

## **Regulatory Measures and Consumer Protection in Electronic Gambling**

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### **Abstract**

This paper advances a novel regulatory framework to address the growing cognitive and behavioral harms associated with electronic gambling machines (EGMs) and iGaming (online gambling) platforms. As the gambling industry rapidly expands, it increasingly capitalizes on users' psychological vulnerabilities and the persuasive design of digital interfaces. Identifying the limitations of AI-driven harm mitigation strategies, which often lack contextual sensitivity and regulatory accountability, this paper argues for an integrated approach that combines targeted AI interventions with enforceable regulatory measures. Drawing on the UK Gambling Commission's model, the paper proposes a new, region-specific framework for the United States and North America that foregrounds fairness, transparency, and consumer protection. This framework makes a novel contribution by incorporating explainable design standards, structural game modifications, and cross-border regulatory cooperation into a cohesive policy blueprint. Key recommendations include rigorous licensing and audit processes, mandated user protections, and

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international collaboration to reduce gambling-related harms and promote ethical industry practices.

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## **Introduction**

The explosive growth of electronic gambling—fueled by digital accessibility and persuasive design—has transformed the industry into a multibillion-dollar force in North America. Electronic gambling machines (EGMs) and online platforms (iGaming) now offer fast-paced, immersive experiences, but these innovations come at a cost. Gambling technologies are engineered to exploit cognitive vulnerabilities using tactics like near misses, losses disguised as wins (LDWs), and overstimulating audiovisual cues. Online platforms intensify these harms through constant availability, anonymity, and personalized features—posing unique risks to younger users and those already vulnerable.

Although AI-based harm reduction strategies have emerged, they are often deployed by industry actors with limited oversight and conflicting incentives. Meanwhile,

U.S. regulatory responses remain fragmented and outdated, failing to address the psychological and structural manipulation embedded in modern gambling systems. This paper addresses that gap by proposing a comprehensive, enforceable framework tailored to North America. Building on—but expanding beyond—the UK Gambling Commission’s model, it integrates insights from cognitive psychology, persuasive design, and international policy to recommend a multi-layered approach. These reforms include explainable AI interventions, structural game design changes, mandatory compliance audits, and cross-border regulatory coordination—together offering a forward-looking roadmap centered on user protection, transparency, and ethical governance in the digital gambling era.

## **Literature Review**

### **Scope of Electronic Gambling and Stakeholders**

Electronic gaming machines (EGMs) encompass all electronic casino games such as video slot machines, virtual poker, electronic roulette, and arcade-style betting games; as well as iGaming online simulations of such games. Electronic gambling contributes to 70% of adult gambling activities (Delfabbro, 2019). In November 2024, the U.S. commercial

gaming industry reached a record \$6.65 billion in revenue, representing a 21.3% increase compared to November 2023. This growth contributed to a year-to-date total of \$65.83 billion for the first eleven months of 2024, an 8.6% increase over the same period in the previous year. Additionally, state gaming tax revenue from regulated gaming operators amounted to \$1.43 billion in November alone, with a total of \$14.15 billion paid through the first eleven months of 2024 (American Gaming Association, 2025).

While only seven states fully legalized online casino games and poker as of December 2023, online sports betting has been more widely embraced, with 30 states legalizing it between 2018 and 2024. Despite the growth of digital platforms, in-person gambling continues to dominate, with the gross gaming revenue (GGR) from land-based gambling in 2023 being more than three times higher than that from online gambling. The online gambling market in the U.S. was valued at \$19.54 billion in 2023, with 14% of the population participating in online casino games. Online sports betting remains the most popular form of online gambling, boasting 25.02 million U.S. sports bettors in 2023, with 10.4% of adults placing daily bets online. (Statista Research, 2025).

With such widespread electronic and online engagement, problem gambling remains a significant concern, with online slots identified as the gambling form with the highest share of people at risk. With 47% of U.S. adults believing that the gambling industry should face stricter regulations,

general awareness of the risks remain high as platform traffic increases. States like Michigan, Pennsylvania, and New Jersey led in online casino game revenue, while Delaware experienced a remarkable 455.12% increase in iGaming revenue after changing its state partner. These insights demonstrate the need for targeted regulations and measures to address both growth and associated challenges (Statista Research, 2025)

As the industry continues to expand, it is critical to understand the demographics and behaviors of its most vulnerable users. Online gamblers tend to be younger, predominantly male, and exhibit higher rates of problem gambling compared to offline gamblers (Ghelfi, et al., 2024; Efthymiou et al., 2023). Moreover, the issue is global. The prevalence of problem gambling worldwide ranges between 0.12% and 5.8%, with online modes posing distinct risks. Features such as continuous access, convenience, and the ability to gamble anonymously exacerbate these risks. The COVID-19 pandemic intensified online gambling trends as land-based options became unavailable (Stark & Robinson, 2021; GJoneska et al., 2022). While many online gamblers avoid developing gambling disorders, those who become addicted are more likely to report psychological distress, substance misuse, and financial difficulties. High gambling intensity, variability, and expenditures, as well as solitary and prolonged sessions, are strongly associated with problematic gambling behaviors. Conversely, protective factors like supportive social relationships are underexplored but critical for prevention (Ghelfi, et al., 2024).

## Cognitive Processes While Gambling

Understanding the risks associated with EGMs and iGaming requires examining the cognitive and behavioral factors that increase vulnerability. While the unique accessibility and anonymity of online platforms amplify the prevalence of gambling-related issues, gambling products are also carefully designed to exploit psychological vulnerabilities. The intersection of behavioral risks and product design sheds light on the mechanisms that drive problematic gambling behaviors and confirms the need for deeper investigation into the psychological processes at play.

Gambling corporations invest heavily in research to design games with cognitive experiences that promote entering trance-like states, reduced loss aversion, and a type of behavior called “chasing,” which refers to the persistent act of continuing to gamble in an effort to recover previous losses. This behavior is tied to dysfunctional decision-making processes and intense craving, which are hallmarks of gambling disorder (GD). Chasing can occur within a single gambling session (within-session chasing) or extend across multiple sessions (between-session chasing). It often stems from a combination of cognitive distortions, such as the gambler’s fallacy—the belief that a win is imminent after a string of losses—and emotional drivers, like the anticipation of excitement or the relief from negative feelings associated with gambling losses (Cosenza, et al., 2024). Research demonstrates that craving plays a central role in motivating chasing behavior.

Gamblers frequently perceive an almost compulsive need to continue playing to alleviate cognitive tension, a phenomenon linked to the “Zeigarnik effect,” where incomplete tasks create a psychological drive to see them through. Developers of gambling systems exploit these experiences by designing games that emphasize near-misses, continuous play opportunities, and variable reward schedules, all of which heighten the urge to chase. For example, flashing lights and celebratory sounds following near-wins reinforce the belief that success is just around the corner, leading players to continue betting despite consistent losses (Hans et al., 2024, Cosenza et al., 2024).

## *The Zone*

When gamblers enter a trance-like state known as “The Zone” they exhibit diminished inhibition and an intense focus on immediate rewards. This psychological state facilitates prolonged engagement in gambling activities, often leading to significant financial and social consequences. Oakes et al. (2018) conducted a qualitative study to investigate the altered state of awareness experienced during EGM gambling with focus sessions and in-depth interviews with 19 problem gamblers, posing various questions to elicit detailed information about their experiences in the Zone. After analyzing the transcripts from the discussions with the participants, the researchers identified five distinct themes. The first, labeled “Altered Attention,” was characterized by an intense focus on gambling, which seemed to direct attention

away from negative emotions and users' long-term commitments and goals. One participant compared it to having blinkers on, remarking, "You sort of don't really think about what you're spending and stuff like that. You just—you look for that win, the spins—the free spins or that win—and just keep going for that hour or half an hour," (Oakes et al., 2018). Many subjects described EGMs as an escape from various emotions such as stress, grief, and worry; where nothing matters in that moment except for the game on the screen. A second theme was "Impaired Volition," where users are unable to think rationally and lack the willpower to stop gambling. Many of the participants regularly experienced a separation between thinking and acting, demonstrating a lack of "self-observation" and "critical review" and resulting in a lack of ability to make rational decisions while gambling and handling money. A third category of responses included "Altered Orientation," marked by confusion and disorientation. This state includes subjects losing track of time, "not feeling like [themselves]," and not knowing why they wanted to gamble but doing it regardless. The fourth commonality was "Altered Perception," in which gamblers reported experiencing a sense of depersonalization. They described the Zone as akin to being in a trance, getting hypnotized, or being asleep. The final category was "Altered Critical Thinking," where many recounted behaviors that reflect "impaired cognitive functioning." One participant recalled thinking that money had lost its value, while another shared how their urges to gamble overtook any thought of quitting. Many

reported that they were unable to remember ever being in the Zone, demonstrating its effect on memory and other cognitive functions. From discovering and analyzing these five categories of participants' comments, the researchers hypothesized that during the Zone, users demonstrate a lack of frontal and temporal functions including "reflection, planning, memory, critical thought and judgment, moral and financial decision making and the exercise of the will."

### ***Reduced Loss Aversion***

Another cognitive process related to chasing and being in the zone is reduced loss aversion, where users become less averse to losses than usual and consequently increase their betting sizes and rates to recover from losses. This state often begins with entering the Zone, losing inhibition and control, and then chasing—making impulsive decisions to spend more and continue gambling. Oakes et al. (2018) report that "destructive EGM gambling patterns occur when gamblers are convinced they will win despite consecutive losses." Normal cognitive patterns indicate that the fear of losing something, particularly money, is typically more overpowering than the pleasure of gaining. In gamblers, this phenomenon can be reversed, with the potential to win overrunning the fear of losing, leading to chasing after wins. Zhang and Clark (2020) proposed two explanations for reduced loss aversion and chasing during gambling. The first one was from a neurocognitive standpoint. They blame users' impulsivity and hasty decision-making during gambling on a loss of inhibition, "a core component of the executive functions." Additionally, they

attribute the existence of “losing contexts” during gameplay to amplifying impaired inhibition, as a result of experiencing urgency, a strong emotion that is heightened during gambling. Negative urgency during gambling supposedly mimics a feedback mechanism where users react to an omission of a reward— an emotionally stressful event (in this case—losing money)-- and the negative emotions cause them to impulsively and persistently chase after the reward (money). Offering behavioral economic explanation, Zhang and Clark introduce two terms: paper losses, the virtual representation of money lost (i.e.: an on-screen credit balance), and realized losses, when the loss of money actually occurs— this experience is more tangible to the user. While bet size increases after paper losses, realized losses abolish chasing behaviors. Zhang and Clark suggest regulating the design and implementation of game mechanics in a way that allows users to experience more authentic, realized losses and protects them from chasing.

### ***Use of Persuasive Design***

Persuasive design is an umbrella term for any means of designing a user interface with the intent of influencing a user’s mind and behavior. Cemiloglu (2022) pointed out that persuasive design is often seen in two different areas: the user-facing elements of a system, and the “under-the-hood” mechanics of the system.

### ***User Facing Elements– The Use of Gamification***

Gamification, the use of game-like elements, is a common high-level persuasive

design technique that quickly appeals to users’ senses. Several different researchers comment on the use of game-like elements in their studies. Harris and Griffiths (2017) demonstrate how games with faster speeds of play are appealing because users, especially gamblers, are extra sensitive to potential rewards and know they will quickly receive them in fast-paced games that reward more in shorter amounts of time. Rapid, easy play also prevents gamblers from normal “response modulation” and fully experiencing their realized losses, removing any barriers preventing them from continuing to gamble. Gamification also includes user experience (UX) design elements that are directly integrated into the game environment, including colorful icons and intense sounds. Similarly, a gambler from Oakes’ study admitted, “the sounds enticed [her] to gamble making [her] emotional and unable to make rational choices,” while another said, “focusing on EGM reels and colours allowed her to forget and enter the zone.”

While all electronic gaming is designed to be habit forming, mobile apps display their uniquely ensnaring designs. Exploring the psychological and technical mechanisms underlying the addictive nature of mobile applications, Hans et al. (2024) identify key design features that perpetuate compulsive app usage. Central is the activation of the brain’s reward system through instant gratification, such as likes and achievements, which release dopamine and reinforce usage patterns. Mobile applications also leverage operant conditioning by employing variable

reinforcement schedules, mirroring the mechanisms of gambling to foster compulsive engagement. Emotional triggers like fear of missing out (FOMO) further amplify addiction by exploiting users' anxieties about social disconnection or missing updates. Mobile games encourage social comparison and validation within social media platforms and create a loop of engagement, as users strive for approval and self-presentation. Other critical design elements include dynamic and ever-changing app content, which maintains user curiosity through novelty, and notifications designed to exploit the Zeigarnik effect, drawing users back to complete perceived “unfinished tasks.” Gamification techniques, such as leaderboards and rewards, incentivize sustained interaction, while personalization algorithms curate content tailored to individual preferences, enhancing engagement further. Easily accessible wherever the phone owner goes, these apps often serve as a coping mechanism for escapism and stress relief, embedding themselves in users' routines and forming entrenched habits that are difficult to break (Hans et al. 2024).

### ***Lower Level Game Design***

Reward variability is a common technique implemented in social media apps, video games, online shopping websites, and other user-facing platforms; due to its positive effect on user engagement. Clark and Zack (2023) list “variable size of the payout, concurrent schedules (e.g. bonus games), and temporal variability (e.g. spin duration) as sources of variability within

online gambling games. Their study explores another common event controlled by developers: near wins. Near wins are outcomes that reinforce a player’s belief that they are very close to winning, despite being no closer than if they had lost. Similarly, Barton et al., (2017) find that EGM outcomes provide a more exciting and engaging experience by giving near-wins more frequently than is realistic. They conduct a systematic review of studies that focus on the psychological effects of this game mechanism. Of the final 51 studies, four studies address the effect of near wins on the perception of winning, finding that “players tend to report significantly more wins when experiencing near [wins].” Sixteen studies discuss how near-wins influence a player’s emotions and thoughts, with several finding that players find near-wins more pleasant than regular losses. The study found that near wins mirror the response to a true win event, and players “reported higher levels of impulsivity and willingness to engage in risky behavior following a near miss during slot machine gambling” (Barton et al., 2017). Barton also explores another common technique built into systems: losses disguised as wins, abbreviated to LDWs. This approach repeatedly gives players wins, but the amount won sums to less than the amount lost. In the same systematic review, five studies discuss the psychological effects of LDWs, revealing players’ tendency to “report inflated estimates of their win frequencies.”

Near wins and losses disguised as wins (LDWs) provides a foundation for

understanding the mechanisms that exploit user psychology in electronic gambling, setting the stage for a broader examination of solutions to mitigate these harms. Near wins, which evoke the same neural response as actual wins, fuel impulsivity and risky behaviors, while LDWs inflate players' perception of success, reinforcing engagement. These features confirm the need for regulatory and structural interventions that address cognitive biases and deceptive practices in gambling systems.

## Discussion

This section outlines several objectives aiming to eliminate the harmful effects of electronic gambling on users' cognitive processes and tendencies, as well as a comprehensive set of regulatory measures necessary to achieve said objectives.

### AI interventions

Researching the use of AI to mitigate gambling-related harm among youth, Efthymiou et al. (2023) explore the integration of Large Language Models (LLMs) to provide personalized intervention and prevention strategies. These AI-powered systems can deliver tailored harm reduction messages, early intervention pop-ups, and educational materials that adapt to individual users' risk profiles. The flexibility and scalability of LLMs allow them to reach a broad audience, offering real-time guidance and support to vulnerable

individuals. However, these models exhibit significant limitations. LLMs primarily rely on historical data and patterns, which may not fully capture the complex and evolving nature of gambling behaviors, particularly among youth. Marionneau, et al. (2023) also encounter these limits when examining machine learning for problematic gambling behaviors. While gambling operators are increasingly using such AI tools to monitor player behavior and provide personalized interventions, such as targeted warnings and self-exclusion prompts, this technology also risks potential misuse. Without proper regulatory oversight of AI-driven interventions, gambling companies could leverage user data to maximize profits rather than reduce harm. Such concerns about data privacy, algorithmic bias, and the potential for user circumvention of guardrails, raise questions about their long-term effectiveness. Another key limitation is the lack of human empathy and contextual understanding that a human counselor or community-based support program can provide. AI interventions, though useful as supplementary tools, should not replace comprehensive, human-centered approaches such as community outreach, family interventions, and public educational programs that address the social and psychological determinants of gambling addiction. A more holistic approach, combining AI-driven tools with regulatory measures, stricter advertising guidelines, and evidence-based counseling services, may offer a more effective strategy for preventing and mitigating gambling-related harm.

### Licensing and Regulation

The UK Gambling Commission (UKGC) provides an exemplary model for licensing and regulation that could inform similar efforts in the United States and North America. The UKGC's measures

emphasize fairness, transparency, and responsible gambling practices, serving as a robust framework for ensuring that gambling operators meet high ethical and operational standards. Similarly, the United States faces a pressing need for comprehensive regulation, as shown in the American Gaming Association's report revealing that 40% of gaming machines in the U.S. are unlicensed, with a staggering 580,000 unregulated machines nationwide. These unlicensed machines pose significant risks, including unfair practices, insufficient safeguards for problem gamblers, and potential involvement in illegal activities.

To address these challenges, the federal government should implement a rigorous licensing process, modeled on the UKGC's best practices, to establish baseline requirements for all gaming operators. This framework should mandate the disclosure of payout rates, ensure the transparency of game mechanics, and require the use of independently certified Random Number Generators (RNGs) to ensure fairness. Additionally, operators should comply with strict anti-money laundering (AML) measures, including customer due diligence, and the reporting of suspicious activities. By adopting these measures, the U.S. could create a safer gambling environment that protects consumers while ensuring the industry operates within ethical and legal boundaries.

### **Compliance and Accountability**

Building on the principles demonstrated by the UKGC, the United States must establish a federal regulatory body to oversee gambling operations and

enforce compliance. This body should be responsible for defining and monitoring the ethical standards that operators must meet, such as transparency, fairness, and player protection. Operators should also be required to submit to regular audits and provide detailed records of their operations to ensure accountability. Furthermore, this regulatory body should have the authority to impose penalties for non-compliance, including financial sanctions and license revocations. Drawing from the UKGC's example, integrating Alternative Dispute Resolution (ADR) services could provide an accessible mechanism for players to resolve complaints and disputes, promoting fairness and trust in the system.

### **User-Directed Changes**

To empower users and promote informed decision-making, the United States should implement regulations requiring all electronic gambling games to provide players with clear, accessible information about game mechanics. For instance, games should include explanations of payout rates, the probabilities of various outcomes, and the risks associated with gameplay. Inspired by the concept of "explainable persuasion" proposed by Cemiloglu et al. (2022), these games could incorporate transparency cards that detail the persuasive design techniques used, such as in-game rewards, along with descriptions of their psychological effects. Additionally, user-centric tools like deposit limits and activity logs—already employed by the National Consumer Protection Framework for Online Wagering—should be mandated to encourage self-regulation. These measures would not only educate

users but also hold gambling operators accountable for ethical practices.

### **Structural Changes**

While user-directed tools aim to enhance autonomy, they are often insufficient due to the subconscious psychological mechanisms that drive gambling addiction. To address this, structural changes to gambling systems must be implemented to minimize harm at a systemic level. For example, mandatory auto-shutdown features could enforce user-defined time and spending limits, while required play breaks of at least five minutes, as demonstrated by Hopfgartner et al. (2021), have been shown to significantly extend the time before users re-engage with games and reduce the size of subsequent bets. Structural changes should also include a shift to cash-instead-of-credit displays, which help users make better-informed decisions by providing a clearer sense of their financial losses. Furthermore, reducing the intensity of visual and auditory stimuli, as Norway has done, could decrease the dopamine-driven reinforcement that encourages prolonged play. By prioritizing these changes, operators would be compelled to create safer gaming environments.

### **Randomness**

To combat chasing behaviors and restore fairness, the U.S. should require all gaming machines and online gambling platforms to employ independently verified RNG algorithms that produce truly random outcomes. This would eliminate fabricated near-win scenarios, which exploit players'

psychological responses to encourage continued play. In addition, companies should provide transparent statistics detailing the ratios of wins, near wins, and losses, ensuring players have realistic expectations about their chances of success. Federal oversight is necessary to set and enforce standards of randomness, aligning the industry with ethical practices and reducing the risks of compulsive gambling.

### **Age Verification**

Protecting minors from gambling requires stringent age verification measures, especially in the context of online platforms. The U.S. should adopt robust systems for identity verification, such as requiring users to upload government-issued identification verified by human reviewers. These measures would prevent underage access and ensure compliance with existing legal frameworks. Moreover, operators should implement real-time monitoring to detect and block attempts by minors to bypass verification processes. By asserting federal authority in this space, the government can safeguard vulnerable populations and enforce responsible gambling practices.

### **Cross-Border Cooperation:**

Given the global nature of online gambling, the United States should collaborate with international regulatory bodies to establish uniform standards for the industry. Initiatives such as sharing best practices, coordinating enforcement actions, and harmonizing regulations could address cross-border challenges, ensuring that operators adhere to consistent ethical and legal standards. For instance, collaboration with entities like the UKGC could provide

valuable insights into effective regulatory strategies, enhancing the integrity of the global gambling landscape.

### **Conclusion**

Robust regulations are vital for protecting users from gambling-related harm. This paper demonstrates that effective regulation can mitigate risks by combining robust licensing processes, compliance mechanisms, user education, and structural safeguards. The proposed framework for the United States draws on successful models like the UK Gambling Commission's approach, emphasizing transparency, fairness, and responsible gambling practices. Mandatory measures, such as random number generator certification, restrictions on misleading design features, and stringent age verification processes, are pivotal in fostering a safer gambling environment. Furthermore, structural interventions, including time-out mechanisms and adjusted visual and auditory stimuli, can address cognitive vulnerabilities such as chasing behavior and reduced loss aversion.

International collaboration is equally important in regulating online gambling's global reach. By sharing best practices, harmonizing standards, and coordinating enforcement actions, nations can collectively protect consumers and uphold ethical standards in the gambling industry. These initiatives strike a balance between protecting vulnerable users and supporting industry sustainability, setting a precedent for ethical and responsible development in

the digital gambling era. This framework not only promotes consumer safety but also reinforces the moral obligation of regulators, developers, and policymakers to address the social challenges posed by modern gambling technologies.

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