

Response to Letter to the Editor

# The Harrison Bergeron Olympics

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We appreciate Bermon and colleagues' (2013) engagement with our critical reflection on the new hyperandrogenism policies from the International Association of Athletics Federations (IAAF) and the International Olympic Committee (IOC) (Karkazis et al. 2012) and thank them for characterizing it as "exceptionally thoughtful and thorough." In the spirit of continued dialogue, we would observe that the authors' response to our analysis repeats the case presented in the policies themselves, yet includes neither new argumentation nor new evidence. We have already addressed our concern that the new policies incorrectly boil the issue of "advantage" down to testosterone levels alone, so we do not elaborate that point here. Instead, we have limited our response to two areas: (1) the absence of evidence to support such policies; and (2) the questionable assertion of benevolence regarding athletes' health.

## ABSENCE OF EVIDENCE AND EVIDENCE OF ABSENCE

Bermon and colleagues make many claims regarding what testosterone does to and for the female athlete, concluding that women with higher testosterone levels have athletic advantage over other women athletes. These authors, among many others, claim as fact that the reason men often outperform women at the elite level is because of large sex differences in average testosterone: "One factor makes a decisive difference in the results of training—the high levels of testosterone in men" (64).

We noted the absence of evidence for these policies in our earlier article, and despite rhetorical flourishes such as asserting that women with high testosterone levels have "massive androgenic advantage," the authors point to no new evidence to support these claims. Moreover, the authors (perhaps inadvertently) highlight evidential gaps when they state, "The male advantage in certain sports is *most likely explained* by the fact that men produce 'much higher levels of androgenic hormones'" (63, emphasis added) and "All these effects of testosterone *could* be beneficial for physical performance" (64, emphasis added).

As we have repeatedly written, testosterone does matter to athletic performance. But *how* it matters is not as simple or

straightforward as either the policies or the current response by Bermon and colleagues would have it.

One common error is confusing correlation for causation—for example, men have the highest testosterone levels and the fastest times, so testosterone must be what causes the performance boost. The authors cite a number of studies demonstrating correlations between testosterone, on the one hand, and speed or strength on the other, but ignore the many interactions and complexities that make it impossible to draw a straight line from testosterone levels to athletic outcomes. A growing body of research approaches testosterone and physical performance as two ingredients within a complex, dynamic, and recursive system of influence, and the studies that Bermon and colleagues cite as if they demonstrate simple effects of testosterone on "athleticism" are in fact much more complex. For example, they refer to work by Blair Crewther and colleagues (Crewther et al. 2012a) as showing that "salivary testosterone at resting conditions predicted explosive strength and sprint running in male athletes" (Bermon et al. 2013, 64). Yet Crewther and colleagues' work actually shows that testosterone was only *correlated* with performance in a *subset* of the male athletes they tested, and then only on a subset of the tasks that were measured. Compared to the simple summary found in the Bermon and colleagues response, the conclusion of that study is considerably more nuanced: "The key conclusion is that the expression of force and power in an elite athletic group *may be dependent, to some extent*, on individual variation in salivary free T [testosterone] concentrations and existing strength or power levels. The current results also confirm that the grouping of elite athletes of mixed strength or power ability may bias predictive results in a manner not reflective of sub-groups within this population" (Crewther et al. 2012a, 221, emphasis added). Crewther and colleagues (2012b) have replicated similar complexity on other groups of elite athletes. Recent summaries in Haff and colleagues (2008) and Gatti and De Palo (2011) both highlight the complex two-way influence between testosterone and specific training regimens and athletic experience, and indicate how much is presently still unknown about the variabilities and

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mediating factors in individual athletes' production of and responses to testosterone.

Bermon and colleagues also appeal to the observable benefits of androgen doping, especially in the former German Democratic Republic, to assert that women with naturally high testosterone have "massive" athletic advantage. Again, though, data on doping are not necessarily informative for understanding how endogenous androgens function, since "data from anabolic steroid users" are not "necessarily likely to represent normal physiological ranges or responses found in healthy young athletes" (Crewther et al. 2012b, 261).

There is a second problem with appealing to the evidence from doping in the context of policies on hyperandrogenism. Too many people view testosterone as foreign to women's bodies and high levels as like doping. This outmoded idea is perpetuated by calling testosterone a "male hormone" even though all people produce testosterone, and it is important for body functions and organs well beyond those we think of as masculine, like the heart and liver. As we noted in our article, unlike doping, women with naturally higher levels of testosterone have introduced nothing foreign into their bodies. These women have not cheated.

These authors echo a claim that is often made, namely, that men have roughly 10 times as much testosterone as women. But men aren't 10 times as fast or strong. Consider Naomi "Supergirl" Kutin, a 105-pound 11-year-old who can squat 226 pounds—a feat that few grown men with double her weight and probably 10 times her testosterone can match. Across most swimming and running races, men's times are roughly 10 *percent* faster than women's—that's obviously far less difference than the supposed 10-fold gap in testosterone (Robinson 2012).

The relationship between testosterone and strength or speed isn't a simple line, where X nmol/L more testosterone results in X faster racing or increased strength. Neither does it appear to be a curve, meaning that larger and larger increases in testosterone are needed to make even a small difference in performance at the very highest levels.

That possibility seems increasingly unlikely as more data emerge on testosterone in elite male and female athletes. The biggest relevant study by far is the GH-2000 study, funded by the IOC and the European Union. Their main goal was to look at human growth hormone, but scientists also analyzed over 600 athletes' samples for testosterone. The testosterone results aren't published yet, but the lead scientist on the study, Dr. Peter Sönksen, allowed us to see preliminary results—results that were actually shared at the meetings that the IAAF and IOC convened to develop the new policies. The relationship between male and female testosterone distributions is quite different from what seems to be found among people who aren't elite athletes. First, about 5% of the women fell into what is often considered the "male" range and fully 8% were above what is usually considered the "female" range. Perhaps more surprisingly, roughly 25% of male elite athletes were *below* the "male" range, with a substantial proportion falling in what is considered the "female" range (Sönksen 2012). So the

gap in strength and speed between male and female athletes' top performances is happening in spite of the fact that testosterone levels in the two groups overlap considerably. In interviews we have conducted over the past year, other scientists who study athletes confirmed that they see overlap in male and female testosterone levels, too, especially when they attend to free testosterone rather than total testosterone, and when they account for the different kinds of sports and training athletes engage in, rather than generalizing across all sports as if "athleticism" is a monolith.

The GH-2000 data were shown at the meetings where the new hyperandrogenism policies were developed. And yet the notion that there are vast differences in male versus female testosterone levels has been repeated by people who were present at those meetings, both in print (see, e.g., Vilain as quoted in Macur 2012) and in conversations. When we asked a high-level sports administrator who attended the meetings how the policies could be reconciled with the GH-2000 data, we were told that these data "were not relevant to the question at hand."

There are many unknowns about how exactly testosterone works with regard to athleticism, but one thing is crystal clear from the evidence so far: You can't use testosterone to predict who is going to do better on any physical feat. You also can't infer that people who do better have more testosterone. As irresistible and convenient as the idea appears, testosterone is not the one-stop shop of athleticism.

The evidence is also beginning to point to a second fact: There is more going on here than a simple absence of data. It's not just what isn't known that's troubling, it is what is seen as irrelevant (as in the GH-2000 data) and what is overlooked or forgotten (as in the actual complexity of the studies showing limited and reciprocal relationships between testosterone and athletic performance). Scholars in science and technology studies increasingly assert the need to actively study the production of ignorance (Proctor and Schiebinger 2008), and suggest that by paying close attention to the ways that what *is* or *could be* known is nonetheless not incorporated into official scientific narratives, we can better understand the assumptions and ideologies that underlie apparently neutral scientific evidence and interpretations. The case of what testosterone does to and for the female athlete is ripe for a study of the active production of ignorance.

#### FOR THEIR OWN GOOD?

The notion that the policies emanate from "concern for the health of athletes" (Bermon et al. 2013, 63) reflects a questionable assertion of benevolence regarding athletes' health and sidesteps the fact that neither governing body pays for nor provides what it construes as treatment. Moreover, as we noted earlier, the interventions used to lower testosterone are controversial and raise health sequelae in the near term and long term—none of which will sports organizations like the IAAF or IOC monitor or pay for. The assertion also ignores the fact that women may not want the interventions, especially if they are not medically necessary.

The purported focus on health masks who will actually bear the burden of these policies. Bermon and colleagues note that “Since the implementation of the 2011 IAAF Regulations, 18 cases have been considered” (2013, 65). At a talk last year, Bermon (2012) reported that 16 women had been investigated since early 2007. It’s not clear how these numbers reconcile, but the new numbers seem to suggest that far more women are being investigated than had been previously publicly known, and they also suggest that the rate of investigation has at least doubled since the new policies were released. Bermon also noted that most, or perhaps even all, of the athletes who have been subject to investigation and exclusion under these policies come from “poor countries,” which has been explained by the supposedly higher prevalence of intersex conditions in some regions of the world, combined with “lack of access” in poor countries to early and intensive medical management—what the policies presume to be “excellent” care, even though that care has been hotly disputed for 20 years.

Why are women from the Global South most likely to be affected? The kind of conditions being singled out may not necessarily be viewed as equally problematic in other countries where allopathic medicine is not as entrenched or where access to medical care may be more limited. Sports administrators, unaware of the ways in which cultural responses to gender-atypical bodies and masculinity and femininity may differ, paint this as a deficit. In a sense, the medical condition of hyperandrogenism is the cover under which ideas about appropriate femininity, appropriate medical care, and any number of other ideas enter. By most parameters, elite athletes are among the healthiest people on the planet, and female athletes with high testosterone levels are no exception to this. But by a medical definition that takes statistical norms as the definition of health, hyperandrogenism (“male” testosterone levels in a woman) is a “disease condition.” This might not be so pernicious except for the very real consequences. In order to compete, women must undergo complex medical interventions that are likely to have debilitating side effects; these interventions may also have lifelong health consequences. This is especially important for women from poor places—as Caster Semenya and Santhi Soundarajan were—for whom sports are a way out of poverty and who may be unduly coerced into intervention in order to compete. Ironically, then, mandatory medical interventions to lower testosterone may well make healthy women ill, even as sports officials rationalize the policy as based in concern about athletes’ health. This false benevolence about health masks an old story about knowing what is best for others in developing countries.

Women of color also may be targeted for investigation because of long-standing and widespread conflation of whiteness with femininity, as well as mistaken but common ideas that people of African descent have higher testosterone levels. Thus, there is another extremely important and complex tale to be told about how these policies play out in a global field marked by a racialization of gender, extreme economic inequality, and medical imperialism.

We appreciate the clarification that the group crafting the policies did include three sports physicians and exercise physiologists. Nonetheless, their point that “all DSD-related matters (genetics, endocrinology, gynecology, sports physiology, psychology, ethics, etc.) were extensively discussed” actually underscores the fact that the group remained focused on intersex, rather than considering the more relevant and broader questions about testosterone and athletic performance. We hope that in future revisions of the policy, any expert group will include scientists who work on testosterone and athleticism.

In the short story “Harrison Bergeron” by Kurt Vonnegut, Jr., set in 2081, Constitutional Amendments have made everyone equal. The agents of the Handicapper General enforce the equality laws and anyone considered above average is given a handicap to render them equal to the rest of the population. People are made equal by devices that bring them down to what is perceived as normal in the story; these devices include weights to stunt speed and strength. The new hyperandrogenism policies move toward just this sort of dystopic vision. Bermon and colleagues maintain that “the early returns are encouraging” (65). For whom? ■

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