Twitter Thread by Kirsti Miller

Kirsti Miller
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@_Miatonin @AOC There is no no differences in strength between men and women are seen when normalized for muscle cross-sectional

@LaurenMurphyMMA @_Miatonin @AOC It is reductionist (and wrong) to suggest the performance gap is all about biology (e.g. testosterone).

@LaurenMurphyMMA @_Miatonin @AOC Based on the present evidence, it is reasonable to suggest that biological, psychological, and sociocultural factors contribute to the range of gender gaps observed across sports.

@LaurenMurphyMMA @_Miatonin @AOC Men and women exhibit similar relative responses to resistance training, with no gender-specific responses noted after 10-weeks of resistance training.
https://t.co/LpI1KiE70c

@LaurenMurphyMMA @_Miatonin @AOC A number of other gender-'independent' factors contribute to the regulation of adult muscle mass, including genetics, race, adiposity, training, diet, and birth order.
https://t.co/qlYh39uwUl

@LaurenMurphyMMA @_Miatonin @AOC For example, data from twin studies suggests up to 50% to 60% of the difference in muscle mass and strength may be due to genetic factors without clear gender influences.

https://t.co/OxpjyGRX5R

@LaurenMurphyMMA @_Miatonin @AOC Said differently, the amount of muscle mass and strength displayed by an individual may be influenced by 'non-sex' genetics to a level that rivals or exceeds the influence of gender.

@LaurenMurphyMMA @_Miatonin @AOC Muscular power can be defined as high-velocity force production. As described above, men tend to be taller, heavier, and carry more muscle and less body fat than women. Despite men having more muscle mass however,..

@LaurenMurphyMMA @_Miatonin @AOC there does not appear to be any difference in average muscle fiber type composition (e.g. Type I- and Type II fibers) between genders.

https://t.co/0qhYEqrhiB

@LaurenMurphyMMA @_Miatonin @AOC Type I muscle fibers are classically referred to as “slow-twitch” muscle fibers and tend to produce low amounts of force for long periods of time, e.g. they are very fatigue resistant. In contrast,..

@LaurenMurphyMMA @_Miatonin @AOC Type II muscle fibers, or “fast-twitch” muscle fibers, tend to produce high levels of force for short periods of time and are tend to fatigue quickly.

@LaurenMurphyMMA @_Miatonin @AOC Interestingly, muscle fiber type composition seems to be more strongly correlated with training history and athlete caliber than gender.

@LaurenMurphyMMA @_Miatonin @AOC For example, women who compete in Olympic weightlifting at the World or Olympic level were found to have 71% fast-twitch type IIa fibers compared to the 63% seen in men competing at the National level.

@LaurenMurphyMMA @_Miatonin @AOC While absolute power output appears to be greater in men in general, when we normalize existing power data for fat-free mass and...

@LaurenMurphyMMA @_Miatonin @AOC fat-free cross-sectional area (approximating the amount of skeletal muscle mass) there are few, if any, gender-specific differences in power.

https://t.co/QpnFskuaQf

@LaurenMurphyMMA @_Miatonin @AOC For example, Slawinski et al. looked at peak acceleration after 1 second in 100 world-class sprinters (50 women and 50 men). After normalizing for body mass, men and women had approximately the same peak acceleration power.
https://t.co/qPYPQ0RDaj

@LaurenMurphyMMA @_Miatonin @AOC Additional evidence from researchers in Spain provides insight here: 155 college-aged, untrained individuals (123 men and 32 women)tested their anaerobic power output using a Wingate cycling test,..

@LaurenMurphyMMA @_Miatonin @AOC ..which showed no differences between men and women when normalized for fat-free mass.
https://t.co/U2HlVL3nTp

@LaurenMurphyMMA @_Miatonin @AOC Athletes caught up in the IAAF/IOC policy on hyperandrogenism were required in order to partake in sport to undergo surgical and/or hormonal interventions unrelated to their health status.

@LaurenMurphyMMA @_Miatonin @AOC These procedures have been called into question as invasively counterproductive to the wellbeing of those women.

https://t.co/2PaxipfIte

@LaurenMurphyMMA @_Miatonin @AOC It might be presumed that, by comparison, trans female athletes have no similar health concerns with their overarching requirement is to keep serum testosterone levels below 10 nmol/L, and they must submit to hormone tests as evidence of that.

@LaurenMurphyMMA @_Miatonin @AOC However, a ten-year struggle by (now-retired) Canadian cyclist Kristen Worley suggests this may not be a simple journey. The intricacies of her story have been deftly summarised by Andy Brown https://t.co/EOH5dSHrxI
and
Pierre-Jean Vazel.

https://t.co/9rjHAMoRqc

@LaurenMurphyMMA @_Miatonin @AOC In essence, Worley underwent gender reassignment via surgery in 2001 and attempted to re-enter the world of sport.
But when she applied for a (TUE) for testosterone (which is a vital hormone for women, as well as men), approval took ten months instead of days or weeks.

@LaurenMurphyMMA @_Miatonin @AOC This put Worley into a “severe post-menopausal state”. It not only impacted on her health, but it prevented her from training as an elite cyclist.
https://t.co/EOH5dSHrxI

@LaurenMurphyMMA @_Miatonin @AOC Ultimately, when Worley was permitted a TUE under the World Anti-Doping Agency (WADA) code, the allowable: levels of synthetic testosterone were not enough to support her basic health let alone compete in sport at any level.

@LaurenMurphyMMA @_Miatonin @AOC Fairness in sport, particularly on the issue of gender, has been a point of confusion and contention for as long as governing bodies have been making the rules for athletic contests.

@LaurenMurphyMMA @_Miatonin @AOC Increasing awareness and visibility of individuals who do not neatly fall into men’s or women’s divisions have exacerbated these concerns.

@LaurenMurphyMMA @_Miatonin @AOC Particular scrutiny has been applied to those who wish to compete as women the men’s divisions have been spared this level of examination and controversy.

@LaurenMurphyMMA @_Miatonin @AOC There has never been a “golden age” when this was simple. In the past, women were simply excluded from sport.

We do not, nor have we ever, had an agreed-upon definition of what defines a man or a woman that can be applied to all humans.

@LaurenMurphyMMA @_Miatonin @AOC There is no specific biological characteristic, nor set of characteristics, including genital structures, reproductive organs, or chromosomal arrangement, that can adequately answer this question.

@LaurenMurphyMMA @_Miatonin @AOC While most humans can be comfortably grouped into either the men's or women's divisions, there are others that cannot.

@LaurenMurphyMMA @_Miatonin @AOC Given that participation in sport is a widely shared and enjoyable undertaking with multiple biological, psychological, and social benefits, finding ways to maximize inclusion while preserving fairness is challenging.

@LaurenMurphyMMA @_Miatonin @AOC Alas, there are no clear answers. Lacking a consistent way to define men and women hamstrings the proceedings from the outset. When examining the performance differences between men's and women's divisions, confounders in the data abound.

@LaurenMurphyMMA @_Miatonin @AOC Teasing out the physiological and psychosocial components of the differences we observe is not yet possible.

@LaurenMurphyMMA @_Miatonin @AOC Even the role of testosterone, which is one of the mostly widely utilized performance enhancing drugs and thought to be the primary arbiter of the gender gap in sports, becomes less clear when looking at the research.

@LaurenMurphyMMA @_Miatonin @AOC A scientific consensus does not yet exist regarding the differences between genders, let alone how to define those genders.

@LaurenMurphyMMA @_Miatonin @AOC Because of this uncertainty, rules and policies that encourage inclusion of transgender athletes represent the best balance among the imperfect choices available.

@LaurenMurphyMMA @_Miatonin @AOC Specifically, allowing male-to-female transgender athletes to compete in the division of their choice within sport should be not be considered prima facie disadvantageous to other women competitors.

@LaurenMurphyMMA @_Miatonin @AOC This situation could potentially change or be clarified with further research and we would adjust our recommendations if such findings became available. For now, allowing transgender athletes to compete in their chosen division is prudent.

@LaurenMurphyMMA @_Miatonin @AOC Even after receiving gender-affirming hormone therapy, women and girls who are transgender have "an absolute advantage" over non-transgender girls. This assertion is based on speculation and inferences that have not been borne out by any evidence.

@LaurenMurphyMMA @_Miatonin @AOC First, these arguments overlook the population of transgender girls and women who, as a result of puberty blockers at the start of puberty and gender affirming hormone therapy afterward, never go through a typical male puberty at all.

@LaurenMurphyMMA @_Miatonin @AOC These girls never experience the effects of high levels of testosterone and accompanying physiological changes. They go through puberty with the same levels of hormones as other girls and develop typically female physiological characteristics, including muscle and bone structure.

@LaurenMurphyMMA @_Miatonin @AOC A trans woman who has not gone through a typical male puberty is similarly situated to a woman with XY chromosomes who has complete androgen insensitivity syndrome, & it has long-been recognized that women with CAIS have no advantage simply by virtue of having XY chromosomes.

@LaurenMurphyMMA @_Miatonin @AOC See, Handelsman DJ, et al. Circulating testosterone as the hormonal basis of sex differences in athletic performance. Endocrine Reviews 2018; summarizing evidence rejecting hypothesis that physiological characteristics are driven by Y chromosome).
https://t.co/bOPXZcmGaS

@LaurenMurphyMMA @_Miatonin @AOC @worldrugby suggests that “benefits that natural testosterone provides to male athletes is not diminished through the use of puberty blockers and cross-sex hormones. This is not true.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby Puberty blocking treatment completely blocks the production of testosterone and someone who has undergone both puberty blocking treatment and then gender affirming hormone therapy to initiate puberty consistent with gender identity would have none of the impacts of testosterone

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby on the body that would be typical for a non- transgender male.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby It is also not true that gender-affirming therapy – even for those who have not undergone puberty blocking treatment – does nothing to minimize the impact of T on the body. In fact, consistent use of testosterone blockers and estrogen has a significant impact on the body.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby Those that advocate against trans athletes argue that Men generally have ‘denser, stronger bones, tendons, and ligaments’ and ‘larger hearts, greater lung volume per body mass, a higher red blood cell count, and higher hemoglobin” and suggest that such characteristics lead ...

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby to athletic advantage and cannot be altered by sustained gender-affirming hormone therapy.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby However, the noted higher red blood cell count and higher hemoglobin are both testosterone dependent. They are both reduced as part of sustained gender-affirming hormone therapy.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby And there is currently no evidence that the remaining noted physiological characteristics actually are advantages when not accompanied by high levels of testosterone and corresponding skeletal muscle.
https://t.co/7DlaFvjSSf

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby The only study examining the effects of gender-affirming hormone therapy on the athletic performance of transgender female athletes is a small study of eight long-distance runners.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby The study showed that after undergoing gender- affirming interventions, which included lowering their testosterone levels, the athletes’ performance had reduced so that relative to

non-transgender women their performance was now proportionally the same as it had ...

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby been relative to non- transgender men prior to any medical treatment.
as the best performer among women of that age after transition. See Harper J. Race times for transgender athletes. https://t.co/YbxZMslW2R

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby In fact, it may be that some of the body changes from endogenous puberty result in poorer net performance for transgender women relative to cisgender women.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby For example, the fact that transgender women who go through typically male puberty will tend to have larger bones than non-transgender women may actually be a disadvantage.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby Having larger bones without corresponding levels of testosterone and muscle mass would mean that a runner has a bigger body to propel with less power to propel it.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby Similarly, in a sport where athletes compete in different weight classes (e.g. weight lifting), the fact that a transgender woman may have bigger bones may be a disadvantage because her ratio of muscle-to-bone will be much lower ....

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby than the ratio for other women in her weight class who have smaller bones.
Even if it could be demonstrated that larger bones or lungs can slightly enhance the athletic performance of TW even after they lower their level of T, that finding would have to be placed in context.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby Larger lungs and hearts generally correlate to a person’s size, so there are significant intra-sex variations of heart and lung size even among women who are not transgender.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby There are also myriad genetic variations among athletes that can enhance athletic performance. In the academic literature these are referred to as ....

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby performance enhancing polymorphisms” or “PEPs.” A PEP is a variation in the DNA sequence that is associated with improved athletic performance.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby For example, variations in mitrochondrial DNA have been associated with greater endurance capacity and greater mitochondrial density in muscles. Other PEPs are associated with blood flow or muscle structure.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby See Ostrander EA, et al. Genetics of athletic performance. Annu Rev Genomics Hum Genet 2009;
https://t.co/LHvWYGk5J5

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby These variations have proven to have a significant impact on athletic ability, unlike bone or lung size in transgender women.

@LaurenMurphyMMA @_Miatonin @AOC @WorldRugby After a transgender woman lowers her level of testosterone, there is no inherent reason why her physiological characteristics related to athletic performance should be treated differently from the physiological characteristics of a non-transgender woman.
https://t.co/fMTheOU4bY

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