Effect of gender affirming hormones on athletic performance in transwomen and transmen: implications for sporting organisations and legislators

Timothy A Roberts ,[1] Joshua Smalley,[2] Dale Ahrendt[2]

[1]Pediatrics, Children's Mercy Division of Adolescent Medicine, Kansas City, Missouri, USA
[2]Pediatrics, San Antonio Military Medical Center, Fort Sam Houston, Texas, USA

Correspondence to
Dr Timothy A Roberts, Pediatrics, Children's Mercy Division of Adolescent Medicine, Kansas City, Missouri, USA; taroberts@cmh.edu

Accepted 28 August 2020
Published Online First 7 December 2020

ABSTRACT:

Objective To examine the effect of gender affirming hormones on athletic performance among transwomen and transmen.

Methods We reviewed fitness test results and medical records of 29 transmen and 46 transwomen who started gender affirming hormones while in the United States Air Force. We compared pre- and post-hormone fitness test results of the transwomen and transmen with the average performance of all women and men under the age of 30 in the Air Force between 2004 and 2014. We also measured the rate of hormone associated changes in body composition and athletic performance.

Results Participants were 26.2 years old (SD 5.5). Prior to gender affirming hormones, transwomen performed 31% more push-ups and 15% more sit-ups in 1 min and ran 1.5 miles 21% faster than their female counterparts. After 2 years of taking feminising hormones, the push-up and sit-up differences disappeared but transwomen were still 12% faster. Prior to gender affirming hormones, transmen performed 43% fewer push-ups and ran 1.5 miles 15% slower than their male counterparts. After 1 year of taking masculinising hormones, there was no longer a difference in push-ups or run times, and the number of sit-ups performed in 1 min by transmen exceeded the average performance of their male counterparts.

Summary The 15–31% athletic advantage that transwomen displayed over their female counterparts prior to starting gender affirming hormones declined with feminising therapy. However, transwomen still had a 9% faster mean run speed after the 1 year period of testosterone suppression that is recommended by World Athletics for inclusion in women's events.

BACKGROUND

Most competitive sports segregate male and female athletes due to biologic differences between the sexes. Because exposure to testosterone in males leads to physiologic advantages in strength and endurance, female sports need to be a protected category to ensure fairness in competition.[1] Questions arise then as to which category a transgender athlete competes in and how society balances benefits to the athlete of sports participation in their experienced gender with perceptions of fairness to other athletes.[2–5] Supraphysiologic doses of androgens have a positive effect on athletic performance.[6 7] However, gender affirming hormones have an unknown effect on athletic performance among transgender individuals during gender transition, making it difficult to develop guidelines for transgender inclusion in sports. Several guidelines for inclusion of transgender athletes in elite international or professional sports exist but they are based on limited research.[8 9] The World Athletics (IAAF) and the International Olympic Committee (IOC) created guidelines requiring female athletes to demonstrate suppression of testosterone levels to less than 5 –10 nmol/L for at least 12 months prior to competing in women's events. However, athletes have challenged the section of these guidelines applying to women with disorders of sexual development and other causes of hyperandrogenism, citing a lack of supporting evidence, which calls these guidelines into question.[10 11]

Gender affirming administration of testosterone in transmen decreases adiposity, and increases muscle mass, thigh muscle volume, haemoglobin, grip strength and thigh strength.[9 12–14] Gender affirming blockage of testosterone and administration of oestrogen in transwomen (oestrogen) has the opposite effect, but transwomen retain an advantage in muscle mass, volume, and strength over female controls after 1 year on oestrogen.[9 14–17] Most changes in body composition occur within the first year on testosterone or oestrogen, with slower changes after that time.[9 16 18–20]

How do these body composition changes affect athletic performance? A retrospective review of self-reported run times among eight transwomen runners found an overall decline in times collected months to years before and after starting oestrogen but not in the runners' performance relative to runners of the same age and gender. No other studies have examined the effect of testosterone or oestrogen on athletic performance.[21]

We conducted this study to examine the effect of gender affirming hormones on body composition and athletic performance among transgender individuals to help improve future guidelines for transgender inclusion in sporting competition.

METHODS

Study population

This was a retrospective review of medical records and fitness tests results from 222 self-identified military personnel who filed a request to begin gender transition or continue testosterone or oestrogen while serving in the United States Air Force (Air Force).

Patient involvement

The idea for this study arose from our discussions with servicemembers seen in the Air Force

To cite: Roberts TA, Smalley J, Ahrendt D. *Br J Sports Med* 2021;**55**:577–583.