



Research Paper

Performance-enhancement in esports – Players' perspectives on prevalence, legitimacy, governance and regulations

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ABSTRACT

The continuing success of esports as a mass phenomenon is accompanied by an increase in challenges regarding governance and regulation as well as integrity. Besides match-fixing and software/hardware cheating, the consumption of performance-enhancing substances by esports players continues to cause negative publicity for the industry. While the number of scholarly contributions on this topic increases, there still is a clear lack of empirical studies that take the perspectives of players into account. In an online survey, we reached 226 esports (Defense of the Ancients 2, DotA 2) players, inquiring about the (perceived) prevalence and legitimacy of alleged performance-enhancing substances as well as aspects relating to governance, integrity, and regulation. Our results disclose a widespread self-reported use of caffeinated drinks and nicotine, with a notable proportion of participants reporting occasional or rare use of prescription drugs. Besides substance use, participants identified match-fixing and cheating as significant challenges to the integrity of esports. The results further indicate a lack of awareness of global governing/regulatory bodies by esports players and underscore the need for enforced regulation and concerted governance initiatives.

1. Introduction

In parallel with the onward march of digitalisation and technological advancement, the esports industry has rapidly evolved into a global powerhouse over the past decade. According to projections, the global esports market's revenue is set to rise to a staggering 4.3 billion US dollars in 2023, underlining its status as a huge economic force (Statista, 2023). However, this meteoric rise has not come without its fair share of challenges, prompting critical discussions about governance, regulations, and integrity concerns within the esports ecosystem (e.g. Peng, Dickson, Scelles, Grix & Brannagan, 2020; Kelly, Derrington & Star, 2022).

One of these challenges is the use of performance-enhancing drugs, which presents both integrity issues and also raises concerns about player health (Gupta, Sharma & Gupta, 2022). As esports competitions often last for several hours without considerable recovery periods, the debate about doping in esports centres on cognitive enhancement (CE) to stimulate sustained focus and vigilance as well as improve reaction

times (Holden, Kaburakis & Wall Tweedie, 2019). CE in esports refers to the use of various methods and techniques to improve the cognitive abilities of esports players. This includes the consumption of medications, supplements, and other interventions that have been shown to improve cognitive performance in various ways.

Wall Tweedie, Rosenthal & Holden (2022) provide a very insightful summary of the use of performance-enhancing substances in esports as well as the challenges involved in regulating it. The authors identified the significant amount of money on the line via tournament prize pools as well as the comparably short careers of professional esports players as two decisive factors for the use of taking performance-enhancing drugs. Further, the authors also remark that unclear governance structures represent an obstacle for a uniform approach to prevent, detect and sanction the use of drugs in esports. While the scholarly discourse develops, there still is a lack of empirical studies that take the perspectives of esports players into account. This is a serious shortcoming in the academic discourse, given that players likely are the stakeholders who are most affected by any regulations, what should give their interest a

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greater weightage (Bafna, 2020). Incorporating the perspectives of athletes in anti-doping policy is also missing in mainstream sport, as outlined by Henning & Dimeo (2022). In their book on the history of doping in sports, the authors recommend greater athlete involvement in the shaping of anti-doping policy. This recommendation can also be applied to esports, especially as the perceived legitimacy of the use of certain substances among athletes will play an important role in the development of anti-doping guidelines tailor-made to the esports context.

Against this background, in the study at hand we empirically investigate perspectives of “Defense of the Ancients 2” (DotA 2) players towards the use of CE substances in competition contexts. DotA 2 is one of the world’s most popular esports titles and to date has the highest prize money ever paid out in esports (Esports Earnings, n.d.). Based on an online survey among the DotA 2 community, the concrete objective of the study is to assess the following dimensions related to the use of alleged performance-enhancing substances in DotA 2 competition contexts: (1) the perceived usage-rate as well as the self-consumption of certain substances; (2) the legitimacy of and motivation behind the self-reported use of certain substances; (3) the need for and the extent of governance changes as well as stricter regulation of substance use. The study thus enlarges the still underdeveloped body of quantitative empirical studies exploring the perspectives on these topics by esports players.

2. Literature review

As the number of players and spectators in esports continues to rise, this topic is also becoming increasingly interesting for academia. Due to the diversity of esports as a mass phenomenon, a large number of scientific disciplines in the natural sciences as well as in the social sciences and humanities have discovered esports as a research topic. The popularity of esports for research is reflected in the increasing number of review articles, among which health-related perspectives clearly dominate (Palanichamy, Sharma, Sahu & Kanchana, 2020; Kelly & Leung, 2021; Pereira, Costa, Verhagen, Figueiredo & Brito, 2022; Seffah et al., 2023). Due to the diversity of esports, an increasing number of contributions addresses conceptual clarifications of esports and related concepts (Tang et al., 2023; Parry & Giesbrecht, 2023).

As outlined by different commentators (e.g. Holden, Rodenberg & Kaburakis, 2017), the esports sector is confronted with a set of challenges that relate to integrity and governance, such as doping and match-fixing. Current scholarship in this context suggests that the problems here are multi-layered and complex (Peng et al., 2020). This is not least due to the fact that esports is an umbrella term for a large number of very different gaming genres and titles, which, due to their characteristics, also harbour different risks for corruption and fraud, for example. Regulating this sector is therefore a challenging undertaking, as demonstrated by Holden, Edelman & Baker (2020) and others for the US context. As outlined by several commentators (e.g. Hamstead, 2020; Rosenthal, 2021), the widespread use of prescription drugs (e.g. Adderall) seems to be an issue particularly relevant to esports contexts. Rosenthal (2021) argue that anti-doping policies in esports will need to particularly address the topic of Therapeutic Use Exemption (TUE)¹ in competition contexts, not least to ensure a level playing field between disabled and able-bodied players. Several studies have addressed the increasing yet still challenging efforts of organizations to adopt a more standardized approach in anti-doping (e.g. Fashina, 2021; Shinohara,

2021; Rana & Parsai, 2023). However, despite the growing number of contributions, we still seem to be scratching the surface in terms of the variety of integrity issues in esports. What is still clearly lacking is valid and reliable numbers showing the prevalence of issues such as match-fixing or the consumption of performance-enhancing substances in different esports contexts.

Schubert, Eing & Könecke (2022) provide a comprehensive overview of the scholarly discourse in this field and state that CE (via agents such as methylphenidate or dextroamphetamines) seem to pose the largest issue to be addressed by anti-doping policy in esports. The fact that the suitability and therefore intake of both prescription and over-the-counter stimulants in esports contexts is of concern has already been pointed out by Holden, Kaburakis & Rodenberg (2018). Empirical research on CE has predominantly been done outside the esports context. A survey among poker players revealed that one in four players admitted to the consumption of prescription drugs (Caballero, Ownby, Rey & Clauson, 2016). In chess players, only 3.5% admitted a lifetime prevalence use of illicit/ prescription drugs (Franke et al., 2017a). The efficacy of prescription drugs containing agents such as methylphenidate or modafinil was tested in chess players, demonstrating improved performance; however, the effects were dependent on the presence or absence of time pressure in the games (Franke et al., 2017b). The question therefore arises as to whether the effects observed in chess, for example, can be extrapolated to tasks under time pressure in esports.

To underline the common and widespread use of CE in esports, in most academic studies reference is typically made to public confessions of professional esports players about their use of substances. While it is acknowledged that such anecdotal evidence may indicate the extent of the problem, more empirical research is clearly needed to provide evidence-based results on the prevalence. A survey among 526 adult video gamers revealed interesting insights, with over 40% of respondents acknowledging the consumption of performance-enhancing substances during gameplay (Ip et al., 2021). Among the reported substances, caffeine and energy drinks emerged as the most prevalent, while a noteworthy 6.1% admitted to prescription drugs for performance enhancement. Schubert et al. (2022) were among the first to collect empirical data from professional (FIFA) esports players on their perceptions of doping and performance-enhancing substances. One core finding is an ambivalent perception towards the legitimacy of different forms of performance enhancement, with the use of prescribed drugs being considered an illegitimate form of performance enhancement, whereas the consumption of caffeine-based energy drinks is being assessed as legitimate. Another interesting result is the lack of anti-doping measures on the part of organizations involved as perceived by esports players. Due to the specific context design of this study (interviews with professional FIFA players in Germany), the authors acknowledge limitations regarding the generalizability of their findings and encourage scholars to investigate other contexts. Richardson, Berger & Smith (2023) surveyed 1.467 e-cyclists on their perception of cheating and doping behaviours in online e-cycling and thus added one other empirical approach to literature.

Following calls to explore views on the use of performance-enhancing substances in other gaming titles, the context of the study at hand is DotA 2, which is one of the most successful esports titles globally. To date, there is no empirical data available that assesses the perceptions of DotA 2 players on the use of performance-enhancing substances. We attempt to address this research gap by exploring DotA 2 players’ views on the prevalence and legitimacy of as well as motivation behind the consumption of certain substances. Further, we assess the need for and the extent of governance changes as well as stricter regulation of substance use in the context of DotA 2 competitions. The study therefore contributes to the debate yet another perspective from players/consumers, who are among the most important stakeholders in the industry.

¹ TUE refers to a concept applied by the World-Anti Doping Agency (WADA): it states that athletes that have an illness or medical condition that require a particular medication, they may apply for a TUE if this medication contains a substance or requires an administration method that is on the List of Prohibited Substances and Methods. The objective is to ensure the athlete can compete in a proper state of health, while not having a competitive advantage.

3. Study context and theoretical underpinning

Compared to single-day (e.g. Super Bowl) or weekly sports events (e.g. Tour de France), Dota 2's main competition, the yearly five-day event "The International", Dota 2 has the 4th highest prize pool in sports history (Rana & Parsai, 2023). Similar to reported cases in other gaming titles (e.g. CS:GO), in 2020, one of the most successful professional Dota 2 teams in history worldwide was accused of using Adderall (Krishnaswamy, 2020). Controversially, Dota 2 publisher Valve pulled out its support of one of the most prestigious Dota 2 competitions in 2020, after Philippine legislation classified professional esports players as professional sports players, requiring them to take drug tests before they can compete in the country; Valve justified this decision based on what they felt to be unreasonable infringements on the privacy of the players, yet it was certainly not considered an endorsement of fighting drug use in esports (Stubbs, 2018). While the publisher has mechanisms in place to curb software cheating and has also banned Dota 2 players for match-fixing (Dota, 2023), activities to address the use of performance-enhancing substances are yet to be identified. However, this problem is by no means exclusive to Dota 2: in fact, anti-doping guidelines in esports are currently the exception rather than the rule. Among the more positive examples of organizations or event organizers that are running doping tests at events are ESL FACEIT and Blast Premier. Both organizations are members of the Esports Integrity Commission (ESIC), an organization founded in 2016 to harmonize the fight against integrity issues in esports (Schubert et al., 2022). ESL FACEIT also has a partnership with the World Anti Doping Agency (WADA). However, the current anti-doping regimes are being criticized for having severe deficiencies (Stivers, 2017; Gupta et al., 2022).

While reliable and representative data on the prevalence of substance use in esports contexts is still missing, the perceived widespread use of CE among players may suggest a more liberal attitude towards the use of performance-enhancing substances within the community. This impression is further reinforced by the close commercial partnerships of esports organisations, event organisers and players with the energy drink industry (Lopez Frias, 2022a; 2022b). Schubert et al. (2022) also indicate that the consumption of energy drinks and gaming boosters are considered legitimate forms of performance enhancement among players. The authors build their study on a model designed by Schubert & Könecke (2015), in which the processes of legitimisation and delegitimisation of social norms in relation to doping in sports are conceptualised. Among the major conclusions is that (a) the perceived legitimacy of performance-enhancing practices is dynamic and subject to social construction processes and (b) legitimacy by a critical mass of stakeholders is an essential condition for credible regulation. Following Schubert et al. (2022) study on professional FIFA esports players, we also assess the legitimacy of the use of certain alleged performance-enhancing substances among Dota 2 players. The perceived illegitimacy of taking substances is considered an important basis for the development of anti-doping policy in esports, particularly because regulating bodies such as ESIC or WADA may as yet lack credibility among players.

4. Methods

4.1. Questionnaire development

The online questionnaire was created with "LimeSurvey" tool (version 5.3.6). 15 single- or multiple-choice questions are analysed and grouped into the four categories below (see appendix for detailed list of all questions and reply options). Prior to the publication of the survey, pretests were run among 20 participants to check for potential problems regarding comprehension, logic and flow, length and adherence as well as technical quality. To counteract possible series effects, the answer options of individual questions were set to random order. Of note, for each question it was possible to choose "no answer" and move on to the

next question. Besides descriptive questions, we decided to use 5-point Likert scales as one of the frequently used and valid psychometric tools. Using a 5-point Likert scale, we ensured participants had balanced and (mostly) symmetric response options in both directions, allowing for neutral, positive, and negative responses as recommended. Regarding consume behaviours, we provided a range from always to never to cover the full pattern of possible use (Joshi, Kale, Chandel & Pal, 2015). Given the novel nature of the study, the choice of survey items was informed by corresponding literature on performance-enhancing substances and esports.

(i) Socio-demographical data and sample characteristics

Five questions were used to assess gender, age, country of origin, monthly esports related income and contract status.

(ii) Awareness and perceptions of alleged performance-enhancing substances

Four multiple-choice questions covered the awareness, familiarity and perceptions of alleged performance-enhancing substances. Respondents were first asked in a multiple-choice procedure which CE they are familiar with in order to obtain an overview of the level of knowledge of the participants. The choice of substances indicated was inspired by previous studies investigating CE in sports (Smith, Stavros & Westberg, 2020; Dietz et al., 2013) as well as in esports (Jasny, 2020; Schubert et al., 2022) and contained different categories, i.e. caffeinated drinks (coffee and energy drinks/gaming boosters), nicotine, prescriptive substances, and illicit substances. Based on these earlier studies as well as by relating to popular discourses on performance-enhancing substances in esports, this choice of substances was considered to represent an adequate set for the given context. The legitimacy of the consumption of these substances in the context of Dota 2 competitions was assessed based on a 5-point "Likert scale" ranging from 1 = "highly legitimate" to 5 = "highly illegitimate". Further questions focused on the assumed motivation and frequency for using CE substances as well as potential regulations in the context of Dota 2 competitions. Both questions were informed by earlier studies in similar contexts (Jasny, 2020; Schubert et al., 2022).

(iii) Esports governance, integrity and regulation

Four multiple-choice questions concerned governance structures and integrity related aspects. Given the organizational clutter within the esports ecosystem and several global governing bodies competing for legitimacy (Peng et al., 2020; Nyström et al., 2022; Heidenreich, Brandt, Dickson & Kurscheidt, 2022, 2023), the question sought to determine if these organizations are known among the esports players. The set of choices coupled with the option to add further bodies was deemed an adequate item to assess the familiarity with major governing bodies. Based on this, a further question addressed how respondents picture an ideal governance structure in esports. Building on Schubert et al. (2022), this question sought to address the ongoing discourse on the advantages and disadvantages as well as feasibility of a more centralised governance system. Respondents were then asked to rate a set of issues regarding their potential threat to the integrity of esports. The set of issues to assess was informed by recent assessments looking into the major integrity threats to esports (Holden, Kaburakis & Wall Tweedie, 2019) and, based on such scholarship, was deemed adequate for our purpose. The final question in this section addressed the desired extent of regulation regarding performance-enhancing substances. This question was informed by earlier findings regarding the need for developing more consistent anti-doping measures (Schubert et al., 2022).

(iv) Self-reported consumption of alleged performance-enhancing substances

Towards the end of the questionnaire, participants were again informed that the survey was anonymous, and that the following

two “sensitive” questions were optional. The respondents were asked about their own consumption of alleged performance-enhancing substances in the context of DotA 2 competitions. Afterwards, participants were asked whether they would use an illegal yet undetectable substance to win the most prestigious tournament. While anticipating the effect of social desirability, these types of questions were still deemed appropriate to at least explore an assessment of willingness to use banned substances in the context of DotA 2 competitions.

4.2. Data collection

The survey was online from September 1st to 30th, 2022. Blogposts were shared on September 1st and again on September 26th on “Reddit” and the respective DotA 2 forum, more specifically the sub-forum “/r/DotA2”, which is the home of the international DotA 2 community and where all game-related topics can be discussed and shared. The forum was founded on October 13th, 2010 and is the most popular DotA 2 forum with 1.1 million registered users (Reddit, 2022). The posting of the survey was done in consultation with and upon explicit consent of the moderators to avoid being deleted or blocked from further use.

A total of around 110.000 people were reached via various channels. The blogpost on September 26th, for example, was viewed 97.000 times within 48 hours. The survey was started by a total of 721 participants and completed in 255 cases. After data cleaning and plausibility checks, 226 completed questionnaires were evaluated. The average processing time was 8 minutes 37 seconds.

4.3. Data analysis

Data were analysed and visually processed using the statistical program SPSS (version 27.0.1.0) and Microsoft Excel (version 16.66). Results are presented in descriptive fashion, i.e., percentage values. If possible, associations between contract and non-contract and other nominal variables were calculated using the chi-square test (McHugh, 2013) with effect sizes using Cramer’s V. Alpha level of significance was set at $p < .05$.

5. Results and findings

5.1. Socio-demographical data and sample characteristics

A total of 226 (mean age: 27.3 years \pm 4.7) participants completed the questionnaire. Of these, 88% indicated male, 2% indicated female, 2% indicated diverse and 8% did not answer. The participants came from a total of 47 different countries. 28% of respondents came from the US, 13% from Germany and 8% from Canada. 5% did not specify their country of origin and the remaining 46% were from 44 other countries. In terms of earnings from esports, 75% reported not making any money, 8% earned up to \$499 per month, 3% earned between \$500 to \$999, 3% earned \$1000 to \$1999, 3% earned \$2000 to \$4999, 1% earned more than \$5,000, and 8% did not answer the question. Out of the 226 participants, 18 individuals indicated that they were currently under contract or had been in the past when asked about their contractual status.

5.2. Awareness and perceptions of alleged performance-enhancing substances

A marked proportion of participants were knowledgeable of substances that are often perceived as performance-enhancing. 97% knew about caffeinated drinks such as coffee, 96% had knowledge about caffeinated drinks such as energy drinks and gaming boosters, 91% were informed about prescription drugs containing agents such as methylphenidate (contained in e.g. Ritalin) or dextroamphetamine (contained in e.g. Adderall). 89% were aware of nicotine and 85% knew illicit substances, including cocaine and amphetamines.

Fig. 1 shows the perceived legitimacy of alleged performance-enhancing substances in the context of DotA 2. Caffeinated drinks such as coffee and energy drinks as well as nicotine were predominantly perceived as highly legitimate by participants in DotA 2 contexts. The legitimacy of the use of prescription drugs such as methylphenidate showed mixed results. Only a third (35%) of the respondents ascribe these drugs an illegitimate status. Illicit substances were rated as highly illegitimate by 60% of respondents. A significant dependency ($p < .001$) was found between contract status and perceived legitimacy of use (Cramer’s $V=0.295$). Yet due to the small number of players under contract ($n=18$), this dependency analysis should be treated with caution.

Regarding the motivation to consume alleged performance-enhancing substances in DotA 2 contexts, 89% indicated performance maximization. Furthermore, motivations included tackling performance anxiety (68%) as well as responding to external pressure and expectations (64%). 57% indicated the absence of anti-doping regulations as motivation, while 40% saw the perception that “everyone is using it” as motivation.

Fig. 2 illustrates the perceived frequency of utilizing alleged performance-enhancing substances in the context of DotA 2 competitions. Consumption of caffeinated drinks (both coffee and energy drinks/gaming boosters) was perceived as being used widespread, with over 80% reporting that they were consumed always or very often. A total of 84% of participants assessed the perceived frequency of consuming caffeinated drinks, like coffee, during competitions, rating it as either always or very often on a 5-point Likert scale. Likewise, 83% indicated always or very often for the perceived usage of energy drinks and gaming boosters in the same context. Nicotine was perceived as being used either always or very often by at least two thirds (67%) of the respondents. Only 12% of the respondents are of the opinion that prescription drugs are never used in the context of DotA 2 competitions. 88% believe that illicit substances are used rarely or never.

5.3. Self-reported consumption of alleged performance-enhancing substances

Fig. 3 illustrates the self-consumption in DotA 2 contexts, revealing a marked contrast with the perceived utilization rate. Mixed patterns were revealed for caffeinated drinks (coffee, energy drinks/gaming boosters), while over 50% completely abstain from nicotine, 77% from prescription drugs and 85% from illicit substances. However, the results still indicate a remarkable prevalence of infrequent use of illicit substances and prescription drugs, ranging from 15 to 23%.

When asked whether a participant would take an undetectable, illegal substance that would guarantee them a first place in the most prestigious tournament in DotA 2, 52% answered “yes”, 37% ticked “no” and 11% gave no answer.

5.4. Esports governance, integrity and regulation

In response to inquiries about awareness of esports organizations, 46% were familiar with WADA, while 31% were not acquainted with any organization. Additionally, 27% were aware of the World eSports Association (WESA), 21% recognized the International Esports Federation (IESF), 20% were familiar with ESIC, 15% knew about the Global Esports Federation (GEF), and 12% were knowledgeable about all the mentioned organizations.

Against the backdrop of the concerted foundation of ESIC, participants were asked on their opinion on their ideal governance structure. Data indicate that 44% of participants express (strongly agree or agree) agreement with the notion of having a single global governing body with a uniform set of rules applicable to all tournaments. The concept that esports should be administered on a per-game-title basis received support from 54% of respondents. Conversely, 56% strongly disagree or disagree with the current governing situation.

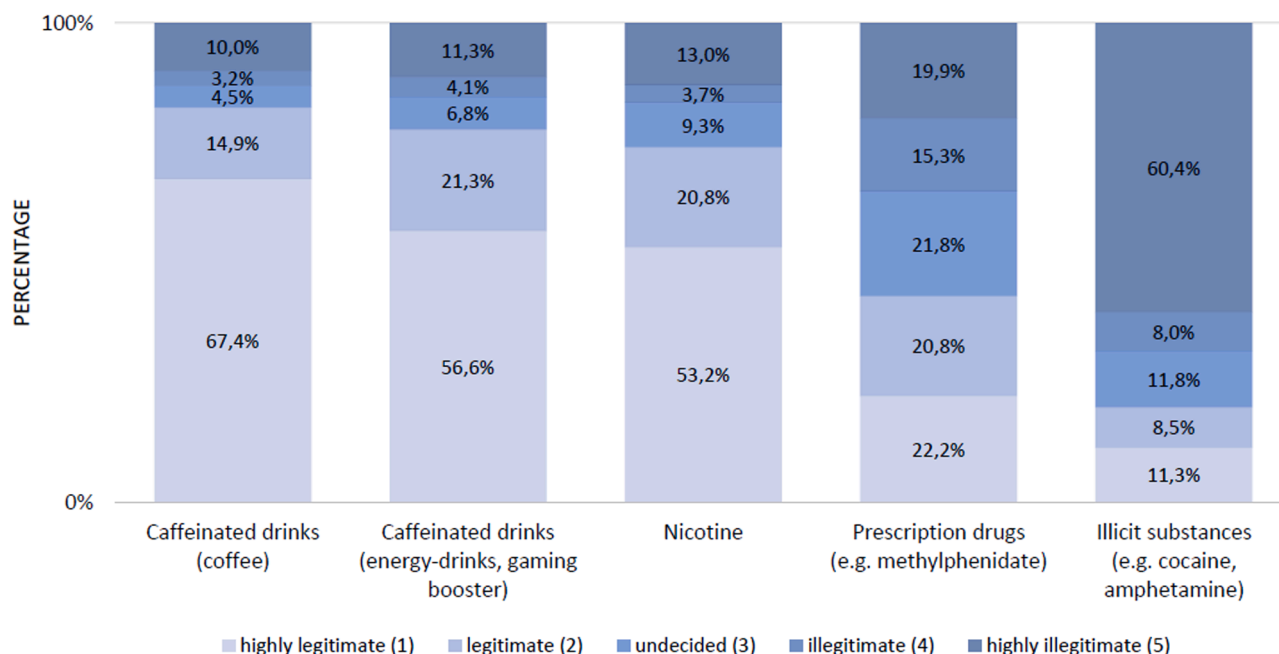


Fig. 1. Perceived legitimacy of alleged performance-enhancing substances. Lighter blue indicates higher perceived illegitimacy (“Please rate the legitimacy of the use of the alleged performance-enhancing substances listed below in the context of DotA 2 competitions.”).

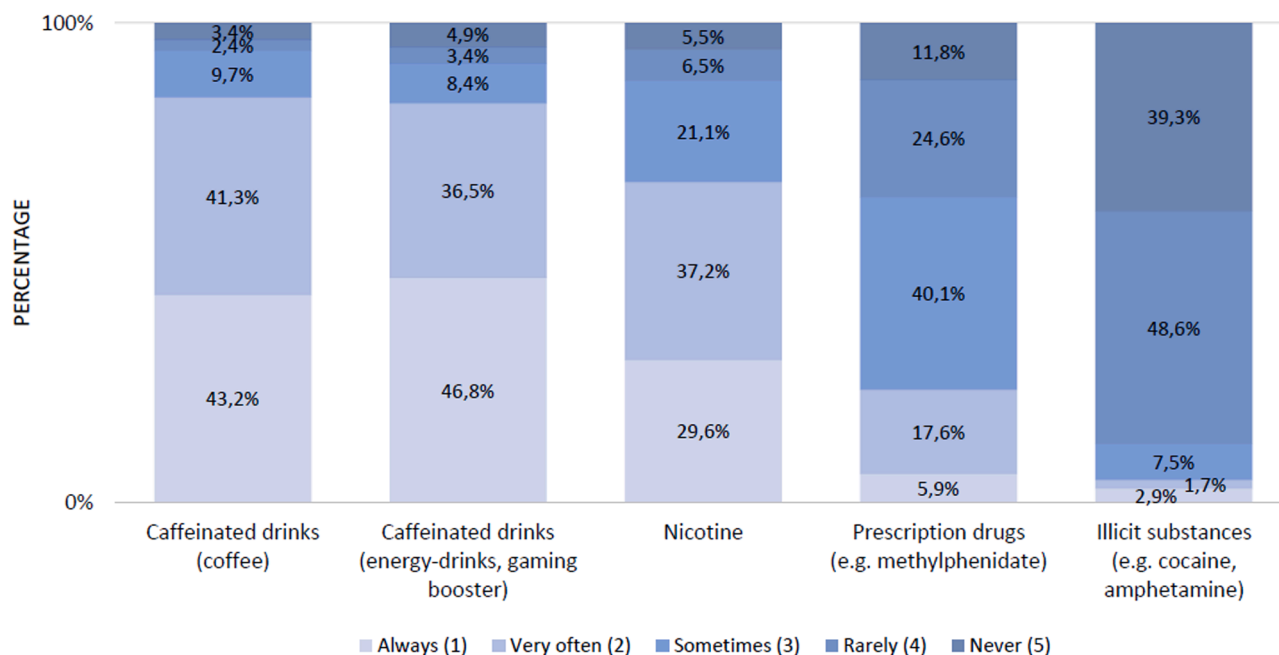


Fig. 2. Perceived usage-rate of alleged performance-enhancing substances. (“How do you rate the frequency of use of the following alleged performance-enhancing substances listed below in the context of DotA 2 competitions?”).

Participants were asked to rate the following five issues regarding their potential threat to the integrity of esports generally on a five-point Likert scale (Fig. 4): “match fixing”, “gambling/betting”, “cheating (software/hardware)”, “alleged performance-enhancing substances” and “unclear governance structures”. The survey revealed that more than 70% of respondents identified “match-fixing” and “cheating” as very important concerns. “Gambling/betting” (64%), “Unclear governance structures” (54%) and “alleged performance-enhancing substances” (52%) were at least considered important threats to esports integrity.

Fig. 5 outlines statements on the desired regulation of alleged

performance-enhancing substances in the context of DotA 2 competitions. A noteworthy 69% of participants either disagreed or strongly disagreed with the statement that players should be permitted to use any alleged performance-enhancing substances. 76% of participants were in favour of regulating alleged performance-enhancing substances, with 84% strongly agreed or agreed with the development of a standardized list of banned substances. The proposal to introduce tests for banned substances received approval from 71% of participants, i.e. strongly agreed or agreed. A substantial 78% of respondents strongly agreed or agreed that sanctions should be in place for the use of prohibited substances.

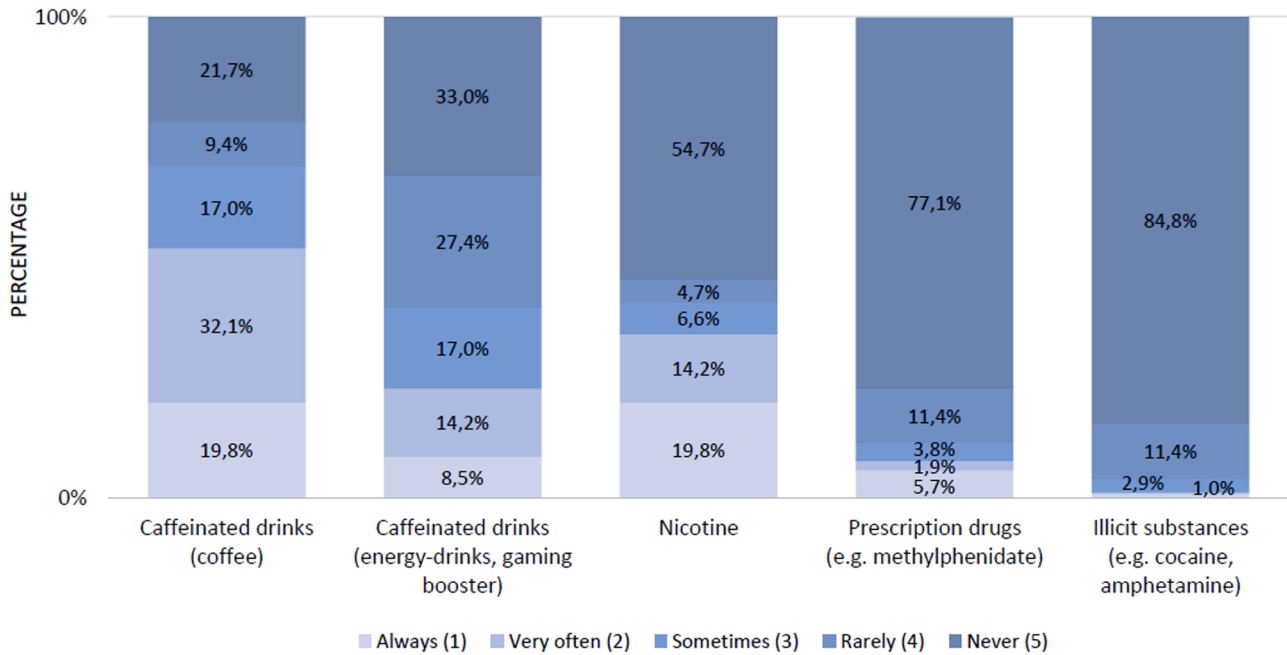


Fig. 3. Self usage-rate of alleged performance-enhancing substances in DotA 2 contexts. (How often have you used the alleged performance-enhancing substances listed below in the context of DotA 2 competitions?).

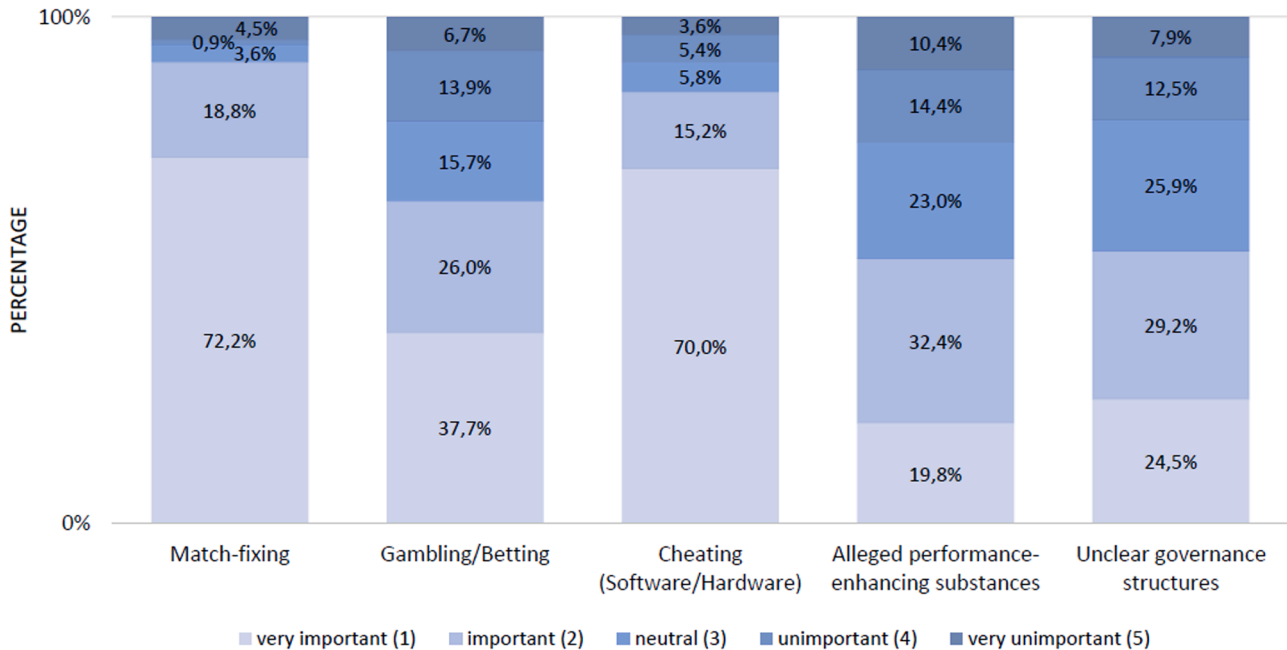


Fig. 4. Potential threats to the integrity of esports (“Please rate the importance of the following issues regarding their potential threat to the integrity of esports.”).

6. Discussion

Our findings offer valuable insights into the perspectives of esports (DotA 2) players regarding a variety of aspects revolving around performance-enhancing substances (prevalence and legitimacy, motivation for use, governance structures, regulation). The dataset represents a geographically diverse cohort. Female players are drastically underrepresented, confirming clear gender disparities in esports found in recent studies (Kordyaka, Pumplun, Brunnhofer, Kruse & Laato, 2023). While respondents are predominantly amateur players, nevertheless their level of awareness regarding various performance-enhancing substances was found striking, ranging from

97% for caffeinated drinks like coffee to a still substantial 85% for those familiar with the effects of illicit substances. Even if the idea of a significant increase in performance is widespread for several substances, there still is a lack of evidence-based studies on actual performance enhancing effects in esports (Fashina, 2021).

As esports players engage in uninterrupted gameplay for extended periods, the significance of nutritional considerations in general has become increasingly prominent in the esports landscape in recent years (Ribeiro, Viana, Borges & Teixeira, 2021). For example, in a recent study it was found that a diet rich in protein and certain micronutrients can be associated with improved cognitive performance in esports athletes (Goulart et al., 2023). Our sample also seems well informed about the

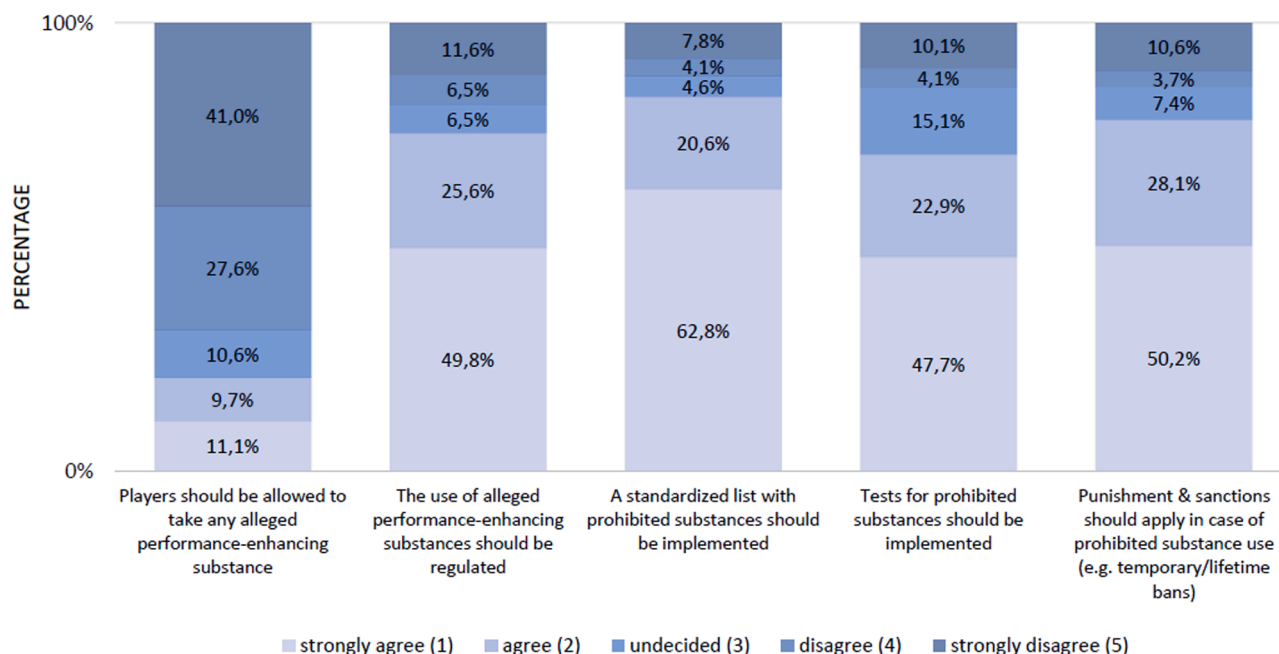


Fig. 5. Statements about the use of alleged performance-enhancing substances. (“Please rate the following statements regarding the use of alleged performance-enhancing substances in the context of DotA 2 competitions”).

existence of different substances that allegedly have performance-enhancing effects. From a general perspective, not least because of the assumed social desirability in response behaviour, the perceived consumption of alleged performance-enhancing substances was, unsurprisingly, higher than the self-reported consumption in our sample. The perceived prevalence of caffeinated drinks and nicotine in the context of DotA 2 competitions was extensive. In the case of the former, also the self-reported consumption of caffeinated drinks among our sample was remarkable, which is in line with the findings by Ip et al. (2021). Further, the vast majority of our respondents believe that prescription drugs are at least used occasionally among players and almost one quarter even admits an infrequent use. This finding is in line with earlier research on the widespread use and need for regulation of prescription drugs (e.g. Rosenthal, 2021). Perceived prevalence and self-use concerning illicit substances is remarkably lower, yet even here a noteworthy 15% acknowledges at least an occasional use. These results clearly indicate that substance use is a relevant phenomenon in the context of DotA 2 competitions.

Regarding the perceived legitimacy of alleged performance-enhancing substances, the results are similar to those on the perceived frequency. Caffeine-containing drinks and nicotine were generally considered as being legitimate, while prescription drugs showed mixed results. The ambivalent perception of the legitimacy of prescription drugs is an interesting finding. As outlined by Hamstead (2020), there are also mixed opinions among players on whether drugs such as Adderall have performance-enhancing effects. Such ambiguity makes the assessment of legitimacy among gamers even more relevant. Having robust data on the perceived legitimacy may also inform the development of anti-doping policy, which will need to find an appropriate way of dealing with TUE (Holden, Kaburakis & Wall Tweedie, 2019).

On the other hand, illicit substances were predominantly considered highly illegitimate. These findings are in line with Schubert et al. (2022), who also found the consumption of caffeinated drinks or tobacco commonly accepted among their sample, while prescribed drugs were seen as illegitimate form of performance enhancement. The endorsement of energy drinks and gaming boosters among our sample is of interest and this finding may contribute to a lively scholarly debate on the controversial role of energy drink manufacturers within the esports ecosystem and its implications for integrity and anti-doping

considerations (Lopez Frias, 2022a, 2022b; Wall Tweedie, 2022). A preliminary relationship between contractual status and legitimacy was found, suggesting that players with contractual status tend to adopt a more lenient view of legitimacy.

Half of the respondents showed their willingness to take an undetectable, illegal substance that would guarantee them a first place in DotA 2 tournaments, demonstrating the competitive mindset of players. In a similar fashion, we were able to show that the use of substances arises primarily from a performance motive, as perceived by our respondents. The perceived existence of motivations such as addressing performance anxiety and the absence of anti-doping regulations and a perception of widespread use among peers may suggest a need for comprehensive anti-doping measures and mental health support within the esports community. Our findings thus also support calls for better educating players on the use and misuse of drugs. As explained by Holden, Kaburakis & Rodenberg (2018), while the use of stimulant substances in professional esports are a concern regarding the integrity of competitions, there are also implications from a public health perspective, in particular due to the young age of gamers on average (see also Wattanapisit, Wattanapisit & Wongsiri, 2020).

Both match-fixing and (software/hardware) cheating are considered to be threatening the integrity of DotA 2 competitions to a larger extent than the use of alleged performance-enhancing substances. This corresponds to ESIC’s assessment of doping being the third greatest threat, after software cheats and match-fixing (Holden, Kaburakis & Wall Tweedie, 2019). This may be explained by arguing that the former two forms of manipulation have more immediate effects on game results. Further, DotA 2 publisher Valve is actively banning players for match-fixing and cheating (Dota, 2023), while, to date, not for substance use.

Slightly more than half of the respondents consider unclear governance structures to be a threat to esports integrity. This finding supports the assessment by several scholars that a lack of unified oversight in esports and a patchwork of policies creates challenges in anti-doping (Fashina, 2021; Wall Tweedie et al., 2022). Our respondents clearly see the need for enforced regulation regarding the use of alleged performance-enhancing substances. The majority of participants expressed support for the development of a standardized list of banned substances, drug testing, and the imposition of sanctions for prohibited

substance use. Along with the expressed concerns relating to match-fixing and cheating, our findings highlight a certain consensus among esports players for a regulated and fair competitive environment in esports. This result is similar to the findings in earlier empirical research (Schubert et al., 2022; Richardson et al., 2023) that found players in support of clearer rules and sanctions for cheaters.

Participants' awareness of esports organizations indicates varying levels of familiarity with different entities. None of the esports governing bodies were known to more than a third of the respondents. Only a fifth of the respondents was familiar even with ESIC, which could be seen as being in a prime position to become the premier regulatory authority in the esports industry due to its links to major tournament organizers (Bafna, 2020; Fashina, 2021). The findings suggest a potential need for increased visibility and education regarding the roles and functions of esports governance bodies among participants. In addition, players distinctly expressed the need for more transparent and stringent governance structures. The disagreement with the current governing situation further emphasizes the need for ongoing discussions and potentially revised governance structures in esports to address the concerns and preferences of participants. Almost half of the participants express support for a single global governing body with uniform rules. This finding is in line with several authors who also refer to calls for one governing body on a global level (Bafna, 2020; Nyström et al., 2022; Rana & Parsai, 2023). As already outlined by Holden and colleagues in 2017, the success of an overarching governance structure will not only require the collaboration of a large number of organisations but likely also demand delegating rule-making authority (Holden, Rodenberg & Kaburakis, 2017). This seems to represent a major challenge to overcome. Recent developments indicate trends of organisational concentration within the still fragmented esports ecosystem: in January 2024, the two largest international esports federations (IESF and GEF) jointly formed the Esports Leadership Group (ELG), which is chaired by IOC Vice President Ser Miang Ng (Livingstone, 2024). The increasing involvement of the IOC towards the first Olympic Esports Games (likely to happen in 2025) may give these trends further momentum. Further, in June 2024, the IOC announced a collaboration with ESIC to combat misconduct in esports (ESIC, 2024), which may give the organisations more visibility.

7. Conclusion, limitations and future research

Despite reaching a substantial number of players through established forums, only 226 completed questionnaires were accessible for analysis. In this respect, it is worth noting that only 18 players had experience with contract status, indicating an underrepresentation of players with contractual agreements in the dataset. Such a high dropout rate of roughly 70% was somewhat surprising. However, depending on the type of sensitive questions, high dropout rates were described in previous studies (Tourangeau & Yan, 2007). In the present study, reasons for discontinuation may be due to the length of the questionnaire (Rolstad, Adler & Rydén, 2011), a lack of interest (Edwards et al., 2002), or, most importantly, privacy concerns with respect to sensitive questions (Joinson, Woodley & Reips, 2007). We acknowledge that such high discontinuation rate may affect the validity of our results. On the other hand, this first survey in the DotA 2 esports context was primarily intended to provide an initial insight into integrity issues. Thus, no elaborative random sampling method was used which would have allowed a certain degree of generalizability. Based on our experience in the study at hand, for the design of future questionnaire-based studies in these contexts we recommend (a) reducing the length of the survey to approx. five minutes; (b) place the questions considered most relevant for the research objectives rather towards the beginning of the survey; (c) adding attention checks to the survey improve data quality.

By placing our questionnaire on established forums, rather than using more targeted communication methods, a possible selection (sampling bias) was introduced toward individuals who, for example,

have internet access, visit the website regularly, and choose to participate in the survey (Bethlehem, 2010). It is also possible that a particular group of people felt particularly addressed, which can lead to an over- or under-representation of prevalence or attitudes. As, consequently, the researchers had little control over the selection process, our sample cannot be considered a random sample because not every individual in the DotA 2 community had an equal chance to participate in the questionnaire. Thus, unbiased estimates are not possible. Future studies should focus on larger random samples that are essential to draw more specific conclusions and move towards the development of preventive measures. This approach is not always straightforward as no standard comprehensive list of email addresses exist from which to draw a random sample, and no standard convention exists that facilitates random sampling (Ball, 2019). However, our survey revealed insights on possible issues relating to CE within the DotA 2 context, suggesting that a replication as well as an extension of this approach to other esports contexts is highly warranted.

In addition, it cannot be ruled out that participants answered in a socially desirable fashion (Choi & Pak, 2005). To improve accuracy, future studies in such collectives could use randomized response techniques that maximize anonymity and minimize social desirability bias (Dietz et al., 2013, Ulrich et al., 2018). Mixed-method designs using a combination of empirically based questionnaires with qualitative interview techniques would help for a more in-depth analysis of integrity issues in esports. Further, given the diversity of the esports landscape, our findings cannot be generalised to the entire esports community. We thus encourage scholars to look into stakeholders' views on (a) other gaming titles and (b) integrity issues beyond CE. Besides obvious challenges such as match-fixing and (software/hardware) cheating, also topics such as safeguarding and abuse as well as discrimination, diversity and inclusion warrant greater scholarly attention.

In summary, this is the first quantitative empirical study exploring players' perspectives on DotA 2, which is one of the most successful esports titles in history. We provide valuable insights into the perceived usage-rate as well as the self-reported consumption of certain substances. Further, we explored the legitimacy of and motivation behind the use of certain substances and we also assessed the need for and the extent of governance changes as well as stricter regulation of substance use. These insights are a valuable contribution to both the academic discourse and may also inform practice, as the opinion of players should be front-seat to the drafting of policies and regulation with the goal of fostering fair play, player well-being, and the overall integrity of esports competitions.

CRediT authorship contribution statement

Mathias Schubert: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Alec Güre:** Validation, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Nils Haller:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Formal analysis, Data curation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1

Survey Questions

- (i) **Socio-demographical data and sample characteristics**
- (1) Please select your Gender. [Female/Male/Diverse]
 - (2) Please state your year of birth.
 - (3) Please select your country of residency.
 - (4) Have you ever been under contract to play Defense if the Ancients 2 (DotA 2)? [Yes/No]
 - (5) What is your esports related income per month? [0 US\$/1-499US\$/500-999US\$/1000-1999US\$/2000-4999US\$/5000+US\$]
- (ii) **Awareness and perceptions of alleged performance-enhancing substances**
- (6) Which of the following alleged performance-enhancing substances do you know? [Caffeinated drinks (coffee), Caffeinated drinks (energy drinks/gaming boosters), Nicotine/Prescription drugs (e.g. methylphenidate), Illicit substances (e.g. cocaine, amphetamine).] Multiple answers possible.
 - (7) Please rate the legitimacy of the use of the alleged performance-enhancing substances listed below in the context of DotA 2 competitions. [Caffeinated drinks (coffee)/Caffeinated drinks (energy drinks/gaming boosters)/Nicotine/Prescription drugs (e.g. methylphenidate)/Illicit substances (e.g. cocaine, amphetamine)]. 5-point Likert Scale: 1 = "Very legitimate", 5 = "Very illegitimate".
 - (8) Why do you think esports players use alleged performance-enhancing substances in the context of DotA 2 competitions? [performance anxiety, external pressure/expectations, performance maximization, absence of anti-doping regulations & policies, because everyone is using it, Other (please specify)]. Multiple answers possible.
 - (9) How do you rate the frequency of use of the following alleged performance-enhancing substances listed below in the context of DotA 2 competitions? [Caffeinated drinks (coffee)/Caffeinated drinks (energy drinks/gaming boosters)/Nicotine/Prescription drugs (e.g. methylphenidate)/Illicit substances (e.g. cocaine, amphetamine)]. 5-point Likert Scale: 1 = "Always", 5 = "Never".
- (iii) **Esports governance and integrity**
- (10) Please check all organizations you have heard or know of. [Global Esports Federation (GEF), International Esports Federation (IESF), World Esports Association (WESA), Esports Integrity Commission (ESIC), World Anti-Doping Agency (WADA), Any National Esports Governing Bodies, None]. Multiple answers possible.
 - (11) Please rate the following statements about the governance of esports. [Only one global governing body with one set of rules & regulations that apply to every tournament should exist, Esports should be governed per title, The current situation is fine as it is]. 5-point Likert Scale: 1 = "Strongly agree", 5 = "Strongly disagree".
 - (12) Please rate the importance of the following issues regarding their potential threat to the integrity of esports. [match-fixing, gambling/betting, cheating (software, hardware), alleged performance-enhancing substances, unclear governance structures]. 5-point Likert Scale: 1 = "Very important, 5 = "Very unimportant".
 - (13) Please rate the following statements regarding the use of alleged performance-enhancing substances in the context of DotA 2 competitions. [players should be allowed to take any alleged performance-enhancing substance, The use of alleged performance-enhancing substances should be regulated, A standardized list with prohibited substances should be implemented, Tests for prohibited substances should be implemented, Punishment & sanctions should apply in case of use of prohibited substance (e.g. temporary/lifetime bans)]. 5-point Likert Scale: 1 = "Strongly agree", 5 = "Strongly disagree".

(iv) **Self-consumption of alleged performance-enhancing substances**

- (14) How often have you used the alleged performance-enhancing substances listed below in the context of DotA 2 competitions? [Caffeinated drinks (coffee)/Caffeinated drinks (energy drinks/gaming boosters)/Nicotine/Prescription drugs (e.g. methylphenidate)/Illicit substances (e.g. cocaine, amphetamine)]. 5-point Likert Scale: 1 = "Always", 5 = "Never".
- (15) Would you take an undetectable, illegal substance that would guarantee a first place finish in the most prestigious tournament? [Yes/No/No answer]

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