

Thursday, July 29, 2021

Dear Chairman Sonney and members of the Pennsylvania House of Representatives Education Committee,

My name is Greg Brown, and I am a Professor of Exercise Science at the University of Nebraska at Kearney. I earned a Bachelor of Science in Physical Education (pre-Physical Therapy emphasis) from Utah State University in 1997, a Master of Science in Exercise and Sport Science (Exercise Physiology Emphasis) from Iowa State University in 1999, and a Doctor of Philosophy in Health and Human Performance (Biological Basis of Health & Human Performance emphasis) from Iowa State University in 2002. I am a Fellow of the American College of Sports Medicine and an American College of Sports Medicine Certified Exercise Physiologist. My research and teaching focus on Exercise Physiology and Sports Nutrition. I have previously provided expert testimony for the legal cases of Soule v. Connecticut Association of Schools, Hecox v. Little, and before several state legislative bodies regarding bills like House Bill 972. These are my own opinions and do not represent an official statement from the University of Nebraska.

I have three main points to make in this testimony, and they are: 1) Eons of human experience and thousands of research studies show that there are important biological differences between human males (boys & men) and human females (girls & women), 2) these biological differences confer inherent athletic advantages to boys & men, and 3) the athletic advantages conferred by male biology are not erased by transgender identification and the use of cross sex hormones.

Sex is an important biological factor that is determined at conception based on the presence of XX or XY chromosomes. Although there are differences of sexual development (sometimes called disorders of sexual development) in which biological sex is ambiguous at birth, these conditions are rare (approximately 0.17% of all births) and are a separate issue from gender dysphoria in which a person's perception of gender does not match their biological sex^(1, 2). In the 2021 paper *Considering Sex as a Biological Variable in Basic and Clinical Studies: An Endocrine Society Scientific Statement*⁽³⁾ the authors state that "Sex is dichotomous", "a clear causative biological underpinning of gender identity remains to be demonstrated", and "sex often influences gender [identity], but gender [identity] cannot influence sex." The importance of biological sex on growth, development, health, and risk of disease has been a point of emphasis in research and clinical application from the National Institutes of Health, Institute of Medicine, and most other medical and biologically based scientific professional societies for almost 30 years⁽²⁾. Indeed, every cell has a sex and every system in the body is influenced by sex.

Briefly summarized, boys & men have more muscle mass, have higher bone mineral density, less fat mass, have larger hearts and lung, and are bigger, faster, and stronger than comparably aged and trained girls & women. This information has been well established by human experience and in innumerable research papers, and can be found in pretty much any textbook on the topic of Exercise Physiology or Fitness Testing. Fitness testing in children as young as 3 years old shows that boys perform better than girls of the same age on tests of muscular strength, muscular endurance, and aerobic fitness⁽⁴⁻⁹⁾. The youth records from USA

Track and Field show boys outperforming girls in every age group from 8 & under through 17-18 years old and in every event ⁽¹⁰⁾. Comparing competitive performance after age 11, boys and men run 10-15% faster than girls & women, jump 15-20% longer and higher, and can lift 30-60% more weight than comparably aged and trained girls and women ⁽¹¹⁻²⁴⁾. To help put this into perspective, based on NCAA Outdoor Championship running performance, the typical time difference between first place and second place is often 0.5-0.7% or less, and the difference between a gold medal and no medal is typically less than 2%.

Opponents of House Bill 972 will argue that if biological males take puberty suppressing drugs and cross-sex hormones the athletic advantages conferred by male biology are erased, but that argument is not supported by research. For example, there is no published research on the effects of puberty suppressing drugs or cross sex hormones on athletic performance and physical fitness in young children. Of six separate research studies published since 2015 measuring the effects of male-to-female hormone administration on muscle strength, three showed no decrease in muscle strength after 12 months of hormone use ⁽²⁵⁻²⁷⁾. The other three show only a 4-9% reduction in muscle strength ⁽²⁸⁻³⁰⁾ (keep in mind that men are 30-60% stronger than women). The handgrip strength in these studies showed that the male-to-female transgender subjects were weaker than most comparably aged men but were stronger than 95% of comparably aged women, even after 2 years of male to female hormones. Another study evaluating running performance in male-to-female transgender subjects found that even after 2 years of male-to-female hormone use, the biologically male subjects were still 12% faster than comparably aged women ⁽³¹⁾. Keeping in mind that men typically have 30-40% more muscle mass than women, a number of longitudinal research studies show that male-to-female hormone use only reduces muscle mass by 4-12% over the course of 3 years ^(25, 26, 28, 29, 32-41). Finally, three recent review papers ^(1, 15, 42) and an in-depth evaluation by World Rugby ⁽⁴³⁾ summarized the research on the changes in physiological factors that influence athletic performance and how these factors are affected by male-to-female hormone use, and all came to the same conclusions; that a year or more of testosterone suppression and male-to-female hormone use does not erase the inherent athletic advantages biologically conferred upon males. World Rugby further concluded that transwomen cannot safely be included in women's rugby due to the inherent advantages conferred by biological male sex ⁽⁴³⁾. The FIMS (International Federation of Sports Medicine) 2021 Consensus Statement on Integrating Transwomen and Female Athletes with Differences of Sex Development (DSD) into Elite Competition concludes that while "trans athletes have a right to participate in sports, cisgender women have a right to participate in a protected category of sport ⁽¹⁾."

Of relevance to middle and high school sports, it is well known and demonstrated that males in this age group outperform females on tests of muscular strength, muscular endurance, aerobic fitness, and in most areas of athletic performance ^(4-10,13, 19, 24). McManus and Armstrong ⁽⁴⁴⁾ stated it well when they wrote "Sexual dimorphism underlies much of the physiologic response to exercise" and "Young girl athletes are not simply smaller, less muscular boys." It is also important to note that a male-to-female individual will never experience a menstrual cycle, or exercise induced amenorrhea, both of which cause variations in hormones that can have profound effects on health and athletic performance ⁽⁴⁵⁾. In the only paper evaluating muscle strength in transgender youth, Tack et al. ⁽²⁷⁾ observed that in 16-year-old male-to-female subjects the use of puberty blockers attenuated the age associated increases in handgrip strength

and muscle mass, but did not eliminate the advantages in muscle mass, body composition, and strength inherent to biological males. Currently it is unknown how the use of puberty blockers in younger children influences athletic performance.

In summary, males have undeniable biologically based athletic advantages over females in almost all sports, and research currently indicates that neither transgender identity nor extended use of male-to-female hormones erases those advantages. All that House Bill 972 seeks to do is to ensure that female sports teams are preserved for biological females so girls and women can compete on a level playing field.

Sincerely,

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