⁴ gender binary, actively invisibilizing GNC communities: "Participants identifying as nonbinary, or identifying other than transgender were not enrolled" (p. 2, Moody et al., 2021). It is unsurprising, therefore, that not a single study within the sample studied included GNC participants, except an article published this year by Loso et al. (2023), wherein brain function in *gender diverse*⁵ youth was studied.

Meanwhile, the studies that fail to include GNC communities within their sample do occasionally acknowledge this as a shortcoming and that their results are limited to a subset of transgender people: "...it is important to highlight that while we attempted to picture the gender differences beyond the cisgender comparisons, we did not include transwomen, genderqueer, or other nonbinary identities" (p. 9, Uribe et al., 2021), "...our results are limited to binary-identifying individuals and thus cannot necessarily be generalized to nonbinary and differently gendered populations." (p. 8, Moody et al., 2021). Thus, despite the lack of GNC inclusion in their samples, neuroscientific studies are more frequently conceding that their operationalization of sex/gender should defy binaries and that a self-report of sex/gender for both cisgender and transgender

⁴ Strict as in strictly *imposed* by the research being conducted or the conditions in which participants find themselves in such as a clinical context that refrains from providing gender-affirming care if a patient does not concede to having a binary trans identity or otherwise not describing themselves as 'completely' cisgender.

⁵ The term gender diverse was defined as any "youth who experience some aspect of gender that does not match society's stereotypes regarding their sex assigned at birth" (p. 1, Loso et al., 2023). The authors themselves concede that while gender minority (i.e., TGNC) youth fall within this definition, being gender diverse does not equal being a gender minority and that the majority of participants in their sample were not a gender minority but instead merely endorsed some level of gender diversity (p. 10). Therefore, it is unclear how many of the participants in their sample, in fact, self-identify as GNC.

participants must be included seeing as “All facets of gender are relevant for all people.” (p. 2, Loso et al., 2023). Thus, going beyond the assumed self-identification of being cisgender, one should ideally provide participants with an extensive list of sex/gender identities to select from (e.g., non-binary, intersex, genderqueer, agender, genderfluid, etc.) or instead, as a few studies within our sample have done (Clemens et al., 2020; Loso et al., 2023; Khorashad et al., 2020), utilize scales for measuring sex/gender that do not conform to traditional binary enactments (e.g., assessing sociocultural embodiments of sex/gender or weighing sex/gender on a continuum). Furthermore, as illustrated above, many studies in our sample also refer to the present gender discourse as new: “...two existing categories of men and women are insufficient to be mapped to actual, modern-day gender identity categories” (p. 7, Clemens et al., 2020), claiming that the advocacy for the inclusion of GNC populations is only recent (p. 6, Mueller et al., 2021), illustrating that neuroscientific inquiries of sex/gender have yet to keep pace with these advances in (trans)gender discourse.

Sexually dimorphic and binary brains persist

Furthermore, in accordance with this cisgenderist engagement with sex/gender in neuroscience thus far, most of the studies in our sample still reinforced the notion of a sexually dimorphic brain, despite earlier neurofeminist work. Dimorphic brain-sex differences (e.g., ‘sex-typical’ brain patterns) between males and females are spoken of as if they were established facts, for example: “...following the pattern of cerebral differences usually found between cisgender men and women.” (p. 3, Burke et al., 2018), and most strikingly: “...there is a consensus of a significant relationship between brain structure and behavior in the context of sex differences.” (p. 2, Baldinger-Melich et al., 2020). Fortunately, many studies have also begun to acknowledge the

shift in discourse concerning the notion of dimorphic sex differences in brain and behavior, thus hopefully weighing this consideration into their study of TGNC people (Uribe et al., 2021).

In contrast, many of the studies in our sample still implicitly or explicitly recreated binary enactments of gender. This enactment manifests in language implying the existence of only two genders (e.g., his/her, male or female, etc.) or in referring to cisgender embodiments as the norm to which trans people aspire rather than taking trans persons bodily integrity and subjectivity as an end to itself. In a frank manner, Clemens et al. (2020) state what is problematically implicit in all neuroscientific inquiry on sex/gender within TGNC populations, namely: "...do trans men and trans women represent separate and dissociable subtypes of gender, or can we classify all people as either male or female?" (p. 2). Thus, unsurprisingly, many of the samples included within the analysis can be described as having the research aim of clarifying whether the brains of TGNC participants resemble that of their sex assigned at birth or their gender identity, inevitably reinforcing a binary view of sex/gender (Clemens et al., 2021; Mueller et al., 2021). In fact, Clemens et al. (2020) highlight how "...findings from fMRI studies investigating transgender are typically interpreted in strict relations to males and females" (p. 9), which neglects the notion that being TGNC may be an identity or enactment of its own, distinct from the binary embodiment of male/female or (trans) man/woman. Thus, neural results are often interpreted strictly in terms of how they relate to one's sex assigned at birth or in contrast to cisgender people, describing findings about brain activity as demonstrating "a sex assigned at birth pattern" (p. 8, Kiyar et al., 2022) or as "...possibly shifting TM's [trans men] brains toward those of CM [cisgender men] and TW's [transgender women] toward those of CW [cisgender women]" (p. 2, Khorashad et al., 2020).

Novel neuroscientific work has therefore employed new approaches to studying sex/gender, which does not utilize an a priori categorization of the participant's sex/gender nor

unnecessary comparisons between cisgender and transgender. In our sample, a handful of authors employ methods such as pattern prediction analyses that combine neuroimaging data and machine learning algorithms to identify correlations between patterns of neural activity and a variable of interest (e.g., behavior, cognition, mental states, etc.) to identify unique patterns of brain activity without having a hypothesis defined beforehand (Baldinger-Melich et al., 2020; Clemens et al., 2020; Flint et al., 2020; Moody et al., 2021). By not classifying TGNC participants as (relative to) either men or women, Clemens et al. (2020) found that: "...these two gender groups were uniquely defined in brain biology rather than representing mere variants of male or female brain activity signatures..." (p. 6), considering these results as an initial step within neuroscience able to move away from binary notions of sex/gender, and in the words of the author: "...taking away the pressure from transgender and intersexual individuals to fit into one of two categories" (p. 9). Furthermore, concerning the interpretation of brain data, the brain mosaic model, proposed by Joel et al. (2015) and acknowledged by many studies in our sample, claims that brains are not sexually dichotomous nor gendered in a binary manner, but rather best considered as composites of both 'male' and 'female' characteristics (Clemens et al., 2021; Mueller et al., 2021). Therefore, rather than "belonging to either extreme ends of the maleness-femaleness spectrum" (p. 2, Khorashad et al., 2020), each enactment of sex/gender may indeed embody its own unique neural phenotype, free from binary notions of sex/gender with these novel methods within the field facilitating the enactment thereof. Some authors, such as Flint et al. (2020), even explicitly grant such data as suggestive of "a dimensional rather than binary gender construct" (p. 7); however, their claim that "...a biological basis for being transgender...destigmatizes TIs [transgender individuals]." (p. 6), is a contentious point, highlighted earlier, that deserves further attention and scrutiny (see Discussion). To summarize, despite earlier neurofeminist work, the present sample studied still

reinforces notions of a ‘sexually dimorphic’ brain by continuing to reify cisgender embodiments as the norm; however, novel work has also conceptualized newer approaches to engaging with sex/gender, which facilitate enactments of sex/gender free from traditional binaries.

Objectives of sex/gender research

Despite the many shortcomings thus far within our sample in regard to engaging soundly with sex/gender, nearly half of the present studies have shown, in one form or another, a more inclusive or forward-thinking manner of dealing with sex/gender. Beyond language use and methodology, several researchers highlight the material conditions and realities TGNC people find themselves in within present-day society (e.g., transphobia-related violence, mental health problems, etc.), a practice not common in the majority of neuroscientific work in our sample, which attempts to distance itself from the societal implications of their research. Clemens et al. (2020) make their concern for TGNC people very clear, stating that:

Gender distinctions influence modern-day societies with respect to income levels, leadership, participation, health, and academic status. Not conforming to the socially established gender norms might likely mean to face stigma, social exclusion, and discriminatory practices, which in turn can have detrimental effects on physical and mental health (p. 7).

Expressing an explicit acknowledgment of care or consideration for the lived realities of TGNC people showcases the aim of the research conducted as done out of concern or a desire to help or alleviate the problems of the target group studied. And whilst those within the field, who demonstrate such concern for the social world of TGNC people, can indeed be presumed to be

operating with good intent, critical analysis unveils the ideological assumptions regarding sex/gender from which such neuroscientific work operates.

The implications drawn from such work appear to be two-fold. On the one hand, it indeed appears to be the case that, occasionally, neuroscientific work is conducted in the best interest of TGNC communities. Such research aims to understand the population studied, hoping to improve access to gender-affirming healthcare and ultimately facilitate societal and political evidence-based policy changes that improve well-being, raise awareness, and combat stigmatization (Loso et al., 2023; Uribe et al., 2022). On the other hand, unfortunately, it appears to be that many within our sample seek to develop an ‘objective marker’ for sex/gender, with some believing this to be one of the most important medical and societal challenges for the 21st century (p. 10, Clemens et al., 2021). One example within neuroscience is a brain-based ‘biomarker’: a structural or functional indicator within the brain associated with a particular condition or state, and while it is a contested tool, it is typically utilized to identify or screen for particular mental disorders. Such a biomarker for sex/gender is purported to aid in biologically characterizing and identifying an individual’s sex/gender using a mere brain scan (Baldinger-Melich et al., 2020). By providing such an ‘objective’ indicator, one can tailor gender-affirming treatments and assess for whom such procedures will be most effective (Clemens et al., 2021; Moody et al., 2021).

This approach is loaded with political connotations as such a biomarker approach may instead end up functioning as a gatekeeper to gender-affirming healthcare, barring TGNC communities from receiving treatment, given, on the basis of their brain data, they are not considered individuals ‘optimal’ for prescription of gender-affirming treatment. Despite such apparent dangers and the claim that such a tool is only meant to be utilized as an adjunct, neuroscientific work presents it as a solution for those who “suffer from health issues associated

with GI [gender incongruence]" (p. 10-11, Clemens et al., 2021). Those conducting research under this pretext believe that such innovation will reduce societal costs and both the psychological and physical harm of gender-affirming treatments to those "who might receive little benefit from it" (p. 8, Moody et al., 2021), implying that such 'objective markers' will spare TGNC persons who are 'mistaken' about their sex/gender identity from undergoing the intensive processes involved in receiving gender-affirming healthcare. Such work, once again, disregards TGNC people's bodily integrity and subjectivity, emphasizing the importance of conducting research in collaboration with TGNC populations to avert forms of stigmatization being perpetuated without the researcher's awareness (p. 9, Uribe et al., 2021), which may inevitably occur as a result of pervasive hetero-cis-normativity.

Bioessentialism over social constructivism

It is evident within our sample studied that bioessentialism predominantly outweighs social constructivist notions of sex/gender. Bioessentialist ideology is most often employed to make sense of sex/gender, with TGNC enactments thereof being primarily attributed to the influence of hormones and several genetic factors on both physical sex characteristics and brain characteristics (p. 9, Clemens et al., 2020). The most predominant model for explaining sex/gender is the brain sexual differentiation model by Bao & Swaab (2011), which proposes that hormonal exposure during prenatal development differs temporally between the brain and the rest of the body, which may cause one's brain to develop a differential sex/gender relative to the body. Thus, how neural systems of bodily representation are 'sexed' or 'gendered' may differ from one's 3G-sex (Joel, 2012), thus resulting in a sex/gender that is incongruent and therefore not cisgender (Manzouri & Savic, 2019). While it is not wrong to believe that such biological processes may influence the

manifestation of sex/gender, such theories inevitably attribute all of TGNC embodiment to developmental changes or ‘sexual differentiation’ within our brain.

A majority of the sample studied utterly ignores or minimizes the influence of environmental factors on sex/gender and denies sociocultural constructions of sex/gender their legitimacy, stating that “sexual differentiation of all somatic tissues, including the brain, is driven both by direct genetic influences and gonadal hormones with only minimal environmental effects.” (p. 2, Baldinger-Melich et al., 2020) or rather bluntly that “Intrauterine hormones drive the development of gender identity, rather than social learning processes.” (p. 6, Flint et al., 2020). Concerningly, Schneider et al. (2019) claim that improvements in TGNC people’s quality of life after receiving gender-affirming healthcare may be attributable to changes in brain connectivity within brain regions involved in emotion and cognition (p. 9); rather than acknowledge the positive experiences of TGNC persons once they can begin to embody a sex/gender more faithful to their identity (e.g., gender euphoria).

Several neuroscientific studies claim the importance of studying sex/gender in TGNC populations as rooted in concern given a “sex-related susceptibility” to various mental disorders previously found in studies comparing cisgender men and women (p. 2, Baldinger-Melich et al., 2020). However, this phenomenon is likewise consistently interpreted from a bioessentialist framework, viewing such susceptibilities as inherent to one’s sex/gender rather than the result of stigmatizing circumstances for both cisgender women and TGNC populations that result in such an increased susceptibility. In the same bioessentialist manner that depression is viewed as the result of a chemically imbalanced brain and that it is therefore not the patient’s ‘fault’, Flint et al. (2020) state that neuroscientific findings on gender incongruence “...could relieve distress in transgender patients in case of experiences of guilt or shame due to the discrepancy between

biological sex and perceived gender.” (p. 6); thus, completely disregarding sociocultural causes for TGNC persons to experience ‘guilt’ or ‘shame’, such as a transphobic and hetero-cis-normative society.

In contrast, although few in number, studies within our sample did occasionally offer sociocultural explanations in regard to sex/gender, despite not taking these factors into account within the conceptualizations or implementation of their research. For example, despite being an afterthought (e.g., disclosed as a study limitation), both Uribe et al. (2021) and Moody et al. (2021) state that political, sociocultural, and interpersonal factors are relevant to the construction of sex/gender. Other studies also acknowledge that sex/gender differences in the brain may result from other causes, such as experiences of prejudice and stigma and lived experiences that differ from cisgender groups because of hetero-cis-normative society (Clements et al., 2021; Loso et al., 2023). Therefore, it is vital to disentangle the supposed ‘hard-wired’ effects of sex/gender on the brain from the indirect effects resulting from one’s lived experiences and enactments of sex/gender independent from the body. Uribe et al. (2022) highlight this: “...it is important to note that the sample characteristics and analytical approach employed here prevent us from discriminating actual gender identity differences from other phenomena such as experiences of stigma that transgender people may have undergone.” (p. 11). To illustrate, Manzouri & Savic (2019) describe how TGNC participants’ neural network activity concerning bodily self-perception may be influenced due to their experiences of gender incongruence leading to an aversion to specific sex/gender-related body parts, rather than such activity being a result of hard-wired brain function or structure, doubting themselves “...whether the observed characteristics among persons with GD [gender dysphoria] were innate or acquired.” (p. 13). In conclusion, despite bioessentialist notions of sex/gender prevailing within the studies sampled, novel work does appear to recognize the

importance of sociocultural constructions of sex/gender, despite these not yet being operationalized within contemporary neuroscientific work.

Discussion

In an attempt to answer our RQ regarding enactments of sex/gender in contemporary neuroscience, the following section utilizes every sub-question (SQ1, SQ2, SQ3) as a framework to come to an overarching conclusion on how this enactment manifests and what the implications thereof may be for TGNC people's bodily integrity and subjectivity.

It would appear definitions of sex/gender for cisgender populations is more variable given cisgenderism (Ansara & Hegarty, 2014) assumes that sex ought to be synonymous with gender and that, therefore, terms such as male/female and man/woman embody identical meanings. In contrast, transgender participants' sex is always defined as separate from gender identity, despite this difference often being blurred when sex/gender is operationalized. GNC participants were almost never included in these studies, and GNC enactments of sex/gender were seldom acknowledged, given studies consistently utilized language implying the existence of only two sexes and two genders, reifying binary enactments of sex/gender. Overall, however, there is almost no actual interrogation of what terms such as sex or gender entail or how their ontological meaning is constructed. Hetero-cis-normativity may be considered an ontological infrastructure so robust that constructions of sex/gender don't require explicit mention; their absence results from the assumption that they are self-evident (Mol, 1999). In this manner, the enactment of sex/gender and neuroscience is depoliticized, and the *site* of decision (p. 80, Mol, 1999) as to how sex/gender is constructed is displaced elsewhere, making ambiguous who is responsible for our understanding

of sex/gender outside of bodily or biological enactments present in neuroscience (Pickersgill, 2013) (SQ1).

Studies sampled persistently employ a strict gender binary when investigating sex/gender in TGNC populations, excluding or invisibilizing GNC people. However, novel neuroscientific work occasionally recognizes advocacy for their inclusion and concedes that the operationalization of sex/gender should defy traditional binaries. And thus, at times, study designs are constructed that facilitate this, demanding sex/gender self-report from both cisgender and TGNC groups whilst providing extensive lists of sex/gender identities to select from or utilizing scales for measuring sex/gender that do not conform to traditional binary enactments. Furthermore, despite earlier neurofeminist work demonstrating that there are no ‘male’ or ‘female’ brains (Eliot et al., 2021; Jordan-Young & Rumiati, 2012), many studies still conceive of their research aims as clarifying whether TGNC people’s brains resemble that of cisgender people as if there were a differential ‘single brain type’ reflective of one’s sex/gender. Therefore, novel work has employed approaches to analyzing brain data that do not require a priori categorizations of sex/gender, nor comparisons between cisgender and TGNC people, working with neurofeminism to recognize brains as composed of both ‘male’ and ‘female’ characteristics. Such novel operationalizations allow each enactment of sex/gender to embody its own unique heterogeneous neural phenotype, free from binary notions of sex/gender, paving the way for GNC people’s inclusion and recognition within neuroscience (SQ2).

Despite discursive shifts that attempt to depathologize enactments of TGNC sex/gender, many studies sampled still utilize language that defines cisgender as ‘normative’ and TGNC as ‘abnormal’. This comes as no surprise, given within our sample, bioessentialist enactments of sex/gender outweigh social constructivist notions: TGNC embodiments and brain characteristics

are most often attributed to the influence of 3G-sex. Thus, ascribing nearly all of sex/gender's enactment to one's biology, the neuroscientific work sampled ignores or minimizes the influence of environmental factors on sex/gender and rejects the legitimacy of sociocultural constructions. Studies sampled did occasionally offer sociocultural explanations regarding sex/gender, despite not taking these factors into account within the implementation of their research. However, the lack of a critical engagement with these 'novel' shifts in discourse and the maintenance of bioessentialist understandings of sex/gender may prove to be harmful to TGNC people. Regardless of the 'born-into-the-wrong-body' argument and its emancipatory use, the notion that destigmatization may result from discovering a biological basis for being TGNC is inaccurate; given, as the analysis has shown, bioessentialism continues to portray TGNC enactments of sex/gender as 'abnormal' or 'disordered'. Given how neurorealism and neuroessentialism operate (O'Connor et al., 2012), neuroscientific knowledge about sex/gender in TGNC participants will shape broader society's general perception of TGNC people. In conjunction with the continued demarcation of being trans as a 'condition', such knowledge will maintain stereotypes such as that "...there is something broken or fixable about transgender individuals" (Mulkey, 2021) (SQ3).

Ultimately, it appears neuroscience (in)directly contributes to the governance of TGNC people, delineating whose bodies are 'normative/ordered' and whose subjective experiences of sex/gender may be deemed legitimate, thus, obstructing enactments hereof that fall outside of hegemonic hetero-cis-normative ideology. Neuroscientific enactments of sex/gender have transformed constructions of both sex and gender significantly; however, these forms of knowledge are not erasing sociocultural notions of sex/gender, rather they are deeply intertwined and embedded in laying down the social foundation (Jasanoff, 2015) for sex/gender, including the construction of TGNC identity. To illustrate, neuroscience and the state are inherently entangled

due to government sponsorship of brain research (Rose & Abi-Rached, 2013). This entanglement leads the state to make moral claims regarding TGNC communities, professing that funding of such research is exclusively out of care and concern for the target group (p. 327, Pickersgill, 2013). Meanwhile, it is evident within our sample that neuroscience has its own contrair ideas on how to help TGNC people, which may inevitably do quite the opposite. Therefore, it is essential that neuroscience works in close cooperation with TGNC people, given they have long expressed their own concerns and doubts over the prioritization of funding for biological research (Duchense & Trujillo, 2021), whilst gender-affirming healthcare for trans persons remains underfunded and underdeveloped to meet the population's needs. Thus, there are "close linkages between how authorities understand human beings and the ways in which they are governed" (p. 7, Rose & Abi-Rached, 2013), and neuroscientific work inevitably influences society's conception of TGNC people and, ultimately, how they 'ought' to be governed.

The above conclusion is not surprising given that neuroscientists, unless additionally expert or knowledgeable in (trans)gender studies, are no more informed than the broader public concerning how to conceptualize of sex/gender (p. 1, Rippon et al., 2014). The entanglement of neuroscientific work in constructing (and governing) TGNC people's sex/gender identity may appear inevitable, concerningly powerful, and perhaps even somewhat bleak, given the problematic manner in which it is engaged. However, the present work has shown, without a doubt, that the discourse is changing and that more studies are indeed beginning to operate with the best interests of TGNC communities in mind. These shifts are evident within (trans)gender discourse and the broader public as well. As a matter of fact, in response to the transphobic Gendertwijfel campaign introduced at the beginning of this work, posters have begun popping up across billboards in the Netherlands as part of Pride Amsterdam's campaign *Wij Twijfelen Niet* (We Do

Not Doubt). The campaign aims to inform the public what the transgender law actually entails and why its introduction is vital for the trans community. In an identical style to that of Gendertwijfel, the poster illustrates the word “HUMAN” under the silhouette of an ambiguously gendered figure in both pink and blue colors alongside the caption: “The new transgender law makes us more human!” (Pride Amsterdam, 2023), demonstrating that regardless of how sex/gender is embodied, trans people are due the recognition of their autonomy and lived experiences.

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Appendix

Studies sampled

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Ethics and privacy checklist



CHECKLIST ETHICAL AND PRIVACY ASPECTS OF RESEARCH

PART I: GENERAL INFORMATION

Project title: "*Enacting neurogenders: a critical analysis of sex/gender within neuroscientific studies of transgender and gender non-conforming (TGNC) people*"

Name, email of student:

Jaïr van Nes (451107jn@eur.nl)

Name, email of supervisor:

Jess Bier (bier@essb.eur.nl) / Irene van Oorschot (vanoorschot@essb.eur.nl)

Start date and duration: *April 3rd, 2023 – June 25th, 2023*

Is the research study conducted within DPAS

YES - NO

If 'NO': at or for what institute or organization will the study be conducted?

(e.g. internship organization)

PART II: HUMAN SUBJECTS

1. Does your research involve human participants. YES - **NO**

If 'NO': skip to part V.

If 'YES': does the study involve medical or physical research? YES - NO

Research that falls under the Medical Research Involving Human Subjects Act ([WMO](#)) must first be submitted to [an accredited medical research ethics committee](#) or the Central Committee on Research Involving Human Subjects ([CCMO](#)).

2. Does your research involve field observations without manipulations that will not involve identification of participants. YES - NO

If 'YES': skip to part IV.

3. Research involving completely anonymous data files (secondary data that has been anonymized by someone else). YES - NO

If 'YES': skip to part IV.

PART V: DATA STORAGE AND BACKUP

Where and when will you store your data in the short term, after acquisition?

- *Digital data files will be uploaded in SURFdrive. Data consists of critical discourse analysis of empirical research papers within the neuroscientific field that study sex/gender in trans and gender non-conforming (TGNC) people.*

Who is responsible for the immediate day-to-day management, storage and backup of the data arising from your research?

- *I alone am responsible for managing, storing and backing data from my research. After completion, my supervisor may remain owner of the data.*

How (frequently) will you back-up your research data for short-term data security?

- *Data will be backed up at every end of the week to ensure up-to-date data back-ups.*

In case of collecting personal data how will you anonymize the data?

- *Not applicable.*

PART VI: SIGNATURE

Please note that it is your responsibility to follow the ethical guidelines in the conduct of your study. This includes providing information to participants about the study and ensuring confidentiality in storage and use of personal data. Treat participants respectfully, be on time at appointments, call participants when they have signed up for your study and fulfil promises made to participants.

Furthermore, it is your responsibility that data are authentic, of high quality and properly stored. The principle is always that the supervisor (or strictly speaking the Erasmus University Rotterdam) remains owner of the data, and that the student should therefore hand over all data to the supervisor.

Hereby I declare that the study will be conducted in accordance with the ethical guidelines of the Department of Public Administration and Sociology at Erasmus University Rotterdam. I have answered the questions truthfully.

Name student:

Jaïr Alexander van Nes

Name (EUR) supervisor:

Jess Bier / Irene van Oorschot

Date: 25/06/2023

Date:

A handwritten signature in black ink, appearing to read 'Jaïr Alexander van Nes', is placed here.