

Understanding gambling in everyday life: What we can learn from thousands of in-the-moment assessments

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Disclosure of Potential Conflict of Interest Statement

Disclosure of potential conflict of interests: I have no potential conflicts of interest to declare in relation to this presentation. My 3-year declaration of interest statement is as follows: I have received funding from multiple sources, including via hypothecated taxes from gambling revenue. I have received research funding from the Victorian Responsible Gambling Foundation, New South Wales Office of Responsible Gambling, Tasmanian Department of Treasury and Finance, Gambling Research Australia, Swedish Gambling Research Council, Health Research Council of New Zealand, and New Zealand Ministry of Health. She has been the recipient of a Deakin University Faculty of Health Mid-Career Fellowship. I have not knowingly received research or consultancy funding from the gambling, tobacco, or alcohol industries or any industry-sponsored organisation.

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Our Reliance on Global Retrospective Reports

No-one is diagnosed or treated because of how they behave in a laboratory or a consulting room... Yet, behaviour is seldom studied, assessed or observed as it unfolds in the real world.

- We have a growing evidence base about gambling behaviour, risk and protective factors, and gambling-related harm.
- Much of this knowledge is derived from cross-sectional survey research.
- There are an increasing number of longitudinal studies, which allow for a more nuanced understanding of temporal ordering.



- Both of these designs rely on global retrospective assessments

Our reliance on global retrospective assessments can keep us from seeing and studying dynamic changes in gambling over time and across situations, from appreciating how gambling varies, and is governed, by context, and from understanding cascades of behaviour, or interactions with others or with our environments that play out as a sequence of events over time

Ecological Momentary Assessment

EMA captures life as it is lived, moment to moment, hour to hour, day to day



- Defined as methods using repeated collection of real-time data on participants' behaviour and experience in their natural environments
- Originally developed for the assessment of mood and affect
- EMA involves monitoring or sampling strategies to assess phenomena at that moment they occur in natural settings in real-time and real-world daily life
- Data collected can include emotions, contexts, activities, aspects of psychopathology, somatic symptoms, and cognitions
- Aka experience sampling method and ambulatory assessment
- Aided by advances in electronic technologies

Unique Features of EMA Study Designs

- **Ecological:** Data are collected in real-world environments, as participants go about their lives, thereby allowing generalisation to the subjects' real lives (i.e., ecological validity).
- **Momentary:** Assessments focus on current feelings or behaviours rather than relying on recall over longer periods of time, thereby aiming to avoid the error and bias associated with retrospection.
- **Moments are strategically selected for assessment:** The moments are assessed by signal-contingent (time-based) sampling, event-contingent (event-based) sampling, or some combination of the two.
- **Repeated assessment:** Participants complete multiple assessments over time, providing a picture of how their experiences and behaviour varies over time and across situations. Due to repeated measurements over time, EMA studies can focus on within-person changes in behaviours and experiences over time, thus allowing valuable insights into the antecedents and consequences of a behaviour and the time-varying relationships between a range of factors in daily life and that behaviour.

The Uses of EMA

- **Individual differences:** EMA data are aggregated to obtain a measure of the participant that is collapsed across time (i.e., across multiple EMA measures) or to compare between-subject characteristics at two different time points.
- **Natural history:** EMA measures are analysed for trends over time. The within-subject variation over time itself is the focus, and time is the independent variable.
- **Contextual associations:** Analyses examine the association or interaction between two or more phenomena that co-occur in time. May be cross-sectional in that they examine the co-occurrence of events or experiences rather than their sequence. Time is therefore not explicitly represented.
- **Temporal sequences:** Explicit examination of temporal sequences of events or experiences to document antecedents or consequences of events or behaviours, or to study cascades of events. The order of events is a key focus and is therefore explicitly considered.

Data provided by EMA studies may be likened to a movie, in which dynamic relationships emerge over time, whereas global or recall measures are analogous to a still photograph, a single static snapshot of time

Advantages of EMA Research

- Increased ecological validity
- Reduction of recall bias
- Temporal dynamics
- Enhanced accuracy
- Contextual information
- Increased sensitivity to individual differences
- Opportunities for intervention
- Longitudinal insights

EMA study designs offer several advantages over traditional cross-sectional study designs



Methodological Considerations in EMA Research



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Ambulatory Assessment in Psychopathology Research: A Review of Recommended Reporting Guidelines and Current Practices

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Consistent reporting of methodological and analytical details of studies increases transparency, facilitates replication, and services to enhance the rigor and utility of future studies

Recommended reporting criterion	% of studies
1. SAMPLE SELECTION AND SIZE <ul style="list-style-type: none">Justify sample size	2%
2. SAMPLING DESIGN <ul style="list-style-type: none">Explain rationale for the sampling designExplain rationale for the sampling density and schedulingProvide technical details of sampling	17% 17% 32%

Recommended reporting criterion	% of studies
3. SELECTION AND REPORTING OF MEASURES <ul style="list-style-type: none"> Report full text of items, rating timeframes, response options or scaling Report psychometric properties of items in the current EMA study (between- and within-subject), as well as the origin of the items 	<p>78%</p> <p>30%</p>
4. DEVICES AND SOFTWARE USED <ul style="list-style-type: none"> Fully describe hardware and software used 	<p>76%</p>
5. COMPLIANCE <ul style="list-style-type: none"> Define valid and missing data, report descriptive analyses regarding valid data 	<p>65%</p>
6. PARTICIPANT TRAINING, MONITORING AND REMUNERATION <ul style="list-style-type: none"> Describe the procedures used to enhance compliance and participation (e.g., remuneration, schedule, participant training) 	<p>73%</p>
7. DATA MANAGEMENT AND ANALYSIS <ul style="list-style-type: none"> Describe the final dataset: number of reports, days in study and retention rates, and rates of delayed or suspended responding Describe preparation for data analyses: centring of predictor variables and at what level; report covariates included in the models Describe levels of analysis (momentary, day, person); explain how time is taken into account in analyses; specify and justify choices of random versus fixed effects in models; describe analytic modelling used as well as statistical software used 	<p>46%</p> <p>60%</p> <p>90%</p>

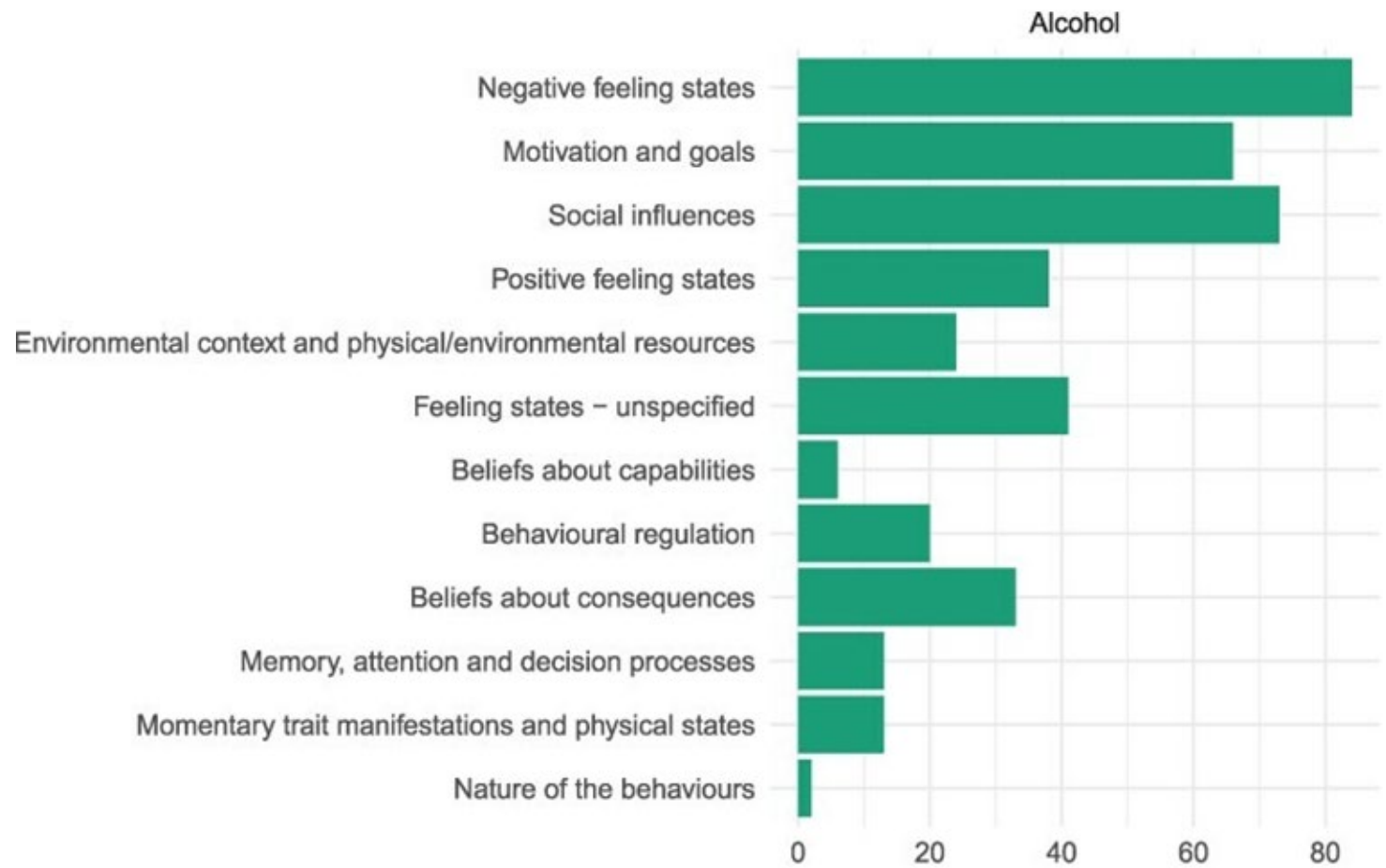
Addiction EMA Studies

- EMA is particularly suitable for study substance use because use is episodic and thought to be related to mood and context
- Common EMA designs combine event-based reports of substance use with time-based assessment
- Approaches to data organisation and analysis are diverse, particularly regarding the treatment of time
- Compliance with signalled assessments is often high
- Compliance with recording of substance use appears good but is harder to validate
- There is variability and ambiguity in study assessment periods, within-study incongruence between assessment period descriptions and associated EMA prompts and a large temporal range of retrospective assessment periods across studies



Alcohol EMA Studies

- Across 413 alcohol EMA studies, the most frequently examined constructs were negative feeling states (k=84, 20.3%) and social influences (k=73, 17.7%) (Perski et al., 2022)
- The EMA evidence base across alcohol use is such that there are systematic reviews on the associations between specific constructs and alcohol consumption (e.g., craving, stress, affect, motives, alcohol marketing)



The Aims

Aim 1: to critically review the design and reported practices of EMA studies in gambling research

Aim 2: to synthesise the main findings of these studies, with particular emphasis on the associations between antecedents-gambling consumption-harms



With a view to...

- *describe the implications of findings*
- *identify important gaps in the literature*
- *Provide recommendations for the reporting the features of future EMA gambling studies*
- *Highlight key future directions for gambling EMA research*

10 Gambling EMA Studies

Authors	Year	Jurisdiction	No. publications
Gee et al.	2005	UK	1
Goldstein et al.	2014-2018	Canada	5
ACIL Allen Consulting et al.	2017-21	Australia	2
Hing et al.	2018	Australia	2
Hing et al.	2018-19	Australia	3
Dowling et al.	2021	Australia	1
Hing et al.	2022	Australia	2
Dias et al.	2023	Australia	1
Dowling et al.	2023	Australia	1
Kim et al.	2023	Canada	2



The EMA Samples

Authors	Sample type	Sample size	% problem gambling
Gee et al.	Adult male regular gamblers	17	71%
Goldstein et al.	Young adult regular gamblers	108	94%
ACIL Allen Consulting et al.	Adult regular gamblers	98	24%
Hing et al.	Adult regular sports and race gamblers	202	79%
Hing et al.	Adult regular sports and race gamblers	722	72%
Dowling et al.	Adult past-month gamblers	109	84%
Hing et al.	Adult regular sports, esports or daily fantasy sports gamblers	267	89%
Dias et al.	Adult past-month gamblers	135	95%
Dowling et al.	Adults with gambling problems	184	100%
Kim et al.	Adult past-3-month in-play sports bettors	84	81%

EMA Protocols: Over 40,000 assessments!

Authors	Sampling design	Monitoring duration	EMA frequency	No. completed EMAs	EMA compliance
Gee et al.	Event-contingent	14 days	--	148	--
Goldstein et al.	Signal-contingent	30 days	3/day	6783	75%
ACIL Allen Consulting et al.	Signal-contingent	28 days	2/day	5165	94%
Hing et al.	Interval-contingent	7 days	1/day	1077	76%
Hing et al.	Interval-contingent	3 weeks	5/week	6843	76%
Dowling et al.	Signal-contingent	28 days	2/day	3142	51%
Hing et al.	Interval-contingent	10 weeks	1/week	1984	74%
Dias et al.	Signal/event contingent	28 days	2/day	5972	79%
Dowling et al.	Signal-contingent	28 days	3/day	8590	56%
Kim et al.	Interval-contingent	14 days	2/day	1365	58%

The Focus of EMA Gambling Studies

Authors	Focus	Risk factors: Individual	Risk factors: Socioecological	Protective factors	Harms	Methodology
Gee et al.	Mood	X				
Goldstein et al.	Mood, motives, social context, social desirability	X	X			X
ACIL Allen Consulting et al.	Antecedents and harms	X		X	X	X
Hing et al.	Direct messages		X			
Hing et al.	Marketing		X			
Dowling et al.	Positive outcome expectancies	X			X	X
Hing et al.	Situational features		X		X	
Dias et al.	Motives	X			X	X
Dowling et al.	COVID-19 stressors	X	X	X	X	X
Kim et al.	In-play betting, self-regulation	X		X	X	

Risk Factors: Individual-Level Proximal Antecedents

Significant associations with gambling outcomes

- Mood: anxiety, depression, stress, excitement
- Cravings: occurrence
- Self-efficacy: Gambling, craving
- Financial worries
- Motives: coping, social, enhancement

Only anxiety, depression, boredom, stress, and subjective alcohol intoxication have been examined in more than one study

Non-significant associations with gambling outcomes

- Mood: boredom, negative affect, positive affect, happiness, loneliness
- Subjective alcohol intoxication
- Cravings: frequency, intensity
- Positive outcome expectancies: enjoyment/arousal, self-enhancement, money
- COVID-19 stress
- Time at home
- Motives: financial

Risk Factors: Individual-Level Distal Antecedents

Significant associations with gambling outcomes

- Demographics: age, male gender, income, disposable income
- Problem gambling severity
- Mood: anxiety, anxiety sensitivity
- Dissociation
- Impulsivity, negative urgency, sensation-seeking
- Adverse childhood events

Non-significant associations with gambling outcomes

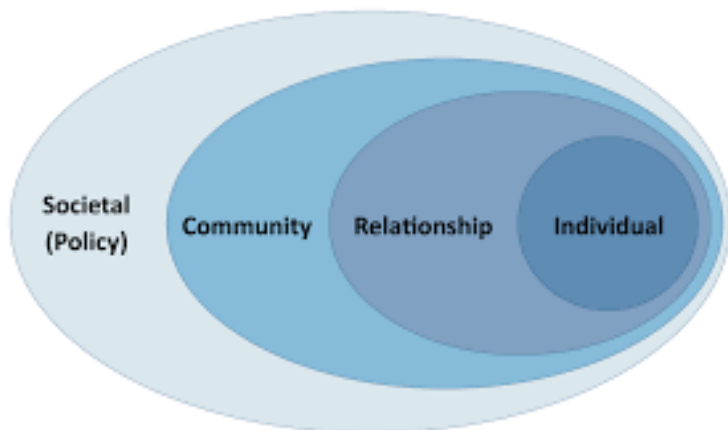
- Demographics: ethnicity, education, employment status
- Psychological distress
- Alcohol problems
- Positive urgency
- Motives: coping, social, enhancement

Only problem gambling severity, alcohol problems, impulsivity, gender, and ethnicity have been examined in more than one study

Risk Factors: Socioecological-Level Proximal Antecedents

Significant associations with gambling outcomes

- Direct messages
- Inducements
- Advertisements/marketing
- Situational characteristics: quick and easy access from home, electronic financial transactions



Non-significant associations with gambling outcomes

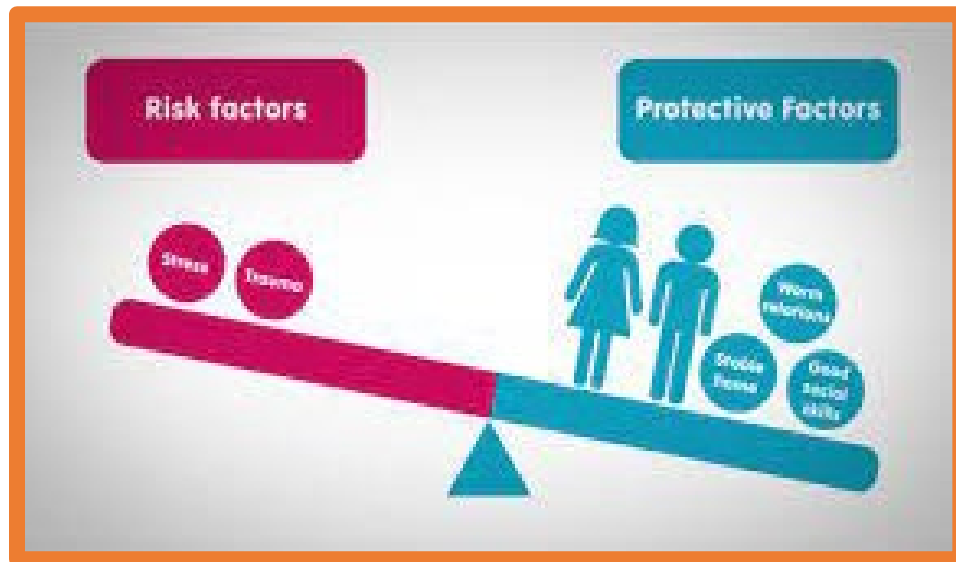
- Situational characteristics: ability to bet anywhere anytime
- Access to promotions and betting options
- Family conflict
- COVID-19 news/media exposure
- Number of betting accounts (distal)

Advertising, marketing and inducements are associated with gambling outcomes

Protective Factors: Proximal Antecedents

Significant associations with gambling outcomes

- Craving self-efficacy
- Offline social interaction
- Lifestyle factors: time outdoors



Non-significant associations with gambling outcomes

- Readiness to change: ready, willing
- Lifestyle factors: sleep quality, daily structure, physical activity, leisure activities, diet quality
- COVID-19 optimism
- Self-regulation: setting monetary limit, stopped when not fun, took frequent breaks

No protective factor has been examined in more than one study

Harms: Proximal Consequences

Significant associations with gambling behaviour

- Mood: boredom
- Craving occurrence
- Craving frequency
- Motives: financial
- Readiness to change: importance
- Subjective alcohol intoxication
- COVID-19 news/media exposure



The ability to examine within-person reciprocal relationships means we can identify “feedback loops”

Non-significant associations with gambling behaviour

- Mood: happiness, depression, anxiety, anger, stress, loneliness, COVID-19 stress
- Financial worries
- Craving: intensity, self-efficacy
- Readiness to change: readiness
- Positive outcome expectancies: enjoyment/arousal, self-enhancement, money
- Motives: coping, social, enhancement
- Family conflict
- Lifestyle factors: sleep quality, daily structure, physical activity, leisure activities, time outdoors, diet quality
- Social factors: time at home, online social interaction, offline social interaction
- Advertising

Harms: Appraisal of Gambling Effects



Gambling episodes:

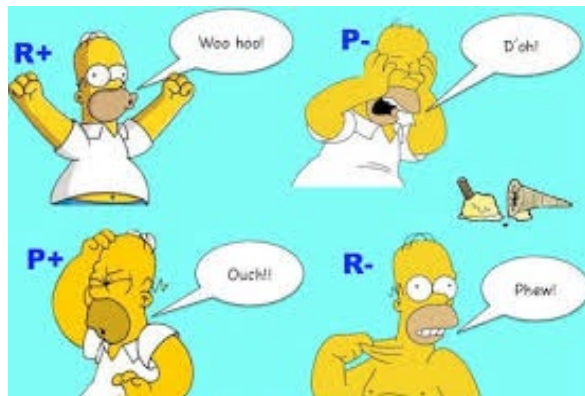
- No significant predictions

Gambling expenditure:

- Positively predicted punishment appraisals.
- Negatively predicted positive AND negative reinforcement appraisals

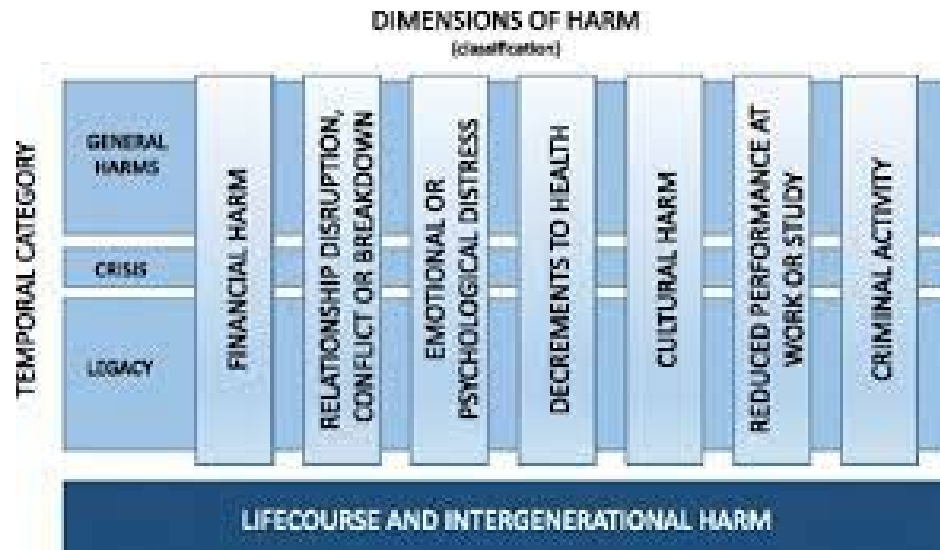
Gambling duration:

- Positively predicted positive reinforcement appraisals AND negative reinforcement appraisals BUT ALSO punishment appraisals



- **Punishment appraisals:** gambling made mood worse
- **Positive reinforcement appraisals:** gambling was pleasurable
- **Negative reinforcement appraisals:** gambling relieved unpleasant feelings

Harms: Attributable Proximal Harms



+ Gambling expenditure and duration predicted financial and emotional harms
ACIL Allen Consulting (2017)

+ PG severity associated with financial and relationship harms
Kim et al. (2023)

- Quick and easy access from home predicted total harms
+ Ability to bet anywhere anytime, privacy when betting, and greater access to promotion and betting options predicted total harms
Hing et al. (2023)

- Participants who set monetary limits were less likely to experience financial, emotional/psychological interpersonal, and health harms.
+ Participants who set time limits experienced more harms and were more likely to experience financial and work/study harms
Coelho et al. (2024)

Methodological Considerations

REACTIVITY

A small reactivity effect, whereby participants engaged in more frequent gambling during the EMA period (*ACIL Allen Consulting et al., 2017*)

SOCIAL DESIRABILITY

With the exception of number of drinks consumed while gambling, none of the gambling variables measured using G-TLFB and EMA were significantly associated with social desirability (impression management, self-deception enhancement) (*Goldstein et al., 2017*)

EMA ITEM VALIDITY

Several studies have found good concordance between EMA items, its corresponding pre-EMA single-item, as well as its corresponding pre-EMA subscale score (*Dias et al., 2023; Dowling et al., 2021, 2023*)

Mixed findings in terms of convergence of gambling behaviour during EMA and post-EMA G-TLFB: (1) good convergence for gambling frequency (*ACIL Allen Consulting et al., 2017*); (2) Compared to EMA, higher TLFB amount of time spent gambling and lower TLFB amount of money won-lost (*Goldstein et al., 2017*)



Recommendations for Future Gambling EMA Research

1. More EMA research, with more diverse constructs, research questions, samples, and analysis
2. More standardised protocols and reporting
3. Employ strategies to increase EMA compliance
4. Evaluate reactivity
5. Investigate validity of EMA measures
6. Integrate passive EMA data with objective measurement
7. Include co-design for future EMA studies
8. Explore the clinical applications of EMA
9. Use EMA data to develop Ecological Momentary Interventions

