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Trouble in Watopia: Negotiating Community Wellbeing and Cheating in Zwift eSports Cycling

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Abstract

This article examines *Zwift* (2015), a massively multiplayer online game that uses an indoor trainer to connect one's bicycle to a virtual world. Using the trainer's various sensors, the game translates speed, cadence, and power data into the movement of the user's in-game avatar. One of *Zwift*'s most popular features are its competitive races that allow cyclists to compete against others at recreational and elite levels. As in any multiplayer game, cheating has become a concern on the platform. Much of the discussion around cheating has focused on "weight-doping," whereby an individual manipulates their weight to gain an advantage over other racers. While virtual "weigh-ins" have been implemented to curb cheating at the elite level, these have proven to be controversial and potentially harmful to racers. Drawing on studies of cheating in games, this article examines the mechanics of *Zwift* that give rise to "weight-doping" to understand the risks and potential harm of its current anti-cheat measures and their relation to self-tracking and gamification.

Keywords: cycling; Zwift; e-sports; cheating; self-tracking; gamification

1. Introduction

In the mid-2000s, sites like MapMyRide and Strava introduced recreational cyclists to self-tracking and the gamification of their sport. The mediatization of cycling has continued to intensify, particularly as cycling moved indoors and onto our screens through exer-games and other fitness platforms (e.g., Apple Fitness+, Peloton). In the beginning, Strava gave recreational cyclists the ability to map their rides, which created a record of the distance, time elapsed, elevation, and speed of their activities. Strava would become notable for its additional self-tracking measures that included estimates for calories burned, "fitness" and "freshness," training load, and, if the user provides heart rate data, the "relative effort" of one's activity (formerly known as a "suffer score"). Foremost, however, Strava is best known for gamifying outdoor cycling by creating a digital overlay on the real-world that allows cyclists to compete on local roads for the fastest times on user-designated road segments, earning the fastest cyclists the title of "King" or "Queen of the Mountain." Strava's most recent update adds the title of "Local Legend," for those with the greatest number of attempts on a particular segment. What

Strava has done for outdoor cycling, *Zwift* (2015) has brought to its virtual worlds and the gamification of indoor cycling. *Zwift* is a massively multiplayer online game that features a number of virtual worlds in which cyclists can ride and race by connecting their bicycle to the game using an indoor trainer or "smart bike." Drawing on data from the trainer's sensors, the game relies on a complex calculation of one's height, weight, and power to determine the speed of one's in-game avatar, which fluctuates based on incline and terrain. Like Strava's digital augmentation of the real world, *Zwift*'s virtual worlds also consist of real-time results for its numerous sprints and climb segments (which can optionally also be synched to a user's Strava account).

While gamification of exercise is often viewed as enjoyable and motivating, the gamification of cycling has been met with criticism for both compromising the safety of cyclists and for substituting the intrinsic value of cycling with chasing virtual achievements and self-optimization (Rey, 2015; Tiessen, 2014). The metrics required by *Zwift* to accurately render one's physical movement within the game requires data not typically recorded by most outdoor recreational cyclists, thereby giving these cyclists a new influx of metrics by which to dissect their performance. This data, however, is also available for public scrutiny on its partner site, ZwiftPower.com, that shares race results. Unsurprisingly, the visibility of this data has led to accusations of cheating, as users compare data and speculate, sometimes rightly so, about others gaining an unfair advantage in competitive events. To curb cheating, *Zwift* has implemented numerous anti-cheat measures designed to reduce "weight-doping" by flagging unusual results, adding a "cone of shame" to sandbaggers (those riding below their proper category), and requiring athletes to submit weigh-in videos prior to participating in elite race events, such as their partnership with the Tour de France and WTRL (World Tactical Racing League)'s *Zwift* Racing League's (ZRL) premier division. Weigh-ins have been at the centre of debate about cheating on the platform, as they are viewed as both a necessary defence against weight-doping and a harmful practice that encourages disordered eating (Lethbridge, 2022; Schwenker, 2021). Although prerace weigh-ins are only required at the highest level, cyclists of all levels must enter their weight for the game to calculate their avatar's movement. As a result, even cyclists participating in any competitive recreational events are acutely aware of the role that weight plays in the game's physics.

By critically examining the game's mechanics, I offer insight into *Zwift*'s gameplay and the regulations that govern its competitive events and argue that attention to rider weight in the interest of creating realism is potentially harmful and neglects the many other strategies used by cyclists to manipulate its system. The game's dynamics and the mediation of users' data intensifies concerns related to self-tracking and self-optimization (Lupton 2016; Neff and Nafus 2016) and draws unhealthy attention to weight in a weight-sensitive sport where power and skill should be key. In order to understand the dynamics of its weight mechanics, it is imperative to examine its gameplay in depth to provide important context for cyclists' experience of the game. Ultimately, the game's emphasis on weight and use of weigh-ins are urgently in need of further study.

2. Welcome to Watopia

Zwift is self-described as an app that "blends the fun of video games with the intensity of serious training" (Zwift n.d.). Available on PC and mobile platforms, *Zwift* is a massively multiplayer online game that offers cyclists a number of virtual worlds to explore including their entirely fictitious Watopia (which features a volcano, towns, deserts, jungles, mountains, and a prehistoric area with roaming dinosaurs) and worlds built on real locations with varying degrees of realism, including London, New York, France, Richmond, Innsbruck, Yorkshire, and Makuri Islands (inspired by Tokyo and its surrounding countryside). While *Zwift* is often referenced as a training program (Westmattelmann *et al.*, 2021), this is only one of several modes available on the platform, as cyclists can also choose to freely explore its virtual roads, complete an individual workout, ride with pace bots, or participate in one of its many public events, including social rides, group workouts, and a range of competitive races (including classic races, criteriums, time trials, chase races, or league series).

The diverse activities and game mechanics available to cyclists situates *Zwift* in a category similar to other exer-games like Nintendo's *Ring Fit Adventure* (2019), *Switch Sports* (2022), or *Wii Sports* (2011), rather than virtual or sports simulation training experiences. While *Zwift* aims for realism in some respects, its aesthetics and mechanics are inspired by video games. The game is most realistic in its calculation of the cyclist's speed that draws on one's height, weight, and power data. In flat areas of its virtual roads, the game largely relies on power data (watts) to determine the avatar's speed, while height and weight are used to simulate drag and drafting mechanics that allow cyclists to maintain the same speed while producing less power when riding directly behind others. Climbing hills and mountains, however, shifts to a watts/kilogram (w/kg) measurement that gives lighter cyclists an advantage on ascents. Inversely, on descents, heavier cyclists descend more quickly. These advantages, however, can be mitigated by a number of tactics. Choosing the most effective bike for the route can give cyclists an advantage. Each bike frame and wheelset has its strengths, as some are lighter or more aerodynamic, while some are designed for particular types of terrain (e.g., gravel and mountain bikes). Diverting from these efforts to realistically simulate outdoor physics, *Zwift* also offers power-ups reminiscent of those found in Nintendo's *Mario Kart* games. Rather than turtle shells and bananas, however, *Zwift*'s power-ups temporarily increase or decrease cyclists' weight, alter draft dynamics (benefiting cyclists or removing draft for others), grant invisibility, and flatten rough terrain.

In addition to its overt game mechanics, *Zwift* also utilizes gamification to keep cyclists engaged and committed to regularly returning to its virtual worlds. Examples of gamification include experience points, levels, in-game currency, and achievements and badges. Cyclists may receive "bonus" power-ups that give them additional experience points (XP), which are used to increase the cyclist's level. While levels in video games typically denote a player's skill level, in *Zwift*, a cyclist's level is indicative of their time spent on the platform, as unlike most video games, a cyclist's performance will rapidly deteriorate with time away from cycling. XP are accumulated at a rate of 20 XP for each kilometre cycled, and on occasion, *Zwift* has hosted events that offer double XP. Reaching particular levels also unlocks aesthetic modifications for

one's avatar (including head gear, glasses, jerseys, gloves, socks, and shoes). While riding, cyclists will also simultaneously earn in-game currency referred to as "drops" (i.e., sweat drops), which accumulate at an increased rate while climbing. Drops can be spent at the "Drop Shop" to purchase additional frames and wheels that offer weight and aero advantages over other bike configurations — though some options require that players reach a specified level before being available for purchase. Finally, *Zwift* currently includes more than 170 badges and achievements for completing courses and missions, giving other cyclists "ride ons," and hitting an increasingly high number of watts.

These gamification elements are used to motivate cyclists to reach goals and to increase their investment in the game. The use of gamification, however, has been met with criticism (Rey, 2015). Writing about the neoliberal applications of gamification, PJ Rey argues that "gamification is meant to re-enchant production and consumption by making them more playful" (2015, p. 291). In *Zwift*, gamification aims not only to keep players from drifting to competitors (such as cycling simulation platforms like ROUVY and Wahoo SYSTM, formerly RGT, or fitness platforms like Apple Fitness+ and Peloton), but also to ensure that cyclists continue paying subscription fees and regularly return to populate its world and events; after all, a race needs other racers. Central to any massively multiplayer online game is a dedicated fanbase and growth. Without an influx of new players, new events, and continued development of the game world, the game will become stagnant and interest will be lost. *Zwift* experienced strong growth as a result of the COVID-19 pandemic that closed gyms and at times restricted outdoor movement, and there is no doubt that its developers are invested in maintaining and growing its userbase. While the precise number of users is unavailable, the company's co-founder and CEO, Eric Min, stated in 2021 that they had over three million accounts (Reed, 2021).

Beyond its Rey's neoliberal context, however, gamification is also critiqued for manipulating the motivations behind our activities. In "Gamed Agencies," Matthew Tiessen begins by imagining a world dominated by gamification; this, he argues, "is a digitally and visually mediated world in which intrinsic values aren't quite valuable, profitable or affectively desirable enough and so are overcoded and re-coded by icons, graphs, statistics, points, and badges, all in pursuit of access, privileges, productivity, prestige, and feelings of satisfaction. This is a world in which the awarding, redeeming, gifting, and trading of credits, digital achievements, and virtual trophies has become an end in itself" (Tiessen, 2014, p. 252). For cyclists who are thoroughly embedded in the world of apps that mediate cycling, this future is now. While Strava and *Zwift* have been discussed thus far, it is important to recognize that for many these are but two among a constellation of other applications that users rely on to triangulate their data. Examples of other sources that may be consulted concerning any single activity include Apple Health, Garmin Connect, Zwift Power, Intervals.icu, AI Endurance, Strava, TrainingPeaks, Today's Plan, and WTRL race results. While one would not likely make use of all of these sources simultaneously, reviewing three or four of these sources of data would not be unusual for those who regularly participate in races.

In addition to participating in individual race events, *Zwift* also hosts leagues where cyclists can join teams to compete in weekly race series. Arguably one of the most popular of such

organized events, and the focus of this article, is WTRL's *Zwift* Racing League, which hosts several seasons each year with over 15,000 global participants across 1800 teams (WTRL, n.d., "About"). Facilitating team events is an excellent strategy for maintaining and growing its userbase, as teams help to keep players engaged by adding a social component, which creates an obligation to others to ensure one's team is able to participate in its events. The introduction of teams has also been central to *Zwift*'s movement into esports and increased interest in serious competition and legitimizing the sport. Much like other popular esports, WTRL's Zwift Racing League (ZRL) events are lived-streamed with accompanying sports commentary by varying commentators across regions. Central to this shift to esports, however, has been responding to concerns about in-game cheating.

Racer categories on *Zwift* are currently determined based on one's w/kg and FTP over a 20-minute effort (see Figure 1). FTP (or functional threshold power) is used to estimate a cyclist's one-hour power. This, in combination with one's w/kg is intended to keep categories competitive across climbs and descents (as lighter cyclists will have a significant advantage on climbing hills). Nevertheless, as many cyclists have experienced, the balancing of these categories is not always fair, as lighter cyclists may end up in events with heavier cyclists based on w/kg, but are unable to match the power output of heavier cyclists on flat and rolling sections of courses that dominate most race events. Consider for example two Mixed B division racers with the same 3.3 w/kg ranking: a 65kg racer with an FTP of 215 watts and an 80kg racer with an FTP of 264 watts.

	Men's/Mixed Divisions		**Women's Divisions**
A+	**4.6**wkg and **300**w FTP		
A	**4.0**wkg and **250**w FTP	**A**	**3.7**wkg
B	**3.2**wkg and **200**w FTP	**B**	**3.2**wkg
C	**2.5**wkg and **150**w FTP	**C**	**2.5**wkg
D	less than **2.49wkg** FTP	**D**	less than **2.49**wkg FTP

Figure 1: race category divisions for men and women participating in WTRL's Zwift Racing League.

In a relatively flat race, where the game's physics rely predominately on one's watt output, the 80kg racer will have a significant advantage by being able to maintain a higher number of watts. If the 65kg racer were able to match the power of the 80kg rider over a 20-minute period, they would be disqualified and moved up to Division A, as their w/kg output would be 4.06 (264 watts/65kg) which exceeds the B Division category limits. For the lighter racer, this means that it would be difficult to be competitive in the B Division, as mountain stages are extremely rare. The significant differences in weight across racers exacerbates these effects and can result in the

feeling that races are unfair. Following any race, users can visit Zwift Power to review race results and examine each competitor's data, including power, weight, heart rate, and w/kg across various time increments (e.g., 20m, 5m, 1m, 30s, 15s). The ability for users to review their competitor's data, however, has led to speculation and accusations of cheating (which are often shared and discussed in Zwift related groups on social media sites). Users may speculate about particularly low weights, or opportune changes to weight that allow a racer to "sandbag:" entering an increase in weight results in a lower w/kg, which can be used to prevent racers from moving up to a higher category. The ability to view this data is intended to keep users honest and to enforce rules through community policing; users may, for instance, report suspicious data or activities to Zwift or WTRL race control.

3. Cheating

When individuals speak about cheating in *Zwift*, it is very often in the context of competitive racing (McIlroy, 2021, Richardson *et al.*, 2022, Westmattelmann, 2021). Richardson *et al.* (2022), in particular, offer a thorough account of cheating in *Zwift* racing and identify several forms of cheating, including height and/or weight doping, gender doping, use of banned substances, sandbagging, unusual pedalling styles, and power and controller manipulation (pp. 5-7). Such conversations, however, do not fully capture the act of cheating on the platform, nor the nuances of the term itself. In her examination of cheating in video games, Mia Consalvo surveys players' experiences and reveals that what was considered to be cheating by players is quite varied; as she writes, "[f]rom the purist to the purely social, cheating ranged from anything outside 'one's own thoughts' in a single-player game to activities that had to make other players worse off" (103). Cheating is a continuum, rather than a clearly defined activity. For the purist, relying on outside information, such as a friend or paratexts (e.g., walkthroughs, guides, or manuals) constitute cheating. In the middle ground are those that view any subversion of the rules as cheating; for instance, the use of cheat codes, hacks, or exploits. Finally, there are those that hold the more commonly shared belief that cheating is about gaining an advantage over others, and therefore can only truly take place in multiplayer games; that is, when the cheater seeks "to gain advantage and progress further (or win) in the game" (109).

Each of these forms of cheating serves a quite different purpose. For some cheating is simply a means to progress the game when one becomes stuck — one might turn to a friend or Google in order to continue making progress in a challenging game. Some may experiment with cheat codes or exploits to test the limits of the game. There are also the triflers (Wark, 2007, p. 040), those who "recognize rules but not goals" (Suits, 1978, p.47), and the metagamers (Boluk and LeMieux, 2017), who subvert the game's rules to make a new game. For these players, cheating is not simply about breaking rules or trying to win; by changing the rules, cheating changes the game: it makes a new game. Yet, there are also, of course, the traditional cheaters who recognize the goal of the game, but not its rules (Suits, 1978, p.47), and the more malicious players at the opposite end of the continuum, which includes spoilsports and those who engage in "grief play." That is, those who recognize neither the rules nor the goals, but instead participate in a kind of dark play (Sicart, 2015), often disrupting the enjoyment of the game for others.

4. Responses to Cheating

In *Zwift*, we find all forms of "cheaters" (depending on where your values fall on this continuum). For those looking for assistance, there are a whole host of paratextual resources available to assist with understanding the game's mechanics, optimal in-game purchases, and strategies for particular routes (e.g., bike choice and timing for using power-ups). Many also discover or learn about various hacks and exploits that exist in the game, or emerge from complications with one's trainer setup. For instance, a player might exploit a flaw in the trainer to cause momentary spikes in power that earn them a badge for hitting 1200 watts, which would have otherwise been well beyond their normal output. Richardson *et al.* describe another exploit related to an unusual pedalling style, whereby cyclists take advantage of a trainer's three-second power average by pedalling in bursts that are read as a greater power output. For some race events, an algorithm is used to detect and disqualify the use of this strategy.

Hacks are also occasionally used in *Zwift*, whereby a user manipulates the game's code or data. In 2019, a cyclist used a bot to unlock the Zwift Concept Z1 bike (colloquially known as the "tron" bike owing to its colourfully illuminated frame). While time consuming to acquire, as it is only earned by cumulatively climbing 50,000m, it is hardly an uncommon bike to see in the worlds of *Zwift*. Compared to other bikes in the game, it is considered one of the strongest all-rounder bikes. This particular cyclist, however, had used a hack to unlock the bike to use while participating in the 2019 British Cycling eRacing Championships. When the act was discovered, the cyclist was fined, suspended for 6 months, and had his title revoked (British Cycling, 2019; Rogers, 2019). British Cycling publicly stated that doing so had given the cyclist an unfair advantage. While the cyclist's method of acquiring the bike may have been dishonest, it is difficult to claim that it gave an unfair advantage. They were not the only cyclists using this Concept Z1, and others may have chosen alternate bikes as a result of sponsorship requirements (much like in professional outdoor races, which notably also produces unfair advantages). Certainly, this act concerns integrity and unsporting behaviour, but ultimately, it raises questions about the game's design; for instance, offering more equitable bike selection for elite events.

More blatant cheating through the use of hacks and data manipulation have also been raised at elite events, and those who participate in such events are regulated by more strict rules and regulations than those at the recreational level. The Zwift Accuracy and Data Analysis (ZADA), which parallels professional cycling's WADA (World Anti-Doping Agency), was created to regulate elite events, including WTRL's Zwift Racing Premier League. Though there are shared rules between elite and recreational racing, the two most significant differences are regulations that require elite cyclists to provide two sources of data for power output (e.g., using both a trainer and power pedals to record power data) and to conduct a video weigh-in prior to the race. In attempts to undermine these regulations, there have been occasions where elite racers have falsified power output data by uploading and altering files before submitting them to *Zwift* (see details on Zwift Performance Verification Board Decisions for cases 2021-01, 2021-02, and 2020-09 under "Zwift Cycling Esports Rules"). Such actions constitute more clear examples of

cheating as they both violate rules and give an advantage to the racer. Although *Zwift* has been relatively successful in identifying falsified data, its regulation of weight-doping (the manipulation of a racer's weight), however, has been met with significant controversy. The following sections will examine the challenges associated with weight-doping in eRacing at both the elite and recreational racing.

4.1 Elite Racing

In weight-sensitive sports, weigh-ins are often seen as a kind of necessary evil. They are imperative to the fairness and accuracy of competition, but are often a point of stress, as many competitors engage in unhealthy behaviours in order to have an optimal weigh-in. For this reason, there has been much debate and consideration of weigh-ins and disordered eating practices. In combat sports, weigh-ins are used to create weight-classes that ensure that competitors are matched appropriately to ensure a fair fight and to avoid endangering competitors. In *Zwift*, weight is a component of categorization (w/kg), but categories are not divided by weight. As a result, two racers can have drastically different weights, but compete in the same division. Lighter riders, however, typically have an advantage over heavier riders. In an article for *Zwift Insider*, Eric Schlange provides a detailed analysis of the effect of weight on climbs, flats, and descents. While maintaining the same power, Schlange found that "reducing your body weight by 1kg will save you ~9 seconds over an hour-long flat race" (Schlange, 2020, "How Rider Weight"). With the exception of an individual time trial, this effect is complicated by drafting, power-ups, and the group dynamics of the peloton, but it is nevertheless unsurprising that riders strive to decrease weight to increase performance. Some racers have even used an exploit in the program that allowed one to manipulate one's weight mid-race to advantageously optimize one's weight for climbs and descents. The discovery of this exploit caused quite a controversy in the community (Schlange, 2022, "The Story of #FreeLuciano"). Falsifying one's weight data can have a significant impact on one's performance, and for this reason, weight-doping is one of the most pervasive forms of cheating in *Zwift*. The use of video weigh-ins as a countermeasure, however, is not tenable at the recreational level (and, as I will argue, inadvisable). Elite racers are required to record and upload a weigh-in video "within two hours of the event start and [be] submitted to Zwift at least one hour before the event start" ("Cycling Esports Rules and Regulations version 1.0.8," 2022). There are also very specific requirements for how the video must be filmed to prevent tampering. While weigh-ins are not an uncommon practice in weight-sensitive sports, there have been criticism of the weigh-in regulations for *Zwift* races. Foremost, concerns have been raised regarding the timing of weigh-ins, which were shifted from 24 hours to one hour prior to race start times. In March of 2022, Alice Lethbridge, a professional road cyclist, wrote a letter reflecting on her experience of the weigh-in process and its potential to encourage disordered eating behaviours. As Lethbridge explains, "The Zwift algorithms where riders are penalized for every extra cm in height and every kg of weight had pushed me over the edge as I sought to raise my level of performance to try and help my team win the title. . . . I realized that being faced with weekly weigh-ins, where every registered user of zwift power would be able to see if I'd gained weight that week, had led

me to slip back into the disordered eating habits I thought I'd put behind me" (2022). Here, Lethbridge reflects on the visibility of *Zwift*'s weight data, but her letter also comments on the shift from the 24-hour to one hour prerace weigh-in time for recording and uploading videos and expresses a preference for the 24 hour allowance, as it permits her to do a fasted weigh-in in the morning and allow for normal eating throughout the day to fuel for the race. A one-hour time restriction, she argues, at worst, encourages cyclists to restrict eating and drinking to achieve an optimal weigh-in, and, at best, makes cyclists particularly conscious of their eating behaviours. This is particularly dangerous given King and Hall's study of indoor cyclists that found that they are not fuelling properly; as they write, "cyclists conducting training sessions using indoor means do not meet sports nutrition guidelines for CHO intake pre, during or post-ride" (2021, pp. 1211-1212). Although outdoor professional cycling does not typically require weigh-ins, it is a weight-sensitive sport and research has noted that there is a prevalence of disordered eating among its athletes (Muros, 2020; Riebl, 2007). In the context of these studies, the timing of *Zwift*'s weigh-in is particularly troubling given that typical ZRL race times begin in the late afternoon or evening (e.g., 7:20 pm ET), and may fall even later depending on one's own time zone; therefore, elite cyclists may be influenced to restrict eating for much of the day.

In his three-part series, "Extreme Dieting in Virtual Cycling," Christopher Schwenker (2021) provides a thorough overview of the research on disordered eating in professional cycling and provides recommendations for *Zwift*'s virtual races. Unlike Lethbridge, however, Schwenker argues against a 24-hour weigh-in period. As he notes, "[a] weigh-in time of not more than two hours prior to competition should be implemented. By doing so, the possibility for an athlete to exhibit the extreme dieting behavior of calorie and fluid restriction prior to weigh-in followed by binging, similar to a bulimic, will be prevented and avoided. This is not the case when weigh-in is permitted 24 hours prior to the event" (part 3). This statement, however, directly conflicts with Lethbridge's experience participating in the Premier League. Reflecting on the weigh-in change to the two-hour time period, Lethbridge writes that, "[w]hat saddens me the most is that a rule change that didn't need to happen, and hasn't seen anyone change their weight to counteract the huge amounts Zwift claimed the 24-hour 'cut' was enabling, has caused a lot of stress and unhappiness and forced talented riders away from elite racing" (Lethbridge, 2022).

Based on the sources that Schwenker provided, his perspective appears to be informed by existing research on weigh-ins required in other sports. However, much of this research currently concerns combat-sports, such as wrestling, and it is well-known that these athletes can undergo significant weight changes prior to their weigh-in if timing allows (Barley, 2018; Oppliger *et al.*, 1993). The concern about the 24-hour weigh-in arises out of consideration of sports that allow significant recovery time between weigh-in and the event; as Burke *et al.* (2021) explain, "some sports (e.g., professional boxing and MMA) offer substantial recovery time (up to 32 h) between the weigh-in and event, with almost unlimited opportunities for pre-event fluid and food intake. While such sports allow the athlete to be well-fueled and hydrated prior to competition, these conditions support a culture of extreme BM manipulation." After the deaths of three competitors as a result of drastic weight cutting, many events moved the

weigh-in time closer to the event start time (Oppliger *et al.*, 2003, p. 30). For combat sports, it is clear why regulation changes are needed to discourage disordered eating behaviours. It is, however, not clear that the recommendations used for combat sports are a benefit to cycling given the differences in the structure of events and supports available to athletes.

Unlike combat sports that are often brief and typically involve infrequent events that take place over an evening or several day tournaments, ZRL races are often 1-2 hours in duration and are held once a week over 8-10 week seasons several times a year. The format of ZRL, as suggested by Lethbridge, does not lend itself to the same disordered eating practices as combat sports. A one-hour pre-race weigh-in makes sense in a context where athletes may attempt to reduce weight over a 5-7 day period (Brechney *et al.* 2021), particularly when the event holds additional weigh-ins throughout the tournament. Cyclists would likely suffer a significant decrease in performance if they were to engage in similar drastic weight cutting tactics in preparation for each weekly race (Arnold, 2020). Instead, in the context of elite racing, cyclists may instead restrict calories on race day or throughout the series. Failure to properly fuel and hydrate before intense exercise can create the conditions for a medical emergency (Oppliger *et al.*, 2003), which is especially dangerous for racers competing at home who may not be supervised.

After consideration of these views, it is clear that research is urgently needed in the specific context of virtual cycling. It is not appropriate or sufficient to adopt the weigh-in standards of another sport, particularly those with drastically different rules, structures, and conventions. It is evident that the current one-hour weigh-in is causing harm in the ZRL community, and it is imperative that *Zwift* and its race organizers aim to reduce harm until well-supported and appropriate research is available.

4.2 Recreational Racing

At the recreational level, racers are not required to provide a video weigh-in prior to race events. Although there is an explicit rule that racers must update their weight within 24 hours of the race, this rule is not enforced. WTRL's regulations further state that "[e]ach week The Board may randomly select teams from each Division to provide height and weight video per rider up to 12 hours pre and 12 hours post race" ("Rule and Regulations 2021/22 Season"); however, this regulation does not appear to be commonly invoked. It is also likely that many cyclists are not in the practice of regularly weighing themselves prior to each race, and it would hardly be surprising to learn that not all *Zwift* cyclists own a scale. While accuracy and fairness are important to the legitimacy of the sport, WTRL's lack of enforcement around weight at the recreational level is, for now, a responsible decision. Certainly, those who explicitly manipulate weight data to gain an advantage should be sanctioned (i.e., those who manipulate weight mid-race and are discovered through data analysis). However, the enforcement of weight reporting rules would be likely to bring more harm than good to the sport.

At the moment, weight-doping is largely policed by the community by reporting suspicious data or results. As Lethbridge notes in her discussion of weigh-ins, one's weight is not only noted in Zwift Power (an external site that shares race results and racer statistics), but both the highest and lowest weights are displayed in a bold red font on both the race results (across all

participants) and on each individual's own profile page. Therefore, when a racer notes an increase or decrease in historical weight, it will appear highlighted on their profile. It is no surprise that some might feel discouraged from updating their profiles as a result of this design choice. Yet, even encouraging racers to regularly weigh themselves prior to each race could lead to problematic eating behaviours (Galli, 2017; Neumark-Sztainer *et al.*, 2006). Recreational racers are also not likely to have the support of a coach to guide their training and eating behaviours (McIlroy 2021). Further still, weigh-in requirements are more likely to impact women, who experience higher incidents of disordered eating (Qian *et al.*, 2013) and are already marginalized in cycling (Jungnickel, 2018; Ryder *et al.*, 2021). The negative outcomes of the introduction of the weight-scale into the home have been well-documented (Crawford *et al.*, 2015), and the effects of the increased mediatization of the self through wearable technologies and devices is a growing area of research. The implementation of gamification and self-tracking in sports not only reconfigures and remediates the intrinsic enjoyment of the activity (Thiessen, 2014), but they become caught up in complex cultural and surveillance practices (Whitson, 2013). In *The Quantified Self*, Deborah Lupton argues that

> Underlying many accounts of self-tracking is a barely hidden discourse of morality, which takes the form of championing those who take action to improve themselves. When one adopts this kind of rationale for entrepreneurial self-optimisation and for the search for self-knowledge as a means to achieve it, one makes the implicit assumption that those people who choose not to engage in practices of selfhood or fail to engage successfully in them are in some way deficient: ignorant, lacking the appropriate drive, or wilfully self-neglecting (2016, p. 74).

Self-tracking and gamification in cycling provides a supposedly clear path to optimizing the self and that path is filled with rewards, achievements, and badges along the way. Yet, the reality is that this path is not so straightforward (especially in the midst of a global pandemic, where even a brief illness can significantly setback one's progress). It can be difficult for athletes when the digital rewards and acknowledgements of personal bests wane. Failure to meet goals is attached to complex moral and social expectations; failing to make continued improvement is perceived as a personal fault — one needs to work harder or lacks fortitude — rather than a normal part of fitness. When the path to success is intrinsically attached to one's weight by design, it is easy to see how problematic behaviours can manifest. If one's fitness is less than optimal, one's in-game performance can be improved by a reduction in weight; that is by improving the weight, rather than the watts of *Zwift*'s w/kg formula.

5. Conclusions and Recommendations

Both Lethbridge (2022) and Schwenker (2021) have made recommendations that suggest that *Zwift* should more openly discuss disordered eating and provide educational resources to their users. In his five-point plan, Schwenker states that *Zwift* should require racers to "complete an

education and instruction module delivered by health professionals with the knowledge noted above" ("Part 3"). It is understandable why this is a difficult topic for *Zwift* to raise in the community. They may, for instance, not wish to draw negative attention to the platform while trying to grow their userbase, as recommendations to require athletes to complete workshops on the subject is unappealing to new users — and, anecdotally, I am sure many of us are quite tired of the webinars and online educational workshops that were pervasive during the work from home period of the COVID-19 pandemic. However, there are other ways to address this subject. *Zwift* already hosts social community events and using these as an opportunity to host community events promoting ZRL that cover a variety of subjects on fuelling and hydration strategies (e.g., pre-race, training, and endurance ride fuelling) would likely be welcomed by cyclists of all levels. Creating a positive relationship to food and fitness is crucial to countering disordered eating behaviours, and, again, as King and Hall (2021) reveal in their study of indoor cycling and nutrition, many cyclists would benefit from learning to fuel appropriately during training and racing.

Deemphasizing the role of weight in the game would also be another important step in this process. Although *Zwift* attempts to reproduce the physics of outdoor cycling, weight is not the sole determining factor in one's speed and decreasing the reliance on weight for this calculation could help to reduce problematic weight-focused behaviours and cheating. It also appears that both *Zwift* and WTRL have been experimenting with new methods of categorizing racers that draw on more factors than w/kg, and this added complexity could be a benefit to racers across all categories. The new "Autocat" system aims to make races more competitive within categories (WTRL, n.d., "Autocat"), which will help to prevent discouraging outcomes for racers who are at a disadvantage as a result of their weight (such as explored in the earlier example of two B category racers at different weights).

Additionally, if the weight data shared with *Zwift* is not especially accurate (whether intentionally or inadvertently), its gameplay will benefit from reframing the w/kg formula. And while *Zwift* strives to offer a realistic experience, it is worth reminding its developers that it is also a game that owes at least some of its inspiration to video games like *Mario Kart*, and they might consider the ways that weight in these games always has clear pros and cons in terms of acceleration, cornering, and top-end speed. Leaning into its game influences through its mechanics, power-ups, and more diverse courses in race series might help to showcase racers' skills and strengths in a way that is not weight-specific.

In the case of elite racing, at the time of writing, there is insufficient research available to make informed recommendations on the weigh-in times for these athletes; however, surveying and listening to the community will be imperative for the safety of racers in the meantime. The current season-based structure of racing does suggest that the format requires a different approach to weigh-ins than that of shorter-term tournaments found in combat sports. As stated, combat sport events operate quite differently from cycling and should not be used as a guideline for virtual cycling. *Zwift* may not have the necessary research to make appropriate recommendations to govern weigh-ins, nor assess the prevalence of disordered eating in virtual cycling; however, they do have control over the design of the game. Modifying its mechanics and gameplay could be used to both reduce the effects of weight-doping and diminish the risks

of developing disordered eating that is associated with weight-sensitive sports. In "MDA: A Formal Approach to Game Design and Game Research," Hunicke et al. argue for moving away from feature-based game development to experience-driven design (2). It is too easy to see realism as the optimal goal of design, but what draws cyclists to *Zwift*, rather than its competitors or other fitness platforms, is the inspiration it takes from video games. As Galloway argues, "[r]ealisticness is important, to be sure, but the more realisticness takes hold in gaming, the more removed from gaming it actually becomes, relegated instead to simulation or modeling" (2006, p. 73). Rather than aspiring to create a realistic cycling experience and model the real world in a virtual one, *Zwift* should strive to embrace what games do best: imagine new and better worlds.

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