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Sport, Ethics and Philosophy

ISSN: 1751-1321 (Print) 1751-133X (Online) Journal homepage: www.tandfonline.com/journals/rsep20

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To cite this article: Anna Semenova, Camilla J. Knight, Lone F. Thing & Mike McNamee (22 Sep 2025): Conceptualising 'vulnerability' across sport integrity contexts, Sport, Ethics and Philosophy, DOI: 10.1080/17511321.2025.2563570

To link to this article: https://doi.org/10.1080/17511321.2025.2563570

Published online: 22 Sep 2025.

SPORT, ETHICS AND PHILOSOPHY
https://doi.org/10.1080/17511321.2025.2563570

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Conceptualising 'vulnerability' across sport integrity contexts

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ABSTRACT

Vulnerability is a multifaceted concept used across disciplines, yet in the context of sport integrity, it remains underexplored and lacks a clear conceptualisation despite its growing usage and wider application. This paper critically examines how the concept of vulnerability is currently incorporated in different sport integrity contexts and research literature. It proposes a novel understanding of vulnerability informed by the fields of research ethics and bioethics, specifically in relation to established analyses and operationalisations of vulnerability. Drawing on the layered account of vulnerability, we conceptualise vulnerability as relational and dynamic, moving beyond fixed and stereotypical categorisations of vulnerability. Our understanding of vulnerability expands the understanding of this concept from its more common association with doping behaviours and populations and illustrates how the layered approach can be helpful in identifying and analysing vulnerability across different sport integrity contexts. In doing so, this paper demonstrates how a bioethics-informed approach can enhance the conceptual clarity and support a more consistent application of vulnerability within sport integrity field.

ARTICLE HISTORY
Received 6 May 2025
Accepted 16 September 2025

KEYWORDS
Layers of vulnerability; bioethics; doping; match-fixing; safe sport

The concept of 'vulnerability' has been applied in various disciplines, with each attributing different meanings to the term. In the social sciences, vulnerability is thought to be an attribute of marginalised groups, caused by poverty, inequality, or social exclusion (Mechanic and Tanner 2007). In psychology, vulnerability has been associated with 'uncertainty, risk, and emotional exposure' (Brown 2015, 55). In healthcare and bioethics, vulnerability has been used to refer to individuals or groups who are at a higher risk of poor health outcomes due to factors such as age, disability, or socio-economic status (Bracken-Roche et al. 2017). Finally, in philosophy, vulnerability applies to existential features and relations, such as care, dependency, and moral responsibilities towards those categorised as vulnerable (MacIntyre 1999; Mackenzie, Rogers, and Dodds 2013).

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Within the sport integrity[1] literature, more specifically, vulnerability has primarily been explored in relation to doping behaviour, often referring to factors that can predispose athletes to dope (Overbye, Knudsen, and Pfister 2013; Petróczi and Aidman 2008; Petróczi, Blank, and Thrower 2024; Whitaker, Backhouse, and Long 2017). The term is, however, beginning to gain traction in broader sport integrity contexts, such as safeguarding and competition manipulation (e.g. Gurgis, Kerr, and Darnell 2022; Stirling and Kerr 2014; Tak, Sam, and Jackson 2018; Vanwersch et al. 2022). Notwithstanding this, the analytical conceptualisation of vulnerability within sport integrity remains somewhat overlooked in the literature (Blank et al. 2016; Clancy et al. 2023; Erickson, Mckenna, and Backhouse 2015; Ntoumanis et al. 2014; Petróczi, Blank, and Thrower 2024; Whitaker, Backhouse, and Long 2017). The lack of a comprehensive account of vulnerability within the field of sport integrity is problematic for both policy and regulation. From a policy perspective, it challenges the accurate identification of those requiring targeted interventions. From a regulatory perspective, the lack of conceptual clarity hinders the development and implementation of precise measures, thus compromising the effectiveness of these measures or leading to misdirected measures that fail to address the specific needs of vulnerable individuals (Solomon 2013).

To address this conceptual lacuna, we draw on research ethics literature, situated within bioethics, to inform and enhance a novel understanding of the concept of vulnerability within sport integrity contexts. We first examine the existing research on vulnerability in sport integrity, particularly focusing on the conceptualisation of vulnerability to doping in times of crises (Petróczi, Blank, and Thrower 2024). We point out the limitations of the current understanding and advocate for a more comprehensive framework. To that end, we turn to the field of research ethics, where the concept has been extensively analysed. We provide a justification for this strategy through a demonstration of relevance, applicability, and benefits of translating related frameworks from research ethics into sport integrity. Specifically, we argue that the layered approach to vulnerability (Luna 2009, 2019) within the broader field of bioethics can be used to unpack the concept within the sport integrity field and offer an operationally effective understanding of vulnerability. We conclude with a discussion on the need for further research to strengthen the conceptual clarity.

Challenges and limitations in the current understanding of vulnerability in sport integrity

Despite the frequent use of the term in sport integrity literature, vulnerability remains underconceptualised and inconsistently interpreted, giving rise to a lack of theoretical clarity and coherence (Nolte and Schneider 2024). Among sport integrity domains, safeguarding literature stands out for engaging more directly with the concept of vulnerability than anti-doping and match-fixing, potentially because it is rooted in protective models from child protection and public health approaches. While safeguarding literature engages more directly with the concept of vulnerability, it is not without its challenges. Much of the safeguarding research, particularly on interpersonal violence, tends to focus on protecting children in sport, but recent research has pointed to the limitations of framing vulnerability strictly in age-based terms (Garrod and Rhind 2024). Vulnerability is a broad concept that can apply to

different individuals at all levels of sport and in diverse forms. Although certain populations may experience higher levels of interpersonal violence (e.g. children, disabled, and ethnic minority), this does not mean that others are exempt from violence (Tuakli-Wosornu et al. 2024). Adult athletes may be vulnerable due to continuing power imbalances, economic dependency, and organisational silence (Garrod and Rhind 2024). Furthermore, violence in sport can extend to online spaces like cyberbullying.

In contrast, anti-doping and match-fixing were initially developed around the detection and punishment of rule violators, rather than the protection of vulnerable athletes. However, a notable shift is occurring in both domains. In anti-doping, there is a push to move away from a reactive approach focused on detection and enforcement toward a proactive and systemic approach that prioritises prevention (McLean et al. 2023). There are similar shifts seen in match-fixing, rejecting the idea that match-fixing is solely an individual failure (Tak, Sam, and Jackson 2018).

Across sport integrity research, related terms such as 'likelihood of X' or 'risk of X' and 'susceptibility' are often used interchangeably or in closely related ways to 'vulnerability'. Misinterpretation of the mentioned terms could be problematic, as while similar, each term conveys a slightly different meaning. The phrase 'likelihood of' can simply refer to the probability of something occurring. For example, studies have examined the likelihood of doping among athletes in different countries and age groups (e.g. Hurst et al. 2019; Ring et al. 2022). Whereas the 'risk' formulation can refer to a potential for harm with serious negative consequences, as seen in the field of interpersonal violence (e.g. Parent and Vaillancourt-Morel 2021; Vertommen et al. 2025). 'Susceptibility' is another related term. For example, Blank et al. (2016) and Hurst et al. (2023) use the term 'susceptibility' in relation to doping, so do O'Shea et al. (2021) to investigate potential decision to fix a match.

The distinction between 'vulnerability' and 'susceptibility' is, however, less obvious, and it remains underexplored in sport integrity scholarship. Bioethics literature can provide a helpful foundation for clarifying this distinction. As Kottow (2003, 2004) argues, 'vulnerability' refers to the universal and intact human condition with the potential to be harmed, whereas 'susceptibility' describes a condition in which individuals have already been harmed and are more likely to experience further harm. Using these terms interchangeably leads inevitably to conceptual confusion as 'vulnerability' encompasses broader ethical and operational concerns.

Efforts to develop greater conceptual clarity around vulnerability first emerged in the sport integrity field in its anti-doping domain. Petróczi and Aidman (2008) first introduced the concept of vulnerability in relation to doping. They proposed a life-cycle model for performance enhancement with a particular focus on risk and protective factors. They frame vulnerability as an interplay of individual, systemic, and situational factors throughout an athlete's career. One of the key assumptions in their model is that doping (except for what is commonly referred to as 'unintentional doping') is a strategic, functional choice that is influenced by a kind of risk and benefit analysis and expectations of positive or negative outcomes of their choice. This perspective, however, exaggerates the agent's rationality in the decision-making process and does not sufficiently account for structural inequalities, coercion, and systemic pressures that may limit autonomy in decision-making (Ntoumanis et al. 2014). Furthermore, this conceptualisation does not convey

the idea that vulnerability can vary in how severe it is, which presents a significant limitation.

Petróczi, Blank, and Thrower (2024) recently broadened the scope of their analysis, arguing that vulnerability is not merely a risk factor for doping but also impacts an athlete's ability to control their actions in crisis situations. In their understanding, vulnerability 'can be viewed as the function of risks of harm, mitigated by system safeguarding and individual factors and self-care' (Petróczi, Blank, and Thrower 2024, 189). Their more recent research applies the Crisis Decision Theory (Sweeny 2008), a psychological model predicting how individuals respond to negative events, and, thus, specifically concentrates on negative events that athletes experience. Examples of such events include injuries, poor performance, and deselection from the team, which are all well-known potential tipping points for doping (Bloodworth and McNamee 2010; Mazanov, Huybers, and Connor 2011; Veltmaat et al. 2023; Whitaker et al. 2014).

There remain, however, limitations to Petróczi, Blank, and Thrower (2024) conceptualisation of vulnerability. First, the rationality bias has not been addressed. Their model assumes that athletes engage in a structured decision-making process when facing crises, which still overplays the role of choice and underplays the role of emotions and contextual features. An alternative approach could recognise that doping is not always a matter of step-by-step decision-making but often a reflection of structural disadvantage and external influences that shape athlete behaviour in ways that are not fully voluntary nor fully independent.

Secondly, the revised account, drawing on crisis moments, risks oversimplifying how vulnerability manifests itself. While significant changes may temporarily increase vulnerability, as will be explained later, there may also be long-lasting, embedded systemic influences that will also affect an athlete's (sense of) vulnerability. Due to its focus on crisis moments, the model may overlook how vulnerability accumulates over 'normal', stable time, for example, in cases where athletes are pressured from a very young age to prioritise performance at all costs. A robust framework should account for both critical crisis points in athlete career but also more persistent influences that may not be called 'crises' but still play a fundamental role in shaping vulnerability.

Thirdly, Petróczi, Blank, and Thrower (2024) themselves acknowledge that their theoretical framework lacks an element of 'subjectivity' (by which it seems they mean acknowledgement of the subject's [agent's] own diachronic perspective[s]); paying insufficient attention to their past experiences and anticipated futures. An alternative conceptualisation could help to address this limitation by offering a nuanced framework focused on the individual *in* context. For instance, an athlete who has been injured in the past but who managed to develop suitable coping mechanisms may be less affected by similar negative events that appear on their pathway as they become empowered to deal with these events.

This counter position aligns with literature exploring both resilience and post-traumatic growth within and beyond sport settings. It reflects the concept of psychological resilience, which refers to the 'role of mental processes and behavior in promoting personal assets and protecting an individual from the potential negative effects of stressors' (Fletcher and Sarkar 2013, 16). Resilience develops over time through interactions between a person and their environment (Sarkar and Fletcher 2014). Repeated exposure to challenges, especially along with successful adaptation, can strengthen the

ability to tolerate future stressors, hence, making individuals' vulnerability less severe in similar situations in their future. Similarly, research on post-traumatic growth demonstrates that trauma does not inevitably result in negative outcomes. Instead, it can foster personal strength, changes in life priorities, and enhanced relations with others Joseph and Linley (2005); Tedeschi and Calhoun (2004). These positive outcomes emerge through the processing of traumatic experiences, often leading individuals to find meaning in trauma and to develop new perspectives on life. These studies, therefore, highlight the value of giving greater consideration to athletes' subjective experiences for a more responsive understanding of vulnerability.

Bringing anti-doping and safeguarding together, Schneider et al. (2025) have made an important contribution to the field by drawing on feminist theories of vulnerability. Their work underscores the interdependence of integrity issues and calls for a more integrated conceptual account of vulnerability. Specifically, they argue that vulnerability to doping is often a safeguarding issue, created by structural and systemic pressures. They advocate for a shift from a punitive model in anti-doping to one that prioritises prevention, education, and support for all athletes.

Similarly to anti-doping, earlier match-fixing literature approached the topic through an individualistic lens (Tak, Sam, and Jackson 2018). More recent research has begun to challenge this view. For example, O'Shea et al. (2021) explore how susceptibility to match-fixing is shaped by athletes' perceptions of power and blame. Their findings suggest that vulnerability arises from relational dynamics with coaches, agents, and criminal intermediaries rather than individual moral failure. Likewise, Tak (2018) highlights how institutional conditions, such as the weak regulation of sport betting and the limited autonomy of athletes, can create conditions in which match-fixing becomes both a structural possibility and a form of ethical compromise. Despite these developments in match-fixing research, the literature lacks a conceptual framework of vulnerability.

In summary, the discussed studies are not exhaustive but representative of the challenges in conceptualising vulnerability. They reflect a growing recognition of the importance of vulnerability in sport integrity, yet they also reveal the lack of a common conceptual language for identifying, analysing, and addressing vulnerability. A shared conceptualisation would be helpful in facilitating the dissemination of valuable insights across different integrity domains. This paper seeks to advance a more consistent understanding of vulnerability, showing how it can be extended and applied across the broad range of sport integrity contexts.

Why do we need a concept of vulnerability in sport integrity?

As noted above, previous research within the sport integrity field primarily explores vulnerability in relation to doping behaviour (e.g. Overbye, Knudsen, and Pfister 2013; Petróczi and Aidman 2008; Petróczi, Blank, and Thrower 2024; Whitaker, Backhouse, and Long 2017). Existing research has extensively examined risk factors that make athletes vulnerable to doping and factors that protect them from it (Blank et al. 2016; Clancy et al. 2023; Erickson, Mckenna, and Backhouse 2015; Ntoumanis et al. 2014; Whitaker et al. 2014). However, we propose that vulnerability should not be understood simply as a series of risk factors predicting negative events. If true, this would make doping decisions a straightforward task,

since all doping decisions could be accurately predicted based on identified risk factors. A corollary of this would be that anti-doping testing could more efficiently be targeted based on such a prediction.

Based on official, though contestable data, only a minority of athletes engage in unethical behaviours such as doping. Alternative research, however, suggests that the prevalence of doping in elite sport is significantly higher than officially reported. For instance, the study by Pitsch and Emrich (2012), which uses Randomized Response Technique, provides estimates ranging from 10.2% to 34.9%, substantially exceeding the number of officially detected cases. If these estimates are accurate, they suggest that doping may be less of a matter of isolated individual cases but more a reflection of contextual influences and systemic conditions.

Furthermore, sports such as skateboarding, gymnastics, diving, and figure skating are known for their profile of young athletes competing at an elite level. Traditionally, therefore, these athletes could be classified as a 'vulnerable group' because of their age and relative (im)maturity in relation to their exposure to high-performance and elite sport. The claim that these athletes are vulnerable carries the implication that they require support, protection, or both. In anti-doping, for instance, WADA's concept of the Protected Person aims to protect minors subject to anti-doping regulations by applying lighter sanctions due to age and legal capacity reasons. However, the effectiveness of this concept in protection of minors has sparked criticism in the literature (Campos, Parry, and Martinkova 2022), while raising a bigger issue of how the entire sport system influences our appreciation of a minor's vulnerability. For instance, coaching practices, sport governance policies, and competitive pressures all contribute to vulnerability in ways that age-based protections alone may not sufficiently address.

To examine vulnerability factors, motivations, sources of knowledge, and beliefs about these factors, WADA commissioned a research project on athlete vulnerability (St-Martin and Pavot 2022). Vulnerability factors pre-identified from the literature were rated by athletes and athlete support personnel from most to least important. As a result, nutritional supplements were chosen by athlete support personnel as the most important contributory factor to an athlete's vulnerability (i.e. likelihood) to an anti-doping rule violation. Yet, this conclusion seems to indicate the risk of inadvertent doping rather than vulnerability *per se*. In our understanding, vulnerability should also account for both structural and individual variables within a given context. These may include socio-economic status that influences reliance on potentially contaminated products, national regulatory oversight, and access to anti-doping education. Recognising the distinction between risk exposure and vulnerability is crucial, as it once again highlights the need for a refined conceptualisation of vulnerability in sport integrity.

For stakeholders in sport policy, a nuanced and multifaceted understanding of vulnerability is crucial for developing effective, targeted, and timely measures that address the needs of vulnerable athletes, and for potentially creating an evaluation framework for these measures. The conceptualisations in the sport literature to date have inherent limitations. There is, therefore, a risk in adopting any of these one-size-fits-all approaches that overlook the diverse ways in which vulnerability is manifested in sport in general and in sport integrity discourses in particular.

Why translation from bioethics to sport integrity is reasonable and valuable?

To inform and enhance a novel understanding of the concept of vulnerability in sport integrity, we propose to draw on the more established literatures from bioethics and one of its subdomains: research ethics. The following section outlines the rationale for this interdisciplinary translation, demonstrating its relevance and value.

The concept of vulnerability in bioethics and research ethics remains a topic of ongoing debate among scholars due to disagreements on the nature of vulnerability ('universal', 'special', 'layered', or other), its application ('vulnerable populations/groups' or 'vulnerable individuals'), and the putative presence of moral implications that vulnerability possesses (Rogers, Mackenzie, and Dodds 2012). The lack of consensus underscores the complexity and contentiousness of the concept. Despite these debates, vulnerability is widely recognised as a fundamental concept crucial for addressing ethical concerns (Bracken-Roche et al. 2017).

Although the broader debates around vulnerability are considered in bioethics, it is within research ethics that the concept has received its most systematic attention. Research ethics, particularly in the context of clinical research involving humans, has produced detailed guidance on vulnerable participants (Bracken-Roche et al. 2017; Rogers 2021). As highlighted by Bracken-Roche et al. (2017), policy documents and ethics guidelines have long struggled to agree and utilise a clear and consistent definition of vulnerability. Their analysis, along with that of Bheekhun and Camporesi (2025), emphasises that ethical protections must go beyond fixed group-based classifications. The 2016 revision of the Council for International Organizations of Medical Sciences Guidelines (CIOMS 2016) reflects this shift as well, moving towards a focus on the characteristics of individuals, such as limited capacity, social marginalisation, or reduced autonomy, that make participants vulnerable in particular contexts. These shifts in research ethics discourse offer a strong foundation, which we believe can be meaningfully adapted to explore vulnerability in sport integrity contexts.

The application of perspectives from bioethics and research ethics to sport integrity is both reasonable and valuable because they provide a well-established framework for examining ethical concerns related to exploitation, autonomy, and justice (Camporesi and McNamee 2018; Rogers, Mackenzie, and Dodds 2012). Bioethics research, dominated by Western perspectives, often emphasises the intersection of individual rights and institutional responsibilities, which makes it particularly relevant for sport integrity, where ethical challenges and dilemmas can emerge from governance structures, regulatory frameworks, and power imbalances between actors within the sport ecosystem. This parallel suggests that despite disciplinary differences, bioethics and sport integrity discourses and policies share certain structural similarities. For example, both bioethics and sport have participants (whether research subjects or athletes) who may experience power differentials, which raises comparable concerns about consent, autonomy, and protection from exploitation (Camporesi and McNamee 2014).

Recognising such overlaps reinforces the value of drawing upon bioethical frameworks to advance the conceptualisation of vulnerability in sport integrity and suggests that ethical considerations of vulnerability in bioethics can be meaningfully adapted to

address sport integrity issues. Given that research ethics has been instrumental in addressing the needs of vulnerable individuals, its application to sport integrity can help to prevent harmful practices and support athlete welfare. To further develop this discussion, we examine related concepts, particularly the 'universal' and 'special' accounts of vulnerability, followed by an exploration of the 'layered' account of vulnerability.

Universal and special accounts of vulnerability and their criticisms

Two primary conceptions of vulnerability are widely recognised: (i) as an ontological condition of all human agents (e.g. Fineman 2008; MacIntyre 1999; Nussbaum 2007); and (ii) as a conditional vulnerability of particular agents or groups to particular types of harm or threats (e.g. Goodin 1985). The former, known as the 'universal' conception of vulnerability, asserts that all humans share a fundamental vulnerability due to their biological and social nature (Rogers, Mackenzie, and Dodds 2012). The latter, termed 'special' vulnerability, focuses on distinct groups with more than usual risk profiles (Mackenzie, Rogers, and Dodds 2013). Both conceptions, however, have been subject to criticism from scholars questioning their scope and practical applicability (e.g. Hurst 2008; Levine et al. 2004; Luna 2009; Nickel 2006; Rogers 2013).

The universal account views vulnerability as a condition shared by all persons due to the nature of human embodiment, which is intrinsic to humankind and from which one cannot wholly be avoided or protected against (Mackenzie, Rogers, and Dodds 2013; McKenny 1997). For example, global health crises like pandemics can illustrate universal vulnerability, as they expose all individuals to potential harm (Fineman 2008). Thus, in criticism of the universal account, it is important to note that while pandemics affect people across all socio-economic and cultural backgrounds, the extent and nature of this impact are unevenly distributed, where marginalised populations often experience heightened vulnerability. Moreover, the universal account has attracted substantial criticism from scholars concerned with its excessively broad definition, which limits its practical applicability (Hurst 2008; Levine et al. 2004; Luna 2009; Schroeder and Gefenas 2009). Failing to differentiate between varying degrees of vulnerability and diverse sources of vulnerability, this account does not assist in practical application as it does not enable the formulation of targeted policies and interventions for those who might benefit from them (Mackenzie, Rogers, and Dodds 2013).

In turn, the special vulnerability account seeks to identify particular groups or individuals who possess specific 'indicators of vulnerability' such as diminished autonomy, social disadvantage, economic dependence, limited access to healthcare, or exposure to systemic discrimination (Rogers et al. 2021). For instance, children are often classified as vulnerable due to their legal and developmental incapacity to provide informed consent. Although this classification can be ethically justified, particularly for younger children, it can also lead to overly cautious approaches that exclude children from research (Farsides 2016; Wright 2015). Treating all children as equally vulnerable risks ignoring the diverse capacities of children to agree to participate or take an active role in decision-making regarding their participation.

In research contexts, a common way of classifying vulnerable participants in accordance with the special account is through the so-called 'labelling approach', in which vulnerability is ascribed based on membership in a certain population or group

attributed with an indicator of vulnerability (Luna 2009). While useful in establishing thresholds for specific populations to meet certain necessary and sufficient conditions to be classified as vulnerable (Luna 2019), this approach has been criticised for reinforcing biases and failing to fully account for the lived experiences of those being labelled (Mackenzie, Rogers, and Dodds 2013). This can result in overly simplistic solutions, for example, the above-mentioned exclusion of children from biomedical research altogether, even though some individuals within this group are autonomous and capable of informed decision-making about their participation. Generalising vulnerability in this way can result not only in (unjustifiably) paternalistic responses but also weaken the effectiveness of protections for those who genuinely need them but do not belong to a group classified as vulnerable (Bracken-Roche et al. 2017; Mackenzie, Rogers, and Dodds 2013; Rogers 2013). Thus, the protections can lose their relevance. It should be noted that this excessive generalisation may apply to both universal and specific vulnerability, though more readily to the former than the latter.

To illustrate how the labelling approach may fail to consider the broader environment and individual characteristics beyond group membership (Bracken-Roche et al. 2017; Luna 2009), we provide another example. While all children are typically classified as vulnerable, those from marginalised communities or impoverished backgrounds could be classified as a *more* vulnerable population. Nevertheless, factors beyond their group membership can influence their vulnerability as well, for instance, the level of education, family and peer support, access to extracurricular activities, and others. This example is somewhat similar to the above-mentioned vulnerability of minors in sport, although application to sporting contexts adds different dimensions.

Moreover, the labelling approach has been criticised for focusing on characteristics of the populations that *may* indicate vulnerability but overlooking other potential risks such as exploitative research practices that can contribute to the risks of harm for participants (Levine et al. 2004; Nickel 2006). For instance, research settings where participants are drawn from regions with limited access to healthcare may fail to address the potential coercion or undue influence by researchers seeking to recruit participant, which can result in a risk of participants giving consent due to perceived health benefits from research, known as therapeutic misconception, rather than properly informed interest in participation (Melo-Martín and Ho 2008).

Furthermore, the labelling approach may be said to be excessively rigid. It treats vulnerability as a 'permanent and categorical condition, a label that is affixed to someone given certain characteristics that will persist throughout the person's existence' (Luna and Vanderpoel 2013, 326). It does not account for how the vulnerability of an individual or a group may evolve over time or in response to changing circumstances. Extending our earlier example: children can change school environments, start new extracurricular activities, and acquire new friends, all of which could add to or detract from their vulnerability.

Given the limitations of both the universal and special accounts of vulnerability and relevant to the present research purposes, conceptualising vulnerability within the context of sport integrity requires a comprehensive approach that ensures protection for those who need it while avoiding unnecessary burdens for athletes who do not. Achieving this balance demands a nuanced assessment that considers the intersection of various

dimensions of vulnerability. A layered account of vulnerability may offer a valuable perspective, which will be explored in the following section.

A layered account of vulnerability

To address the drawbacks of the labelling approach, Luna (2009) proposed the metaphor of 'layers' as a way of thinking about vulnerability in bioethics. Layers of vulnerability emerge from the interactions between individuals' characteristics and their environment, which interact to form a deeply contextualised vulnerability (Luna and Vanderpoel 2013).

Luna's (2009) early work focused on the concept of the layered account, while her later work addressed practical applications, rejecting taxonomies of sources of vulnerability in favour of a more relational and dynamic understanding (Luna 2015). Furthermore, in yet later work, Luna (2019) further refined her understanding of the concept by clarifying that her approach incorporates other definitions of vulnerability rather than contradicting them. The 2019 article also introduced new concepts, such as 'cascade layers of vulnerability' and the 'latent' or 'occurrent' nature of the layers that will be explained below. Luna (2019) addressed previous criticisms of the vulnerability concept (Levine et al. 2004) by demonstrating how her approach overcomes issues like stereotyping and permissive applications.

The layered approach incorporates a relational and dynamic conceptualisation of vulnerability (Luna 2009). In other words, it is context-dependent and processual, meaning that it reflects ongoing interactions rather than fixed characteristics, which is not the case if vulnerability is seen as a label for categories (Luna 2009, 2019; Luna and Vanderpoel 2013; Victor et al. 2022). It further suggests that there might be multiple and overlapping layers of vulnerability that can be acquired or removed separately (Luna 2009, 2019).

The methodological approach has similarities to the application of the concept of intersectionality (Crenshaw 1989), which has already been fruitfully applied in sport psychology and sociology, to avoid reductionist explanations based on single concepts such as dis/ability, ethnicity, gender, or race (Pape, Schoch, and Carter-Francique 2023). Intersectionality highlights how multiple identity characteristics interact to shape an individual's experiences of discrimination or marginalisation within sport (Blodgett et al. 2017).

When vulnerability is seen as layered, vulnerability arises from the interplay of multiple layers, and it cannot be explained by any single characteristic alone (Luna and Vanderpoel 2013). At the same time, layers of vulnerability may be present but remain latent, only becoming occurrent when specific conditions trigger their 'activation' (Luna 2019). The difference between crisis moments in Petróczi, Blank, and Thrower (2024) work and stimulus conditions in Luna's account, in our understanding, lies in their relationship to events. While Petróczi, Blank, and Thrower (2024) understand crisis moments as negative events that require a response as per the Crisis Decision Theory (Sweeny 2008), Luna's (2019) stimulus conditions activate pre-existing layers of vulnerability, which do not always correspond to recognisable events.

Luna's conceptualisation, thus, invites consideration of how individuals are rendered vulnerable through the accumulation of layers of vulnerability, the triggering conditions that activate these layers, and the cascading effects of some layers, which means that,

once triggered, they generate multiple layers of vulnerability at the same time or aggravate existing ones (Luna 2019; Victor et al. 2022). The complexity of this approach can be seen as its disadvantage because, from a practical view, the layered approach presents a more demanding task for researchers and policymakers. Specifically, it requires thorough identification and continuous assessment of multiple intersecting and evolving layers of vulnerability, rather than applying a single static criterion or category. Nevertheless, the complexity of a layered account offers enduring advantages. Particularly, it allows for the development of tailored safeguarding and empowerment strategies to address the distinct layers of vulnerability over time (Bracken-Roche et al. 2017; Luna 2014, 2019; Luna and Vanderpoel 2013; Victor et al. 2022). In summary, Luna (2009, 2019) layered approach to vulnerability acknowledges the diversity of experiences among individuals within the same population and explicitly avoids defining individuals as vulnerable due to group membership or a singular vulnerability indicator. Instead, this framework enables an analysis of how vulnerabilities emerge, interact, and shift in response to changing conditions.

A relevant illustration of the layered account's operational value can be found in public health ethics, through a consideration of vulnerability during the COVID-19 pandemic. Angeli, Camporesi, and Dal Fabbro (2021) apply Luna's model to the context of the COVID-19 pandemic and identify three main axes of vulnerability: biological (e.g. likelihood of severe illness because of getting COVID-19), socio-economic (e.g. exposure to the financial impact of lockdowns), and psychological (e.g. mental health effects of isolation). While their terminology refers to 'axes' rather than 'layers', their analytical function seems to be equivalent. Their model also incorporates transversal axes, such as age, gender, and race, which cut across their three axes. This application demonstrates how Luna's account can be translated beyond bioethics into fields characterised by complex, shifting contexts. This is particularly relevant as we will now explore how the layered approach can be meaningfully applied to the sport integrity field, while ensuring that vulnerability is examined in a way that is conceptually rigorous and can be made operationally effective.

Application of the layered account to sport integrity contexts

To illustrate the applicability of the layered approach, we analyse a few hypothetical cases from different sporting contexts that can provide clarity on potential physical, psychological, and economic layers of vulnerability. We apply Luna (2009, 2019) approach based on the core papers and drawing on its application in identifying the layers of vulnerability in the case of older persons (Luna 2014).

Combat sports such as boxing and martial arts are often perceived, particularly within Western urban contexts, as being predominantly practiced by individuals from low socio-economic backgrounds, who may view these sports as pathways to social mobility or financial reward. Wacquant's (1992) ethnographic study on a Chicago boxing gym shows that these spaces can operate as stabilising institutions within communities affected by poverty, structural neglect, and limited social opportunities. They may offer discipline, structure, and a sense of belonging to those navigating difficult life circumstances. On the other hand, these environments often cultivate a specific gym culture, where athletes may

come to accept expectations to tolerate hardship and perceive risk to their own health as necessary to achieve athletic success.

Under the special account of vulnerability, such athletes would be classified as vulnerable based on their economically disadvantaged background. However, the layered account challenges this static categorisation. It recognises that economic conditions may form one layer of vulnerability, but also that this layer interacts with other individual and context-specific factors. For instance, the physical demands of weight categorisation, often managed through short-term weight-loss practices, may introduce additional risks for athletes' health. The practices can become normalised within gym cultures as a necessity for success, therefore heightening both physical and psychological vulnerability.

In accordance with the layered model, these layers are not uniformly present. For example, where training environments lack formal safeguarding procedures or medical oversight, the structural conditions of the sport can make layers more occurrent. In turn, access to stable financial income or sponsorship, regulated coaching, and athlete support programmes may reduce financial pressure and mitigate some of the layers, such as economic, physical, or psychological. The layered account thus provides a dynamic and responsive framework for analysing vulnerability in combat sports, without relying on fixed labels.

A similar pattern can be observed in globally popular professional sport where financial instability can affect vulnerability. The FIFPRO Working Conditions in Professional Football report indicates that 40% of players have experienced late payments during their careers (FIFPRO Men's Global Employment Report 2016). For an athlete struggling with late payments, the lack of financial security introduces an economic layer of vulnerability that may limit access to high-quality recovery treatments and, subsequently, increase physical vulnerability. In the absence of protective mechanisms or a strong ethical stance, an athlete may resort to prohibited substances in order to accelerate recovery (Overbye, Knudsen, and Pfister 2013) or engage in match-fixing as a means of securing additional income. Financial strain may also generate psychological vulnerability due to the stress of financial insecurity that can create pressure to seek alternative, and sometimes, unethical 'solutions'. However, as circumstances change, for instance, through completing an educational qualification that secures career prospects beyond sport, certain layers of vulnerability (e.g. psychological stress resulting from financial instability) may be mitigated or even removed (Voorheis et al. 2023). This example illustrates the dynamic and context-specific nature of vulnerability that recognises the changes to vulnerability in relation to the ongoing (personal) life processes. The layered account, therefore, provides a more adaptable framework for understanding how vulnerability emerges rather than treating it as a fixed label (Luna 2019). In addition, this case also illustrates how institutional failures, such as the lack of mechanisms to enforce contractual agreements or to support career transitions, can affect vulnerability in an individual's context.

We can also consider elite female gymnastics as a context where a layered account reveals multiple areas that can be impacted to the detriment of athletes. Typical of the sport, our hypothetical gymnast faces physical vulnerability due to the high risk of injury. When she sustains a serious injury, her physical vulnerability, initially latent, becomes occurrent and may have a cascading effect. The injury might lead to social vulnerability if she becomes isolated from her teammates during the recovery period, with whom she

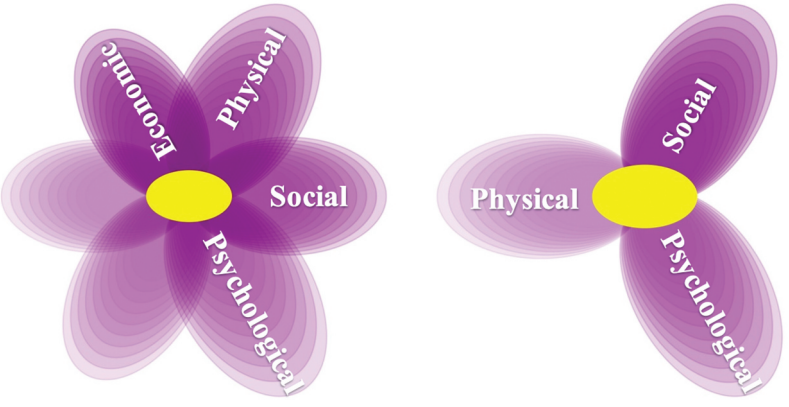

Figure 1. Schematic representation of the layered approach to vulnerability.

would normally spend most of her time. In aesthetic sports, such as gymnastics, performance is closely related to athletes' appearance and weight. This creates the risk of disordered eating or body image distress that may further exacerbate the psychological layer of vulnerability. These experiences are not evenly distributed across all injured athletes and can be more pronounced in environments where medical decisions are measured by performance goals, and not in priority of long-term health of athletes. Furthermore, Thing (2006) argues in a study of ACL-injured female handball players that, for athletes in such a sport, motion skills are central not only to performance but also to social integration and identity. An injury and its change to the body perception can lead to a 'spoiled identity', where the athlete may perceive herself and may be perceived as a failed member of the sporting society. The accumulation of social and psychological layers in the above examples illustrates how vulnerability can cascade and transform a short-term physical limitation into a complex ethical concern.

The above examples illustrate the value of the layered account in analysing vulnerability within different sport integrity contexts. Unlike static models that categorise individuals into predefined vulnerable groups, we showcase how this approach accounts for the evolving nature of vulnerability, the role of context in heightening vulnerability, and the cascading effect of some layers of vulnerability (Luna 2019; Victor et al. 2022).

Finally, we illustrate how the layered approach can assist in analysing individuals' vulnerability in Figure 1. The visual representation takes the shape of a flower, where each petal symbolises a distinct layer of vulnerability. Some petals appear more transparent while others are more vividly coloured, indicating the layers that are currently more severe. The central part of the flower, where all petals intersect, represents an individual's vulnerability. Two flowers in this figure represent the same individual, but under different circumstances and/or in different periods. The greater the number of intersecting petals, the smaller the central space becomes, but the more heightened the vulnerability. In contrast, fewer layers result in a larger central space but lower vulnerability. This flower metaphor also captures the processual nature of vulnerability. Just as petals may bloom, fade, or change in shape, layers of vulnerability can change in response to shifts in an individual's situation.

Conclusion and future steps

Through integration of philosophical perspectives from bioethics, specifically the layered account of vulnerability (Luna 2009, 2019), we propose a novel conceptualisation of vulnerability in sport integrity. Moving beyond static population-based definitions of vulnerability, the layered approach sees vulnerability as dynamic, relational, and always shaped by multiple intersecting layers that evolve over time. Consequently, it provides a more adaptable framework for understanding vulnerability across sport integrity contexts. Our analysis has demonstrated how the layered account of vulnerability offers a nuanced alternative to existing models that frame vulnerability in relation to specific integrity threats like doping, but we have also demonstrated how the layered approach could be applied across diverse sport integrity issues beyond it.

To gain a deeper understanding of vulnerability in sport integrity, future research should identify the specific behaviours underpinning the sport integrity threats to which athletes might be vulnerable. Building on existing research, future studies should also explore ways in which various influences interact to form deeply contextual layers of vulnerability. Additionally, further research into protective influences (or even deterrents) that can prevent athletes from engagement in unethical behaviours would be valuable. These empirical research efforts could contribute to a precise articulation of the layers of vulnerability and support the design of effective safeguarding strategies to protect athletes from engaging in behaviours that threaten both their personal integrity and the integrity of sport generally.

While this paper has focused on athletes, it is not exclusive to them. The concept of vulnerability could extend to many other actors within the sport ecosystem (e.g. coaches, referees, and athlete support personnel), who may also experience vulnerability due to power imbalances, institutional pressures, or financial struggles. Future empirical research could profitably explore how the layered account applies in their contexts.

In conclusion, this paper aimed to refine the conceptual understanding of vulnerability across sport integrity contexts by offering an application of the layered account of vulnerability to the sport integrity field (Luna 2009, 2019). It allowed us to refine the existing conceptualisation of vulnerability in sport integrity and extend it across different sport integrity contexts. Future research should support further refinement of the offered conceptualisation to ensure its conceptual rigour and practical value for sport actors, including but not limited to athletes, sport governing bodies, and independent integrity units.

Note

1. As a relatively recent term of art, a broad conception of 'sport integrity' is assumed throughout, as opposed to a narrow conceptualisation by some parts of the sport world where it refers to little more than 'match-fixing' (McNamee 2013; McNamee and Moriconi 2024).

Acknowledgments

We are thankful to the anonymous reviewers for their thoughtful comments and valuable feedback, which contributed to the improvement of the previous version of this article.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Funding

The author(s) declare that financial support was received for the research, authorship, and/or publication of this article. This project DAiSI has received funding from the European Union's Horizon Europe by the granting Authority REA (the European Research Executive Agency) under Grant Agreement No. 101120342; from the Swiss State Secretariat for Education, Research and Innovation (SERI) and from the Engineering and Physical Sciences Research Council (grant number: EP/Y031687/1). Funded by the UK Research and Innovation.

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