SOME FEATURES OF BIOMEDICAL SUPPORT OF TRANSGENDER ATHLETES AND NON-BINARY PEOPLE IN SPORTS

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Annotation. A right of transgender athletes to participate in the competitive process in accordance to their gender identity is a controversial issue. Because of concerns related to potential professional benefits some sports organizations introduce restrictions on participation of transgender athletes in sports. A number of people who identify as transgender constantly grows. It is expected that issues concerning their integration into competitive sports activity would become more relevant. This article presents a review of modern requirements and criteria for inclusion of people, who went through transition, into professional sport and competitive activity. We examine main medical and psychological aspects related to the state of health and the training process organization of such athletes. Development of policy and events for biomedical support of this group, creation of non-discriminatory atmosphere and at the same time – a fair system of evaluating athletes regardless of their gender identity is of great significance.

Introduction. Sports system is based on a gender binary, i.e. athletes should be divided into strict categories of biological sex assigned at birth. Girls/women still face some problems in types of sports where masculine features are encouraged (hard play, aggressiveness and assertiveness). In this case, male body is an example reflecting ideas of strength characteristics as an exclusionary male trait. Authors of the review are of traditional ideas about gender identification. Nonetheless, they understand that issue of tolerance in the international society has different boundaries of discussion. Thus, an issue of refereeing and biomedical support of cisgender and transgender athletes is more relevant.

Transgender is a person with a gender identity that differs from the sex they were assigned at birth; behavior and self-expression that do not align with socially accepted norms depending on sex; and/or desire to change sex/gender characteristics of their body. This category includes transgender men and women, non-binary people (i.e. people, who do not identify themselves as men, women and transgender

people) [1, 2]. A trans man is a man who was assigned female at birth, trans woman is a woman who was assigned male at birth, a cisgender is a person whose gender identity matches the biological sex they were assigned with [2, 3]. Estimated prevalence of transgender people in the US is 390 people per 100 000 of the population [4].

Standard presumption of male dominance and physical superiority substantiates segregation based on biological sex in sports system, which was created in theory for giving equal possibilities and supporting fair competition for people of both sexes [2]. Thus, transgender people have to adapt to a gender binary and follow sports policy, which requires compliance of a gender identity to its biological sex. Processes of adaptation and events for changing the assigned sex with a new subjective gender identity happen on different levels, beginning from self-awareness and social acceptance to hormone therapy and surgical intervention. Transgender athletes are considered as individuals who disturb the set boundaries and contradict fair in-game conditions in sports. In particular, female transgender athletes when transitioning often criticized for having some benefits compared to cisgender women. Moreover, trans men face less criticism compared to trans women [1, 2].

On the other hand, sports organizations are accused of promoting oppressive policy based on biological sex, as well as systematic exclusion of transgender athletes and restriction of their rights for sports activity. For some time, transgender athletes were discussed as members of the LGBT community (community of lesbians, gays, bisexuals and transgender people) [5, 6, 7]. This approach for uniting transgender athletes with other sexual minorities was called in question because these groups face different problems and prejudices in sports.

Structure barriers include a certain policy, which can prevent transgender people from playing in sports teams that match their gender identity. Changing and shower rooms divided according to biological sex count as spatial barriers. Social microclimate of team sports also can serve as a traumatizing factor for transgender athletes, because they are judged by the staff, teammates and society. Exclusion from sports associated with a gender identity contributes to further isolation from society, i.e. an absence of possibility to make connections, develop professional skills of teamwork, physical training and preservation of a sense of gender identity [5, 6, 7].

Isolation is the reason of missed opportunities and strengthening social inequality. Integration into society is based on achieving solidarity, as well as giving social rights and freedoms to every person regardless of their social status, ethnic origin, sexual orientation or gender identity, including access to engage in physical culture and participate in competitive activity. Sports contribute to strengthening solidarity of people from different social circles, give them possibility to develop

professional and social skills, strengthen a sense of belonging and self-identification within a certain social group [1, 2]. Coaches can optimize the competitive process by receiving continuous education on issues considering transgender people, promoting values of open mindedness and transparency, using gender inclusive language.

In order to evaluate a degree of discrimination based on gender identity, the Cunningham model is used. On the macro level, cultural norms influence on perception of trans people by the traditional sports society. Meso-level factors operate on an organizational level and affects the isolation and discrimination through the behavior of a team leader or a coach, a structure of training process and team spirit. These factors show conservative values and opinions, which are shared by the whole team and serve as an orienting point for defining a specific gender behavior in accordance with biological sex. It is notable that support in groups on an emotional, organizational, material and technical level contributes to a creation of a safe space and positively influences on mental and physical well-being of transgender athletes [8]. According to the Meyer's concept, stress of a minority is connected to social conditions, status and identity of this group; prejudices, discrimination and violence are traumatizing factors and contribute to stigmatizing and deprecation of a minority, imply subconscious anticipation for rejection and covering their gender identity [9].

Personal experience of transgender people's participation in mass physical culture, their psychoemotional state and socializing level are important for defining a ratio of inclusive/exclusive processes in society and developing events aimed at elimination of negative consequences of social isolation of transgender people. In Scotland, 8 out of 10 transgender people agree with the fact that homo-/transnegativity is a main barrier for participation in sports. Most of them witnessed it and experienced episodes of negative influence in sports. In Canada, 85% of transgender people have a personal negative experience in sports activity because of their gender identity [10]. The European Union Agency for Fundamental Rights (FRA) revealed that almost a half of transgender respondents informed about experiencing discrimination and harassment in a year before the study.

Verbal form of experiencing transnegative behavior is prevalent. Almost every trans person was subject to verbal abuse, mainly from teammates and rarely from coaches, the public or formal representatives. Besides verbal abuse, 16% of transgender athletes told that they were victims of physical assault, 7% reported sexual harassment. Transgender athletes have lower results in psychological tests aimed at evaluating perception of their physical "self". Both social and psychological reasons are a source of stress and stress factors of disturbing physical and mental health. It was revealed that transgender people tend to avoid getting in social situations, which lead to negative consequences contributing to a restriction of their social bubble and worsening social isolation. Large-scale sports events are considered as an unsafe space, a source of potential discrimination. Visiting a changing room is one of the complicated psychological barriers: feeling shame, incongruity and dissatisfaction with their own body, constant fear of reactions from others are the main internal stress factors that are supported by external barriers in a form of humiliation, discussions about gender non-conformity and no acceptance in teams. Locations related to an increased risk of the society's negative reaction include gyms, sports fields, stadiums and pools. This is the reason why it is important to create an inclusive environment for transgender people with a high level of physical activity or who are engaged in professional sports, taking into account proven benefits of regular intense loads for mental and physical health [1, 11]. It is especially important for transgender people, since it was revealed that there is a high prevalence of depressive states and anxiety, negative consequences of which can be corrected using systematic physical activity. There is an evidence that regular loads improve processes of self-awareness and acceptance of their own body, gender identification, decrease of psychoemotional stress and the level of stress/aggression. Positive influence of sports on mental well-being and social involvement against the background of creating safe and comfortable sports conditions strengthen tolerance to stress and adaptation potential of transgender people [12, 13, 14]. Moreover, physical activity can contribute to maintaining a certain body mass needed for the sex reassignment surgery.

In 2004, the International Olympic Committee (IOC) announces that transgender people are allowed to compete in accordance to their gender identity under a condition that they went through the sex reassignment surgery, can legally confirm their new gender, went through the hormone therapy and lived in this state for at least 2 years [15]. However, this approach includes a very narrow definition and excludes most transgender people who refused to go through the surgery and people who are in the process of transition. In 2016, changes were applied to the IOC's competition policy. Male transgender athletes are allowed to compete in the male category without any limitations. Female transgender athletes, however, are allowed to compete under a condition of transitioning for at least 4 years with a testosterone level lower than 10 nmol/l within not less than 12 months before competition. If indicators do not meet these requirements, female transgender athletes may compete in the male category [16].

The National Collegiate Athletic Association and the British Rowing require only the gender-affirming hormone therapy (GAHT). Nonetheless, trans women have to give more information on hormone therapy and results of the testosterone level test in comparison with trans men [1, 16]. Policy of the Association of Boxing

Commissions makes various requirements to the hormone therapy depending on a gender assigned at birth and a preferred gender [18]. Requirements of the Ladies Professional Golf Association and the International Association of Athletics Federations regarding a necessity for the gender-affirming surgery also differ: unlike trans men, trans women have to go through this procedure obligatorily. The International Federation of Volleyball (Fédération Internationale de Volleyball) have more strict policy: athletes must show a birth certificate for evaluation [1, 19]. In addition, trans women may be asked to give a sex reassignment certificate or go through screening if the evidence is not enough. One of the problems in establishing fair policy regarding children or adolescent athletes is related to limitations of the time of going through transition. In 2011, the World Professional Association for Transgender Health (WPATH) published an updated seventh version of the Standards of Care. According to these standards, an adolescent must give an informed consent with their parents it they did not reach the legal age for treatment decisions. They do not receive treatment until they reach legal age. The patient must live for at least 12 months in a gender role that is congruent with their new gender identity [12]. An issue of creating a clear set of rules on equalizing capabilities of all athletes and excluding potential advantages becomes more complicated in case of younger transgender athletes. It is implied that in accordance with IOC's requirements to the androgen test results used until the age of 16, a male transgender athlete is forced to compete either as a woman or with cisgender male athletes, who have benefits due to the naturally increased level of endogenic androgens. At the age of 16-17 years, a male transgender athlete has to choose between being disqualified from the women's team due to a hormone advantage (androgen level) during the transition or compete as a man. A 16-year-old female transgender athlete in the process of GAHT will not have the right to compete as a woman until 17 under a condition of following requirements to the duration of the transition period (not less than 1 year). In the course of this period, she must compete as a man despite intake of hormones that would make them less capable compared to male athletes. Regarding sports types and a level of capability, there is a narrow age gap, within which an athlete is deemed capable. This is the reason why the transition year can substantially affect an athlete's career [1, 2].

The Canadian Center of Ethics has their own opinion on this issue and published recommendations for sports organization on inclusionary competitive policy for transgender people. The expert group holds the view that each person has the right to compete in accordance with their gender identity on amateur and elite level. The sex-reassignment surgery and hormone therapy should not be an obligatory requirement in sports. If a certain sports organization requires a hormone intake for a certain amount of time, it should present scientific evidence. It is important to develop new weight or other categories of professional skills to preserve the principle of fairness of the competitive process [22].

Gooren et al. revealed in their study that after a year of hormone therapy trans men have an increased testosterone level and muscle mass, which reached a range typical for cis men. Among trans women, a testosterone level decreased after 1 year of the GAHT, muscle mass also decreased but remained higher than in trans men without the hormone therapy. Authors concluded that trans men can compete on equal conditions without any advantages 1 year after the hormone therapy [23]. Most trans women are prescribed testosterone blockers to reach the level of cisgender testosterone; testosterone level suppression for 6 months is an obligatory requirement for going through the sex-reassignment surgery. Therefore, when discussing athletic advantage, a differentiated approach is needed for not only people who are on the gender-affirming hormone therapy, but also trans women who take testosterone blockers.

Muchicko et al. studied relations between gender identity and physical activity. Among transgender participants, lesser physical activity in comparison with cisgender participants was registered, which indicates the significance of social support and public opinion influencing gender identity and physical activity [24]. It was found that transgender people prefer training individually, since it is related to fear of social disapproval. Limiting access to physical activity sessions was one of the anxious traumatizing factors for transgender people, because they cannot keep themselves in the physical form, which, in their opinion, is important to prepare to the transition surgery [1, 11].

It is widely accepted that androgenic hormones (high testosterone level in particular) give an advantage in competitive sports, increase endurance and muscle mass. However, testosterone cannot be the only marker for defining athletic advantage. Physiological studies with male cisgender participants demonstrated that testosterone deficit is connected to a decrease in muscle power, and its additional administration leads to an increase of strength and speed characteristics [15]. Elbers et al. discovered that after the 12-month GAHT the female type fat accretion increased and a mass of the musculus quadriceps femoris decreased [26]. Other studies showed that female transgender athletes after the transition and hormone therapy reported decrease of muscle strength. Their testosterone level was even lower than reference values of cis women [27].

It was estimated that due to a decrease in testosterone and hemoglobin concentration trans women will have the same parameters of aerobic endurance as cis women after the transition period. Meanwhile, the study of Karkazis et al. did not receive reliable evidence confirming an influence of the endogenic testosterone level, which remains within reference values for men, on athletic advantage [28]. Thus, sports medicine doctors will need to acknowledge with specific questions and problems of transgender athletes when it comes to sports sessions.

Results of studying trans women who went through the GAHT also show changes in body muscle mass, strength indicators, hemoglobin and hematocrit content in blood. In types of sports, which give increased requirements to endurance indicators, some hematologic parameters responsible for supporting working muscles with oxygen, have great significance. Reference values of hematocrit and hemoglobin values are higher in men than in women. Testosterone concentration can lead to an increase in these indicators. The GAHT decreases significantly the testosterone level in trans women, which can influence hematologic indicators and endurance [29, 30, 31]. Studying dynamics of hematologic results showed that after 3-4 months of the GAHT, levels of hemoglobin and hematocrit of trans women matched values of cis women.

In sports demanding high speed and strength characteristics, an absolute mass of skeletal muscles is considered as a key factor defining athletic performance. In cisgender men, increase of testosterone in the course of puberty contributes to a growth of muscle mass combined with strength and cross section of muscle fibers. A hypothesis was suggested that cross-striated muscles preserve long-term memory, which allows them performing usual tasks more effectively. It is generally thought that preservation of most myocyte nuclei, which are created when training with weights and using anabolic steroids, play a significant role in a development of muscle memory. In addition, long breaks in sports or stopping steroids intake do not lead to decrease in a number of myocyte nuclei. Strength advantages gained when training in conditions of high testosterone content cannot be possibly neutralized with a change in the endocrine profile in trans women when going through the transition [32, 33].

In the study with using the dual energy X-ray absorptiometry of anabolic properties of testosterone and mixed estrogenic effects associated with the 1-year GAHT, a decrease of lean body mass (0,8%-5,4%) and an area of muscle cross section (1,5%-9,7%) was registered. Strength qualities also decreased to 7% from the initial level [34].

The GAHT for trans men implies testosterone intake, in some cases analogues depot of gonadotropin releasing hormone can be used the or the medroxyprogesterone can be created for stopping menstrual cycle. Trans women take anti-androgen preparations and estrogens: spironolactone is commonly used in the US, while cyproterone acetate is commonly used in Europe. Potential side effects caused by a changed endocrine profile should be controlled regularly in case of the biomedical support of transgender athletes. For elite athletes stopping the therapeutic use of any hormone preparation from the prohibited list of the World Anti-Doping Agency should be ended before competition. The estrogen therapy is a proven factor of the thromboembolism registered in trans women who go through the hormone therapy. In order to reduce the risk of venous thromboembolism, it is advisable to avoid prescribing ethinyl estradiol, use of transdermal estrogen is preferable [35].

Studies demonstrated that before the GAHT lower bone density was registered in trans women compared to trans men or cis men of the same age. In 26% of trans women, who were going through the GAHT, had signs of osteoporosis in the radius, 9% – in the femoral neck and 2% – in the femur. The bone density in trans men corresponded with reference values. When comparing trans women and cis men of the same age, it was discovered that before the hormone therapy trans women have lower muscle mass, strength and bone density than men [36]. It is widely thought that it is related to the aforementioned decrease in physical activity of this category of people. Prospective study of the bone tissue in trans women demonstrated that bone density remained the same or slightly increased after the hormone therapy. Meanwhile, fat mass in trans men decreased, muscle mass and density in the distal part of the radius increased after the hormone therapy [37]. However, people who stopped the hormone therapy after the gonadectomy can be subject to a higher risk of losing bone mass and decreasing bone density. This is why the last mentioned indicator is advisable to include into the protocol of screening transgender athletes.

Starting from puberty, there is a higher risk of the noncontact anterior cruciate ligament tear in cis women compared to men [38]. These differences can be explained by anatomic features and neuromechanical factors controlling mechanics of its stretching in case of physical loads and appearing after the beginning of puberty. The studies have shown that such injuries often take place during the ovulatory menstruation phase. Increased estrogen levels correlated with a decreased level of the cruciate ligament's stiffness, which indicated a significant hormone influence on the joint and ligamentous apparatus. Although there is a small number of studies concerned with diseases and pathological states of the musculoskeletal apparatus among transgender people who went through the surgery and the hormone therapy, the sports medicine doctor must take into account a gender status of an athlete when taking their history and complaints. Research is needed in the area of injury rate features and strategies of its prevention among transgender athletes.

This systematic literature review demonstrated an absence of an evidence for the increasing risk of cardiovascular diseases and thromboembolism among transgender people on the hormone therapy, which indicates the necessity to conduct additional studies in this field. There are separate reports on increasing resistance to glucose and insulin in transgender people on the GAHT. It is reasonable to carry out regular cardiac screening and control indicators of lipid and carbohydrate profile of transgender athletes [39]. As an addition to gender dysphoria, there are other accompanying mental disorders. It is being noted that depression, anxiety, suicidal tendencies and drug abuse are frequently registered in transgender athletes. Among transgender youth of the senior school age, 33% reported self-harm episodes, 18% told they attempted suicide during the previous year [40].

Conclusion. It is reasonable to conduct additional studies on developing the unified methodology including medical aspects related to the GAHT and the sex-reassignment surgery with consideration of specificity of different sports and a personified mental status of an athlete. Research of features of nutrition and nutritional status of transgender athletes and giving further recommendations for optimizing their food ration to increase endurance and athletic performance are also relevant.

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