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Expertise and Non-binary Bodies: Sex, Gender and the Case of Dutee Chand

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Abstract
How do institutions respond to expert contests over epistemologies of sex and gender? In this article, I consider how epistemological ascendancy in debates over the regulation of women athletes with high testosterone is established within a legal setting. Approaching regulation as an institutional act that defines forms of embodied difference, the legitimacy of which may be called into question, I show how sexed bodies are enacted through and as part of determinations of expertise. I focus on proceedings from 2015 when the Court of Arbitration for Sport was asked to decide whether an Indian sprinter, Dutee Chand, could compete as a female athlete. Despite acknowledging that sexed bodies are unruly, the court ultimately endorsed the use of testosterone as seemingly essential to women's athletic performance, thereby reasserting a two-category model of biological difference. The legitimacy of these regulatory efforts was established through the concurrent narrowing of expertise and the body, a process that is also revealed to be gendered.

Keywords
complexity, embodiment, epistemology, expertise, regulation, science, sex, sport, testosterone

In 2011, the participation of women in the sport of track-and-field became subject to formal Hyperandrogenism Regulations stipulating a limit to the amount of naturally occurring testosterone allowed in their bodies. In 2014, Indian sprinter Dutee Chand was barred from

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international track-and-field competition for ostensibly having 'violated' this regulation. When she subsequently contested the legitimacy of this regulatory regime before the international Court of Arbitration for Sport (CAS) in 2015, the adjudicating panel ruled that the Regulations were not yet sufficiently supported by scientific findings, suspending them for 2 years but encouraging the pursuit of new evidence to support their reinstatement. Given the role of sport and law as institutions that affirm the scientific basis of binary sex differences (Henne, 2015; Meadow, 2010), the CAS decision potentially represented a moment of ideological destabilization and change. However, with the international governing body for track-and-field announcing new regulations in IAAF (2018), the implications of the Chand appeal are now clear: sport remains stubbornly committed to a binary model of embodied difference, with measures of testosterone endorsed as the legitimate means of regulating this binary in practice.

Feminist scholarship in the social and biological sciences has shown that dominant epistemologies of sex and gender – and especially those that represent biological sex in terms of the distinct, binary categories of male and female – can be contested and even abandoned in favour of a scientific approach to embodied difference that is less troubled by oppressive gender ideology and more rigorous as a result (Fausto-Sterling, 2000; Fine and Jordan-Young, 2017; Lorber, 1993; van Anders, 2012). Given the existence of alternative scientific accounts of the sexed body as complex, dynamic and indeterminate, as well as recent shifts in the political boundaries of gender identity as a result of intersex, transgender and queer activism (Davis, 2015; Meyerowitz, 2002), it is by no means inevitable that the legal and administrative governance of sport continues to endorse a restrictive biological account of the female athlete body. Since sports governing bodies themselves have acknowledged that determinations of gender and sex can be neither scientifically nor ethically justified (CAS, 2015; IOC, 2015), how did the CAS succeed in legitimating the regulation of binary sex-based categories for sports competition? On a broader level, what does this case reveal about the institutional mechanisms that underpin the stubborn persistence of binary and biological epistemologies of sex and gender?

In this article, I consider the role of expertise in the legal proceedings that enabled the International Association of Athletics

Federations (IAAF) – the peak governing body for the sport of track-and-field – to continue pursuing its long-standing regulatory agenda targeting the bodies of women with differences of sexual development. According to theories of expertise as developed within Science and Technology Studies, the achievement of expertise relies upon favourable institutional conditions for both the *production* and the *recognition* of particular knowledge claims (Frickel et al., 2010; Jasanoff, 2005; Suryanarayanan and Kleinman, 2013). At the level of production, state and non-state agents of governance enable and privilege certain forms of science by drawing selectively on expert scientific advisors to develop and legitimate policy efforts, who often interpret available facts in ways that are politically expedient (Jasanoff, 1990: 282; Lentsch and Weingart, 2011). Legal decision-making bodies represent key recognition-granting institutions and may favour certain kinds of scientific knowledge claims, given that the mutually constitutive or coproductive cultures of law and science 'jointly produce our social and scientific knowledge' (Jasanoff, 1995: 8; Merry, 1988). I suggest that these institutional practices also jointly produce particular understandings of bodies. I examine how the granting of expertise in legal settings enables the production of the binary sexed body, and inversely, how such bodies support the achievement of expertise. In doing so, I argue that the body can be understood as both the *product* of expertise and the *unruly material* that aspiring experts must contend with in order to lay claim to epistemological ascendancy.

A central project for Feminist Science Studies has been to reveal this unruliness, particularly as concealed within scientific claims about binary sex difference. In the process, scholars have demonstrated that scientific representations of the body in terms of binary sex categories are deeply gendered, with researchers pursuing such knowledge in ways inseparable from their own gendered social locations and paradigmatic assumptions while engaging in considerable work to align their findings with strongly held social expectations of binary sex difference (Lorber, 1993; Martin, 1991; Spanier, 1995; Tuana, 1988). The 'gender panic' surrounding intersex bodies can be explained by the challenge they pose to the alleged biological basis of the gender binary, leading to their forced alignment at the hands of medical practitioners (Davis, 2015; Fausto-Sterling, 2000; Kessler, 1998; Westbrook and Schilt, 2014). The 'awkward surpluses' of

biological matter that leak beyond the boundaries of the binary and reveal its social nature also occur in the laboratory in the study of animals and genetic sex difference (Fujimura, 2006: 51). Such insights have laid the foundation for a growing body of feminist empirical research in the biological sciences exploring the complexity and dynamism of sexed bodies (see Fausto-Sterling, 2012; Ritz, 2017; van Anders, 2012).

Colleagues and policymakers have often been resistant to the alternative epistemologies of sex and gender advanced by feminist scholars in the social and biological sciences (Fausto-Sterling, 2003; Fine and Jordan-Young, 2017; Ghorayshi, 2016). However, there has been little attention to the specific institutional mechanisms by which these feminist claims about biological difference exit the laboratory and are granted or denied legitimacy in other settings (Sanz, 2017). Charting this step offers a crucial addition to existing feminist research in and on the biological science, completing the analytical circle from the gendered production of knowledge, to the uptake of that knowledge in regulatory efforts, to their effects on the actual enactment of binary sexed bodies and, finally, to their influence on the worldviews of scientific researchers (Epstein, 2004; Haraway, 1988; Sanz, 2017).

The regulation of women with high testosterone in international sport is ripe for the pursuit of such an agenda. Feminists have long critiqued the deployment of medical and scientific knowledge through regulatory interventions designed to police intersex, chromosomal and hormonal variation among women athletes (Jordan-Young and Karkazis, 2012; Kane, 1995). These regulatory acts can be understood as institutional interventions that actively produce forms of embodied difference (Epstein, 2007). However, the actions of sports governing bodies do not take place in a vacuum, and these regulations are contestable, involve diverse stakeholders and are subject to the many forms of formal and informal, legal and non-legal ordering that generate complex regulatory effects and consequences within a given social context (Parker and Braithwaite, 2003). Moreover, approached from the perspective of global legal pluralism, the CAS is not an isolated legal decision-making body (Berman, 2005, 2009; Merry, 1984, 1988). The ways in which the CAS grants legitimacy to certain expert claims and representations of the body can be investigated as an instance of legal norm articulation with

relevance to proceedings in other international, national and local contexts (Henne, 2010, 2015). The Dutee Chand appeal thus presents an important opportunity to examine how legal decision-making bodies respond when regulatory interventions that seek to define sexed, athletic bodies in terms of testosterone are called into question.

The Chand case focused on the Hyperandrogenism Regulations of the IAAF and IOC,[1] developed following the IAAF's mishandling of the gender controversy surrounding South African athlete Caster Semenya in 2009.[2] Part of a much longer history where sports governing bodies have variously surveilled competitors in international women's sporting events, the 2011 Regulations defined endogenous (naturally occurring) testosterone in women athletes' bodies as the key factor determining their athletic abilities and compromising the 'fairness and integrity' of women's competition (IAAF, 2011b: 1). Distinct from anti-doping efforts, they alleged that women with naturally elevated testosterone are technically not cheating but gain an unfair advantage from having masculine physiology. There have been no equivalent regulations specifying 'fair' levels of naturally occurring testosterone in men. Under the Regulations, the limit to the amount of functional endogenous testosterone in female athletes was arbitrarily defined as the start of the 'normal male range' or 10 nmol/L (IAAF, 2011a: 12). Importantly, the 2011 Regulations did not mandate the testing of all female athletes and allowed considerable room for interpretation with respect to how a 'suspect' athlete may be identified.[3] Increasingly, it appears such regulations have been applied in practice in ways that disproportionately target women of colour from the Global South, suggesting that the geopolitics of race and nation also shape the constructions of femininity that are privileged in international sport (Henne and Pape, 2018; Karkazis and Jordan-Young, 2018).[4]

Women singled out for testing and found to be above the specified limit were subjected to examinations to determine the functionality of their testosterone, with a clinical assessment of 'virilization' (or the extent to which they had developed masculine characteristics) erroneously taken to indicate the extent of their athletic abilities. The Regulations did allow women athletes who violated the policy to be reinstated, but only by undergoing medical interventions to return their testosterone to levels deemed appropriate by the IAAF and IOC.

Chand stood accused of violating this standard and her appeal was heard at the CAS headquarters in Lausanne, Switzerland, over 4 days in late March 2015, with the adjudicating panel ultimately ruling to suspend the Regulations for a period of 2 years. The IAAF was invited to submit new evidence during that time.

Through a close reading and textual analysis of the court documentation,[5] I consider the relationships among representations of the body, the achievement of expertise and the legitimation of regulatory regimes. I show how sexed bodies are enacted *through* and *as part of* determinations of expertise. In this case, the legitimacy of the Hyperandrogenism Regulations was established through the *concurrent narrowing* of expertise *and* the body by the CAS adjudicating panel, such that recognition could only be granted to binary accounts of testosterone as the basis of sex difference and athletic ability. Moreover, only certain expert accounts of the body could be realized and acknowledged in the future, due to the research agendas endorsed by the panel.

In what follows, I develop this argument in three sections. In the first section, I show how the first step in narrowing expertise and the body was to disqualify certain knowledge claims, and especially those involving athletes' lived experiences of regulation. Also marginalized were social scientific accounts, with the result that the athletic body was reduced to a partial instantiation, represented in terms of hormones alone and measures of testosterone in particular (Berg and Akrich, 2004: 4). This created a scenario where the regulated body could only legitimately be contested – and expertise claimed – in terms of simplistic narratives about the biological mechanisms of testosterone, which were given additional weight over other types of knowledge claims. In the second section, I consider how the adjudicating panel excluded even those scientific accounts that acknowledged the workings of testosterone, and specifically those that emphasized testosterone as complex, such that the hormonal body could only be represented in binary terms. In the third section, I show how the panel encouraged only the *pursuit* of knowledge that would contain unruly bodies within a binary framework, revealing the institutional limits on realizing alternative forms of expertise and alternative bodies *in the future*. In sum, this configuration of expertise explains how, and despite the existence of evidence to the contrary, the CAS came to view testosterone as the basis of

binary sexed bodies, thereby legitimating the regulation of women with high testosterone.

Paring Down the Regulated Body

Epistemological ascendancy in debates over expertise is shaped by the historically established and context-specific 'social organization of knowledge production', which produces an uneven terrain for the recognition and valuation of different knowledge claims (Suryanarayanan and Kleinman, 2013: 218). This is shown to have particular implications for the efforts of non-scientists, social scientists and feminists to have their knowledge claims legitimated. In the case of expertise and policymaking, for instance, demarcation efforts may seek to exclude non-scientific or 'lay' considerations such that contested policy issues are reduced to matters of scientific expertise alone (Wynne, 2008: 26). Similar efforts to distinguish 'science' from 'non-science' occur in the context of legal proceedings, where decision-making bodies committed to particular ideologies of science focus on demarcating 'true' (objective and falsifiable) science from that which is 'pseudo' or 'junk' (Cole, 2007: 807; see also Cole and Bertenthal, 2017; Jasanoff, 2005; Kirkland, 2012). These narrow definitions of science may exclude social scientific claims to expertise, as seen in the efforts of witnesses from the social sciences to articulate complex structural accounts of institutional racism and other forms of discrimination (Nelson et al., 2008: 104–105). Demarcations of legitimate knowledge during legal proceedings may also be gendered. For instance, feminist legal studies scholars have shown that legal decision-making bodies narrow their recognition of expertise by marginalizing women's lived experiences, devaluing feminized ways of knowing and disqualifying critical feminist perspectives that emphasize social structure and other perceived intangibles (Azocar and Ferree, 2015; MacKinnon, 1987).

My analysis reveals that this narrowing of legitimate evidence to *certain* forms of scientific knowledge also occurs when the regulation of women's bodies is called into question. Faced with an overabundance of data and perspectives, including Chand's lived experiences of being subjected to the IAAF's regulatory regime and social scientific accounts of the complexities of testosterone and athletic performance, the CAS adjudicating panel constructed which

ways of knowing the body would be recognized as relevant to the legitimacy of the IAAF's regulatory efforts. Mirroring other arenas where expertise is established, the panel here drew a line between 'science' and 'non-science' and prioritized the former (Wynne, 1992). The exclusion of social science from this framing meant that expertise was reduced to a *certain kind* of science, with scientific legitimacy defined in biological terms alone. Matters of implementation, including Chand's embodied experiences of regulation as a woman of colour from a Global South nation, were cast as secondary to the narrowly hormonal content of the Hyperandrogenism Regulations. By excluding these ways of knowing the regulated gendered (and racialized) body, the panel limited relevant expertise to the seemingly biological realm and to questions about how and to what extent testosterone matters to athletic performance.

Witnesses discussed a range of actual and potential harms inflicted on women's bodies under the IAAF's regulatory regime and demands that 'suspect' bodies undergo medical interventions in order to compete. Consistent with the treatment of other women athletes under gender eligibility policies, Chand's case included violations of her right to confidentiality and informed consent (Karkazis et al., 2012). For example, without Chand knowing the purpose:

> She was subjected to a 'humiliating' examination by a male doctor, who asked intrusive questions about her body hair, menstrual cycle, surgical history and her hobbies. Several doctors carried out physical examinations of the Athlete body, including on her genital area. The Athlete said she felt vulnerable and did not feel that she had any choice in relation to the testing. (CAS, 2015: 108)

A leak to the media had led to humiliating public scrutiny and 'severe distress' for Chand (CAS, 2015: 108), making 'life extremely difficult for the Athlete' in a country embedded with common-sense notions about athletic bodies and a culture of 'misogyny and violence against women' (CAS, 2015: 111). A social scientist and activist testifying in support of Chand also 'cited examples of athletes being forced to undergo surgery without clear information about what the treatment involved' (CAS, 2015: 110). Even an IAAF witness conceded 'that it was "questionable at best" whether young women in that position can give informed consent for medical interventions within the current procedures' (CAS, 2015: 97).

The CAS adjudicating panel acknowledged that the Regulations could lead to 'significant detrimental consequences' (CAS, 2015: 146). However, Chand's experiences were described only as 'important *background* to the Athlete's case' (CAS, 2015: 107, emphasis added) and addressed in a separate section of the Award document following the issues represented as central to the appeal. In other words, such concerns factored into the panel's assessment only insofar as the Regulations could be scientifically justified. Despite Chand's experience to the contrary, the panel accepted the IAAF's argument that the Regulations provided a clear protocol for ensuring confidentiality and obtaining informed consent, rendering the implementation of the Regulations irrelevant to their legitimacy (CAS, 2015: 30, 107). In this move, Chand's embodied experiences were constructed as an irrelevant form of expertise, rendering experiential dimensions of the regulated body incontestable and positing them instead as the legitimate outcomes of regulations imposed – on certain women more than others – by international sports governing bodies located in Global North nations (Henne and Pape, 2018; Karkazis and Jordan-Young, 2018).

The devaluing of social scientific ways of knowing followed a similar path, seen particularly in the experiences of bioethicist Katrina Karkazis, a witness for Chand. Among her arguments was the claim that 'there is "a great deal of mythology" about the physical effects of testosterone' (CAS, 2015: 51) on athletic performance. Critiquing the normative basis of the Regulations, she argued 'more than half of the indicators specified in the Hyperandrogenism Regulations . . . are "entangled with deeply subjective and stereotypical Western definitions of femininity"' (CAS, 2015: 76). These indicators included 'deep voice, breast atrophy . . . increased muscle mass, [and] body hair of male type' (Karkazis et al., 2012: 13). Additionally, Karkazis pointed to the myriad social factors beyond physiology that influence the athletic success of elite athletes, such as access to training facilities, superior coaching, sports psychology, sports science, nutritious food and health supplements, each of which are more widely accessible to athletes in resource-rich countries (see also Karkazis et al., 2012). The panel's response was to describe these claims as 'sociological opinion, which does not equate to scientific and clinical knowledge and evidence' (CAS, 2015: 134).

However, the arguments contained in Karkazis' evidence and publications were more than sociological in nature. For example, Karkazis and colleagues provided a comprehensive review of the scientific evidence for and against the claim that testosterone can be relied upon as a single indicator of athletic advantage (Karkazis et al., 2012: 8, 11). It also reviewed the potential health implications, positive and negative, associated with the IAAF's proposed medical interventions (p. 12). In determining not to 'give great weight to this article for the purposes of this case', the panel defined not only the *kinds* of claims that were to be deemed legitimate expertise, but also *who* was credible in making those claims, serving to further narrow the conditions under which representations of the regulated body would be recognized (CAS, 2015: 134). In sum, the vast array of knowledge claims that were presented as evidence to challenge the legitimacy of the Hyperandrogenism Regulations were reduced to a very specific area of expertise: direct engagement with the biological study of testosterone. And here, too, only certain representations of testosterone would count.

Excluding Complexity

The reduction of the sexed, athletic body to a single biological characteristic can be understood as a partial instantiation or approximation of the 'body as a whole', and a strategic step for regulatory efforts that might be crippled if the body's full complexity was acknowledged (Karkazis and Jordan-Young, 2018; Mol and Law, 2004). Similarly, feminist scholar Carol Smart has shown that the 'precision' demanded by the legal process simplifies complex gendered experiences, replacing them with oppositional binaries such as truth/untruth or consent/non-consent, as she documents in relation to rape (Smart, 2002: 26). This binary logic has been shown to extend to transgender identity claims, with courts and state agencies in countries like the United States more likely to recognize those individuals who have undertaken medical interventions to fit within the expected gender/sex binary (Meadow, 2010). Thus, like other regulatory agents, legal decision makers often reject expert claims emphasizing the complexity of gender as a lived and embodied experience, aligning instead with those experts who reproduce the simplified binary logic of the 'social and cultural status quo' (Wilson, 2016: 742).

However, testosterone is an unruly entity (Oudshoorn, 1994; Roberts, 2007). The adjudicating panel was asked by Chand's witnesses (including those with the 'appropriate' scientific expertise) to recognize that testosterone evades the efforts of researchers to establish it as both the basis of binary sex difference and the key factor contributing to athletic ability. These expert witnesses argued specifically that two 'factual premises' of the Hyperandrogenism Regulations were overly simplified and therefore 'fundamentally flawed:' (i) that elevated levels of natural testosterone give female athletes a decisive performance advantage and (ii) that medical science can delineate distinct testosterone ranges for male and female athletes (CAS, 2015: 34). By contrast, the IAAF's experts argued that testosterone is 'the best discriminating factor between male and female athletes in sports' with 'no overlap in testosterone levels between men and women' (CAS, 2015: 37, 135). At issue was both expertise and the ontological character of testosterone: was it complex, dynamic and indeterminate, or could it be relied upon to invariably represent a binary model of sex and athletic ability?

There were signs that the panel was amenable to the position that sexed bodies are complex. For example, the panel agreed with Chand's experts that 'sex in humans is not simply binary' and 'there is no single determinant of sex' (CAS, 2015: 11). Despite this acknowledgement, the panel accepted the IAAF's claim that the Hyperandrogenism Regulations 'do not police the male/female divide but establish a female/female divide within the female category' (CAS, 2015: 147). The panel explained further:

> [Testosterone] is not being used to determine whether an athlete should compete either as a male or as a female. Instead, it is being used to introduce a new category of ineligible female athletes within the female category. (CAS, 2015: 147–148)

This logic permitted the Hyperandrogenism Regulations to be treated as distinct from earlier forms of gender verification, such as chromosomal testing, which had been abandoned for their scientific inaccuracies (Henne, 2015). But although the CAS acknowledged that efforts to represent sexed bodies as binary were problematic, it approximated such accounts by introducing a new binary model of difference, one that continued to rely on a single biological factor –

testosterone – to draw a line between 'normal' women's bodies on one side and 'superwomen' and men on the other (Pape, 2017). This new binary simulated the sex categories of male and female in all but name, not least since there was to be no third category for competition purposes. Rather, women with functional testosterone above 10 nmol/L who refused to medically lower their testosterone levels would be required to compete with men (IOC, 2015).

This new binary relied on the panel's recognition of the IAAF claim that male and female bodies conformed to distinct and non-overlapping ranges of testosterone once 'pathological' outliers were excluded from the analysis. Calculations here were based on data collected from the population of 2,127 elite athletes competing across the IAAF World Championships of 2011 and 2013, in which there were 'a significant number' of men ($n = 198$) with testosterone below the so-called normal male range, including four whose levels were considered to fall within the female range, and only 13 women whose testosterone levels were above the nominated normal limit for female athletes (CAS, 2015: 44). Chand's experts opted to include these outliers, arguing that it was scientific to include all of the naturally occurring diversity within the elite athlete population, leading them to conclude that there was 'complete overlap of endogenous testosterone levels between the sexes' (CAS, 2015: 42). By contrast, and consistent with the clinical construction of intersex as a disorder, the IAAF experts argued that such outliers were 'pathological' and should be excluded when calculating normal and 'healthy' testosterone ranges (CAS, 2015: 54–56).[6] In assessing these competing approaches, the panel accepted the clinical representation of outliers as pathological bodies, determining that the IAAF had 'provided an explanation for why those outliers should be disregarded' and that the regulators were 'reasonably entitled to rely on testosterone' as an approximation of binary sexed bodies (CAS, 2015: 143).

Determining testosterone's role in enhancing athleticism was more challenging. Again, the panel showed signs of acknowledging complexity, noting 'other factors besides testosterone . . . may also contribute to the significant male athletic advantage over females' (CAS, 2015: 150). However, this acknowledgement was forgotten as the panel narrowed in on debates about the nature of testosterone. One such debate was whether endogenous (naturally occurring) testosterone produced similar effects in athletes' bodies to exogenous

(artificially administered) forms of testosterone, since the latter was known to be a performance enhancer.[7] In other words, how complex was testosterone itself? Did it have absolutely determined effects on the body regardless of how it arrived there?

Expertise here became a matter of what should constitute legitimate interpretation of secondary studies, since both sides 'relied on different published papers to support his or her view on whether there was an exogenous/endogenous divide' (CAS, 2015: 137). In the process, both sides questioned the findings of peer-reviewed articles. But whereas the panel saw the IAAF's critiques as '[coming] directly from their fields of expertise' (CAS, 2015: 138), they would not grant the same right to Chand's experts, stating that they could 'not accept unsupported speculation and hypothesis to overcome established data and expert conclusions drawn from those data' (p. 139). In other words, the peer review process was trustworthy when it produced a binary account of testosterone, but questionable when it legitimated findings of complexity.

With Chand's expert interpretations of secondary studies disqualified, the panel saw their complex representations of testosterone as insufficient and lacking an empirical basis (CAS, 2015: 143). According to the CAS, the burden of proof was on Chand to establish on the balance of probabilities that testosterone either *was* or *was not* a material factor in determining athletic performance, with the panel concluding that 'the Athlete [had] not established that there is *no* relationship between testosterone and athletic performance' (CAS, 2015: 137, emphasis added). However, this binary burden of proof contradicted Chand's claim that both athletic performance and sex difference are complex and involve multiple biological determinants, including *but not limited* (or reducible) to testosterone. By requiring an impossible confirmation of the null, that is, proof for the negative claim that testosterone does *not* confer an advantage of *any* size, legitimate expertise could only be that which constructed testosterone – and the sexed athletic bodies it was taken to approximate – in binary terms. Expert accounts advancing a more nuanced and complex representation of biological bodies were disqualified by this decision.

Realizing the Knowable Body

Knowledge production relies on the institutionalized allocation of power, resources and opportunities. The absence of such allocations

may also lead to certain forms of knowledge being left 'undone' (Frickel et al., 2010). This is particularly likely to occur if a research agenda conflicts with or undermines existing ideologies and interests (Böschen et al., 2010; Kleinman and Suryanarayanan, 2012; McGoey, 2007). Indeed, for this very reason, certain forms of knowledge about gendered and sexed bodies may lack institutional support and become relegated to the realm of ignorance. For instance, Nancy Tuana (2004) shows that medical training and textbooks have historically overlooked the anatomy and functioning of the clitoris, thereby limiting knowledge about how women experience sexual pleasure and containing their sexuality in the process.

The institutional line drawn between knowledge 'done' and that left 'undone' is significant to the possibility of claiming expertise, since aspiring experts draw on existing or 'done' bodies of knowledge. Not all research agendas involving the body will receive institutional support, but those that do will lead to the body becoming knowable in certain 'expert' ways (Mol, 2003). The outcome of the Chand appeal, in which the CAS adjudicating panel supported in principle the use of testosterone to regulate women's athletic participation, had the effect of limiting how the sexed body could be known and who could claim such expertise in the future. Although they opted to suspend the Regulations in the short term, the panel encouraged the IAAF to pursue new areas of research to support the reintroduction of their regulatory regime. Moreover, only the IAAF was invited to return to the CAS with new evidence. Thus, although the potential directions of future research were diverse, the CAS decision endorsed the pursuit of a research agenda that would confirm testosterone as the basis of binary athletic bodies.

The CAS panel was forced to acknowledge remaining uncertainty concerning the *magnitude* of testosterone's effects on athletic ability. They had required the IAAF to demonstrate 'the *degree* of competitive advantage conferred by a testosterone level above 10 nmol/L', such that the exclusion of women above this level could be justified (CAS, 2015: 155, emphasis added). In the absence of such evidence, IAAF experts had relied on the claim that 'the best analysis of [the physical effects of testosterone] is the clinical response . . . namely virilisation' (CAS, 2015: 131). The panel was unconvinced that this constituted a definitive measure of testosterone's effects on athletic ability, describing it as inferior to 'scientific data from a properly

conducted study' (CAS, 2015: 142). However, they expressed their confidence that such a study could be conducted. In other words, the panel determined that more research of a *specific kind* was needed to address remaining uncertainty surrounding the magnitude of testosterone's effects on athletic bodies.

In this instance, the panel deemed the IAAF's overall hypotheses to be worthy of further investigation. According to the panel, while there was 'presently no available evidence' that testosterone conferred a male-sized advantage to women with naturally elevated levels, the IAAF's 'assumption may well be proved valid' (CAS, 2015: 155). They noted further that 'evolving scientific evidence or the compilation of existing evidence and data [may] reach a sufficient level of proof', recognizing in particular the IAAF's stated plans to reanalyse their World Championships data set (CAS, 2015: 156). In sum, the panel's decision defined the need for more 'science' to be done, but *only* about the magnitude of testosterone's effects, presenting this binary claim as probable but as yet unproven. By contrast, the panel was silent on the possibility that Chand's experts could or should do the same. A line was drawn between doable and undoable research, with that which would challenge binary representations of sex and athletic ability defined by omission as unnecessary science.

This decision in support of the IAAF's overall research agenda belied the extent to which both Chand's and the IAAF's research results were inconclusive about exactly if and to what extent testosterone confers an athletic advantage. This is despite the fact that at key moments during the proceedings, the IAAF hypothesis that testosterone corresponded with enhanced athletic ability was revealed to lack support. For example, in an academic article submitted as evidence to the CAS, IAAF witnesses conceded that 'the lack of definitive research linking female hyperandrogenism and sporting performance is problematic' and that 'there is no clear scientific evidence proving that a high level of T is a significant determinant of performance in female sports' (Bermon et al., 2014: 4334). One IAAF witness acknowledged this uncertainty during the hearing, stating that 'we don't have much evidence' and 'there was no definitive proof' of the link between testosterone and differences in male and female athletic abilities (CAS, 2015: 57). With both Chand's and the IAAF's claims revealed as inconclusive, both could have been

represented as warranting further research. Instead, the legal vision of doable research pushed certain *potential* accounts of the body to the margins, simultaneously discouraging the realization of related expertise.

The panel's assessment of worthy and unworthy research also contained a gendered asymmetry. The outliers excluded by the IAAF when calculating 'normal' testosterone ranges included male athletes whose testosterone fell in the 'female range', potentially as a result of 'hypogonadism' (the underproduction of testosterone), which IAAF experts described as a 'medical condition' (CAS, 2015: 93). Despite a key justification for the Hyperandrogenism Regulations being the IAAF's alleged concern for the health of female athletes with high testosterone, it was stated that 'the lower boundary of the male range was a "non-issue,"' and in regard to men, 'a "huge amount of work" would need to be done to . . . see if the levels of testosterone were normal or pathological' (CAS, 2015: 53, 93). The panel accepted the IAAF's claim that men's bodies were not worthy of clinical investigation in the same way as women with non-normative testosterone levels, meaning that the attribution of 'pathology' was also gendered (Westbrook and Schilt, 2014). Now in the realm of non-knowledge, men's bodies with so-called female levels of testosterone would have no bearing one's ability to claim expertise. Nor would these bodies be constructed as the legitimate targets of regulation. This example reveals the IAAF's agenda to be distinct from health concerns. Rather, the purpose of the IAAF's regulatory efforts is once again the containment of women's bodies in service of the gender binary (Cavanagh and Sykes, 2006).

Concluding Remarks

There is an overarching puzzle underpinning this analysis of expertise in the Chand appeal: if feminist scholars in science studies and biology are providing alternative ways of conceptualizing the sexed body as complex, dynamic and indeterminate, what institutional mechanisms prevent the broader recognition and experience of the body in such terms? When the regulatory regimes that underpin the practice of binary sex in sport are called into question, so too are the forms of scientific and medical knowledge on which they rely. Yet the purpose of the questions raised in this article is not to outright

reject scientific representations of embodied difference since, as argued by Fine and Jordan-Young (2017), complex epistemologies of the sexed body can in fact be considered more scientifically rigorous than the ideologically driven binary alternative. Rather, Chand's legal challenge presents a rare opportunity to chart the institutional process by which legitimacy is denied to complex scientific renderings of sex and gender. The contribution of this article to such an agenda is to examine precisely how expertise and the body are co-produced as part of the reassertion of binary accounts of biological sex (Epstein, 2004; Jasanoff, 1995). At the same time, the outcome of the Chand appeal is important to understand in its own right, since the panel's overall support for testosterone as definitive in producing women's athletic excellence paved the way for the IAAF to introduce a revised regulatory regime in IAAF (2018). Much like the original Regulations, this version is the focus of yet another heated international debate in and beyond the sporting world.

This debate is additionally salient, given the apparent over-representation of women of colour from the Global South among those athletes singled out for investigation (Bohuon, 2015; Henne and Pape, 2018; Karkazis and Jordan-Young, 2018). This focus is aligned with a history of medical experts marking the bodies of Black women as sexually ambiguous in service of the co-production of femininity and whiteness (Magubane, 2014). As established in this article, it is notable that arbitration procedures put the burden on Chand, from a working-class family in rural India, to disconfirm the experts of international sports governing bodies located in the Global North, who hold considerable resources to invest in their research agendas (Galanter, 1975; Pape, 2017; Straubel, 2005).[8] This regulatory process thus exposes the intersectional effects of race, class and nation on decisions about gendered bodies, indicating that gender determination is never a purely one-dimensional process.

In order to reassert sexed bodies as binary, it was necessary for the CAS adjudicating panel to progressively narrow their determinations of expertise. In the first instance, this took the form of disqualifying those knowledge claims that did not relate specifically to a narrowly defined focus on the biological mechanisms of testosterone. Particularly troubling here is that the differential treatment of women's bodies can be justified by such science. Although the IAAF and the IOC have long agreed that female athletes should not be subjected to

gynaecological examinations – the so-called 'nude parades' that were initially used to 'verify' the sex of competitors in women's events (Bohuon, 2015) – the Hyperandrogenism Regulations preserve and legitimate this precise practice for women whose bodies 'fail' a testosterone screening.

The onus of proof requiring Chand to empirically demonstrate that testosterone either *does* or *does not* influence performance disqualified from the outset her actual claim that testosterone is one of many factors implicated in the production of athletic excellence. This aversion to complexity aligns with the interests of the more powerful stakeholders involved in expert debates, as does the exclusion of the social and experiential claims advanced by Chand and her experts (Suryanarayanan and Kleinman, 2013: 232; see also Nelson et al., 2008). Also excluded from the panel's narrow vision of expertise to be left undone were the alternative hypotheses advanced by Chand's experts, which were also the research agendas most likely to destabilize the binary embodiments of sex institutionalized in and beyond sport. Determinations of doable and worthy research emerge as significant to both future expertise and potential embodiments: institutional support matters not only to the *recognition* of claims based on 'done' research but also to the possibility of *doing* such research and revealing unruly bodies in the first place.

The uneven terrain represented by the CAS for the recognition of expert claims was also explicitly gendered, not least in legitimizing the prevailing asymmetrical tendency in medicine and sport to problematize and intrude upon women's bodies (Jordan-Young and Karkazis, 2012; Kane, 1995; Moscucci, 1990; Rapp, 1999; Westbrook and Schilt, 2014). More generally, the CAS decision rendered illegible those accounts of women's bodies that would challenge existing notions of binary embodied difference and related gender inequalities. As such, and as also seen in the regulation of transgender women in sport, the outcome of the Chand case forms part of institutional resistance to change at a moment when alternative accounts of sexed and gendered bodies are gaining broader recognition (Cavanagh and Sykes, 2006; Davis, 2015; Meyerowitz, 2002). There are high stakes attached to the institutional politics of epistemology as a site of contending modes of expertise. In the case examined here, they include whether and to what extent alternative embodiments of sex and gender are rendered legitimate and liveable.

Yet the stakes are also broader, encompassing a very central concern for feminist scholars and one that affects many more women: the project of reconfiguring the dominant ideological construction of women bodies as fundamentally different from and physically inferior to men's.

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Notes

1. The International Olympic Committee is the peak governing body for the Olympic Games. Both organizations released their Hyperandrogenism Regulations in 2011.
2. During the 2009 World Championships, the International Association of Athletics Federations (IAAF) announced that they were investigating Semenya for suspected ambiguities in her sexual development (Clarey, 2009). They were subsequently criticized for not having a clear testing protocol and disregarding Semenya's right to confidentiality (Cooky et al., 2013).
3. In Chand's case, the Athletics Federation of India allegedly investigated the 18-year-old athlete after several competitors allegedly 'expressed concern . . . that the Athlete appeared to be very masculine in her physique' (CAS, 2015: 112).
4. As several scholars have convincingly shown, earlier efforts at gender eligibility regulation were similarly underpinned by geopolitics (Bohuon, 2015; Henne, 2015; Pieper, 2016). Regulatory efforts during the Cold War era targeted allegedly masculine women athletes from Eastern Bloc nations.
5. The analysis draws primarily on the 161-page interim arbitral award document released by the CAS in 2015 (CAS, 2015). I conducted a

textual analysis of the panel's representation of the case, informed by feminist methodology and drawing on abductive coding techniques in an effort to generate new theoretical insights based on how the panel constructed relations between expertise, the body and regulation (Charmaz, 2006; Cook and Fonow, 1986; Timmermans and Tavory, 2012). Working with small excerpts at a time, I iteratively read and coded the proceedings, seeking to identify the discursive moves by which the CAS adjudicating panel represented the body and related knowledge claims.

6. Whereas Chand's experts argued that '*healthy* women with high testosterone levels [may] never present themselves for clinical attention' (CAS, 2015: 57, emphasis added), IAAF experts responded that 'the chance of a healthy woman having a testosterone level of 10 nmol/L is "zero"' (CAS, 2015: 56).
7. The IAAF relied on data showing a positive relationship between anabolic steroids and athletic performance. Chand's experts argued that doping 'involves the introduction of a new biochemical agent that upsets the body's equilibrium', whereas the IAAF argued there is 'no biochemical difference between endogenous and exogenous [testosterone]' (CAS, 2015: 35, 54).
8. The IAAF's anti-doping budget, which supports the research of the Medical and Anti-Doping Committee, totalled US$2.03 million in 2015 (IAAF, 2016).

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