

USA Powerlifting TUE Committee Report, 2019

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Overview

As USAPL continues to grow, so do requests for therapeutic use exemptions. We have continued to request that Therapeutic Use Exemptions (TUEs) be submitted 60 days prior to intended competition. Our turnaround time for most TUEs is quite fast, but if there is debate or a specific concern requiring additional information, the full 60 days is often needed. It is for the athlete's benefit to use the full 60 days as additional paperwork from a prescribing provider can take some time to acquire, and the committee will have to come to a second, sometimes third or fourth consensus.

Challenging areas that we have encountered in the last few years, and especially in the last few months, have been regarding androgens, stimulants for ADHD, opiates, and transgender athletes. Going forward, areas of discourse likely will include Differences of Sexual Development (DSD). In the interest of fair competition, herein we include an honest and open evaluation of the literature as well as the existing powerlifting data on the latter two matters.

Androgens

Most of the TUE requests for androgens we receive are for injectable synthetic testosterone. These requests are often from individuals with "low T" - usually masters lifters, and frequently former steroid abusers. Technically, synthetic testosterone is considered an anabolic-androgenic steroid representing a competitive advantage of about 10% on one's total (Nuckols, 2015). Discussion on transmen will come later, but, based on historical precedent, androgens and any androgen derived forms have been denied across the board as it has been deemed antithetical to our mission statement of "Drug Free Powerlifting." The fact that androgens have never been approved is on the website, and this will now be placed at the top of the TUE form in bold letters. Please discourage athletes from applying for TUEs for this as it will likely result in immediate denial.

Stimulants for ADHD

Medications for ADHD are being prescribed in record numbers. This speaks to a lot of factors - possible lobbying by the pharmaceutical industry, better recognition of the disease by providers, greater attempts at patient satisfaction to provide a requested prescription regardless of disease state - among others.

The majority of medications used to treat ADHD are stimulants, particularly amphetamines. Many are close cousins of methamphetamine and have near identical effects in the body. For individuals with ADHD, this can be of particular use because it improves attentiveness. Unfortunately, amphetamines also provide this benefit in individuals without ADHD, as well as other theoretical sport performance enhancing benefits.

Medications for ADHD are being overprescribed and misused in record numbers. Depending on the study one looks at, between 5-10% of all high school students are misusing the medication as well as up to 35% of college students (Clemow, 2014).

Thus, the TUE committee has deemed one or two handwritten sentences from a prescribing provider insufficient. These handwritten notes often come from providers with no formal training in the field. We have now required that individuals who are prescribed this medication provide clinic notes from a clinical psychologist or psychiatrist, or that the athlete provide a submission of a formal testing instrument for ADHD such as an ADHD self-reporting scale.

Opiates

Roughly 130 people die *per day* in the United States from opioid overdose (CDC, 2018). 21-29% of patients abuse prescribed opioids for chronic pain (Vowles, 2015). About 80% of individuals that currently use heroin first misused prescription opioids (Muhur, 2013).

Dr. Tan, our board certified Pain Medicine physician, advises that there are “no lifesaving benefits of the opiate class of medications.” These medications are mind-altering depressants that diminish coordination and levels of arousal. Toward that end, they pose a risk to the spotters, lifters, judges, and any other individuals near the platform.

The committee is now of the stance that chronic opioid use will not be approved. This includes long-acting medications such as suboxone, which are used to wean individuals off opioids. We are now matching the current medical climate and not allowing chronic opioids for non-cancer related pain. Short term use of opioids for conditions like post-operative pain might be approved on a case-by-case basis.

Transgender Athletes

Current IOC Guidelines

To frame this discussion, one needs to understand the International Olympic Committee (IOC) guidelines set forth on transgender athlete participation, which are minimal.

Currently, they state verbatim:

1. Those who transition from female to male are eligible to compete in the male category without restriction.
2. Those who transition from male to female are eligible to compete in the female category under the following conditions:
 - 2.1. The athlete has declared that her gender identity is female. The declaration cannot be changed, for sporting purposes, for a minimum of four years.
 - 2.2. The athlete must demonstrate that her total testosterone level in serum has been below 10 nmol/L for at least 12 months prior to her first competition (with the requirement for any longer period to be based on a confidential case-by-case evaluation, considering whether or not 12 months is a sufficient length of time to minimize any advantage in women’s competition).
 - 2.3. The athlete's total testosterone level in serum must remain below 10 nmol/L throughout the period of desired eligibility to compete in the female category.
 - 2.4. Compliance with these conditions may be monitored by testing. In the event of non-compliance, the athlete’s eligibility for female competition will be suspended for 12 months (IOC, 2015).

The current World Anti-Doping Agency (WADA) guidelines for transgender athletes clearly state, “It is not the purpose of this medical information to define the criteria for the eligibility of these athletes to participate in competitive sport, which is entirely left to the different sporting federations and organizations” (WADA, 2017). Additionally, the IOC guidelines clearly state, “Nothing in these guidelines is intended to undermine in any way the requirement to comply with the World Anti-Doping Code and the WADA International Standards” (IOC, 2015). Our policy on transgender participation was borne from the fact that the requisite 12 months of androgen blockade, regardless of resultant testosterone levels, does not come close to reversing the effects of having been born into the male sex when measuring the effect on powerlifting total, as discussed below.

Central to one claim of fair transgender inclusion in sports is the premise that, since the Court of Arbitration for sport (CAS) and IOC make no distinction between sex and gender, sporting organizations should accept that trans women, born male, are actually female and the data on sexual dimorphisms and physiological differences is irrelevant. Our counterclaim to this argument is that identifying as one sex does not defy the factual physical

differences between sexes that exist regardless of sex reassignment or hormone suppression. The assertion of gender choice, although legal to change in parts of the world, does not erase the dimorphic differences of sex, formalized at birth and continually developing throughout the lifespan, that have direct implications to performance advantages. Although gender may best be understood on a continuum, designation and consequences of biological sex do not.

The Institute of Medicine defines sex as “being male or female according to reproductive organs and the functions assigned by chromosomal complement (XX for female and XY for male)” (Wizemann & Pardue, 2001). Deviations from normal biological patterns, such as disorders of sexual development, do not warrant viewing sex as existing on a continuum; this minority group requires special attention that is separate from the transgender conversation. Healthcare practitioners recognize sex as an important dichotomy; groups such as the American Heart Association, American Cancer Society, and the American Lung Association, to name a few, mount targeted campaigns to educate health care providers of sex differences in symptoms, outcomes, and mortality of specific diseases. Decategorizing humans as men and women or animals as male and female in a similar manner is deleterious to our understanding of the world for scientific purposes and will cause a major regression of important physiological, pathological, and psychological research. Ignoring the differences between sexes has resulted in some high-profile FDA actions on approved drugs, most notably thalidomide and zolpidem, due to the underrepresentation of women in clinical trials resulting in tragic misunderstandings of the drugs’ effects on the different sexes. In fact, the landmark Institute of Medicine report “Exploring the Biological Contribution of Sex” concluded that sex matters in all aspects of cellular function and physiology from “womb to tomb” (Wizemann & Pardue, 2001). This weighs heavily into the issue of fair play in our static strength sport. Herein, we will review the magnitude of the effect of being born in the male sex, compare it to the small effect of androgen blockade, and describe the magnitude of these effects as they apply to powerlifting.

Muscle Effects

Countless studies have demonstrated higher muscle mass in male infants, adults, and numerous other species excluding humans (Ellis et al., 2009). In a human DXA study, males were shown to have significantly higher lean mass (92%) than females (79%) (Nieves et al., 2005). In addition, most of the studies assessed by Ellis (2008) concluded that females have proportionately greater body fat than males. The cross-sectional area of muscle in males has been shown to be greater in males reflecting higher levels of lean body mass (Jones, Bishop, Woods, & Green, 2008).

Since males have greater muscle mass than females, the strength capacity also is greater holding neural factors constant. The preponderance of non-athlete studies in North America, Asia, Oceania, Europe, and Middle East have confirmed this assertion and demonstrated greater muscle strength in males spanning the entire lifespan (Ellis et al., 2009).

Using sprint tests, Esbjörnsson Liljedahl et al. (1996) showed greater peak and mean power in males compared to females. Komi and Karlsson (1978) reported substantially greater muscular power and total leg force in males compared to females. A national-level sprinting study showed significantly greater performance in power output on all measures of the Wingate test and greater catecholamine response in male sprinters over female sprinters (Gratas-Delamarche, Le Cam, Delamarche, Monnier, & Koubi, 1994).

Interestingly, the effect of anabolics do not disappear in spite of lowered levels later due to the complex physiology of myonuclei. In the study by Egner et. al (2013), female mice were treated with subcutaneous testosterone propionate or placebo pellets, then 2 weeks later their EDL and soleus muscles were excised and examined. Testosterone and exercise independently led to hypertrophy and the anticipated increases in muscle cross-sectional area and myonuclear number. In animals that received both treatments, these effects were additive and t h e

muscles displayed a 90% increase in the number of myonuclei. Three weeks after removing the drug, fiber size was decreased to the same level as in sham treated animals, but the number of nuclei remained elevated for at least 3 months (>10% of the mouse lifespan, or the equivalent of 10 human years). After this protracted period of time, when the anabolic steroid effect would be washed out, the muscles were then again reworked. Astoundingly, in the absence of additional anabolic stimuli, the steroid-treated group displayed a 31% increase in CSA compared to a modest 6% in placebo controls. Taken together, these data suggest that: (1) once a myonucleus is acquired, it is essentially permanent; and (2) more nuclei translate into greater capacity for regrowth, which translates into enhanced muscle strength. These two points are essential to understanding our position statement, and the fact that transwomen will have a conferred advantage over the entirety of her life over a woman born into the female biological sex.

Neurologic Effects

In humans and many other mammal species, males compared to females have greater numbers of motor neurons in the spinal cord (Ellis et al., 2009). The number of motor neurons and their associated muscle fiber types are globally fixed after postnatal development and maturation in biological sex similar to muscle fiber type distribution (Ellis et al., 2009; Hadi Mansouri, Siegford, & Ulibarri, 2003; Schiaffino, Sandri, & Murgia, 2007). This means that the actual number of nerves to supply muscle tissue is already advantageous immediately out of the womb, which is an immutable, irreversible difference. Males possess larger neuronal cell bodies and nuclei than females during maturation due to circulating androgen levels. In maturation, muscle fiber numbers are higher in males to the point of neuromuscular synapse elimination. Therefore, once puberty is initiated, this higher number of nerve cells is further developed into an advantage with an increase in signaled size. In addition, the neuromuscular system (motor neurons and associated muscles) during growth and maturation of mammals and onwards throughout the lifespan are directly influenced by circulating androgens and the presence or lack of a Y chromosome to direct ultimate functioning of these cells (Sengelaub & Forger, 2008).

Skeletal Effects

During puberty, peak bone mass is acquired and sexual dimorphism in bone geometry and bone mass are established (Laurent et al., 2014). Shortly following puberty almost all studies in the literature have shown greater overall skeletal mass, individual bone mass, and bone strength in males compared to females (Ellis et al., 2009; Looker et al., 2009; Nieves et al., 2005). The DXA study by Nieves et al. (2005) on males ($n = 36$) and females ($n = 36$) revealed significantly higher bone mineral content and density in males compared to females.

Frequently, the Hochberg (2007) study is cited by the media as evidence that “the bone strength of black women to be higher than that of white men” (Ziegler, 2019). This study looked at hip fractures in individuals over the age of 65. While it did demonstrate more hip fractures in white men than black women, hip fractures in VA patients are a multifaceted issue, clouded by the larger sample size of white men in a group of veterans as well as the fact that white men tend to live longer and thus have more opportunity to break bones than black women (Hochberg, 2007).

Indeed, the concept that white men have weaker bones than black women, argued by some supporters of transwomen competing as women, has actually been disproven in a study these supporters cite in an attempt to prove this same line of logic. Ziegler (2019) cites a study by Ettinger et al. (1997) in an attempt to state this fact, which actually demonstrated that total body bone mineral density of white men is higher than black women (1.177 vs. 1.163 g/cm², respectively). A much larger cohort in the National Health and Nutrition Examination Survey, which included 13,091 adults age 20 years and older, clearly confirms this same point; white men have higher total body bone density than black women at 1.184 vs. 1.148 g/cm², respectively (Looker et al. 2009).

IPF Data and Youth Nationals Data

To answer the question of fairness in our specific sport, we sought first to establish the difference between male and female sex. We looked for the most appropriate data set to control for age, training effect, and bodyweight.

Controlling for these variables most appropriately paints an accurate picture of the overall difference between the two groups. As such, we analyzed the IPF data used to generate the IPF coefficient; these data include individuals competing at the international level, which one would assume includes well trained powerlifters. This data set covers IPF and IPF affiliate competitions January 2011 through March 2018. It includes only the best raw total for an individual lifter for this timeframe. It represents all IPF meet data reported to <http://www.openpowerlifting.org/data.html>. Approximately 1,300 competitions (local, state, regional, national, international, world championship, and invitational events) were included.

We then selected for the open category only to control best for post-pubertal age. Several analyses were then based upon bodyweight and weight class, as the men's and women's weight classes do not match up completely. These data included 17,531 athletes, 11,000 men and 6,351 women. For the men, the range of totals went from 75 kg to 1,105 kg, with a mean total of 556 kg. For the women, the range of totals went from 112 kg to 654 kg, with a mean total of 305 kg.

Men and women were grouped into body weight increments of 5 kg and average totals were compared across the groups. From these groupings, males experienced a 64% advantage on total over females. Totals of men and women fit a normal distribution. Without using the groupings (meaning no control for bodyweight) and using only mean for men and women, males experienced a 46% advantage on total over females.

Descriptive statistics were run using ANOVA on these data to further categorize. In particular, coefficient of determination (R^2) was used to look at what impact each variable would relate to totals. For both men and women analyzed separately, R^2 for weight class impact (not with 5 kg increments) on total was 27% for men and 13% for women. For men and women analyzed together, R^2 for 5 kg body weight groupings was 49.5%. For sex, R^2 was even higher at 61.7%, the highest of any variable investigated. When the data was analyzed with two-way ANOVA to explore the roles of both sex and body weight, R^2 reached 73%, with sex being the largest contributor to the variation in lifter totals. It should be noted there is a statistically significant interaction term in the two-way ANOVA, suggesting the effect of sex is not constant across all body weights, thus interpreting the main effect of body weight cannot be done without taking sex into consideration. All of the aforementioned values were at extremely high statistical significance due to the large number of athletes, with $Pr > F$ of 0.0001.

From these analyses, we can conclude the following:

1. Men have a 64% advantage over women at the open international level.
2. Sex is the single most impactful factor on one's powerlifting total.
3. The combination of sex and body weight have the highest combined impact on total among open international lifters, and the effect of sex is more pronounced at higher body weights.

Similarly, the impact of maturation on performance in powerlifting is highlighted through examination of data from USA Powerlifting competition in youth divisions. Analysis was performed using powerlifting total as the measure of performance in the three contested age divisions: 8-9 years old, 10-11 years old, and 12-13 years old. Significant changes occurred from childhood to middle adolescence. Whereas boys totals averaged 98% of girls at 8-9 years old, they improved to 115% in the 10-11 year old division and 124% at 12-13 years of age (total $n = 630$).

Effect of Antiandrogens

At the microscopic level and in the absence of testosterone, greater satellite cell and myonuclei number persists in biologically born males even with the use of anti-androgens to suppress T because greater numbers of these structures were established by the male sex and exist with or without circulating androgens (Herbst & Bhasin, 2004; Sengelaub & Forger, 2008). This is supported by literature studying strength training in individuals on antiandrogens, data studied in males being treated for prostate cancer (PCa) on antiandrogens, as well as studies of transgender individuals.

The net negative 10% statistic continues to be a recurrent theme in the academic literature regarding antiandrogens, similar to the positive 10% effect of anabolics. The study by Ruzic, Matkovic, and Leko (2003) investigated the effect of antiandrogens in mostly untrained individuals compared to controls after implementation of an exercise regimen. This group was entirely female, investigating the effect of an antiandrogen versus pure estrogen as a contraceptive therapy. Over twelve weeks, they found a strength increase of 42.3% in the antiandrogen group and 53.9% in the control group, which was a statistically significant 11.6% difference in the increase between the two groups.

A common mainline therapy for prostate cancer involves antiandrogens. Multiple studies have demonstrated the effect of exercise in attenuating the sarcopenic effect of these drugs. In fact, many untrained individuals experience a substantial strength increase, and it has become recommended as part of adjuvant therapy for PCa. From a study done by E. D. Hanson et. al (2004), 17 untrained PCa patients demonstrated clear improvements in strength measures. Strength training substantially increased unilateral 1RM strength for the knee extensors ($27.8 \pm 3.4\%$), chest press ($18.4 \pm 3.3\%$), and leg press ($22.5 \pm 3.3\%$) to a statistically significant effect, offsetting theoretical strength decrements observed from aforementioned studies.

From a transgender study by Gooren and Brunck (2004), we can clearly see that antiandrogens do not decrease muscle size to a sizeable extent that would offset the effect of being a biologically born female, as is the case with the data comparison among transwomen and transmen. In this study, transwomen experienced a decrease in muscle area of less than 10% after use of 1 year of antiandrogen, a protocol simulating the IOC guidelines. Transmen experienced an increase in muscle area of approximately 10% after androgen therapy. However, the mean muscle area of transwomen post therapy (277.8 cm^2) when compared to the mean muscle area of transmen pre therapy (238.8 cm^2) remained different to a statistically significant effect. Moreover, the post-therapy muscle area of transwomen and transmen were similar, making a strong argument that a biological woman would have to take anabolics to have a similar muscle diameter to a transwoman, an important point for our drug-free sport (Gooren and Brunck, 2004).

Harper Article

The study by Harper et. al (2015) comes up frequently in the transwomen athlete debate. These data included eight athletes transitioning from male to female. Data was *self-reported* by the runners. Essential information, including that regarding training history, injury, diet, weight, body composition, mental health, among other variables, are not provided nor controlled for. To say that this study was not based in scientific reality is an understatement; the author is attempting to draw biased conclusions from seven years of data with reliance upon a runner's memory and recall. This study is largely a qualitative look at the data and amalgamates multiple different distances over four different sports. Quite simply, this study is irrelevant to our sport, and it adds little to nothing with regard to the larger body of scientific knowledge on the matter of the fairness of transwomen competing in the female category.

Spironolactone Data

We ran gross qualitative analysis of spironolactone data for USAPL athletes along with descriptive statistics. TUE data was gathered for the last 5 years and totals at the time of application as well as totals on athletes 12 months thereafter. All individuals eligible for inclusion were female. Reporting here is limited pending a final decision regarding a need for IRB approval, but any reporting on athletes is anonymous using no athlete identifiers.

In general, after 12 months from point of TUE application, all athletes experienced an improvement in powerlifting total. This is likely multifactorial; all athletes were female thus less androgen suppression, athletes may have been on spironolactone prior to point of application for TUE, athletes may have improved training/diet/sleep after point of application, among other factors. However, a gross qualitative look at the data demonstrates that performance

decrement on powerlifting total due to spironolactone can likely be overcome with optimization of other training variables.

Laurel Hubbard

While no formal investigations of the impact of transition from male to female in the context of strength sports are in the extant literature, examination of the pre- and post-transition competition results of Laurel Hubbard, a male to female transgender Olympic-style weightlifter, shows a decrease in total combined using best results prior to transition vs. after of 20 kg., from 300 kg. to 280 kg. Her best total, set in 1998 at 20 years of age pre-transition was 300 kg., while her best post-transition total of 280 kg. was set in 2017 at 39 years of age (Olympic, 2017). This decrease, approximately 7% at 5 years post-transition, is less than the 10%-12% claimed through examination performance of runners and other athletes and suggests that the process of transition does not substantially reduce performance.

Conclusions Regarding Transwomen

From the antiandrogen literature above, if we assume a 10% disadvantage with antiandrogen from the process of male to female transition (which is generous given Ms. Hubbard's performance), then:

1. The 64% advantage on powerlifting total of male over female is not eliminated with this disadvantage (theoretically, this would be 54% for transwomen post transition).
2. The 10% advantage conferred with steroids in powerlifting (Nuckols, 2015) does not come close to the transwoman advantage with implementation of IOC guidelines.
3. A transwoman would have over a theoretical fivefold advantage on total compared to that which would be conferred by steroids taken by a cisgender female.
4. Strength differences between males and females increase as a function of maturation, and these differences remain into adulthood.
5. These differences are so significant that an immutable advantage is conferred in powerlifting by being male for even a brief amount of time through puberty.
6. If Ms. Hubbard's performance in weightlifting is reflective of the decrease expected through male to female transition, as would be a balanced assumption with the existing literature, then consuming the minimal amount of antiandrogen set forth in the IOC guidelines cannot reverse the male advantage to a degree sufficient enough to ensure fair competition.

Transmen

Because testosterone is disallowed for any purpose, transmen become difficult to accommodate. This becomes an issue of dissonance when considering that we do not allow testosterone for "low T" individuals. While the competitive advantage would theoretically be minimal, the allowance of testosterone is, again, antithetical to our mission statement of "Drug Free Powerlifting." We have a historical precedent of denial for this group, as well as anyone else that applies for testosterone for TUE.

Partnership with Fairplayforwomen.com

Grassroots movement www.fairplayforwomen.com, based out of the U. K., has openly supported our decision (Fair - USA, 2019). There have been several articles written on our behalf that have come out of authors that either contribute to or cite this website. USAPL leadership as well as the TUE committee chair have been in ongoing communication with this movement, and current members of the medical board among several other scientists are collaborating to write a scientific review article to be published on this specific topic. The IPF data and spironolactone are additional datasets for potential academic publication.

Differences of Sexual Development

Differences of sexual development have not yet been encountered as a major issue by USAPL, but this issue will likely come to pass. Advocates for unbridled transwoman participation frequently conflate the issue of DSD athletes

being one in the same as trans athletes. These are two separate issues that need to be viewed on a case-by-case basis. The amount of DSD possibilities are vast because the number of diagnoses under this umbrella are substantial. USAPL as a body will need to come up with a general guideline in this area as there have been several high profile cases brought forth to the Court of Arbitration for Sport.

The pertinent decision for the CAS will hinge upon T needing a specific threshold for determination of male or female, versus the decision of T not requiring a threshold. With the first decision, trans lobby groups will advocate for a T threshold to supplant biological sex and rather become athletic gender. As outlined above, this is faulty reasoning in the case of transwoman athletes. In the latter potential CAS decision, trans lobby groups will challenge the need for a testosterone threshold for transwomen at all. Neither arguments are applicable in the transgender athlete debate - DSD athletes have different chromosomal makeup that is separate from the trans athlete discussion. Fair Play for Women has proposed a solution that female sex have a separate category, then men/transmen/transwomen/DSD have a separate “open gender” category (Fair -Rules, 2019). While this is one possibility for a guideline, USAPL as a body will need to come to a relative consensus to address this issue specifically, although most decisions will need to be on a case-by-case basis depending on the specific DSD.

Conclusions

An important final thought: even in the current transgender IOC guidelines, it is stated, “these guidelines are a living document and will be subject to review in light of any scientific or medical developments.” They further state that “the overriding sporting objective is and remains the guarantee of fair competition. Restrictions on participation are appropriate to the extent that they are necessary and proportionate to the achievement of that objective (International Olympic Committee, 2015).”

Everyone deserves to feel safe and understood. Often times for the trans community, this right is made more difficult to achieve through societal norms and pressures. It is not the intent of this paper to demean or denounce the trans community. Rather, our goal is treat our athletes as fairly as possible, and to use science as a lens for understanding how to level the playing field for all. As above, with an objective, honest evaluation of the extant literature, there is compelling reason to restrict transgender participation in our drug free sport. We feel that the current USAPL guidelines accomplish the preservation of fair play for this ultimate purpose.

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