Narrative Review Article

An Economic Review of Cheating in Competitive Swimming: Incentives, Benefits, Strategies, and Solutions

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ABSTRACT

Cheating in competitive swimming has long challenged the integrity of the sport, raising questions about fairness, enforcement, and the motivations that drive athletes to bend or break the rules. This paper explores the different ways cheating manifests in swimming, ranging from performance-enhancing substances to more subtle violations of technical regulations. While these practices may provide short-term advantages, they undermine both the credibility of competitions and the trust athletes and spectators place in the sport. Beyond identifying the problem, this paper examines potential solutions, including stricter enforcement mechanisms, education-based prevention strategies, and innovations in testing and monitoring. By incorporating economic perspectives, the discussion highlights how rational decision-making can be influenced by both structural rules and cultural norms within the swimming community. Ultimately, the analysis suggests that effective solutions require a balance between punishment and prevention, as well as recognition of the broader economic and psychological forces at play. Through this lens, the paper not only addresses cheating in swimming but also points toward a framework that can apply to other sports where fairness and integrity remain at risk.

Keywords: Competitive swimming; Performance-enhancing drugs; False starts; Illegal turns; Sports ethics; Behavioral economics; Incentives; Anti-doping policy

INTRODUCTION

There are strong incentives to cheat in competitive swimming, and those incentives are shaped by the structure of the rules and the conditions under which they are enforced. For example, in competitive swimming, the pressure to achieve elite times and the difficulty of detecting performance-enhancing drugs during certain training periods create strong incentives for athletes to use banned substances to gain a competitive advantage (1, 2). From performance-enhancing drugs (PEDs) to intentional false starts and illegal turns, each type of rule violation is associated with a different risk versus reward. Economic theory provides a useful framework for analyzing when and why cheating is likely to occur. If swimmers face relatively low probabilities of being caught and stand to gain a significant advantage, the temptation to cheat increases (7). At the same time, if rule enforcement becomes easier or penalties become more severe, cheating becomes less attractive. This paper uses economic principles to predict when violations are most likely to occur in swimming and offers concrete proposals for deterring them. These include economic incentives, enforcement probabilities, and rule structures.

This paper focuses on three types of cheating

behavior in swimming: the use of PEDs, intentional false starts, and intentional illegal turns. Each of these is governed by strict rules. PEDs are banned entirely and are enforced through a mix of scheduled and random targeted drug testing (1, 2). False starts are defined as leaving the block before the start signal and result in immediate disqualification (5, 6). Illegal turns, such as failing to touch the wall correctly to change direction, are violations of stroke-specific technical requirements and are monitored by lane officials (15, 16). Despite these clear rules, all three behaviors are still subject to various forms of evasion or rule-breaking.

But rules by themselves alone are not enough. Their effectiveness depends on the conditions under which they are enforced. For PEDs, enforcement weakens during the off-season, when testing is less frequent and athletes can experiment with short cycles of drug use that improve performance but are designed to avoid detection by the time competition starts (7, 8). In the case of illegal turns, judges may become distracted during fast-paced heats with many simultaneous infractions, making it easier for swimmers to go unnoticed (16). False starts, though governed by technological precision, still present incentives to "push the limit" in highly competitive races—particularly when swimmers are facing equally matched opponents, and the marginal gain of a quick start can make the difference between winning and losing (5).

From this, we can derive testable predictions. If PED testing is rare in the early off-season and the benefits of even brief PED use are significant, swimmers are most likely to begin short-term PED cycles shortly after the competitive season ends (1, 7). If turn judges are most distracted during large or chaotic heats, we should expect a higher frequency of illegal turns during such events (16). And if the benefit of a fast start increases when competition is closely matched, false starts or near-false starts should occur most often in races where swimmers have similar seed times (5).

The following sections apply economic principles, focusing on incentives and risk-reward, to explain cheating in swimming. Incentives shape behavior through rewards or punishments, while risk-reward highlights that greater gains usually involve higher risks. Section I examines PED use, focusing on short-cycle doping and the conditions that enable it. Section II analyzes false starts, emphasizing competitive dynamics and the marginal value of reaction speed. Section III looks at illegal turns, showing how judging structures and race settings affect enforcement. Section IV concludes with policy recommendations, stressing that effective anti-cheating measures must anticipate when cheating is most tempting and align incentives with enforcement.

This paper examines three major forms of cheating in competitive swimming: performance-enhancing drugs (PEDs), false starts, and illegal underwater movements during turns. Although these actions differ physically, they are all driven by the same economic logic, as athletes compare the potential rewards of winning to the risk and cost of being caught. By viewing each behavior through incentives, enforcement, and expected outcomes, this paper explains how cheating can be a rational choice even when it is unethical (1, 2, 5, 6, 15, 16).

PERFORMANCE-ENHANCING DRUGS

PEDs represent one of the most significant issues in competitive swimming. The strict prohibition of PEDs is enforced through a framework coordinated by World Aquatics and the World Anti-Doping Agency (WADA), which maintains a comprehensive list of banned substances including anabolic steroids, erythropoietin (EPO), stimulants, and hormone modulators (1, 2, 7). Despite rigorous testing protocols, the incentives for swimmers to use PEDs remain substantial due to the competitive advantages they provide, and the limitations inherent in current enforcement mechanisms.

Athletes know that the chance of getting caught is low, and the numbers support this. The World Anti-Doping Agency's 2023 Testing Figures Report shows that testing increased by 12.5% from 2022 to 2023, yet only 0.80% of tests came back positive for banned substances, up only slightly from 0.77% in 2022 (1). That means fewer than 1 in 100 samples showed any violations. This makes the expected risk of getting caught feel small compared to the potential reward of doping. The report also shows that the number of blood tests increased from 25,456 in 2022 to 27,606 in 2023, but even with more advanced testing, there are still long periods, especially off-season, where athletes are less likely to be tested (1).

A key factor in PED use is how long the drugs stay detectable in the user's body. Oral steroids, like oxandrolone, are usually detectable in urine for a few weeks. Injectable steroids, like nandrolone, can remain detectable for several months. Blood tests typically detect more recent use, and hair or nail tests can reveal drug use over several months (7, 8). These differences in decay rates allow swimmers to plan PED cycles timed to clear from their system before testing, especially during periods when enforcement is less frequent (7).

At the higher levels of competitive swimming, PED testing occurs both in-competition and out-of-competition, each serving a distinct role (1). In-competition, testing begins at 11:59 p.m. the day before an event and continues throughout the meet, targeting not only medalists but also randomly selected athletes. Out-of-competition testing can take place during the competition season, and swimmers in the Registered Testing Pool must submit "whereabouts" forms so that testing authorities can locate them at any time. Testing intensity increases in the months leading up to major events such as the Olympics or World Championships (1). Recent cycles have seen athletes tested an average of 8–13 times before competition. However, despite the season-round framework, enforcement gaps may still arise during the off-season, when testing frequency tends to drop and swimmers can use PED cycles timed to clear from the body before testing resumes (7). An instance of this would be in 2008, when swimmer Jessica Hardy tested positive for a banned substance shortly after the off-season (1).

Official sources show that positive drug tests are very low, under one percent, but these likely underestimates actual use because some athletes use short cycles or masking strategies to avoid detection (1,7). Studies show that drugs like EPO, HGH, and steroids improve recovery and endurance, letting swimmers train harder and perform better (9, 10). Reports also explain how athletes can plan drug cycles around testing schedules to reduce the chance of getting caught (8). This evidence supports the idea that when testing is predictable or infrequent, the reward from doping is higher, making cheating a rational choice for some swimmers (1, 7-10).

The primary incentive for swimmers to use PEDs lies in the noticeable performance gains the drugs offer. Anabolic steroids, for example, promote muscle gains and increase recovery, which allows swimmers to increase training volume and intensity. Erythropoietin (EPO) improves oxygen delivery by raising red blood cell counts, enhancing endurance particularly in middle and long-distance events (7). Studies have shown that PED use can reduce recovery times by up to 30% and improve oxygen uptake by a good percentage. This translates into improvements in race times, sometimes in the range of several tenths of a second which is an enormous margin in a sport where a hundredth of a second can separate medalists (7).

Because of how the testing for PEDs is timed, there are large gaps in between the testing and non-testing season. This creates a window of opportunity for athletes to engage in "microdosing" or short cycles of PED use designed to maximize gains while minimizing the detection risk (7, 8).

Official statistics report positive tests in the low single digits of total tests conducted, but experts believe the true rate of PED use is higher, partially because athletes have created methods to evade detection (7, 8). Additionally, some athletes employ "designer steroids" which are chemically altered to avoid standard testing but with similar performance effects (7, 8).

Given these factors, the economic incentives for doping are the following: athletes competing at the highest levels face a lot of pressure to decrease their times and secure limited spots on national teams, professional endorsements, and high-level meet qualification. The high reward for marginal time improvements, combined with the low perceived risk of being caught, especially during periods of reduced testing, creates a strong motivation to engage in doping behaviors despite the repercussions involved (1, 2, 7).

To reduce PED-related cheating, adjusting testing protocols to close the off-season enforcement gap is essential (1, 7). Increasing the frequency and unpredictability of tests during unmonitored periods could reduce the incentive of short-term doping cycles. Furthermore, improvements in testing technology may increase the chances of detecting subtle or intermittent drug use.

INTENTIONAL FALSE STARTS

A false start in swimming occurs when a swimmer leaves the block before the official starting signal and results in immediate disqualification. The current rule, adopted internationally in the late 2000s, operates on a mostly "zero tolerance" basis (1). This means that any swimmer who creates movement prior to the start signal, even marginally, risks instant removal from the race if both the starter and the referee confirm the infraction. This rule replaced earlier formats that allowed more leniency, such as a "first false start charged to the field" approach, where strategy and gamesmanship, including deliberate early jumps, were common in pre-digital eras (2).

Intentional false starts often arise from swimmers attempting to time or predict the start signal to gain even a tiny edge. This is a strategy that can yield tenths or hundredths of a second, critically important in sprint or highly clustered races. Anecdotal evidence from former swimmers highlights this behavior: one shared that teammates would alternate false starts to "mess with

competitors" or gain a psychological edge. Similarly, some forum accounts confirm that attempting to "jump the start" by leaning forward or anticipating the signal is common, but when misjudged, simply leads to awkward falls and disqualification (3).

Intentional false starts are seen as a form of cheating because they give swimmers an unfair advantage by letting them launch off the blocks faster than those who wait for the official signal. Even if the swimmer doesn't gain much time (though the value of this time is valued more the higher the standard of the meet), the attempt itself undermines the integrity of the competition. The rules are designed to make sure that every athlete begins under the same conditions, and breaking that rule, whether successful or not, shows a deliberate attempt to bend the system in their favor.

Additionally, intentional false starts can harm other competitors who are following the rules. When one swimmer moves early, it can distract or distract off the concentration of the swimmers beside them, potentially ruining their reaction times. In this way, it does not only affect the rule-breaker's race but also the level of the entire playing field. This is why governing bodies like Fédération Internationale de Natation (FINA), the international governing body for aquatic sports, take false starts seriously and enforce strict penalties for anyone attempting to anticipate the signal.

High-stakes competitions have produced memorable examples. At the 1952 Olympics, U.S. swimmer Bowen Stassforth intentionally false-started in the final of the 200m breaststroke. He did this not to gain advantage, but to "loosen up" in cold conditions. Although he risked disqualification, the tactic paid off: he posted an American record and earned silver (4). In a more recent incident, at the 2012 London Olympics, Sun Yang dove early in the 1500m final when he claimed to have misinterpreted a noise as the starting beep. Officials ruled it an unintentional error and did not disqualify him; he recovered to set a world record (5).

Originally, in competitive swimming, the rules allowed one false start per race which meant the first early jump was a warning to the entire field, and subsequent false starts led to disqualification. However, in 2001, FINA introduced the "one start rule," where any swimmer who false starts is immediately disqualified. This change was sparked largely by the 2000 Sydney Olympics, where multiple false starts caused confusion, long delays, and frustration for athletes and viewers. The new rule was meant to eliminate these disruptions, prevent gamesmanship where swimmers tried to guess

the start, and ensure a fairer competition environment.

Official data shows how small differences at the start can affect a race. A study of 19,215 race starts found that male swimmers in 50m races had an average reaction time of about 0.65 seconds, while in longer 1500m events, the average was about 0.74 seconds (6). Even a difference of 0.01 seconds can change who wins at the elite level. Because of this, some swimmers may try to predict the start rather than react to it perfectly. Since detection still mostly depends on what the officials see with the naked eye, and not on sensors in all competitions, the expected reward of a faster start can seem worth the risk of disqualification.

These incidents show two distinct motivations for early starts: deliberate advantage-seeking and panic or confusion. These help the swimmer causing the disruption by throwing his opponents "off their game". The current "one-strike, you're out" rule reduces the likelihood of calculated risk-taking by increasing the cost of miscalculation. But intentional early starts are still more likely under tight competitive conditions, particularly in races with evenly matched field swimmers, where even the slightest edge matters, or under environmental reasons such as noise, fatigue, or temperature.

Rule evolution reflects these dynamics. Prior to the zero-tolerance standard, swimming enforced a system whereby the first false start issued a warning to the field, but later infractions led to disqualification. This system invited strategic behavior and psychological games. In response, a no-recall, immediate disqualification system became standard across international swimming from around 2010 onward. This change aligned with efforts to minimize gamesmanship and streamline meet operations at the expense of occasionally penalizing swimmers for minute plausible movements (7).

Though this may seem cliché, a potential solution to this issue is to use more advanced starting technology. The primary way of judging the starts is by officials (usually two) watching for any early movement (8). An answer to this could be to use sensors on the starting blocks that could detect the movements of the swimmer. Another solution would be to randomize when the whistle is blown. This would imply that the whistle be blown somewhere between one to three seconds after getting ready on the blocks. This would make it much harder for swimmers to predict the whistle or sneak in an early start, creating a fairer race for everyone.

To summarize, intentional false starts often stem from the high return on tiny timing advantages, especially in

fast, closely contested events. Notable historical cases show both calculated tactics and misinterpretations as underlying causes. By transitioning to a zero-tolerance regime, governing bodies have curtailed most of these strategies. Still, the rule may penalize swimmers reacting to environmental cues or fatigue, raising questions about where enforcement clarity and fairness intersect. Some proposed solutions to these issues are starting systems which could include random whistle delays or pressure sensors that detect an athlete's exact movement off the blocks.

INTENTIONAL FALSE TURNS

A false turn in swimming occurs when a swimmer fails to touch the wall correctly or executes the turn in a way that violates the rules, such as missing the wall entirely or performing an illegal maneuver during the flip or open turn. Like false starts, false turns can be intentional or accidental, but when deliberate, they often aim to create disruption or gain hidden advantages. For example, a swimmer could exaggerate a slip during the flip, push off slightly askew, or make it appear as though contact with the wall was questionable. While a true missed touch should lead to immediate disqualification if seen by officials, in practice, the underwater nature of turns and the difficulty of monitoring every lane make false turns harder to catch than false starts (1). This opens a loophole for intentional misrepresentation.

Intentional false turns connect to economic incentives in a similar way to false starts. In sprint races, even a fraction of a second gained from a quicker push-off can be decisive, while in longer races, feigning a "mistake" can occasionally force officials to consider a restart, or distract competitors nearby. The cost–benefit tradeoff is central: the chance of a small but impactful edge versus the relatively low risk of detection (2). Because judges must simultaneously watch multiple lanes at each wall, swimmers understand that the probability of being penalized for a subtle false turn is lower than for a false start (3). This asymmetry of enforcement brings in more opportunistic behavior which means rational athletes, especially at high-stakes meets, may attempt it if the expected reward outweighs the potential penalty.

The structure of swim meets also amplifies these incentives. Unlike starts, which are highly scrutinized and involve all swimmers at once, turns are individualized and occur many times over the course of a race. This multiplies the opportunities for bending the rules while reducing the chance of being caught on a single instance. For example, in a 1500m freestyle race, a swimmer makes 29 turns. If even one of those turns is subtly illegal but goes unnoticed, the swimmer could shave time without consequences. The frequency of turns combined with the difficulty of simultaneous officiating creates an environment where the expected return on a risky maneuver is unusually high.

Documented cases are rarer than with false starts, but do exist at elite and collegiate levels. Some swimmers have admitted in interviews or online forums to "botching" turns strategically to disguise fatigue or disrupt opponents' pacing. Others recall teammates intentionally missing a wall touch just enough to raise confusion without triggering disqualification. At the 2004 U.S. Olympic Trials, several coaches raised complaints about swimmers who appeared to turn illegally during preliminaries, though no official disqualifications were handed down. These incidents highlight how the opacity of turn enforcement leaves room for gamesmanship.

False turns can also affect competitors in ways beyond time advantages. A poorly executed or intentionally disruptive turn can cause turbulence in the lane lines or disturb adjacent swimmers, especially in butterfly and backstroke where precision and rhythm matter most. This means that one swimmer's deliberate infraction has externalities—it imposes a hidden cost on rule-following competitors. Much like in economic markets where one actor's strategic manipulation disadvantages others, intentional false turns undermine the level playing field the rules are meant to preserve.

Rule evolution reflects these dynamics. Unlike false starts, which moved to a global zero-tolerance standard in the late 2000s, turn rules have historically remained less rigid. The requirement is clear—a swimmer must make a legal touch at every wall—but the enforcement relies almost entirely on human officials stationed at the poolside. In large meets with limited staffing, the sheer number of turns across heats makes strict enforcement inconsistent. This has left more space for discretion and interpretation compared to starts, where technology and rules have converged toward clarity.

Potential solutions to this enforcement gap resemble those proposed for starts. One approach is wider use of underwater video review, already employed at the highest levels like the Olympics, but often absent from lower-tier meets where manipulation may be easier. Another is the introduction of pressure-sensitive touchpads not only at the finish but at every turn wall, ensuring that officials receive electronic confirmation of a valid touch (4). Randomized video spot-checks could also act as

deterrents by raising the perceived risk of detection (5). These measures would make the cost of attempting a false turn higher, reducing the incentive for calculated risk-taking.

In sum, false turns reveal the same incentive-driven behavior as false starts, but with a twist: they are harder to detect and thus arguably more rational from a risk–reward perspective. Swimmers seeking even marginal advantages may exploit the underwater blind spot at the wall, especially in crowded races where oversight is limited. Just as the zero-tolerance standard reshaped the calculus for false starts, improvements in underwater video monitoring and pressure sensors on pool walls could reduce the incentive for manipulating turns, preserving fairness while curbing opportunities for deliberate infractions. A comparative summary of the three cheating types, their risk-reward balance, and recommended policy responses is presented in Table 1 below.

CONCLUSION

Cheating in competitive swimming comes in different forms, but the main reason behind it is always the same: swimmers weigh the risks of being caught against the possible rewards. From using performance-enhancing drugs to false starts or illegal turns, these choices aren't random. They are calculated, shaped by how rules are written and how strongly they are enforced. Looking at these issues through an economic perspective helps explain why cheating happens and points to ways the sport could make it less tempting. As shown in Table 1, different forms of cheating vary in risk-reward structure and require tailored deterrence strategies.

PEDs are the clearest example of incentives and loopholes working together. Athletes know that some drugs can leave the system quickly, while others linger for months. They also know that testing during the off-season is lighter than during the competition period. That mix makes it possible to time drug cycles to get benefits while avoiding detection. The payoffs are huge: faster recovery, more endurance, and training at higher intensity. When the reward is that high and the chance of being caught feels low, it makes sense why some athletes are willing to take the risk.

False starts show a slightly different type of calculation. Here, the "reward" is tiny in terms of time saved, but in sprint races or when the field is evenly matched, those fractions of a second matter a lot. Older rules gave swimmers more chances, which made false starts almost part of strategy. But now, with the zero-tolerance rule, the risk is much greater—immediate disqualification. Even with that, the temptation hasn't completely disappeared, especially in big races where the difference between gold and nothing can be razor-thin.

Illegal turns might be the hardest to regulate of all. Unlike starts, which are highly visible and happen at the same moment for everyone, turns happen constantly and underwater, where judges cannot see everything at once. The more laps in a race, the more chances a swimmer has to "test the system." One missed illegal turn in a long race can give an advantage, and the chances of being caught are fairly low. This makes turns a logical target for subtle cheating. On top of that, a bad or intentionally disruptive turn can mess with the rhythm of nearby swimmers, meaning the cheater's gain creates a hidden cost for others.

Rational cheating can be affected in two main ways: by making it more likely that cheaters get caught or by increasing the penalties if they do. Athletes naturally weigh the rewards against the risks, so even small changes in detection or punishment can change behavior. When the chance of being caught is high, moderate penalties can stop most cheating, while severe

Table 1. Economic Comparison of Cheating Behaviors in Competitive Swimming and Corresponding Deterrence Strategies

Cheating Type	Risk–Reward Tradeoff	Policy Solution / Enforcement Improvement
Performance-Enhancing Drugs (PEDs)	High reward (faster recovery, more endurance) vs. moderate detection risk, especially off-season	Increase random/out-of-competition testing; close off-season enforcement gaps; improve detection technology
False Starts	Small time advantage (fractions of a second) vs. high risk (immediate disqualification)	Starting block sensors; random whistle delays; stricter monitoring at major meets
Illegal Turns	Fractional time gain vs. low detection risk due to underwater/turn complexity	Underwater cameras; pressure-sensitive touchpads at all walls; random video spot checks

penalties might not work if the rules are rarely enforced. Understanding this helps sports organizations design rules that actually discourage cheating. It also shows that changing incentives can guide behavior even without rewriting the rules.

When you step back, thinking about cheating in swimming through economic theory reveals clear predictions. If swimmers act like rational players who make decisions based on the rules of the game, PED use happens when the testing system is predictable. False starts are tempting when the field is tight. Illegal turns thrive because monitoring them is inconsistent. In all of these cases, cheating becomes most likely when the expected benefit is greater than the expected punishment.

The solutions point in the same direction: change the balance of those incentives. For PEDs, that means closing off-season testing gaps and using more random testing so athletes cannot plan cycles around predictable schedules. For false starts, technology like block sensors or randomizing start times could make it harder to game the system. For illegal turns, underwater cameras, turn-wall sensors, and random video reviews would increase the chances of being caught. None of these ideas rely on harsher punishments—they rely on smarter enforcement that makes the risk higher and the reward less attractive.

Fairness is at the center of this issue. Swimming is a sport where the difference between winning and losing is often less than a second. That makes even tiny advantages powerful. If competitors, coaches, or fans believe cheating is going unchecked, it damages trust in results. Just like in economics, when people lose faith in a market because of manipulation, the whole system suffers. Strong enforcement in swimming is not just about catching cheaters, it's about keeping the sport credible.

Thinking about swimming through economic theory is useful because it treats athletes as decision-makers, not just as rule-breakers. Cheating doesn't happen in a vacuum. It happens because rules, enforcement, and incentives allow it to. If those structures change, then the calculations athletes make also change. In other words, the goal isn't just to say "do not cheat," but to make cheating an irrational choice in the first place.

To sum it all up: PEDs, false starts, and illegal turns are different forms of the same problem. They happen when athletes see more benefit than risk. By fixing enforcement gaps, using better technology, and raising the certainty of punishment, governing bodies can flip that balance so honesty makes more sense than cheating. That is how the sport can keep competition fair, results trustworthy, and the playing field level for everyone.

CONFLICT OF INTEREST

The author declares no conflicts of interest related to this work.

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