An investigation into the attitudes of virtual cycling participants regarding avatar bodyweight manipulation and weight doping.

Abstract

This study aimed to investigate the viewpoints and attitudes about virtual e-cycling apps with respect to the manipulation of an avatar's stated body weight. An adaptation of the Performance Enhancement Attitude Scale (PEAS) delivered in the form of an online questionnaire was created to assess the act of intentional avatar weight manipulation in e-cycling apps. The level of agreement to 12 items was measured on a 5-point likert scale and 638 responses were received. Content analysis was performed on the responses to two open-ended questions. The respondent's disagreed with 9 of the 12 PEAS statements suggesting that they saw no value to the practise of intentional avatar weight manipulation. The qualitative analysis revealed that many respondents appeared to accept that e-doping was common practice and that prevention measures and punishment were ineffective. The results of the PEAS questionnaire and content analysis by the majority of the respondents support that the act of avatar weight manipulation in virtual cycling Esport sees similar results, feedback and undesirability to other forms of sporting fraud such as the use of performance enhancing drugs. It is therefore proposed that the act of avatar weight manipulation should be treated as an illicit, deceptive or wholly negative practise.

Keywords: virtual cycling, e-Cycling, esports, online, deception

Introduction

Cycle-based e-racing is a relatively new form of competitive sporting activity. It provides a participant with the means to physically engage in the sport of cycling but it typically takes

place indoors and the user is represented by a digital avatar in a simulated and virtual environment (Dyer, 2020). Virtual cycling e-racing is typically available utilising a range of commercial apps or digital platforms with equipment typically consisting of a computer, a static resistance trainer with a bicycle fitted to it and an internet connection (Dyer, 2020). As an organised sport, it has gained official recognition quickly. For example, in 2020, cycling's global governing body, the UCI, publicly endorsed a virtual Tour de France and officially sanctioned the first Cycling Esports World Championships. Online e-cycling was also actively promoted as a result of the societal restrictions surrounding the Covid-19 global pandemic (Westmattelmann et al., 2021).

As a relatively new field of study, virtual cycling Esport in particular has seen limited research to date (Bjärehed & Bjärehed, 2023). These have included a generalised introduction to virtual cycling (Dyer, 2020), the introduction and growth of virtual cycling activity (Savage & O'Reilly, 2021), the advantages and disadvantages of virtual cycling (McIlroy et al., 2021), an exploration of whether the Zwift's e-racing anti-doping policy is open to cheating (Richardson et al., 2020) and the exploration of the relationship of e-Cycling both now and in the future with the Olympic movement (Abanazir, 2022; Miah, 2021). The general consensus from these studies thus far is that there are health and fitness benefits created via the use of online cycling apps but that there are concerns as to the conduct of some users in these virtual environments – notably when competing (Bjärehed & Bjärehed, 2023).

A series of constitutive rules outline how a sport should be conducted (Silva, 1981) and when such rules are intentionally broken, this is deemed as an act of cheating. However, dishonest behaviour, use of controversial technology (Dyer, 2015) or illegal performance enhancement (Loland, 2009) are not new concepts in traditional sports. More recently though, such

controversy or sporting fraud has now also been levelled against virtual cycling racing specifically (Dyer, 2020; McIlroy et al., 2021; Richardson et al., 2020). For example, since the release of the virtual cycling app, Zwift, in 2014, it has been proposed that users have been cheating in the game using a variety of methods including height doping, weight doping, gender doping, 'sandbagging', use of banned substances and data manipulation (Dyer, 2020; Richardson et al., 2020). There have been a small number of publicised cases of sporting fraud using virtual cycling apps. These involved a rider that was disqualified from a national championship who had obtained a more advantageous cycling avatar by artificially generating the volume of riding they were doing to obtain it (Anon, 2019). Other cases involved two athletes manipulating their data when verification of their performance was questioned (Maker, 2020) and an athlete that actively increased and decreased their avatars weight mid-event after discovering a glitch in the software (Maker, 2022). As a result, the theorised concerns of sporting deception in virtual cycling has now been realised in reality. However, it has not been explored in peer reviewed literature why such deceptions take place and the feelings from participants regarding such behaviour. It could be assumed that the reasons an athlete or participant cheats or attempts to deceive are the same as those reported in traditional sports such as those seen with respect to the use of performance enhancing drugs (Petróczi & Aidman, 2009) or being undertaken as a conscious or subconscious act of self-deception (Reddiford, 2002). However, Esport in general offers the unique circumstance that the participant could remain relatively anonymous, may not easily be subjected to reprisals and whose identity visually is represented by an avatar that does not have to be representative of their true self. This anonymity could therefore positively or negatively influence others within the same virtual environment but the relative infancy of research in this particular type of Esport has not fully investigate avatar behaviour. As a result, this papers objective is to investigate and explore current user's viewpoints and attitudes within bicycle e-racing apps

with respect to their virtual avatar. In this specific case, the stated body weight of an online cyclist's avatar will be primarily investigated as this has been widely reported as a well-known source of concern, inaccuracy or intentional manipulation (Dyer, 2020). Beginning to address this will highlight any motivations for avatar manipulation and help inform athletes, sports governance and app developers in the future.

Methods

The study collected quantitative and qualitative data using an online survey that was constructed and delivered utilising the google forms application (Google, US). The eligibility criteria for participation in the questionnaire were that respondents were virtual cyclists and above 16 years of age and this was stated clearly in the questionnaire invitation messaging. The online survey began by asking participants to disclose their age and gender, the number of years they had used such apps and the type. This was followed by a 12-item questionnaire. An adaptation of the 'Performance Enhancement Attitude Scale' (PEAS) was used as the basis for the questionnaire design. The PEAS survey was originally introduced as a means of measuring participants' attitudes toward doping (Petróczi, 2002) and was validated with adequate reliability and acceptable levels of internal consistency (Petróczi & Aidman, 2009). Given it was felt that avatar body weight manipulation could also be seen as a form of sports technology fraud, it was felt that the PEAS would be a suitable tool to explore this issue. In its typical form, it comprises a 17-item uni-dimensional series of statements assessed using a six-point likert scale. However, due to the nature of virtual cycling, not all of the 17 items were suitable to be included in the study in this context so 5 were removed. The resulting 12 PEAS items that were modified and then reformulated in this study are shown in table 1.

[INSERT TABLE 1 HERE]

Like the PEAS questionnaires defined by (Petróczi & Aidman, 2009), a Likert Scale was utilised for this study as a suitable means to quantify psychological and sociological constructs (Warmbrod, 2014). A five-point symmetrical likert scale was selected to suggest the level of agreement of the 12 items shown in table 1. The five statements used were 'Strongly Agree', 'Agree', 'Neither Agree or Disagree', 'Disagree' and 'Strongly Disagree'. For the purposes of subsequent statistical analysis, these statements were later converted to a numerical value based upon a continuum. These were Strongly Agree=1, Agree=2, Neither Agree or Disagree=3, Disagree=4 and Strongly Disagree=5. Whilst the value of removing the neutral option and forcing a respondents opinion has been proposed (Dyer et al., 2020; Joshi et al., 2015), a neutral choice was included in this study as it wasn't known if respondents would participate or respond honestly in this relatively new area of research when their own conduct was arguably being questioned. Furthermore, this inclusion ensured that a participant's ambivalence or indifference on this subject could also be recorded and potentially seen as significant. However, it is acknowledged that the role or definition of the neutral option may be perceived differently between respondents. To counter this, each participant was informed in the survey brief that they did not have to answer every question if there were not happy to so. This action was taken so as to reinforce that option 3 was a neutral choice rather than potentially that of a 'didn't know' or a 'not applicable' option.

Two open-ended questions were placed at the end of the survey to collect qualitative data which would undergo content analysis to help gain further understanding of the respondent's beliefs on this topic. These questions asked, 'Do you think having an incorrect weight on an indoor e-cycling app is different to the use of (for example), performance enhancing drugs? If

so, can you explain why?', and 'This space is provided if you have any opinion you would like to share on the subject of weight doping in e-cycling'.

Procedure

To maximise participation levels and response time, an online data collection method was used. Online-based questionnaires have been investigated for their value (Evans & Mathur, 2018). They offer notable clear advantages over other formats such as their global reach, speed, convenience (Evans & Mathur, 2018) and anonymity. However, it is conceded that such methods pose shortcomings which could apply to this study. These include sample identity control and duplicate or bogus submissions. In the case of this study, these shortcomings were reduced by inviting participation through sports specific forums and social media. This would make it more likely that the participants were of the appropriate background. Any privacy concerns were minimised by maintaining the anonymity of all participants' responses from each other and the investigators at all times. The raw data would be checked for duplicate submissions at the point of analysis. The questionnaire itself was constructed using the 'Google Docs' application (Google, Mountain View, US).

Participants were invited to complete the questionnaire via social media driven formal invitations. The invitation to participate was lodged on two online forums that specialized in either cycling or triathlon. These were www.slowtwitch.com and www.timetriallingforum.co.uk. Further invitations were placed on several Facebook social media pages. These were typically centred around the use of specific cycling esports apps or cycling sports pages and included: 'Mywhoosh', 'RGT Members', 'VCycling news', 'Timetrialling UK', 'Triathlon age group' and 'Zwift members'. The invitations to participate were posted during January 2023. The questionnaire was left open to participation for a

period of four weeks. Once this time had elapsed, it continued to be left open until a period of seven days had passed without further participation before it would then be closed. When the data collection period ended, it was then downloaded from Google Docs to Microsoft Excel (Microsoft, Washington, US) for subsequent analysis.

All participants were informed that their participation and consent was based upon when they hit 'submit' and that they could withdraw from the study prior to this by not completing the questionnaire. In the event that any participant wished to withdraw after this point could then contact the research team. Their responses could be identified in the raw data by knowing when they completed the survey and then matching their responses. Institutional ethics approval was obtained prior to this study commencing.

Statistical Analysis

This study followed the guidance for Likert Scale analysis as summarised by Sullivan and Artino (Sullivan & Artino, 2013). Due to a lack of certainty regarding whether the Likert Scale could be considered ordinal or interval-based from the viewpoint of the respondents in the context of this research, both parametric and descriptive statistical analysis of Likert data was undertaken in this paper. The merits of both parametric and descriptive statistical approaches have been outlined (Sullivan & Artino, 2013) but other studies have identified common issues and concerns by doing so (Jamieson, 2004) which have made determining the optimal analysis of Likert data contentious and unresolved. As a result, both reporting methods were utilised in this paper as complimentary methods and to add value but it was conceived that such an approach could potentially obtain conflicting results. As a result, the median and mode were primarily used as the measure of central tendency (Jamieson, 2004) as well recording the proportional percentages for each questions response to then illustrate the

discrete nature of the data (South et al., 2022). The mean and standard deviation were calculated. Cronbach's Alpha was applied to assess internal consistency of the 12 items. The level of acceptability of α was set as 0.7 based upon previous guidance (Tavakol & Dennick, 2011; Gliem & Gliem, 2003).

Qualitative analysis

The responses to the two open-ended questions were analysed using content analysis. This was considered the most appropriate analytical method as responses were brief and lacked the detail needed for qualitative inferences to be made through analysing the meaning of the words and concepts, such as by using thematic analysis (Clarke & Braun, 2021) which tends to be used on larger data sets collected for example from interviews. The are many forms of content analysis, but a key feature of all forms is that the key words of text are classified into much smaller content categories. Stemler (2011) states that content analysis "allows inferences to be made which can then be corroborated using other methods of data collection" (p. 1) and therefore it is appropriate for this study which aims to analyse and synthesise qualitative and quantitative data. Vears & Gillam (2022) recommend inductive content analysis (ICA), also known as qualitative content analysis, for relatively small-scale, non-complex research. This study satisfies this requirement.

The process of ICA is similar to other methods of qualitative analysis in that the first stage involves an initial review of the data and then coding takes place, where main codes and sub-codes are identified. In the initial coding using ICA, codes are assigned to over-arching content categories. For example, in our study for open-ended question 1 the comments were divided into those relating to whether weight e-doping and PEDs were the same or different. This is then followed by comparing, grouping and sub-dividing groups of codes, which results

in final content categories and subcategories, rather than "themes" as would be the case with thematic analysis. A "content category" is a broad idea or concept within which a number of more specific content codes have been grouped. One of the researchers completed the content analysis and no interrater reliability was carried out for this small-scale exploratory study.

Results

Cronbach's alpha between the 12 item PEAS statements was calculated as 0.79 and therefore satisfied this study's pre-determined threshold of acceptability for internal consistency.

639 questionnaire responses were received. One duplicate entry was identified in the raw data so was removed from analysis. This left 638 valid responses. These comprised of 542 males (85%), 89 females (14%) and 6 indicated 'prefer not to say' or declined to disclose their gender (1%). The age demographic of the participant sample is summarised as 16-29 (5.5%), 30-39 (17.7%), 40-49 (28.2%), 50-59 (30.7%), 60-69 (14.7%), 70-79 (2.7%) and 80+ (0.3%). The number of years the respondent had been competing were: less than one year (6.1%), 1-2 years (12.1%), 2-3 years (25.4%), 3-4 years (18.3%), 4-5 years (13%) and 5+ years (25.1%). A further detailed analysis by age group or gender was not pursued due to the disproportionate or very small sample pools in some of these groups.

The results of the 12-item PEAS statements are shown in Table 2.

[INSERT TABLE 2 HERE]

It is proposed that the use of both parametric and descriptive statistical analysis of Likert data in table 2 did not conflict with each other and were complimentary. It can also be seen in table 2 that the respondents disagreed with eight out of the twelve offered statements and specifically on items 1-5 and 9-12. Items 6-8 demonstrated a different type of response. Item six in particular was predominantly neutral in nature with respect to mode and median and with a mean value that showed leant to the negative side of the Likert scale.

The participant's choice between the five Likert options in all 12 items is further visually summarised in figure 1 below.

[INSERT FIGURE 1 HERE]

Figure 1 shows the clear shift to neutrality in responses on items 6-8.

Qualitative analysis

For question 1, of the 638 participants, 82 did not respond to this question; the remaining 555 participants produced 9294 words in their responses, therefore responses on average were 17 words (the longest was 77 words, the shortest was 1 word). For question 2, of the 638 participants, 329 did not respond to this question; the remaining 309 participants produced 12233 words in their responses, therefore responses on average were 40 words (the longest was 162 words, the shortest was 1 word).

Responses to the two questions were analysed separately because after the initial read-through of the responses it was clear that different and closely linked categories were arising from responses to each question. For example, responses to the first open-ended question were clearly reasons given for whether weight e-doping and PEDs were the same or different. In

contrast, responses to the second question were more thoughtful and in many cases involved thinking about wider implications and philosophical issues, such as ethics and links to mental health. Therefore, it was felt that combining responses to the two questions would lose this level of context for the responses. The responses to the first open-ended question revealed two categories and the second question revealed six categories, both with associated sub-categories. The analysis will now be presented in separate sub-sections.

Analysis of responses to the first open-ended question

The first question asked, 'Do you think having an incorrect weight on an indoor e-cycling app is different to the use of (for example), performance enhancing drugs? If so, can you explain why?'. The analysis of the responses to this question revealed two categories, with three sub-categories in each. Because of the dichotomous nature of the question, responses were initially categorised as either 'weight e-doping and PEDs are different' or 'weight e-doping and PEDs are the same'. Once this was completed, the two sets of comments were reviewed once again and three sub-categories identified for each category. Table 3 summarises these categories, sub-categories and example comments for each.

[INSERT TABLE 3 HERE]

From the responses coded within category 1, it was clear that many respondents accepted that weight e-doping happens and that there could be some justifications (e.g. it is a passive way of cheating rather than actively taking drugs or that it might be negligent rather than deliberate cheating). Also, it is interesting to note that the responses within categories 2.2 and 2.3 could be linked to potential motivations for cheating, with 2.2 indicating that individuals are cheating themselves so it may be related to self-perception and 2.3 indicating that cheating

may be motivated by a competitive advantage arising from a need to compare themselves with others.

Analysis of responses to the second open-ended question

The second open-ended item asked, 'This space is provided if you have any opinion you would like to share on the subject of weight doping in e-cycling'. The analysis revealed six categories with associated sub-categories. Table 4 summarises these categories, sub-categories and example comments for each.

[INSERT TABLE 4 HERE]

From the examples coded within category 1, it was clear that many respondents accepted that weight e-doping was a common occurrence and in many ways was 'normalised'. Some respondents even offered naive justifications (e.g. that it would be accidental), or stated that as it was not illegal and was difficult to identify then there was a low risk, or that it was OK if it only took place in social racing. In contrast to this, another set of respondents indicated strong emotional responses towards weight-doping stating that it was immoral and dishonest (category 6) and could lead to severe psychological and health impacts. Strong emotions were also commonly expressed regarding punishment for those caught (sub-category 3.3), such as being publicly ridiculed. It is interesting to note that the responses within category 5 could be linked to respondent's thoughts about what they thought potential motivations for cheating on e-cycling might be, for example the need to compare oneself to others or trying to boost self-esteem.

Of particular note, was the high number of responses relating to category 3 ‘preventative measures’. Suggestions ranged from racer behaviours that should be enforced to changes in e-cycling hardware or software. For example, suggested required behaviours included, “the racer should have to prove their weight pre and post race” and “I do regular weigh-in videos to prove my weight and my real life claiming data supports my performance”.

Suggestions regarding changes to e-cycling hardware or software included:

“the only way to eliminate it is building scales into the bikes”

“Unless bikes comes with scales we won’t ever get 100% clean”

“I use a smart scale that syncs to Strava and zwift”

“It would require calibrated and synchronized scales in the homes of eCycling athletes for parity along with some other authentication validation”.

Finally, many suggested strict controls, for example “It should be policed properly by the host organisation”. Although the problems with implementing these measures was mentioned frequently, for example, “Even if you had to get electronic scales to record a weight, rather than input your own, people would cheat the system. It is a hard one to police” and “but policing/forcing video weigh ins etc. would be a huge task”.

Discussion

Statistical analysis

Despite the application of the PEAS approach to this novel context, it obtained a level of statistical reliability consummate with that of the original study (Petróczi, 2002). This indicates that despite the change in nature of chemical to digital-based performance enhancement, there is no evidence to suggest that the method deployed in this study was not suitable for application in this context.

Use of parametric and descriptive statistics broadly obtained complementary and similar results. One concern was that the standard deviation for the respondents for each item was often greater than a Likert interval of one, thereby reducing its value. This concern was caused almost exclusively through use of a 5-point Likert Scale and would likely have been reduced if the Likert Scale format utilised a greater number of intervals. Nonetheless, the mean generally reflected the same swing towards agreement or disagreement as the mode and median and did not in any circumstances countermand it by obtaining a score that was of a different polarity.

The Likert Scale in this study used the phrase ‘neither agree nor disagree’ but each respondent may have perceived the meaning of this phrase differently. There is a risk that some may have seen this either as a neutral option, an opt-out, a declaration of indecision, an act of ambivalence or alternatively some level of apathy. These feelings are all different and have been reported to vary by context and the level of perceived controversy (Edwards & Smith, 2014). Other studies of potential technologically-based doping sought to remove the neutral option entirely to force an opinion (Dyer et al., 2020) but the Edwards & Smith study (Edwards & Smith, 2014) proposed that this approach may not resolve this issue and could lead to false reporting. As a result, results on items six and seven likely require some caution in any interpretation. Either way, it was interesting that the respondents in the main had a view that was predominantly neutral regarding items six and seven. It may be that the relatively recent creation of virtual cycling or only the relatively recent surge in participation has meant that relatively few cases of cheating or dishonesty have taken place in competition thus far to raise awareness or importance of issues regarding the medias behaviour regarding online Esport fraud. It may take more instances of Esport deception or fraud before this is the case. For example, the discourse surrounding Esport cheating is a relatively recent line of

research inquiry (Johri, 2020; Conray et al., 2021; Johnson & Abarbanel, 2022) and so could be concluded is in a state of relative infancy. However, some level of awareness must exist as the widespread agreement with item eight was that weight e-doping is an unavoidable part of online e-cycling competition. This was the only PEAS statement in this study that the respondents agree with by majority.

The overall results revealed that the participants broadly disagreed with the statements offered in items 1-5 and 9-12. The common inference of all of those item statements suggest the general unacceptability of intentional avatar-based weight manipulation. For example, the respondents disagreed that this manipulation would be fundamentally beneficial for the sport and would not provide additional motivation to train or compete in it. Furthermore, the respondents did not feel it should be used as a means to make up for lost time or due to injury or were ever pressured to lie or exaggerate their avatars weight. However, these results do not concern accidental or incorrectly entered avatar weights nor if the cyclists weight has changed without their awareness. It would be interesting to identify if there would be an emotional response on the part of someone who discovered this about their avatar. For example, the use of banned performance substances has been shown to generate feelings of guilt and that response could help regulate an athlete's behaviour in sport in the future (Ring et al., 2019). The importance of guilt as a tool for change could start to be inferred in this study from the results of item four whereby the majority of respondents disagreed that they should not feel guilty about breaking any rules when entering an incorrect weight. Furthermore, whilst the participants seemed to infer that the act of avatar weight manipulation is undesirable or not necessary, it would be interesting to know whether the same respondents would be willing to disclose whether they have ever realised their avatars weight was incorrect or intentionally lied about their own avatars weight. The ability to self-report or self-disclose illicit practises

such as doping has been proposed as problematic (Petróczi et al., 2008) so the experiment design to obtain such candid honesty, whilst highly valuable, would need to be carefully considered.

Respondents also disagreed that they were pressured to lie or exaggerate about their avatars weight. This would fall under the conditions to be defined as coercion (Dyer, 2015). This has been proposed as an issue in the use of sports technologies before (Dyer, 2015) so this result was interesting because it therefore differs from that of other forms of sports technology. It is possible that since such cycling apps are not always being used for competitive purposes that the level of influence is lower, only focuses on a sub-group who choose to compete or alternatively that the degree of anonymity that online Esport can provide reduces any threat of coercion.

Item 2 produced a result that produced a potentially contradictory outcome. This item asked whether a participant felt it necessary to manipulate an avatars weight to be competitive. The majority of the respondents disagreed with this statement but the ability for a cyclist to change their power to weight would improve the avatars ability to ascend gradients such as simulated hills and mountains when in apps such as Zwift (Dyer, 2020). This result could suggest that respondents either feel that their competitors or the sport itself is generally honest about avatar weights or that competition in such apps is not their main reason for virtual cycling. This would not be known without further exploration and enquiry. Nonetheless, it cannot be disputed that lowering their avatars weight would make them more competitive if they wished to.

Whilst none of the items asked the participants directly whether they felt the act of avatar weight manipulation could be labelled as cheating, there are such inferences that can be drawn from these results. For example, item four saw the respondents disagree that athletes should not feel guilty about avatar weight manipulation and also disagreed that it wasn't cheating since everyone did it. They also saw it as a different issue to conventional performance enhancement (item 12) which suggests that digitally-based performance enhancement is perceived as fundamentally different in ethos to those made in reality. It is conceded though that disagreement of any statement does not mean that respondents agree with the opposite or its inverse but both of these items and the qualitative comments made at the end of the questionnaire generally infer this to be the case. Furthermore, whilst it could be asked whether participants care about the weight doping issue at all, the evidence in this study suggests that some level of ethical conduct is important to them when the majority disagreed with statement 11 that stated that only the quality of performance should matter, not how they achieved it. These issues were highlighted again in the qualitative data. Given the inference from the participation that some level of ethical consideration is of value with respect to weight doping, recent research has been justified in consistently highlighting specifically the issue of weight manipulation as a concern (Bjärehed & Bjärehed, 2023; Richardson et al. 2022; Thorne, 2022; Dyer, 2020).

Overall, there was no evidence to suggest that the respondents supported the use of avatar weight manipulation in any way, in any form or for any mitigating context from the statements offered in this study. It is conceded that the proportion of the respondents that selected the neutral option could have suggested some level of disinterest or apathy about it. However, in the majority, it is therefore proposed that the act of avatar weight manipulation should be treated as an illicit, deceptive or wholly negative practise as has been reported with

the use of other technologies such as performance enhancing drugs (Caitlin & Murray, 1996) or the illegal manipulation of sports technology (Dyer, 2015). With this in mind, virtual cycling applications should seek to implement the means to remind a user to keep such information upto date in all types of virtual cycling rides and/or to verify the weight of a rider.

Qualitative analysis

A key finding identified from the qualitative data was that for many respondents there was some acceptance that weight e-doping is less severe than using PEDs as in comparison it caused no physical harm, there were no health risks, and there was no cost. Further justifications were that it could be accidental (e.g. the unintended insertion of an incorrect weight or not updating weight frequently) and it was not illegal and unlikely to be caught so was deemed low risk. Respondents with this view also gave justifications that it was a way to race with friends in a specific weight category or that it was OK if it only took place in social racing. In summary, these comments indicated an acceptance that weight e-doping was common, or the norm, and it can be linked to the psychological social norms theory (Perkins, 1986). This theory proposes that individual's behaviour is influenced by misperceptions of how they think others in a community are thinking or acting. Therefore, if individuals in the cycling community overestimate the incidence of weight-doping this can cause the individuals to increase their own problem behaviour or believe that it is OK. Social norms theory is often used as a behaviour change strategy (Dempsey, McAlaney & Bewick, 2018), whereby underestimating a problem behaviour in a community could discourage individuals from engaging in the problematic behaviour and in such cases a behaviour change strategy would involve highlighting the inaccuracy of that norm. So in the context of e-doping, if the

app or an applicable governing body corrected misperceptions it could result in a decrease in the problematic behaviour of weight e-doping.

In contrast to the above, another set of respondents indicated strong emotional responses towards weight-doping and used words like immoral, dishonest and unethical and indicated that weight-doping was the same as cheating using PEDs. It was interesting that unlike respondents who thought weight-doping was risk-free, these respondents identified the psychological and health impacts that could develop as a result of focussing on a lower weight, such as eating disorders. Some also indicated strong punishment for those caught, such as being excluded and ridiculed. It is not healthy to have this level of negative emotion and distrust within a sporting community. We suggest that it would be helpful if these findings are used by the app or applicable governing body to communicate with its participant community of why weight-doping should not be tolerated.

Many of our respondents highlighted the difficulties in prevention and also suggested many novel ideas. For example, a creative response was, "A focus on finding solutions like athlete agreements and ebiopassport (transparency) profiles should be more the focus as a prevention/intervention strategy". The suggestions made by our respondents could be considered by the app developer or governing body in making changes by considering and reviewing the prevention methods and the potential sanctions that could be imposed.

A number of respondents included comments that could be interpreted as them reflecting on why e-cyclists were motivated to cheat. For example, comments related to individuals cheating themselves which is related to enhancing self-esteem or that cheating could be motivated by a competitive advantage arising from a need to compare themselves with others.

This relates to the work by Lee, Jeong, Lee & Kim (2021) who researched why people playing online games were motivated to cheat, finding that there were three main factors, boosting self-esteem, being competitive and a tendency to be aggressive. While our research did not aim to address motivations to cheat in e-cycling, further research to explore this would be helpful.

Limitations and Future Research Directions

An important limitation of this research is that participants were recruited via opting in to undertake the survey. As a result, the results are a product of whatever proportions of different age groups or genders that chose to partake. It could not be guaranteed that if such proportions changed whether any results would then also change. However, due to the consistency of the results in this study, there is no indication that this would be the case. It is also conceded that due to the relative infancy of Esports that this study should be seen as a 'snapshot' in time and that the views and perceptions could also change at a given point in the future. It is also conceded that the PEAS questionnaire did not account for the different situations or contexts that users of cycling apps may opt for. These could range from training or racing to a confounding occurrence of training when in a race or opting to race others when in training sessions. Because these permutations are wide ranging and contextual, more in-depth interviews with such users could yield more data in this respect.

It should be noted that the expression 'weight doping' was not formally defined to the participants before undertaking the survey. This colloquial phrase was assumed to be well known to participants of cycling Esports. However, given that the views on this topic have now been clarified by the participants here, future work should now attempt to ascertain how many such participants are pro-actively artificially changing their avatars body weight to

therefore ascertain the scale of such deception. Furthermore, it would be interesting to note if there are any differences in moral reasoning and ethical perceptions based upon age and gender. Whilst both aspects were recorded in the raw data in this study, the disproportionate number of participants in some groups made further analysis too superficial for further analysis.

The qualitative data collected in this study mainly involved brief responses, and while the quantity was large in terms of the number of responses, the quality was often lacking. Future research would collect data using individual interviews to gain a deeper understanding that would address perceptions of both personal expereinces and thoughts about motivations of others to cheat in e-cycling. In-depth data such as this would be analysed using thematic analysis (Clarke & Branu, 2021) to gain an understanding of the lived experiences of those cheating as well as individuals experiencing other's cheating.

Conclusion

An adaptation of the Performance Enhancement Attitude Scale in the form of an online questionnaire was created to assess the users of online cycling apps with respect to their perceptions of any intentional avatar weight manipulation in online cycling Esport apps. A 5-point Likert Scale was applied to 12 statements and 638 responses to the questionnaire were received. The respondent's disagreed with 9 of the 12 item statements thereby suggesting that they saw no value to the practise under any circumstances. The results of the qualitative analysis provided extra insight regarding cyclist's thoughts and emotions towards weight e-doping and also provide some indication of it occurring in e-cycling. The results of the PEAS questionnaire and the content analysis support that the act of avatar weight manipulation in cycling Esport sees similar results, feedback and undesirability to other forms of sporting

fraud such as the use of performance enhancing drugs. It is therefore proposed that the act of avatar weight manipulation should be treated as an illicit, deceptive or wholly negative practise and that virtual cycling organisations should communicate with its participant community of why weight-doping should not be tolerated and advertise potential sanctions.

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