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A local criterion of fairness in sport – comparing the property advantages of Caster Semenya and Eero Mäntyranta with implications for the construction of categories in sport.

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1. Introduction

Over the past ten years, the case of South-African middle-distance runner Caster Semenya has grown from one instance of ‘sex-testing’ in sport¹ to an international human right case concerning women’s participation in sport.² Of relevance for this paper, Semenya’s case has prompted a reinvigorated discussion in the philosophy of sport arena, of the following question: “*What counts as unfair advantage in competition, and why?*”.

A common, tentatively plausible way to understand unfair advantages in sport is some type of one-dimensional view of fairness. This kind of view employs a single criterion of unfair advantages. When an advantage meets the criterion, it counts as unfair. However, it is difficult to find a criterion that distinguishes between fair and unfair advantages in a consistent and non-problematic way across all sport competitions.³ The advantages that are present in sport are just so various. Nevertheless, it might be possible to find a local criterion of fairness that works consistently and non-problematically in a limited range of cases. In fact, it seems that there

¹ Camporesi, S., & Maugeri, P. (2010). Caster Semenya: sport, categories and the creative role of ethics. *Journal of Medical Ethics*, 36(6), 378–379.

² UN Letter to Seb Coe highlighting concern of human right discrimination. (2018). Retrieved from https://www.ohchr.org/Documents/Issues/Health/Letter_IAAF_Sept2018.pdf

³ Carr, C. L. (2008). Fairness and performance enhancement in sport. *Journal of the Philosophy of Sport*, 35(2), 193–207; Edwards, S. D. (2008). Should Oscar Pistorius be excluded from the 2008 Olympic games?. *Sports Ethics and Philosophy*, 2(2), 112–125; Gardner, R., (1989). On performance-enhancing substances and the unfair advantage argument. *Journal of the Philosophy of Sport*, 16(1), pp.59–73; Jones, C. and Wilson, C., (2009). Defining advantage and athletic performance: The case of Oscar Pistorius. *European journal of sport science*, 9(2),125–131.

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3 would be several local criteria of fairness. A specific local criterion of fairness would be
4
5 beneficial in evaluating the related cases, guiding further discussion about them and
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7 highlighting options for decision-makers. In addition, it could aid understanding unfair
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9 advantages in sport more broadly.
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15 This paper looks for a local criterion of fairness by comparing the cases of Caster Semenya
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17 and Finnish skier Eero Mäntyranta. The former has been associated with an advantage
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19 originating from high amount of testosterone while the latter's high haematocrit levels are often
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21 cited in the sports literature as an example of genetic advantage.⁴ We examine whether there is
22
23 a difference between these two advantages that would justify treating the athletes differently.⁵
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25 If we can find a relevant difference, it could stand as a local criterion of fairness.⁶
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31 We commence our analysis of Semenya's and Mäntyranta's cases by elaborating on
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33 advantages in sport competitions and by explaining the term property advantage. We next look
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35 closer at the two cases and the athletes' property advantages. Then, we utilise the earlier
36
37 literature related to one-dimensional views of fairness. We examine whether a criterion
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42 ⁴ Murray, T.H. (2018). *Good Sport: Why Our Games Matter--and How Doping Undermines Them*. New York:
43
44 Oxford University Press; Tännsjö, T. (2005). Hypoxic air machines. Commentary. *J Med Ethics* 31, 113.

45
46 ⁵ The rationale of focusing on the differences is the notion that they may solve conflicts between one-dimensional
47
48 views of fairness locally. One criterion may count the two advantages as fair while another criterion may count
49
50 them both as unfair. However, if there is a criterion that counts one advantage as fair and the other advantage as
51
52 unfair in a relevant way, this criterion could be used to settle the conflict. An additional assumption, though, is
53
54 needed for this conclusion: none of the criteria has absolute trumping power over other criteria. This seems to be
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56 plausible assumption due to the difficulty of finding a universal criterion of fairness.

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58 ⁶ A local criterion of fairness could still exist even though our approach of focusing on differences would not
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60 reveal it.

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3 mentioned in the literature would differentiate between the two property advantages. We test
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5 ten proposed criteria and suggest that three of them indicate a possible difference. After that,
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7 we discuss whether any of these three criteria is relevant for treating the cases differently. We
8
9 argue that one of them, that is, not attainable by others in the same category, can play a relevant
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11 role under certain conditions. Lastly, we address its significance as a local criterion of fairness.
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17 **2. Property advantages**

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22 Gaining an advantage over adversaries is key in any kind of competition. Advantage is
23
24 a relation of superiority: it requires comparison of two parties to determine which one is better
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26 according to some agreed on parameter. We can say that there are two types of advantages:
27
28 performance and property advantages.⁷ Performance advantage is a relationship of superiority
29
30 between performance numbers possessed by different athletes (or teams) and is defined as
31
32 follows: “*A has a final performance advantage over B if A has a better final performance*
33
34 *number than B*”. Examples of performance numbers are the number of seconds that an athlete
35
36 runs a sprint in, or the numerical score that is the result of a football match. Property advantage
37
38 is defined as follows:
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40
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42 “*A has an advantage over B in property X if A has a more favourable amount of this*
43
44 *property X than B does*”, where properties are “*constituent parts of competitors and*
45
46 *competition environment*”.⁸
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49 Performance advantage is a function of property advantages, which affect performance in a
50
51 context and time-dependent fashion. It is a complex function, as there are many different
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56 ⁷ Hämäläinen, M. (2012). The concept of advantage in sport. *Sport, Ethics and Philosophy* 6(3), 308–322.

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59 ⁸ Ibid: 317.
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3 factors that influence performance at a given date/time. Some property advantages are ‘natural’
4 advantages, i.e. part of the genetic lottery, while other property advantages are not ‘natural’
5 (e.g. technology, diet, access to coach and training, drugs.) We lack a fully fledged analysis of
6 the ways in which property advantages affect performance, and it is not clear that it is possible
7 to model the function for a given athlete, due to the complexity of the factors, and
8 epistemological issues in accessing the factors. Instead, it is possible to single out individual
9 property advantages and try to analyse how they contribute (or affect) performance for a given
10 event.⁹ As a matter of fact, the studies that inform the IAAF Regulations on the eligibility of
11 female athletes with differences of sex development to compete in the female category are
12 exactly studies of this type. It is important to remember that what these studies can do is only
13 attempt at establishing a correlation between a single factor (i.e. testosterone) and performance,
14 among the many factors that influence it.
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33 In the next section we apply the concept of property advantage as defined above to our two
34 case studies.
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40 **3. Caster Semenya and Eero Mäntyranta: standing out from fellow competitors** 41 **because of a property advantage?** 42 43 44 45 46 47 48 49

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51 ⁹ e.g. Bermon, S., & Garnier, P. Y. (2017). Serum androgen levels and their relation to performance in track and
52 field: mass spectrometry results from 2127 observations in male and female elite athletes. *Br J Sports*
53 *Med*, 51(17), 1309–1314; Ospina Betancurt, J., Zakynthinaki, M.S., Martinez-Patiño, M.J. and Cordente
54 Martinez, C., (2018). Hyperandrogenic athletes: performance differences in elite-standard 200m and 800m
55 finals. *Journal of sports sciences*, 36(21), 2464–2471.
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3 Caster Semenya is a South African runner who came under the spotlight in 2009, when
4 only 18 years old she won the World Track & Field Championships 800 m final in Berlin with
5 more than a 2 seconds margin to the silver medallist, finishing in 1.55.45 (the silver medallist
6 Janeth Jepkosgei Busienei from Kenya completed the race in 1.57.90). The victory ignited
7 discussion about her eligibility to compete in the female category. Here, we recapitulate only
8 the relevant information of her case.¹⁰
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19 Following her victory in Berlin in 2009, Semenya's medal was revoked by World Athletics
20 (formerly known as IAAF or International Association of Athletics Federations¹¹) while she
21 underwent investigations triggered by fellow competitors who questioned her identity as a
22 woman. Semenya's high levels of testosterone have been attributed to a - never publicly
23 disclosed, but always inferred – difference of sex development (DSD), where Semenya would
24 have a karyotype of 48XY, and while display external female genitalia but also have internal
25 gonads (testes) which would be responsible for the high production of testosterone.¹²
26 Differences of sex developments is a relatively recent “umbrella term” in use since 2008¹³ to
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39 ¹⁰ for an exhaustive overview of her case, see Camporesi, S. (2018). [https://aeon.co/essays/sports-](https://aeon.co/essays/sports-culture-binds-us-to-gender-binaries-this-is-unfair)
40 [culture-binds-us-to-gender-binaries-this-is-unfair](https://aeon.co/essays/sports-culture-binds-us-to-gender-binaries-this-is-unfair) AEON
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44 ¹¹ In this paper we continue using the acronym IAAF as that was how the regulations were known. The name
45 World Athletics is in place only since November 15, 2019.
46

47 ¹² Pastor, A. (2019). Unwarranted and Invasive Scrutiny: Caster Semenya, Sex-Gender Testing and the Production
48 of Woman In 'Women's' Track and Field. *Feminist Review*, 122(1), 1–15.
49

50 ¹³ This new term was adopted in the scientific and medical community on the basis of a 2007 consensus statement
51 of the European Society for Paediatric Endocrinology and the American Lawson Wilkins Pediatric Endocrine
52 Society known as the “Chicago consensus statement”. Hughes, I. A., Houk, C., Ahmed, S. F., Lee, P. A., &
53 Society, L. W. P. E. (2006). Consensus statement on management of intersex disorders. *Journal of pediatric*
54 *urology*, 2(3), 148–162.
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3 refer to what previously referred to a variety of congenital conditions in which babies are born
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5 with genitalia that are atypical since birth or who may display differences in the development
6
7 of the reproductive and sexual organs at puberty.
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15 In May 2011, following Semenya's case, IAAF published new guidelines known as
16
17 Hyperandrogenism Regulations to regulate the eligibility of female athletes to participate in
18
19 the female category. The regulations required female athletes with testosterone levels higher
20
21 than 10 nmol/Lit to take androgen suppressive therapy for up to two years (i.e. drugs to reduce
22
23 her testosterone levels) to bring them below the threshold 10 nmol/LIT in order to re-enter
24
25 competition. The IAAF Hyperandrogenism regulations remained in force from May 1st, 2011
26
27 to July 24th, 2015, when they were suspended following the Indian sprinter Dutee Chand's
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29 appeal to the Court of Arbitration for Sport¹⁴. The suspension was granted on grounds that
30
31 there was not enough evidence to demonstrate a correlation between increased testosterone
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33 levels and performance advantage.¹⁴
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38 New regulations were announced on April 26th, 2018 by IAAF in response to the Court
39
40 of Arbitration for Sport's Interim Award in 2015 and requirement that additional evidence
41
42 should be produced about the correlation between testosterone levels and performance results.
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44 The regulations, known as Eligibility of female athletes with DSDs to compete in the female
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52 ¹⁴. Camporesi, S. (2016, July 29). Clear Skies Overhead for Dutee Chand, But Clouds Loom on the Horizon.
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54 Huffington Post. The text of the 2011 Hyperandrogenism regulations has since been taken off the IAAF website
55
56 but can be found here:
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58 [https://silviacamporesiresearchdotorg.files.wordpress.com/2016/08/iaafguidelineseligibilityhyperandrogenism1](https://silviacamporesiresearchdotorg.files.wordpress.com/2016/08/iaafguidelineseligibilityhyperandrogenism1my2011.pdf)
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60 my2011.pdf

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3 category¹⁵, came into effect on November 1st, 2018 and supersede the previous
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5 Hyperandrogenism Regulations. The DSD regulations, are at the same time more and less
6
7 restrictive than the previous 2011 IAAF Regulations. They are more restrictive because they
8
9 target all athletes with testosterone levels above 5 (not 10) nmol/Lit; however they can be
10
11 considered less restrictive because they target only a subset of events (400 m, 400 m hurdles,
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13 800 m, 1,500 m, and the mile).
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20 The assumption underlying the regulations has not changed from the 2011 to the 2018
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22 regulations, although the details have. For both sets of regulations IAAF has relied on the
23
24 assumption that higher levels of testosterone confer an unfair competitive advantage to
25
26 Semenya over fellow female athletes.
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32 Eero Mäntyranta (1937–2013)¹⁶ was a Finnish cross-country skier active in the 60s and
33
34 early 70s. Mäntyranta won two gold medals at the Innsbruck winter Olympics in 1964 in the
35
36 30 km and 15 km race. de Chapelle and others conducted a study over 200 members of his
37
38 extended family, which was published in 1993 in the Proceedings of the National Academy of
39
40 Science (PNAS). The study demonstrated that Mäntyranta had a rare genetic mutation in the
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42 receptor of the erythropoietin gene, or EPOR gene.¹⁷ The EPO receptor can be normally in an
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49 ¹⁵ Franklin S., Betancurt J.O, Camporesi, S. (2018). New Eligibility Regulations for Female Athletes with
50
51 “Differences of Sex Differentiation”, British Journal of Sport Medicine Blog. Retrieved from
52
53 [https://blogs.bmj.com/bjasm/2018/04/26/new-eligibility-regulations-for-female-athletes-with-differences-of-sex-](https://blogs.bmj.com/bjasm/2018/04/26/new-eligibility-regulations-for-female-athletes-with-differences-of-sex-differentiation/)
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55 differentiation/

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57 ¹⁶ International Olympic Committee. *Eero Mäntyranta*. Retrieved from <https://www.olympic.org/eero-mantyranta>

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59 ¹⁷ de La Chapelle, A., Träskelin, A. L., & Juvonen, E. (1993). Truncated erythropoietin receptor causes dominantly
60
61 inherited benign human erythrocytosis. *Proceedings of the National Academy of Sciences*, 90(10), 4495–4499.

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3 active state, when the EPO molecule is connected to the receptor, and in an inactive state, when
4 it is not; whereas in the constitutive state, the receptor is permanently in an active-like state.
5
6 Mäntyranta's 'gain of function' mutation (caused by a stop codon in the DNA sequence,
7
8 leading to a truncated erythropoietin receptor) leads to a constitutive activation of the receptor
9
10 for EPO. The mutated receptor in its active-like state sends messages to the body to continue
11
12 producing red blood cells, or erythrocytes, even in absence of the physiological signal that
13
14 would in physiological conditions lead to erythrocyte production.
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22 The mutation affecting Mäntyranta and members of his family is an autosomal
23
24 dominant mutation. This means that only one affected allele (one copy of the gene) is sufficient
25
26 to bring about the phenotypic effects. The result is an erythrocytosis i.e. increased production
27
28 of red blood cells, which causes an increase in hemoglobin (Hb) concentration in blood and in
29
30 haematocrit value (haematocrit by definition is the ratio of the volume of red blood cells to the
31
32 total volume of blood).
33
34

35
36 Mäntyranta's property advantage was the level of EPO in the blood with the resulting
37
38 increased oxygen carrying capacity of his red blood cells. The scientists led by De Chapelle
39
40 who originally studied his case wrote that:
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45 "In human pathology, the naturally occurring mutation described here appears
46
47 to be a fairly unique example of a mutation leading to an increased functional activity
48
49 that does not have any harmful effects on its bearer. On the contrary, the resulting
50
51 erythrocytosis and high Hb concentration lead to increased oxygen transport capacity."
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53 (De Chapelle 1993, 4498),
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3 Primary Familiar Congenital Polycythemia (PFCP) is the medical term in use to refer
4 congenital conditions characterized by increased erythropoiesis, where ‘polycythemia’ literally
5 means ‘lots of erythrocytes’. These conditions can be caused by variety of mutations, the first
6 of which was described by le Chapelle et al in 1993 building on the pedigree of Mäntyranta’s
7 family. Later studies into the aetiology of PFCP concluded that in addition to the “benign
8 phenotypic effects” described by le Chapelle in 1993, individuals who have mutations in the
9 EPO receptor gene often experience symptoms derived from the high haematocrit¹⁸ .¹⁹
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21 On the basis of the available studies into the aetiology of PFCP we can conclude that
22 the condition affecting Mäntyranta and other members of his family is a pathological condition,
23 and that the same property can function as a property advantage in a given context e.g. cross
24 country skiing, and as a disadvantage in other contexts. Alone, the property advantage is not
25 sufficient to gain a competitive advantage, although it contributes to the overall performance
26 advantage in endurance events, by providing a higher degree of oxygen carrying capacity to
27 the red blood cells.
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48 18 Among these symptoms, PFCP patients may present headaches, dizziness, epistaxis (bleeding from the nose),
49 and exertional dyspnea (difficulty breathing during exercises). More severe events such as thrombotic (blood
50 clots) and hemorrhagic events leading to premature death have also been reported.
51

52 19 Perrotta S., Cucciolla V., Ferraro M., Ronzoni L., Tramontano A., Rossi, F. ... della Ragione, F. (2010). EPO
53 Receptor Gain-of-Function Causes Hereditary Polycythemia, Alters CD34+Cell Differentiation and Increases
54 Circulating Endothelial Precursors. PLoS ONE 5(8): e12015. Retrieved from
55 <https://doi.org/10.1371/journal.pone.0012015>
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3 **4. In what ways can Semenya's and Mäntyranta's property advantages be**
4 **considered different?**
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10 In this section we compare the property advantages of Semenya and Mäntyranta against
11 ten different one-dimensional views of fairness from the literature. The goal is to analyse
12 whether the two cases differ according to any of these views' criteria.
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21 ***"The property advantage is unfair because":***
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- 26 1. *it is unnatural*²⁰. The natural/unnatural is a key distinction in ethics and philosophy of
27 sport. Both property advantages under examination in this paper, high levels of testosterone
28 and mutations in the EPO R receptor, are natural.
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34
35 2. *it is against the rules*²¹ In the case of Semenya, there were no rules in place regulating the
36 eligibility of female athletes with high levels of testosterone when she started competing in
37 2008 (there were no sex testing regulations per se, in place at that time). The 2011 IAAF
38 Hyperandrogenism Regulations rules were created following her investigation as described
39 above. In the case of Mäntyranta, although there were no rules regulating the competition
40 of athletes with high haematocrit levels at the time he was competing, it is not immediately
41 clear whether he would be currently excluded from participating in races if he competed
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56 ²⁰ Jones & Wilson, op. cit. note 3, p. 127.

57 ²¹ Butcher, R. & Schneider, A. (2003). Fair Play as Respect for Game. In J. Boxill, Sport Ethics. An Anthology
58 (pp. 153–171). Melden: Blackwell Publishing, 157.
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3 today. Thus, we earmark this as the first possible difference between the two property
4 advantages under analysis, which we further unpack in the next section.
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- 10 3. *it is breaking a contract*²². Breaking a contract refers to instances in which competitors,
11 who have agreed either explicitly or implicitly on the conditions of competing, break the
12 (explicit or implicit) agreement. For instance, football players may have implicitly agreed
13 that they do not bite each other on the field. However, when someone does bite another
14 player on the field, the agreement can be challenged or made explicit. It is difficult to see
15 how Semenya or Mäntyranta would have entered into an agreement that they would be
16 breaking, unless one wishes to understand this distinction as a subset of the previous one.
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28 4. *it is vicious*²³. An advantage can be understood to be vicious if it exemplifies or results
29 from ill-will. Neither Semenya nor Mäntyranta can be suspected of acting viciously since
30 their property advantages are congenital, or present from birth.
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37 5. *it is cheating*²⁴ Cheating is typically understood as intentional deceiving. Use of
38 performance enhancing substances represents often intentional deceiving because the user
39 of the substances typically wants to give an impression that she or he has not used them.
40 Therefore, for the same reasons as in 4., it would be hard to count Semenya's or
41 Mäntyranta's property advantage as cheating.
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51 ²² Ibid: 158–159

52
53 ²³ Ibid: 154

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55 ²⁴ Schneider, A. J. & Butcher, R. B. (2000). A philosophical overview of the arguments on banning doping in
56 sport. In T. Tännsjö & C. Tamburrini, *Values in Sport. Elitism, nationalism, gender equality and the scientific*
57 *manufacture of winners* (pp. 185–199), London and New York: Routledge.
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6 6. *it is against the spirit of the sport*²⁵ The spirit of sport refers to ethos or some kind of ideal
7
8 conception of how the sport should be practiced²⁶. None of the property advantages can be
9
10 considered against the spirit of the sport because they are based on congenital qualities of
11
12 the athletes.
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17 7. *it is undeserved*²⁷ An advantage could be understood as undeserved if the athlete gained it
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19 without any effort. Both property advantages are undeserved in this sense as they are part
20
21 of the genetic/natural lottery, they are not the outcome of training.
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25
26 8. *it is an all-purpose advantage* (compared to a sport specific advantage). Knox and co-
27
28 authors (2019) argue that “ High testosterone levels are beneficial in almost all sports (an
29
30 all-purpose benefit) whereas other advantages are beneficial in only some. For example, a
31
32 short person is highly unlikely to become an elite basketballer but may excel in gymnastics.
33
34 Individuals of varying height can self-select into sports that suit their physiological make-
35
36 up, whereas people with average or low testosterone levels cannot.”²⁸ If this statement is
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38 correct (it is a question that remains open to empirical scrutiny), there seems to be a way in
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40 which the property advantage derived from high levels of testosterone can be said to be
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48 ²⁵ Carr, op. cit. note 3, p. 195.

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50 ²⁶ McNamee, M. J. (2012). The spirit of sport and the medicalisation of anti-doping: empirical and normative
51
52 ethics. *Asian bioethics review*, 4(4), 374–392; McNamee, M. (2015). The spirit of sport and the world anti-
53
54 doping code. In *Routledge Handbook of Drugs and Sport* (pp. 55–67). Routledge.

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56 ²⁷ Jones & Wilson, op. cit. note, 3 p. 127.

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58 ²⁸ Knox, T., Anderson, L.C. and Heather, A., 2019. Transwomen in elite sport: scientific and ethical
59
60 considerations. *Journal of medical ethics*, 45(6), pp.395-403, p. 399

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3 different from the property advantage derived from high haematocrit level. This is the
4
5 second possible difference between the two property advantages which we further analyse
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7 in the next section.
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12 9. *it is not available to all*²⁹ Semenya's and Mäntyranta's property advantages can both be
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14 considered unfair according to this criterion because they are the result of a genetic
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16 mutation - thus not available to all.
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21 10. *It is not available/attainable to others in that category*³⁰. This argument is a variation of
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23 the previous. There seems to be a way in which the property advantage derived from high
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25 testosterone levels can be said to be different from the property advantage derived from
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27 high haematocrit level, on the basis of the fact that there are no categories based on
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29 haematocrit levels, but there are female and male categories based on the assumption that
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31 male have better performances because of higher levels of testosterone³¹. This is the third
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33 possible difference between the two property advantages which we further analyse in the
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35 next section.
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45 **5. Are possible differences in Semenya's and Mäntyranta's property advantages**
46
47 **philosophically relevant?**
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51 ²⁹ Jones & Wilson, op. cit. note, 3 p. 127.

52
53 ³⁰ Bianchi, A., 2017. Transgender women in sport. *Journal of the Philosophy of Sport*, 44(2), pp.229-242.

54
55 ³¹ There are also other explanations of female and male categories in sport, see Tännsjö, T. (2000). Against
56
57 sexual discrimination in sports. In T. Tännsjö & C. Tamburrini (eds.), *Values in Sport. Elitism, nationalism,*
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59 *gender equality and the scientific manufacture of winners* (pp. 101–115), London and New York: Routledge.
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6 To summarize thus far, the two property advantages under examination may differ in
7
8 three dimensions i.e. the ‘against the rules’ dimension; the ‘all purpose versus sport specific’
9
10 dimension; and the “not attainable in the same category” dimension. In this section, we evaluate
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12 whether these possible differences are philosophically relevant.
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19 *6.1 Against the rules?*

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24 The first way in which testosterone and haematocrit levels may differ is in relation to
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26 the existence of a rule. As we explained earlier, Semenya’s property advantage is in violation
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28 of IAAF’s rules, which were put into place in 2011, suspended in 2015, and re-established in
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30 a different form in 2018. However, when Mäntyranta was competing, in the 1960s, there was
31
32 no rule prohibiting somebody with a haematocrit level of 60 or above from competing. Only
33
34 in 1997 the International Ski Federation (FIS) introduced upper limits to haemoglobin
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36 concentration in the blood for athletes. The limit was set at 18.5 g/dl for men and at 16.5 g/dl
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38 for women. If an athlete’s Hb level were equal or higher to the set limit, the athlete could not
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40 take part in competitions for five days. The rule had been set with the explicit goal to protect
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42 athletes’ safety.³² An implicit goal appeared to be preventing use of doping. Since 1997 FIS
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52 ³² Ronsen, O. & Rusko, H. (2003). Special and Practical Issues in Cross Country Skiing (141–175). In H. Rusko;
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54 *Handbook of Sports Medicine and Science: Cross Country Skiing*. Malden: Blackwell Science; Videman, T.,
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56 Lereim, I., Hemmingsson, P., Turner, M. S., Rousseau-Bianchi, M.-P., Jenoure, P., Raas, E, Schönhuber, H.,
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58 Rusko, H., Stray-Gundersen, J. (2000). Changes in hemoglobin values in elite cross-country skiers from 1987 to
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60 1999. *Scand J Med Sci Sports* 10, 98–102.

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3 has lowered the limits a few times. In 2003, the limit for men's value was set at 17.0 g/dl and
4
5 for women's value at 16.0 g/dl³³. FIS has not lowered the limits again since 2013.
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10 Athletes have been able to apply for an exemption on the basis of naturally high Hb
11 concentration at least since the year 2003. For instance, German Evi Sachenbacher-Stehle
12 applied for an exemption in 2003, 2004 and 2005, however she was not granted it. At the 2006
13
14 Turin Winter Olympics, the German athlete received a ban for a too high haemoglobin
15 concentration when she had measures of 16.5 g/dl and 16.4 g/dl³⁴. In contrast, another German
16
17 cross-country skier, Jens Filbrich (male athlete), was granted the exemption during the same
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19 season³⁵.
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30 FIS introduced personal, long-term statistical haemoglobin limits besides the existing
31 universal limits in season 2008 - 2009. If an athlete's Hb concentration deviated too much from
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40 ³³ FIS (2008). FIS Fact Sheet. Backgrounder on FIS Medical and Anti-Doping Activities, June 25, 2008. Retrieved
41 from https://assets.fis-ski.com/image/upload/v1536946665/fis-prod/assets/FIS_Anti-Doping_Activities.pdf;

42
43 Tarasti, L. (2001). Lahden dopingjupakan juridiikkaa. Urheilu-oikeuden yhdistys. Retrieved from
44 https://www.urheilu-oikeudenyhdistys.fi/urheilu-ja-oikeus-vuosikirja/2001/lauri_tarasti/;

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46 YLE (2003). FIS alentaa hemoglobiinirajoja. YLE Urheilu October 27, 2003 (updated May 29, 2012). Retrieved
47 from <https://yle.fi/urheilu/3-5950985>

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49 ³⁴ CAS (2006). Arbitration CAS ad hoc Division (OG Turin) 06/004 Deutscher Skiverband & Evi Sachenbacher-
50 Stehle v. International Ski Federation (FIS), award of 12 February 2006. Retrieved from [https://jurisprudence.tas-
51 cas.org/Shared%20Documents/OG%2006-004.pdf](https://jurisprudence.tas-cas.org/Shared%20Documents/OG%2006-004.pdf)

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53 ³⁵ Ibid; DPA 2006 DPA (2006). German skier banned for 5 days at Turin Olympics. *Expatica*, February 10, 2006.
54 Retrieved from <https://www.expatica.com/de/german-skier-banned-for-5-days-at-turin-olympics/>
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3 her historical values, the athlete received an initial prohibition of 14 days³⁶. In 2013, FIS
4 renounced all universal haemoglobin limits and in line with other federations, adopted personal
5 limits in the form of the WADA's biological passport³⁷. Under the new rules, an atypical value
6
7 in an athlete's longitudinal haematological profile may bring about a sanction for the athlete.³⁸
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15 If Mäntyranta were to compete according to today's rules, he would be apparently
16 eligible to take part in competition on the condition that FIS accepted his longitudinal
17 haematological profile as non-problematic. We are aware of at least one case of the Finnish
18 skier's Krista Pärmakoski (female athlete), who has naturally high Hb concentration, and has
19 been allowed to compete after the introduction of the biological passport.³⁹
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29 In conclusion, it seems to be the case that Semenya's property advantage can be
30 considered against the rules, while Mäntyranta's property advantage is neither against the rules
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36 ³⁶ FIS (2009a). FIS Media Info. FIS promotes zero-tolerance on doping: Anti-Doping Programme at the FIS
37 Nordic World Ski Championships 2009 in Liberec (CZE). February 16, 2009. Retrieved from [https://assets.fis-
38 ski.com/image/upload/v1536946375/fis-prod/assets/FIS_promotes_zero-tolerance_on_doping.pdf](https://assets.fis-ski.com/image/upload/v1536946375/fis-prod/assets/FIS_promotes_zero-tolerance_on_doping.pdf); FIS (2009b).
39 FIS Fact Sheet. FIS Anti-Doping Program enters the Olympic year. November 25, 2009. Retrieved from
40 [https://assets.fis-ski.com/image/upload/v1536946401/fis-prod/assets/FIS_Anti-
42 Doping_Program_enters_the_Olympic_year.pdf](https://assets.fis-ski.com/image/upload/v1536946401/fis-prod/assets/FIS_Anti-
41 Doping_Program_enters_the_Olympic_year.pdf)
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48 ³⁷ WADA. Athlete biological passport. Retrieved from <https://www.wada-ama.org/en/athlete-biological-passport>

49 ³⁸ FIS (2013). FIS Fact Sheet. Val di Fiemme 2013: FIS Anti-Doping Programme at the World Championships.
50 February 20, 2013. Retrieved from [https://assets.fis-ski.com/image/upload/v1536946124/fis-
53 prod/assets/Val_di_Fiemme_-_FIS_Anti-
54 Doping_Programme_at_the_FIS_Nordic_World_Ski_Championships.pdf](https://assets.fis-ski.com/image/upload/v1536946124/fis-
51 prod/assets/Val_di_Fiemme_-_FIS_Anti-
52 Doping_Programme_at_the_FIS_Nordic_World_Ski_Championships.pdf)
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57 ³⁹ STT – Yliniemi, K. (2013). Hiihtäjän hemoglobiinirajasta tuli yksilöllinen. *Kestävyyssurheilu.fi* February 18,
58 2013. Retrieved <https://www.kestavyyssurheilu.fi/hiihto/4036-hiihtajan-hemoglobiinirajasta-tuli-yksilollinen>
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3 of his days nor against the rules of today (with the caveat that federations such as FIS may
4 decide to accept, or not, an athlete's longitudinal haematological profile which deviates from
5 the norm, and the basis of these decisions is not always easy to discover). In any case, we argue
6 that this possible difference is philosophically irrelevant. Philosophical fairness evaluation
7 focuses on how things should be, rather than on how they are, and the rules represent how things
8 are. In other words, philosophy is looking for justifications instead of descriptions of status
9 quo. Though, we admit that the possible difference related to rules may be legally or
10 procedurally relevant, but it is not relevant to the philosophical considerations of this paper.
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23 24 *6.2 An all-purpose advantage?* 25

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28 The second way in which testosterone may differ from haematocrit levels is in relation
29 to being an all-purpose versus a sports specific benefit. This argument has been made by Knox
30 et al⁴⁰, who have argued that while athletes can self-select into a specific sport on the basis of
31 property advantages of various kinds, they cannot do so on the basis of testosterone, because
32 the latter gives a performance advantage across the spectrum of all sports. On this basis it could
33 be argued that if an athlete has a property advantage derived from testosterone, this athlete will
34 crowd out other athletes, for whom there will not be the possibility of self-selecting in a given
35 sport. In the case of the property advantage derived by high haematocrit, while one could
36 reasonably argue that high haematocrit levels affects performance across a variety of events,
37 these are all endurance events: e.g. cross-country skiing, marathon, triathlon, etc. High
38 haematocrit levels will not confer a property advantage in sprinting.
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⁴⁰ Knox et al., op. cit. note 31.

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3 To evaluate this argument, we distinguish between its two prongs: the empirical part –
4 i.e. is it the case that testosterone is an all-purpose benefit – and the normative part – is this
5 philosophically relevant?– We acknowledge that the argument might be empirically correct.
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7 Testosterone might be a property advantage in a majority of sports while haematocrit is not, or
8 at least testosterone might be a property advantage in more numerous sports than haematocrit.
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10 However, normatively, this argument carries minimal weight. Let us imagine two athletes: A
11 and B. A has higher testosterone level than B. Consequently, A has an all-purpose property
12 advantage over B and it would be unfair. In fact, all property advantages concerning
13 testosterone would be unfair, which is hardly the desired outcome of the argument by Knox et
14 al. To sum up, also the second difference is philosophically irrelevant.

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16 Let us imagine two athletes: A and B. A has higher testosterone level than B.
17 Consequently, A has an all-purpose property advantage over B, and this property advantage
18 would be unfair according to the argument by Knox et al. In fact, all property advantages
19 concerning testosterone would be unfair, which is hardly the desired outcome of the argument
20 by Knox et al. To sum up, also the second difference is philosophically irrelevant.

21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 *6.3 Not attainable by others in the same category?*

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44 The third possible difference is that Semenya's property advantage is not available to
45 others in the female category, while Mäntyranta's property advantage does not have category
46 restrictions (both men and women can be affected by the mutation that confers high Hb levels).
47 We analyse this possible difference by distinguishing between what we call strict attainability
48 and category attainability.
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3 Strict attainability refers to whether a specific individual can be said to have the property
4 advantage. For instance, if a specific female athlete cannot attain the same level of testosterone
5 as Semenya, the property advantage can be said not to be *strictly attainable* to her, even though
6 she is a member of the female category.
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14 *Category attainability* refers to whether at least some individual(s) in the category can
15 attain the property advantage. For instance, if 90 per cent of females cannot attain a property
16 advantage and 10 percent of females can attain the property advantage, then the property
17 advantage can be said to attainable to the members of female category according to the category
18 attainability criterion. Category attainability often implies counter-factual attainability: a
19 specific individual in the category could attain the property advantage if the individual were to
20 belong to the fortunate part of the category. For instance, in the previous example, a female
21 athlete belonging to the 90 per cent could have the property advantage if she were to belong to
22 the 10 %.
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38 Now, we apply the distinction to Semenya's and Mäntyranta's property advantages. According
39 to the strict attainability criterion, Semenya's property advantage is not available to others in
40 the same category because most females cannot attain as high level of testosterone as Semenya.
41 However, if we look beyond the conventional category of females, it is possible to construe a
42 smaller category consisting of individuals with polycystic ovaric syndrome, or differences of
43 sex differentiation like Semenya (both conditions confer high levels of testosterone). Within
44 this category, Semenya's property advantage is available also to others. The same kind of
45 reasoning applies to Mäntyranta's property advantage. His property advantage is not strictly
46 attainable to many male athletes because they cannot have as high haematocrit values as he.
47 However, if we conceive a smaller category based on one of the conditions falling under the
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3 umbrella term of PFPC , then Mäntyranta's property advantage could be attainable to others in
4 that category. To recapitulate, Semenya's and Mäntyranta's property advantages are available
5 to others in the same category when we apply the strict attainability criterion and look beyond
6 the conventional categories of male versus female. Or, vice versa, depending on how we define
7 the categories for Semenya and Mäntyranta, the property advantage may or may not be strictly
8 attainable to others in that category.
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19 Strict attainability has significant implications for current sports. By creating enough
20 new categories, it is possible to conceive of a situation where all property advantages are
21 strictly attainable to all members of each category. For example, we may create a category
22 which includes all DSDs conditions, or we might create as many categories as many conditions
23 known as DSDs we know. The same holds for PCFP: we might create a category for all PCFPs,
24 or as many category as many mutations causing PCFPs we are aware of. However, this may
25 lead to an explosion in the amount of categories. The exact amount of categories one would
26 like to establish is partly an empirical question, and partly a conceptual question. It is empirical
27 insofar as it based on data, it is conceptual insofar as it is based on the values of fairness and
28 inclusivity which inform the discussion of the creation of categories in sport.
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45 To sum up our discussion of the third possible difference, according to category
46 attainability, Semenya's property advantage is attainable to others in the female category as
47 long she is included in the female category. The reason is that category attainability focuses on
48 the strongest members of the category, not on the weakest. This focus on the strongest members
49 of the category follows from the nature of category attainability: It explores what is possible
50 within the category, not what is possible for individual members of the category; in other
51 words, category attainability explores the limits of the category, not the limits of the individual
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3 members of the category. Similarly, Mäntyranta's property advantage is attainable to others in
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5 the same category according to category attainability, whatever the category in which he
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7 belongs to.
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12 Hence, Semenya's and Mäntyranta's property advantages can be considered different
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14 if we use the strict attainability and set the categories, for instance, so that Semenya's property
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16 advantage is not available to others in the category while Mäntyranta's property advantage is
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18 available to others in that category. Is this difference then relevant? The answer depends on the
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20 justifications for setting the categories. We will discuss this issue in the next section, which
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22 concludes our paper.
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28 **6. Conclusions**

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33 We compared the cases of Caster Semenya and Eero Mäntyranta to find a local criterion of
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35 fairness. Our approach suggests that the criterion 'not being attainable by others in the same
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37 category' seems to represent a local criterion of fairness under certain conditions. These
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39 conditions are as follows: (i) attainability is interpreted as strict attainability, (ii) sport
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41 categories are set such that one advantage is strictly attainable by other athletes while the
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43 remaining advantage is not strictly attainable by other athletes and (iii) the sport categories are
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45 justified. Two questions are then relevant. First, what kinds of categories are justified? Second,
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47 if the categories are justified, what the local criterion of fairness implies?
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54 We will address the latter question first. That is, what are the implications of the local
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56 criterion of fairness if sport categories are justified? If Semenya's and Mäntyranta's cases are
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58 the only ones that matter, then the local criterion helps to distinguish in a meaningful way
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3 whose advantage is fair and whose advantage is unfair. However, the local criterion cannot
4 settle overall the two cases without a further argument, since the two cases are not the only
5 ones that matter in the overall evaluation. The first question provides a possible starting point
6 for looking for a further argument.
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15 The first question asks what kinds of sport categories are justified. This question reveals
16 what kind of decision-making factors are at stake in Semenya's and Mäntyranta's cases. In the
17 previous section of this manuscript, we saw that if we follow strict attainability, there is a threat
18 of category explosion. On the other hand, relying on category attainability implies, at worst,
19 that we treat people only as category representants, not as individuals. In the Semenya's vs.
20 IAAF dispute at the Court for Arbitration of Sport in Lausanne in 2019, the CAS judges
21 accepted IAAF's assumption that the male/female binary as we know it in track and field was
22 un-challengeable.⁴¹ At the very beginning of the executive summary in their Arbitration
23 released on April 30th, 2019, the judges state that the decision is "constrained by the accepted,
24 necessary, binary division of athletics into male and female events".⁴²
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38 Hence, on this basis, in the Semenya vs. IAAF trial they only deliberated on whether
39 the evidence put forward by IAAF about a correlation between testosterone levels and
40 performance advantage was deemed sufficient to co justify the reinstatement of regulations
41 which require the pharmacological suppression of testosterone levels in order to level the
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50 41 Camporesi, S., 2019. When does an advantage become unfair? Empirical and normative concerns in
51 Semenya's case. *Journal of Medical Ethics*, 45(11), pp.700-704.

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53 42 Court of Arbitration for Sport executive summary in the Semenya and ASA vs IAAF case released April
54 30th 2019, 2019. Available: [https://www.tas-](https://www.tas-cas.org/fileadmin/user_upload/CAS_Executive_Summary__5794_.pdf)
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3 playing field and eliminate the ‘unfairness’ due to testosterone levels not attainable to others
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5 in the same category within the female category. The initial decision of not challenging the
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7 status quo of categories framed the judicial discussion of the trial by leaving out discussions of
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9 strict and category attainability.
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13 However, we argue, the un-challengeability of the male/female division needs to be
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15 revisited, and a discussion of strict attainability and category attainability needs to be included
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17 to move forward the discussion on unfair advantages in sport. While Semenya’s case may have
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19 come to its legal conclusion, its legacy requires the close examination of the normative
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21 justification for existing categories in sport.
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25 Moving forward will require a careful balancing act between the two ends of creating
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27 categories based on strict attainability criteria and treating athletes as category representants,
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29 not as individuals. Setting the balance between these two ends, however, remains outside the
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31 scope of this paper. We recommend further philosophical research on categories in sport⁴³,
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33 which can then inform practical decision makers, such as World Athletics and the Court of
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35 Arbitration of Sport.
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47 43 On this note, and after completion of this paper, we would like to point out the recent work by Irena
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49 Martinkova (2020) who has argued against the justification of ‘protecting women in sport’ as a necessary
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51 condition for the binary classification. Athletes who are skilled enough to compete in the higher category should
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53 be allowed to ‘move up’,
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55 Martínková, I. (2020). Unisex sports: challenging the binary. *Journal of the Philosophy of Sport*, 1-18. And
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57 Martínková, I. (2020). Open Categories in Sport: One way to decrease discrimination. *Sport, Ethics and*
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59 *Philosophy*, 1-17.
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