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Exploring the Associations Between Momentary Gambling Motives and Gambling Behavior: An Ecological Momentary Assessment Study

Chloe O. Hawker[1], Stephanie E. Dias[1], Stephanie S. Merkouris[1], Simone N. Rodda[1, 2], and Nicki A. Dowling[1]
[1] School of Psychology, Deakin University
[2] Department of Psychology and Neuroscience, Auckland University of Technology

Objective: Drawing on the dynamic model of relapse, this study examined real-time relationships between momentary gambling motives (enhancement, coping, social, financial) and gambling behavior (episodes, expenditure, duration), as well as the moderating role of stable (problem gambling severity, high-risk situations) and momentary (psychological distress, emotion dysregulation, distress intolerance, state impulsivity) vulnerability factors, and the concordance between stable (Gambling Motives Questionnaire–Financial) and momentary measures of gambling motives. ***Method:*** A convenience sample of 132 Australian adults who endorsed gambling in a typical month (M_{age} = 29.9 years; 58.3% male; 94.7% endorsed gambling problems) completed a 28-day ecological momentary assessment protocol, involving twice-daily smartphone assessments of momentary variables and gambling episodes, following a preecological momentary assessment survey of stable variables. ***Results:*** Mixed-effects ordinal logistic regression analyses revealed that momentary coping (*OR* = 2.03), enhancement (*OR* = 1.73), and social motives (*OR* = 1.57) predicted increased gambling expenditure. Mixed-effects binary logistic regression analyses revealed that longer gambling duration predicted increased momentary financial motives (*OR* = 3.31), though financial motives did not predict gambling behavior. Individuals with distress intolerance were more likely to report a subsequent gambling episode when coping or enhancement motives were endorsed. No other factors showed significant moderating effects. Stable and momentary motives were strongly correlated (r_s = 0.71–0.89), supporting the validity of single-item ecological momentary assessment measures relative to both the corresponding Gambling Motives Questionnaire–Financial item and subscale. ***Conclusions:*** These findings underscore the importance of momentary motives, particularly coping and enhancement, and emotional vulnerability in understanding gambling behavior in real time. Interventions targeting these dynamic processes and integrating distress tolerance training may enhance harm reduction efforts.

Public Health Significance Statement
This study found that gambling to cope with distress or enhance mood was linked to greater gambling losses, especially among people with low distress tolerance. By capturing real-time data on gambling motives and behavior, the findings support interventions that deliver in-the-moment support to reduce gambling harm.

Keywords: gambling, motives, reasons, distress tolerance, ecological momentary assessment

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Correspondence concerning this article should be addressed to Nicki A. Dowling, School of Psychology, Deakin University, 221 Burwood Highway, Burwood, VIC 3125, Australia. Email: nicki.dowling@deakin.edu.au

Gambling-related harm is a significant public health concern (Price et al., 2021). While only a small proportion of adults display problem gambling[1] (0.4%–0.6% in Australia; 1.4% internationally), many more gamble at harmful levels (up to 11.4% in Australia and 10.1% internationally; Dowling et al., 2016; Gainsbury et al., 2014; Tran et al., 2024). Gambling-related harms are diverse and far reaching, including financial distress, relationship breakdown, psychological distress, health issues, and cultural disconnection, with impacts extending to families and communities (Langham et al., 2016). Most of this harm is attributable to low- and moderate-risk gambling due to their greater prevalence in the general population, which indicates the need for prevention and intervention approaches that target harmful gambling at all levels of risk (Browne et al., 2017).

Gambling motives, defined as the reasons people gamble, are key mechanisms implicated in the development and maintenance of harmful gambling (Dias, Dowling, et al., 2025; Witkiewitz & Marlatt, 2004). Four gambling motives are consistently identified in the literature: enhancement (gambling to increase pleasant emotions), coping (gambling to reduce or avoid unpleasant emotions), social (gambling to increase social connection), and financial (gambling to win money; Dechant, 2014). These motives are grounded in operant conditioning principles (Mcleod, 2023), with enhancement, social, and financial motives typically associated with positive reinforcement (the addition of rewarding experiences), and coping motives associated with negative reinforcement (the removal of unpleasant experiences), both of which increase the likelihood of subsequent gambling behavior.

Robust cross-sectional evidence links these distinct gambling motives with gambling outcomes, suggesting that motives might be an optimal target for prevention and treatment. A recent meta-analysis of 44 studies found that financial motives were moderately associated with both gambling frequency and problem gambling severity (Tabri et al., 2022). Similarly, meta-analytic evidence from 27 studies found that coping motives were positively associated with problem gambling severity, even after controlling for financial motives (Alaba-Ekpo et al., 2024). Another meta-analysis of 55 studies using validated motive measures found that coping motives had the strongest positive associations with problem gambling severity, followed by enhancement, financial, and social motives (Dias, Dowling, et al., 2025). These findings are consistent with a meta-analysis of 26 population-representative studies reporting large effects for coping motives and medium effects for enhancement motives (Allami et al., 2025), as well as broader addiction research (Cooper et al., 2016; Votaw & Witkiewitz, 2021). All meta-analyses reported considerable heterogeneity in effect sizes, however, largely unexplained by study-level characteristics, which suggests that individual psychological factors may influence how strongly each motive drives gambling behavior and problems.

Cross-sectional studies highlight the moderating role of individual psychological traits in the relationship between gambling motives and gambling problems. In a sample of 919 young adults in Canada, Marchica et al. (2020) found that the link between coping motives and gambling problems was strengthened by aspects of emotion dysregulation, including poor emotional clarity, poor emotional awareness, and fewer difficulties engaging in goal-directed behavior when distressed. Similarly, in a sample of 342 Australian adults with past-month gambling, Dias, Merkouris, et al. (2025) found that distress tolerance moderated the effects of all four gambling motives. For coping motives, gambling problems were elevated only among those with low distress tolerance. For enhancement, social, and financial motives, low distress tolerance increased risk at all levels of motive endorsement. Additionally, enhancement motives interacted with impulsivity, such that individuals with higher positive urgency reported greater gambling problems, regardless of motive strength. While these findings underscore the influence of emotion dysregulation, distress intolerance, and impulsivity, they do not account for potential momentary fluctuations in motives that may also drive harmful gambling (Dias, Dowling, et al., 2025).

The dynamic model of relapse (Witkiewitz & Marlatt, 2004) offers a useful framework for understanding these dynamic fluctuations. Originally developed to explain substance use (Marlatt, 1985), the model conceptualizes gambling behavior as shaped by the interaction of stable background factors (e.g., gambling severity and trait motives) and transient states (e.g., momentary motives, psychological distress, and state impulsivity). Stable factors may set a person's baseline vulnerability to gamble, while momentary shifts in transient factors can act as immediate triggers for gambling in high-risk situations. In the model, gambling motives are conceptualized as cognitive processes that can be stable or transient, along with gambling cravings, self-efficacy, and outcome expectancies. For example, a person with a stable tendency to gamble to cope may experience an increase in momentary coping motives in times of acute distress. This spike in momentary coping motives may trigger a gambling episode, especially if the person lacks effective coping strategies. In the model, gambling episodes are thought to subsequently reinforce the original motive, creating a feedback loop that maintains gambling behavior. Despite this emphasis on dynamic processes, most gambling research has relied on cross-sectional designs that cannot capture real-time fluctuations in momentary factors nor potential feedback loops.

Ecological momentary assessment (EMA) offers a promising approach to capture the dynamic processes outlined in this model. EMA is a microlongitudinal research method that involves repeatedly assessing individuals' behaviors and experiences in real time and in their natural environments, using tools such as smartphones or wearable devices to enhance ecological validity and reduce recall bias (Shiffman et al., 2008). While EMA has been widely used in substance use research to examine momentary motives (Votaw & Witkiewitz, 2021), its application in gambling remains limited, with only a small number of gambling EMA studies examining the moderating role of trait motives assessed at baseline. In these studies, Goldstein et al. (2014) found that high-trait enhancement motives predicted longer gambling durations in response to positive mood, Hawker et al. (2021) found that trait coping motives intensified the relationship between gambling self-efficacy and expenditure, and Dowling et al. (2021) found no moderating effects of trait motives on the relationship between outcome expectancies and gambling episodes. The dynamic and reciprocal relationships between momentary gambling motives and

[1] References to problem gambling are made in the context of research using measures such as the PGSI, which assesses both behavioral dependence and adverse consequences from gambling. Gambling harm is a closely related but distinct construct, which only considers adverse consequences. This article uses "harmful gambling" and person-first language wherever possible to avoid stigmatizing language and to recognize the complex range of social, cultural, policy, and economic factors that influence gambling harm (Australian Psychological Society, 2025).

gambling behavior, hypothesized in the dynamic model of relapse (Witkiewitz & Marlatt, 2004), therefore remain untested.

The Present Study

An enhanced understanding of the dynamic relationships between momentary gambling motives and gambling behavior, as well as the stable and momentary psychological factors that shape this relationship, has important implications for the development of tailored interventions to reduce gambling-related harm. Using EMA, the primary aim of this study was to test the hypothesized reciprocal relationships between momentary gambling motives and gambling behavior. Secondary aims are to explore whether individual-level gambling-related and psychological vulnerabilities moderate the relationships between momentary motives and subsequent gambling episodes and to assess the concordance between stable and momentary gambling motives. Specifically, the following are hypothesized:

Hypothesis 1 (H1): Momentary enhancement, coping, social, and financial motives will be positively, reciprocally related to gambling episodes, expenditure, and duration.

Hypothesis 2 (H2): Stable (problem gambling severity, high-risk situations) and momentary (psychological distress, emotion dysregulation, distress intolerance, state impulsivity) factors will exacerbate the relationships between momentary motives and subsequent gambling episodes.

Hypothesis 3 (H3): Stable and momentary gambling motives will be positively correlated.

Method

Participants

The final analytic sample comprised 132 adults (58.3% male), with an average age of 29.9 years (SD = 8.6, range = 18–64), recruited from the Australian community. Participants were most often born in Australia (53.8%), employed full time (41.7%), and held a bachelor's degree (35.6%). Just under two thirds (61.4%) used an iOS/iPhone smartphone. Most participants reported gambling on number games like lotteries, Keno, Powerball, or bingo (74.2%), sports/event results (70.5%), racing events (68.9%), and electronic gaming machines (67.4%) in a typical month pre-COVID-19, with just under half of the sample gambling on table games (49.2%) and informal private betting (48.9%). Table 1 provides descriptive statistics for the sample.

Table 1
Descriptive Statistics for the Sample

Sociodemographic characteristic	*n*	%
Age (*M*, *SD*)	29.9	8.6
Gender (male)	77	58.3
Born in Australia	71	53.8
Employment status		
Full-time employment	55	41.7
Part-time or casual employment	31	23.5
Full-time student	34	25.8
Full-time home duties	3	2.3
Retired	1	0.8
Sick or disability pension	1	0.8
Other	7	5.3
Highest education level		
Did not complete Year 12 or equivalent	1	0.8
Year 12 or equivalent	25	18.9
Vocational qualification	9	6.8
Associate diploma	14	10.6
Undergraduate diploma	15	11.4
Bachelor's degree	47	35.6
Postgraduate diploma	4	3.0
Master's degree	16	12.1
Doctoral degree	1	0.8
Smartphone operating system		
iOS/iPhone	81	61.4
Android	51	38.6
Gambling-related characteristic	***M***	***SD***
PGSI problem gambling severity	7.7	5.1
Nonproblem gambling (*n*, %)	7	5.3
Low-risk gambling (*n*, %)	17	12.9
Moderate-risk gambling (*n*, %)	39	29.6
Problem gambling (*n*, %)	69	52.3
GMQ-F stable gambling motives		
Enhancement motives	12.2	2.5
Coping motives	10.3	3.6
Social motives	11.2	2.8
Financial motives	12.0	2.6
IGS-10 high-risk situations		
Positive reinforcement	10.6	2.9
Negative reinforcement	13.5	4.4
Gambling participation (*n*, %)		
Number games (e.g., lotteries, Keno, Powerball, or bingo)	98	74.2
Sports or event betting	93	70.5
Horse/harness/greyhound racing	91	68.9
Electronic gaming machines	89	67.4
Table games	65	49.2
Informal private betting	64	48.9

Note. n = 132. PGSI scores indicate nonproblem gambling (score of 0), low-risk gambling (scores of 1–2), moderate-risk gambling (scores of 3–7), and problem gambling (scores of 8–27). Higher GMQ-F subscale scores (range = 4–16) indicate more frequently experiencing that motive to gamble. Higher IGS-10 subscale scores (range = 4–16 for positive reinforcement; 6–24 for negative reinforcement) indicate more frequently gambling in positively or negatively reinforcing situations. PGSI = Problem Gambling Severity Index; GMQ-F = Gambling Motives Questionnaire–Financial; IGS-10 = Inventory of Gambling Situations–Short Form.

Measures

Pre-EMA Survey of Stable Factors

The pre-EMA survey assessed demographic and gambling participation to describe the sample. This survey also measured gambling motives and potential moderators (problem gambling severity, high-risk situations) that constitute stable factors in the dynamic model of relapse, which are postulated to set a person's baseline vulnerability to gambling episodes and relapse (Witkiewitz & Marlatt, 2004).

Demographic Characteristics. A series of single items collected information on the participants' age, gender, country of birth, employment status, highest level of education, and smartphone operating system. With the exception of age and gender, which were included as covariates in analyses, these variables were only reported descriptively.

Gambling Participation. Participants indicated their participation across six gambling activities in a typical month, including

number games (e.g., lotteries, Keno, Powerball, or bingo), sports or event betting, horse/harness/greyhound racing, pokies (electronic gaming machines), informal private betting, and table games.

Stable Gambling Motives. Stable gambling motives were assessed using the 16-item Gambling Motives Questionnaire–Financial (GMQ-F; Dechant, 2014). The GMQ-F comprises four motive subscales: enhancement (gambling to increase pleasant emotion), coping (gambling to avoid or reduce unpleasant emotion), social (gambling to increase social affiliation), and financial (gambling for monetary gain). Each subscale consists of four items rated on 4-point scale from 1 (*never or almost never*) to 4 (*almost always or always*), yielding subscale scores from 4 to 16. Each subscale displayed good internal consistency in this study: $\alpha = .84$ for enhancement motives, $\alpha = .79$ for social motives, $\alpha = .92$ for coping motives, and $\alpha = .71$ for financial motives.

Problem Gambling Severity. Problem gambling severity was assessed using the nine-item Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001). The PGSI assesses both behavioral dependence (e.g., gambling more than one can afford to lose; four items) and adverse consequences from gambling (e.g., gambling-related health problems; five items) over the past year. Items are rated on a 4-point scale from 0 (*never*) to 3 (*almost always*), yielding a total score from 0 to 27. Total scores indicate nonproblem gambling (score of 0), low-risk gambling (scores of 1–2), moderate-risk gambling (scores of 3–7), and problem gambling (scores of 8–27). The PGSI demonstrated high internal consistency in this study ($\alpha = .91$).

High-Risk Gambling Situations. High-risk gambling situations were assessed using the 10-item Inventory of Gambling Situations–Short Form (IGS-10; Smith et al., 2011). The IGS-10 comprises two subscales to assess how often participants gamble heavily in situations providing positive reinforcement (e.g., gambling after winning; four items) and negative reinforcement (e.g., gambling to cope with unpleasant feelings; six items) over the past year. Items are rated on a 4-point scale from 1 (*never*) to 4 (*almost always*). Each subscale demonstrated high internal consistency in this study: $\alpha = .83$ for positively reinforcing situations and $\alpha = .89$ for negatively reinforcing situations.

EMA of Momentary Factors and Gambling Episodes

The EMA protocol was delivered by the MetricWire smartphone application, a secure research platform for real-time data collection (https://metricwire.com). The protocol involved both time-based EMAs (t-EMA) to assess momentary internal states and event-based EMAs (e-EMA) to assess gambling behavior. Participants received prompts to complete t-EMAs twice daily for 28 days at semirandom intervals within predefined windows: morning (9:00 a.m. to 12:00 p.m.) and evening (5:30 p.m. to 8:30 p.m.). Push notifications were sent to participants' smartphones, with each prompt remaining active for 2 hr.

The t-EMAs included single or brief multi-item measures of momentary gambling motives, psychological distress, emotion dysregulation, distress intolerance, and state impulsivity, selected based on strong psychometric properties of the employed scale, where available. These constructs constitute momentary or transient states in the dynamic model of relapse, which can act as immediate triggers for gambling in high-risk situations (Witkiewitz & Marlatt, 2004). The t-EMAs took 3 min to complete.

Participants could report gambling behavior either during a prompted t-EMA or through a self-initiated e-EMA, which could be completed at any time. If participants reported gambling during a t-EMA, they were asked whether they had already recorded the episode via a self-initiated e-EMA. If not, they were prompted to provide additional details about the gambling episode, including gambling expenditure and duration. Each e-EMA took 1–2 min to complete. Table 2 details the constructs measured in each t-EMA and e-EMA, as well as the corresponding items, response options, and response categories employed in the analyses.

Procedure

Participants were recruited between July 2020 and April 2021 through convenience and snowball sampling using social media platforms and online groups/forums. Recruitment occurred during COVID-19 lockdowns in Australia, when land-based venues were largely inaccessible and online gambling increased (Jenkinson et al., 2020). Hence, participants were asked to describe their gambling participation in a typical month (pre-COVID-19) to contextualize their usual gambling behavior. Eligibility criteria included aged 18 years or older, owning a smartphone, and gambling on any activity (excluding lotteries) in a typical month pre-COVID-19. Interested individuals could access the pre-EMA survey through the online advertisement or by contacting the research team. Hosted by Qualtrics, the pre-EMA survey took 30 min to complete and obtained informed consent, confirmed participant eligibility, and collected baseline data. Following survey completion, participants were emailed instructions to download the MetricWire smartphone app to commence the 28-day EMA protocol.

A total of 245 participants completed the pre-EMA survey. Of these, 142 downloaded the MetricWire app, and 134 completed at least two EMAs, enabling their inclusion in analyses. Of the 134 participants, 101 participants completed 75% or more of the t-EMAs and received a $30 e-gift voucher in recognition of their time. Of the 134 participants who completed at least two t-EMAs, two were excluded from the analyses (one identifying as trans/gender diverse and one who preferred not to specify their gender) as these identities did not meet the predetermined sample size threshold (>5 participants; consistent with Howlett et al., 2024). To protect the privacy and safety of participants, and because all analyses covaried for gender, it was not feasible within the current analytic framework to combine these identities or include them as standalone groups. While inclusion was preferred to support diverse representation, this was not possible under the current analytic constraints (see Cameron & Stinson, 2019, for guidelines on respectful gender measurement). The final analytic sample therefore comprised 132 participants. Ethical approval was granted by the Deakin University Human Research Ethics Committee (2020-039).

Data Analysis

Data analysis was conducted in Stata Version 18 (StataCorp, 2023). No pre-EMA or EMA data were missing due to the use of forced-response formats. During data cleaning, duplicate entries of gambling episodes were identified across t-EMAs and participant-initiated e-EMAs. Participant-initiated e-EMAs were therefore reviewed, cleaned, and merged into the corresponding t-EMA. Specifically, events recorded before the 28-day EMA protocol commenced

Table 2

Time-Based EMA (t-EMA) and Event-Based EMA (e-EMA) Items

Construct and source of item	EMA item	Response option	Response category employed in the analyses
	t-EMA items		
Momentary gambling motives: Assessed using the highest loading items of each GMQ-F subscale (Dechant, 2014)	Right now, how strongly do you agree with the following statements? I would gamble a. because it is exciting b. to forget my worries c. because it makes a social gathering more enjoyable d. because I enjoy thinking about what I would do if I won a jackpot	1. Strongly disagree 2. Disagree 3. Agree 4. Strongly agree	1. Strongly disagree/disagree (scores of 0–1) 2. Strongly agree/agree (scores of 3–4)
Momentary psychological distress: Assessed using a single-item distress thermometer validated in cross-sectional research (Donovan et al., 2014)	How distressed have you been today and over the past week?	0 (no distress) to 10 (extreme distress)	1. No distress (score of 0) 2. Any distress (scores of 1–10)
Momentary emotion dysregulation: Assessed using a scale specifically developed for EMA studies, which measures the use of adaptive and maladaptive emotion regulation strategies (Short et al., 2018)	Did anything upsetting or stressful happen to you since the last prompt? Administered following a "yes" response: Did you do any of the following?	1. No 2. Yes	1. No 2. Yes
Adaptive strategies	a. I thought about it in a different way. b. I tried to accept that this is the way things are. c. I tried to think about a way to fix the problem.	1. No 2. Yes	1. No adaptive strategy used 2. Any adaptive strategy used
Maladaptive strategies	d. I tried not to think about it. e. I kept my emotions to myself. f. I could not stop thinking about it. g. I did something impulsive to make me feel better (e.g., using alcohol or drugs). h. I went out of my way to avoid thoughts, situations, or activities that would make me upset again.	1. No 2. Yes	1. No maladaptive strategy used 2. Any maladaptive strategy used
Momentary distress intolerance: Assessed using the Momentary Distress Intolerance Scale validated for use in EMA studies (Veilleux et al., 2018)	Please indicate your perception of the ability to tolerate your feelings right now in this moment. a. I want to stop what I am doing right now so I can feel better. b. Right now, my emotions are getting in the way. c. I can keep doing what I am doing right now, regardless of what I feel (reverse scored).	1. Strongly disagree 2. Moderately disagree 3. Mildly disagree 4. Neither agree nor disagree 5. Mildly agree 6. Moderately agree 7. Strongly agree	1. No distress intolerance (scores of 1–4) 2. Distress intolerance (scores of 5–7)
Momentary state impulsivity: Assessed the validated Momentary Impulsivity Scale validated for use in EMA studies (Tomko et al., 2014)	Since the last prompt, a. I said things without thinking. b. I spent more money than I meant to. c. I have felt impatient. d. I made a "spur of the moment decision."	1. Very slightly or not at all 2. A little 3. Moderately 4. Quite a bit 5. Extremely	1. Lower state impulsivity (score of 1) 2. Higher state impulsivity (scores of 2–5)
	e-EMA items		
Gambling event	Have you gambled since the last prompt?	1. No 2. Yes	1. No 2. Yes
	Has this event already been recorded? The following items were administered following a "no" response:	1. No 2. Yes	1. No 2. Yes

(*table continues*)

Table 2 *(continued)*

Construct and source of item	EMA item	Response option	Response category employed in the analyses
Gambling expenditure	Did you win or lose overall?	1. Win: Enter winnings minus money spent 2. Loss: Enter money spent minus total lost 3. Broke even 4. I do not know the outcome of this bet yet	1. $0 (won or broke even) 2. Loss of $1–$30 3. Loss of $31 or more
Gambling duration	How much time did you spend gambling?	Enter numeric value	1. 45 min or less 2. More than 45 min

Note. Time-based EMAs (t-EMAs) were administered twice daily in the 28-day EMA protocol. Event-based EMAs (e-EMAs) were administered as a part of a t-EMA where a gambling event was reported, and they could be self-initiated any time. Constructs measured in the EMAs are referred to as "momentary" to reflect their conceptualization as transient states that can act as immediate triggers for gambling in high-risk situations, consistent with the dynamic model of relapse (Witkiewitz & Marlatt, 2004). EMA = ecological momentary assessment; GMQ-F = Gambling Motives Questionnaire–Financial.

(i.e., prior to any t-EMA prompts) were excluded, while those recorded during the EMA protocol were merged with the subsequent t-EMA. In addition, when multiple events contained different information, all distinct details were retained by merging them with the relevant t-EMA, whereas duplicate events with identical data were de-duplicated so that only a single record was retained.

To address skewed distributions, GMQ-F stable gambling motives and IGS-10 high-risk gambling situations scores were dichotomized using median splits. Median cutoffs were as follows: 12 for coping, social, and financial motives; 13 for enhancement motives; 11 for positively reinforcing situations; and 15 for negatively reinforcing situations. For the moderator analyses, PGSI problem gambling severity scores were dichotomized using established categories (nonproblem gambling: scores of 0–7 vs. problem gambling: scores of 8–27). Momentary variables were dichotomized based on their distributional pattern: gambling motives (disagree/strongly disagree vs. agree/strongly agree), psychological distress (absent: score of 0 vs. present: scores of 1–10), emotion dysregulation (no strategy used vs. any strategy used), distress intolerance (absent: score of 1 vs. present: scores of 2–7), and state impulsivity (absent: score of 1 vs. present: scores of 2–5). Gambling behavior variables were also categorized based on their distributional patterns, where gambling expenditure formed three categories (won/broke even vs. loss of AU$1–$30 vs. loss of AU$31 or more) and gambling duration formed two categories (45 min or less vs. more than 45 min). The decision to dichotomize moderator variables also enhanced the interpretability of simple slopes in the moderation models.

To test the primary hypothesis (H1), a series of mixed-effects regressions with logit links were conducted to examine reciprocal relationships between momentary gambling motives (enhancement, social, coping, financial) and gambling behavior (episodes, expenditure, duration). Specifically, mixed-effects binary logistic regressions were used when the dependent variable was gambling motives, gambling episode, or gambling duration, while mixed-effects ordinal logistic regressions were used when the dependent variable was gambling expenditure. To test the secondary hypothesis (H2), the same models were reestimated with interaction terms to test moderation effects. Momentary independent and moderator variables were time lagged in all relevant analyses to reflect values from the previous t-EMA, ensuring appropriate temporal ordering relative to the outcome. All analyses controlled for age, gender, time, and the outcome variable at the previous t-EMA. Significance was set at $\alpha = .05$ for main effects and reduced to $\alpha = .03$ for moderation analyses to account for the large number of moderator variables and increased risk of Type I error (Dowling et al., 2021; Hawker et al., 2021). Pairwise comparisons for marginal means were used to examine the nature of significant interaction effects. Odds ratios (*OR*s) were interpreted as small (*OR* = 1.68), medium (*OR* = 3.47), and large (*OR* = 6.71; Chen et al., 2010). Post hoc power analyses accounting for clustering (effective sample size $= nm/[1 + (m - 1)\rho]$, with $\rho = .50$) indicated effective sample size of 258 (gambling episode as dependent variable), 153 (gambling expenditure as dependent variable), 156 (gambling duration as dependent variable), and 242 (gambling motives as dependent variables). Using a two-tailed $\alpha = .05$, these correspond to ~87%, 65%, 66%, and 84% power, respectively, to detect a small within-person effect (standardized $\beta \approx .19$).

To test the final hypothesis (H3), a series of Spearman correlations examined the concordance between each EMA item measuring

momentary gambling motives and each corresponding GMQ-F subscale and item measuring stable gambling motives in the pre-EMA survey. Correlations were interpreted as negligible (r_s = ±0.00 to ±0.30), low (r_s = ±0.30 to ±0.50), moderate (r_s = ±0.50 to ±0.70), strong (r_s = ±0.70 to ±0.90), and very strong (r_s = ±0.90 to ±1.00; Hinkle et al., 2003).

Results

Descriptive Statistics

In the pre-EMA survey (see Table 1), 125 participants (94.7%) endorsed PGSI gambling problems across the continuum of risk: 69 participants (52.3%) endorsed problem gambling, 39 participants (29.6%) endorsed moderate-risk gambling, 17 participants (12.9%) endorsed low-risk gambling, and only seven participants (5.3%) endorsed nonproblem gambling. In addition, participants most often endorsed enhancement motives (M = 12.2), followed by financial motives (M = 12.0), social motives (M = 11.2), and coping motives (M = 10.3). Participants also more commonly endorsed gambling in high-risk situations providing negative reinforcement (M = 13.5) than positive reinforcement (M = 10.6).

Across the 28-day EMA protocol, a total of 5,864 t-EMAs were completed (compliance rate = 79.3%). On average, participants completed 44.4 t-EMAs (SD = 13.6, range = 4–56) and reported 14.9 gambling episodes (SD = 10.5, range = 0–47).

H1: Reciprocal Relationships Between Momentary Gambling Motives and Gambling Behavior

Table 3 presents the results of the mixed-effects regressions examining reciprocal relationships between momentary gambling motives and gambling behavior. After adjusting for covariates and the outcome at the previous assessment, there was no evidence of reciprocal relationships. Small but significant regression effects were however identified between momentary enhancement (OR = 1.73, 95% confidence interval [CI] [1.13, 2.64], p = .012), coping (OR = 2.03, 95% CI [1.28, 3.24], p = .003), and social motives (OR = 1.57, 95% CI [1.03, 2.40], p = .038) and subsequent gambling expenditure, as well as between gambling duration and subsequent momentary financial motives (OR = 3.31, 95% CI [1.24, 8.79], p = .017).

H2: Stable and Momentary Moderators of the Relationship Between Momentary Gambling Motives and Subsequent Gambling Episodes

Table 4 presents the results of the moderated mixed-effects binary logistic regressions examining whether individual-level gambling-related and psychological vulnerabilities—both stable (problem gambling severity, high-risk situations) and momentary (psychological distress, emotion dysregulation, distress intolerance, state impulsivity)—moderate the relationships between momentary gambling motives and subsequent gambling episodes. No significant moderation effects were observed for stable or momentary factors (at $p < .03$ to control for Type 1 error), with the exception of momentary distress intolerance.

Momentary distress intolerance moderated the relationship between enhancement motives (OR = 1.63, 95% CI [1.15, 2.30], p = .006) and coping motives (OR = 1.44, 95% CI [1.05, 1.99], p = .026) and subsequent gambling episodes. Pairwise comparisons showed that when enhancement motives were endorsed, individuals with distress intolerance were more likely to report a subsequent gambling episode (35.5%) than those without distress intolerance (32.6%; p = .048; see Figure 1). Conversely, when enhancement motives were not endorsed, individuals with distress intolerance were significantly less likely to report a subsequent gambling episode (30.9%) than those without distress intolerance (36.8%; p = .035). A similar, though weaker, pattern was observed for coping motives. When coping motives were endorsed, individuals with distress intolerance were more likely to

Table 3

Mixed-Effects Regressions Examining Reciprocal Relationships Between Momentary Gambling Motives and Gambling Behavior

	Outcome		
Predictor	Gambling episode[a] *OR* [95% CI]	Gambling expenditure[b] *OR* [95% CI]	Gambling duration[c] *OR* [95% CI]
Enhancement motives	1.07 [0.87, 1.33]	1.73 [1.13, 2.64]*	0.87 [0.46, 1.67]
Coping motives	0.99 [0.79, 1.24]	2.03 [1.28, 3.24]**	1.15 [0.52, 2.51]
Social motives	1.00 [0.80, 1.25]	1.57 [1.03, 2.40]*	0.96 [0.47, 1.94]
Financial motives	1.13 [0.89, 1.43]	0.87 [0.55, 1.37]	0.73 [0.34, 1.57]

Predictor	Enhancement motive *OR* [95% CI]	Coping motive *OR* [95% CI]	Social motive *OR* [95% CI]	Financial motive *OR* [95% CI]
Gambling episode[a]	1.09 [0.86, 1.38]	1.01 [0.78, 1.30]	0.84 [0.66, 1.08]	0.93 [0.72, 1.22]
Gambling expenditure[d]	1.00 [0.35, 2.82]	1.04 [0.35, 3.13]	0.60 [0.17, 2.15]	3.20 [0.75, 13.87]
Gambling duration[d]	0.67 [0.32, 1.38]	0.82 [0.37, 1.86]	0.54 [0.23, 1.25]	3.31 [1.24, 8.79]*

Note. Analyses were adjusted for age, gender, time, and outcome measured at previous time point. CI = confidence interval.
[a] Based on analysis of 132 participants providing 5,732 observations for coping, enhancement, and social motives and 5,730 observations for financial motives. [b] Based on 88 participants providing 585 observations. [c] Based on 88 participants providing 701 observations. [d] Based on 129 participants providing 1,912 observations for coping, enhancement, and social motives and 1,910 observations for financial motives. Mixed-effects binary logistic regressions were used when the dependent variable was gambling motives, gambling episode, or gambling duration, while mixed-effects ordinal logistic regressions were used when the dependent variable was gambling expenditure.
Significant regression effect at * $p < .05$ and ** $p < .001$.

Table 4
Moderated Regression Analyses of the Relationship Between Momentary Gambling Motives and Subsequent Gambling Episodes

Predictor x Moderator	*OR*	*SE*	*p*	95% CI
Stable (pre-EMA-measured) moderators[a]				
Problem gambling severity (PGSI)				
Enhancement Motives × Problem Gambling Severity	1.48	0.34	.085	[0.95, 2.32]
Coping Motives × Problem Gambling Severity	1.07	0.25	.790	[0.67, 1.70]
Social Motives × Problem Gambling Severity	1.29	0.30	.279	[0.81, 2.05]
Financial Motives × Problem Gambling Severity	1.27	0.32	.352	[0.77, 2.08]
High-risk situations (IGS-10)				
Enhancement Motives × Positive Reinforcement	1.09	0.26	.711	[0.69, 1.74]
Enhancement Motives × Negative Reinforcement	0.75	0.20	.287	[0.44, 1.27]
Coping Motives × Positive Reinforcement	0.95	0.23	.829	[0.59, 1.53]
Coping Motives × Negative Reinforcement	1.36	0.38	.270	[0.79. 2.33]
Social Motives × Positive Reinforcement	1.02	0.25	.928	[0.63, 1.66]
Social Motives × Negative Reinforcement	1.66	0.48	.077	[0.95, 2.91]
Financial Motives × Positive Reinforcement	1.09	0.30	.759	[0.64, 1.86]
Financial Motives × Negative Reinforcement	1.26	0.38	.438	[0.70, 2.28]
Momentary (EMA-measured) moderators				
Psychological distress[a]				
Enhancement Motives × Psychological Distress	1.10	0.24	.661	[0.72, 1.69]
Coping Motives × Psychological Distress	0.92	0.20	.697	[0.61, 1.40]
Social Motives × Psychological Distress	0.87	0.19	.516	[0.57, 1.33]
Financial Motives × Psychological Distress	0.84	0.20	.470	[0.52, 1.35]
Emotion dysregulation[b]				
Enhancement Motives × Adaptive Strategies	0.46	0.43	.403	[0.07, 2.84]
Enhancement Motives × Maladaptive Strategies	0.32	0.39	.347	[0.30, 3.41]
Coping Motives × Adaptive Strategies	2.02	1.83	.438	[0.34, 11.93]
Coping Motives × Maladaptive Strategies	2.78	3.02	.347	[0.33, 23.35]
Social Motives × Adaptive Strategies	1.17	1.15	.874	[0.17, 8.01]
Social Motives × Maladaptive Strategies	0.70	0.86	.773	[0.06, 7.67]
Financial Motives × Adaptive Strategies	1.06	1.03	.951	[0.16, 7.15]
Financial Motives × Maladaptive Strategies	0.36	0.50	.465	[0.02, 5.66]
Distress intolerance[a]				
Enhancement Motives × Distress Intolerance	**1.63**	**0.29**	**.006**	**[1.15, 2.30]**
Coping Motives × Distress Intolerance	**1.44**	**0.24**	**.026**	**[1.05, 1.99]**
Social Motives × Distress Intolerance	1.29	0.23	.149	[0.91, 1.82]
Financial Motives × Distress Intolerance	1.29	0.25	.185	[0.88, 1.90]
State impulsivity[a]				
Enhancement Motives × State Impulsivity	1.23	0.30	.412	[0.75, 2.00]
Coping Motives × State Impulsivity	1.24	0.47	.575	[0.59, 2.60]
Social Motives × State Impulsivity	0.75	0.19	.274	[0.45, 1.25]
Financial Motives × State Impulsivity	1.13	0.28	.626	[0.69, 1.84]

Note. All analyses were adjusted for age, gender, time, and outcome measured at the previous time point. Values presented in bold indicate significant moderation effect ($p < .03$), whereby a more conservative threshold was used to control for Type 1 error (Dowling et al., 2021; Hawker et al., 2021). *SE* = standard error; CI = confidence interval; EMA = ecological momentary assessment; PGSI = Problem Gambling Severity Index; IGS-10 = Inventory of Gambling Situations–Short Form.
[a] Based on 132 participants providing 5,732 observations for coping, enhancement, and social motives and 5,731 observations for financial motives. [b] Based on 100 participants providing 434 observations.

report a subsequent gambling episode (34.9%) than those without distress intolerance (31.9%; $p = .073$; see Figure 2). However, when coping motives were not endorsed, gambling likelihood did not significantly differ between individuals with or without distress intolerance ($p = .145$).

H3: Correlation Between Stable and Momentary Gambling Motives

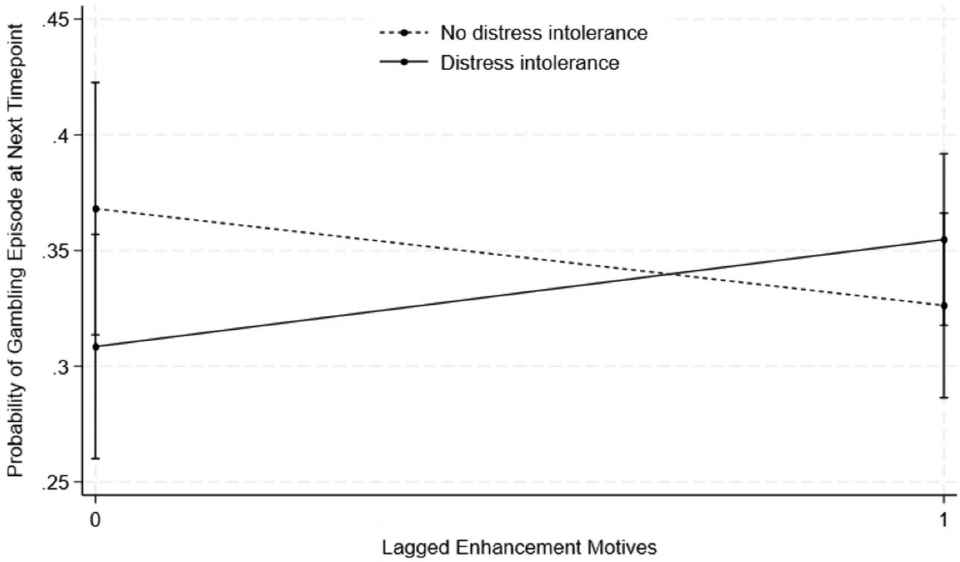
Stable and momentary gambling motives were strongly, positively correlated. Each momentary motive EMA item was significantly correlated with its corresponding pre-EMA single item (selected as the highest loading item from the relevant GMQ-F subscale: $r_s = 0.71–0.86$, $p < .001$) and with the full GMQ-F subscale score ($r_s = 0.77–0.89$, $p < .001$; Table 5).

Discussion

This study is the first to use EMA methodology to examine reciprocal relationships between momentary gambling motives (enhancement, coping, social, financial motives) and gambling behavior (episodes, expenditure, duration), framed within the dynamic model of relapse (Witkiewitz & Marlatt, 2004). The moderating role of both stable (problem gambling severity, high-risk situations) and momentary (psychological distress, emotion dysregulation, distress intolerance, state impulsivity) vulnerability factors, and the concordance between

Figure 1

Significant Interaction Effect Between Momentary Distress Intolerance and Enhancement Motives Predicting Subsequent Gambling Episodes



momentary and trait gambling motives, were also explored. This study therefore offers novel insights into how and when motives influence gambling in real time and how individual vulnerabilities may intensify these effects.

H1: Reciprocal Relationships Between Momentary Gambling Motives and Gambling Behavior

The primary hypothesis (H1) that there would be reciprocal relationships between gambling motives and gambling behavior was partially supported. As hypothesized, momentary coping motives showed the strongest association with subsequent gambling expenditure, followed by enhancement, and social motives. These findings support EMA evidence in the broader addictions field (Votaw & Witkiewitz, 2021) and extend meta-analytic evidence in the gambling field (Allami et al., 2025; Dias, Dowling, et al., 2025) by highlighting their role as immediate triggers for gambling. These motives did not predict subsequent gambling episodes or gambling duration, however, which suggests that while they may influence how much people gamble, they may not be sufficient on their own to initiate or sustain a

Figure 2

Significant Interaction Effect Between Momentary Distress Intolerance and Coping Motives Predicting Subsequent Gambling Episodes

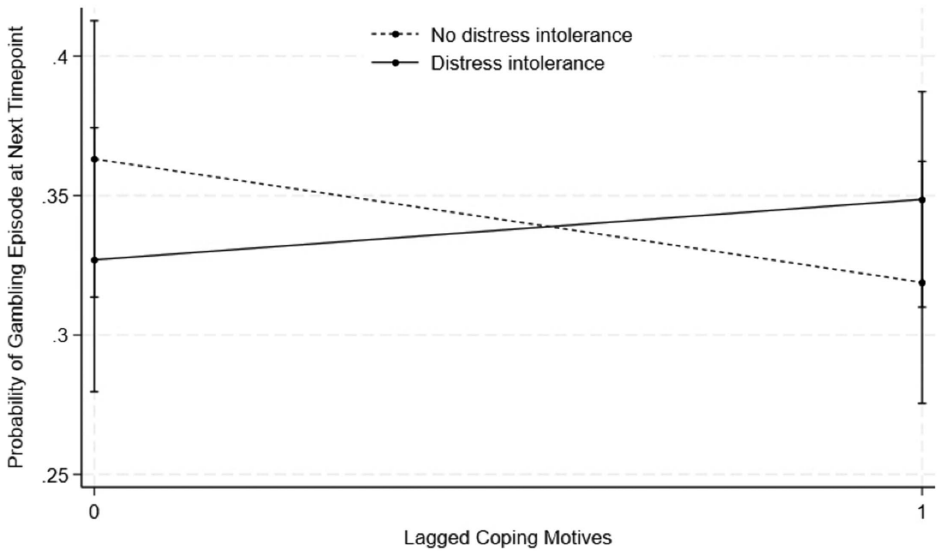


Table 5
Spearman Correlation Coefficients Between Stable and Momentary Measures of Gambling Motives

EMA measure of momentary gambling motive[a]	Pre-EMA measure of stable gambling motive	
	Corresponding GMQ-F item[a]	Corresponding GMQ-F subscale
Enhancement motive item	0.71	0.77
Coping motive item	0.86	0.89
Social motive item	0.71	0.81
Financial motive item	0.79	0.85

Note. EMA = ecological momentary assessment; GMQ-F = Gambling Motives Questionnaire–Financial.
[a] The highest loading item of each GMQ-F subscale was used to measure the corresponding momentary motive in the time-based EMA (Dechant, 2014).

gambling episode. Furthermore, gambling behavior did not predict subsequent motives, which partially challenges the feedback loop component of the dynamic model of relapse (Witkiewitz & Marlatt, 2004). This finding adds to the mixed EMA evidence on dynamic associations between cognitive processes outlined in the model. Prior research has shown reciprocal relationships between self-efficacy and gambling duration and that gambling cravings predict subsequent gambling episodes (Hawker et al., 2021). By contrast, positive outcome expectancies have not shown direct associations with gambling behavior, except when interacting with other stable and momentary factors (Dowling et al., 2021). Taken together, these findings suggest that reciprocal effects may depend on the specific psychological process under study.

A different pattern of results emerged in relation to financial motives. Contrary to robust cross-sectional evidence linking trait financial motives to gambling severity and frequency (Dias, Merkouris, et al., 2025; Tabri et al., 2022), momentary financial motives did not predict subsequent gambling behavior in this study. Instead, longer gambling duration predicted stronger financial motives. This finding suggests that momentary financial motives may serve as postgambling rationalizations, perhaps for chasing losses or attempting to maximize potential winnings. Similar findings have been recorded in substance use EMA research, where postuse motives reflect retrospective interpretations of the behavior rather than prospective triggers (Votaw & Witkiewitz, 2021). Alternatively, these null findings may relate to how momentary financial motives were measured in this study. Although the EMA item correlated strongly with the GMQ-F financial subscale, its narrow focus on jackpot fantasies may have limited its relevance, particularly as the study took place during COVID-19 lockdowns in Australia, when access to gambling formats wherein jackpots are most salient (e.g., electronic gaming machines in venues) was largely restricted (Jenkinson et al., 2020). Future EMA studies may benefit from using measures that capture the full conceptual range of financial gambling motives.

H2: Stable and Momentary Moderators of the Relationship Between Momentary Gambling Motives and Subsequent Gambling Episodes

Contrary to hypotheses (H2), none of the examined stable or momentary factors implicated in the dynamic model of relapse moderated the effect of momentary gambling motives on subsequent gambling episodes, with the exception of momentary distress intolerance (Witkiewitz & Marlatt, 2004). Specifically, momentary distress intolerance exacerbated the effect of enhancement motives and, to a lesser extent, coping motives on gambling episodes. When these motives were endorsed, individuals with momentary distress intolerance were more likely to subsequently gamble, whereas when enhancement motives were not endorsed, distress intolerance was associated with a reduced likelihood of gambling. These findings align with prior cross-sectional research by Dias, Merkouris, et al. (2025), who found that low distress tolerance strengthened the association between gambling motives and gambling problems. This pattern also makes intuitive sense: If someone gambles to escape unpleasant emotions or to feel a rush of excitement, they may be especially vulnerable to gambling when they find it difficult to sit with distressing feelings. Together, these results suggest that distress intolerance may increase vulnerability to motive-driven gambling in the moment, reinforcing its relevance as a dynamic risk factor in gambling behavior and harm.

Contrary to previous research (Dias, Merkouris, et al., 2025; King et al., 2024; Marchica et al., 2020), this study found no moderation effects for stable factors (problem gambling severity, high-risk situations) or other momentary factors (psychological distress, emotion dysregulation, state impulsivity). Several methodological factors may explain these null findings. First, the study utilized a relatively small, convenience sample, of whom just over half (52.6%) displayed problem gambling. While capturing the full spectrum of gambling risk aligns with public health recommendations (Browne et al., 2017), it may limit the ability to draw conclusions about the processes driving harmful gambling (Votaw & Witkiewitz, 2021). Problem gambling severity did not moderate any of the observed relationships, suggesting that motives may operate similarly across levels of risk. This pattern is consistent with EMA research on positive outcome expectancies (a related construct; Dowling et al., 2021) and recent large-scale survey findings linking coping motives and problem gambling in a nationally representative U.S. sample (King et al., 2024), further underscoring the central role of motives in predicting gambling-related harm across risk levels. Second, the use of dichotomized variables and single-item EMA indicators may have reduced sensitivity to detect subtle or context-specific effects. For instance, emotion regulation strategies were only assessed if participants reported a recent upsetting event, resulting in fewer data points and potentially underpowered moderation analyses. That said, it is also possible that these factors exert weaker real-time influence on motive-driven gambling than expected (Witkiewitz & Marlatt, 2004) or that their effects emerge more gradually. Further EMA research with larger, more diverse samples and continuous measures of individual vulnerability factors may help clarify how these factors influence gambling risk.

H3: Concordance Between Stable and Momentary Gambling Motives

The final aim was to assess the concordance between single-item momentary assessments of enhancement, coping, social, and financial motives and more established stable measures of trait motives. As hypothesized (H3), all EMA items measuring momentary motives showed strong, positive correlations with their corresponding GMQ-F subscales and highest loading items from the pre-EMA survey

(Dechant, 2014). These findings provide empirical support for the construct validity of using single-item EMA measures of momentary gambling motives in future research, when assessment brevity is a priority. As noted earlier, however, the narrow phrasing of the momentary financial motive item may have lacked conceptual breadth. Future research is needed to assess the psychometric properties of EMA motive measures, such as testing their factor structure, using open-ended items to capture unique momentary motives, and ensuring comprehensive coverage of relevant motive subtypes (Votaw & Witkiewitz, 2021). These improvements must be balanced against participant burden, particularly in high-frequency EMA designs, in which brief, focused assessments are key to maintaining compliance and data quality.

Study Limitations

This study has several limitations. The sample was relatively small and included participants endorsing a broad range of gambling risk, which may limit the generalizability to clinically affected populations and constrain conclusions about processes underlying harmful gambling. Although most of the main analyses were adequately powered, the regression models with gambling expenditure or duration as dependent variables and the moderation models were likely underpowered due to fewer participants and observations. A stricter significance threshold for moderation models ($\alpha = .03$) was applied, however, meaning null findings should be treated cautiously, while significant effects can be considered more robust. Some data quality issues also arose, including duplicate entries in self-initiated gambling event reports, which were merged with time-based prompts, thereby possibly reintroducing recall bias (Dowling et al., 2021). Several key variables were assessed using single items and dichotomized scores, and the EMA measure of psychological distress captured past-week rather than momentary distress, potentially reducing sensitivity to detect more nuanced effects. The 28-day assessment period and twice-daily prompting schedule may have missed low-frequency gambling behaviors and rapid changes in momentary states or behavior (Votaw & Witkiewitz, 2021). Additionally, although the momentary financial motive item correlated strongly with its corresponding stable measure, its narrow focus on jackpot fantasies may not have captured the full range of financial motives. Finally, the study was conducted during COVID-19 lockdowns in Australia, when public health restrictions limited access to land-based gambling, likely shifting participation toward mobile and noncasino forms (Jenkinson et al., 2020). This restricted gambling environment may have influenced gambling patterns in ways that contributed to null findings, including the absence of moderation effects for problem gambling severity. Future research should replicate this work under typical conditions and with these limitations addressed to determine whether the findings generalize.

Study Implications

These findings offer important insights for both gambling researchers and clinicians. From a research perspective, they demonstrate the value of EMA for capturing the real-time antecedents of gambling behavior and for testing dynamic theoretical models such as the dynamic model of relapse in ecologically valid settings (Shiffman et al., 2008). Future studies should aim to replicate and extend these findings with larger and more diverse samples, continuous measures, and refined EMA designs that avoid conditional question formats where possible (Votaw & Witkiewitz, 2021). From a clinical perspective, the findings suggest that interventions could benefit from identifying and addressing specific momentary motives, particularly enhancement, coping, and social motives, in real time. For example, a just-in-time adaptive intervention has demonstrated promising findings delivering tailored support during cognitive vulnerability, characterized by high craving intensity, low self-efficacy, and positive outcome expectancies (Dowling et al., 2022, 2024). Distress intolerance also emerged as a key momentary vulnerability, suggesting that strategies to improve distress tolerance, such as mindfulness and emotion regulation skills, may reduce the impact of gambling motives on behavior. While emerging motive-matched interventions (Stewart et al., 2016) have shown promise, this study's findings suggest that distress tolerance should be a core target regardless of the motive. Interventions that combine both motive-specific and transdiagnostic elements may be especially beneficial.

Conclusion

By leveraging real-time data collection, this study contributes novel evidence on how momentary gambling motives interact with individual vulnerabilities to influence gambling behavior. Momentary coping, enhancement, and social motives predicted subsequent gambling expenditure, while longer gambling duration led to subsequent endorsement of financial motives. Distress intolerance intensified the link between both enhancement and coping motives with subsequent gambling episodes, highlighting a key mechanism for targeted interventions. These findings underscore the importance of addressing both motive and emotional vulnerability in real time and offer a foundation for developing tailored, in-the-moment supports to reduce gambling-related harm. The strong concordance between measures of momentary and trait gambling motives further supports the validity of brief EMA assessments and highlights their potential utility in gambling research and clinical contexts.

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Retraction of "Preventing Tobacco and Alcohol Use Among High School Students Through a Hybrid Online and In-Class Intervention: A Randomized Controlled Trial," by Williams et al. (2025)

The following article is being retracted: Williams, C., Griffin, K. W., Sousa, S. M., & Botvin, G. J. (2025). Preventing tobacco and alcohol use among high school students through a hybrid online and in-class intervention: A randomized controlled trial. *Psychology of Addictive Behaviors*, *39*(6), 528–540. https://doi.org/10.1037/adb0001061. The published paper reported an incorrect registration number for https://clinicaltrials.gov/. When comparing the correct https://clinicaltrials.gov/ trial registration (NCT03219190) and the published article, there were several discrepancies between the protocol as reported in the published paper and the appropriate https://clinicaltrials.gov/ registry, which deviated from accepted standards for the reporting of RCTs. The outcomes reported in the published article were not specified as primary or secondary outcomes of the trial. The Allocation (randomized) sample size ($n = 1804$) was markedly less than the registered Anticipated sample size of $n = 3000$. The age range for the population listed in the https://clinicaltrials.gov/ registration (11–14 years old) was younger than the average age of participants in the published paper (mean age = 15.2). The published paper examined data at the registered post-test timepoint without analysis of the additional registered follow-up timepoints, representing an interim analysis, but an interim analysis was not pre-specified or described as such in the paper. Finally, the primary outcome was not discussed in the published article, which does not accord with trial reporting practices where all outcomes should be reported together in a single paper, unless the reasons for the exclusion of an outcome are discussed and justified. To correct these reporting errors and the scientific record, the Editor and authors have agreed to retract the article. An updated version of the manuscript will be resubmitted for peer review and potential publication.

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