

CENTRE for GAMBLING RESEARCH at UBC

**Characterizing habit formation in
modern slot machine gambling**

**Mario Ferrari, Eve Limbrick-Oldfield &
Luke Clark**

Lisbon Addictions
23 November 2022



a place of mind

THE UNIVERSITY OF BRITISH COLUMBIA

Department of Psychology

Disclosures

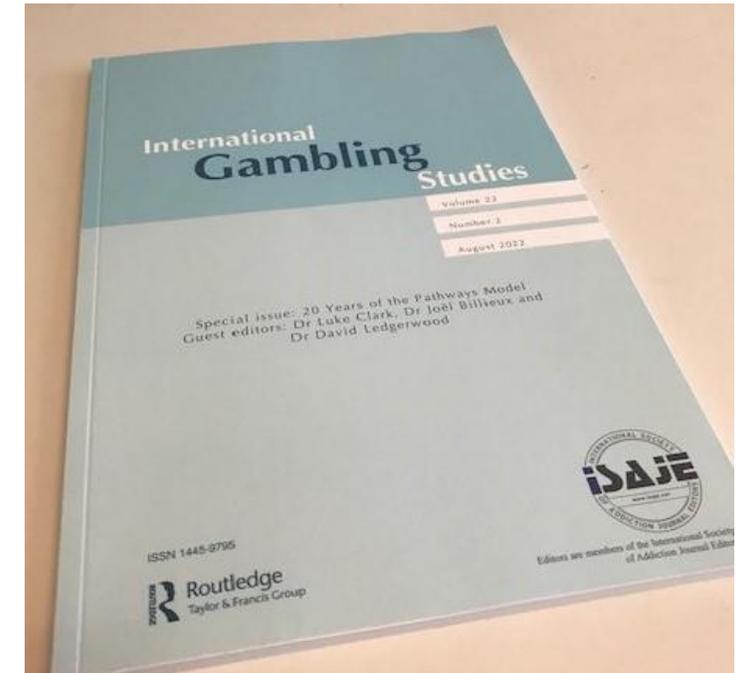
The Centre for Gambling Research at UBC is supported by the Province of BC government and the British Columbia Lottery Corporation (a Crown Corporation). The terms of this funding maintain the academic independence of the Centre.

Speaker honoraria: National Association of Gambling Studies (Australia), International Center for Responsible Gaming (US). Consulting / reviewing fees: International Center for Responsible Gaming (US), Gambling Research Exchange Ontario (Canada), GambleAware (UK). Other: LC has received royalties from Cambridge Cognition.

Behavioral analysis of habit formation in modern slot machine gambling

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1 Dec 2022, 10pm GMT: Season 3 Technology, Risk & Gambling webinar: “20 years of the Pathways Model: Understanding disordered gambling and other behavioural addictions”. Alex Blaszczynski & Lia Nower interviewed by David Ledgerwood and Luke Clark. Free registration: <https://www.sydney.edu.au/brain-mind/our-research/technology-addiction/gather-webinars.html>

Why study habit formation in gambling?

- Neuroscience models of addiction have proposed a transition from goal-directed to habitual behaviour (underpinned by the striatum) as key process (Robbins & Everitt)
- Individual differences exist in the speed of habit formation, which may be relevant to addictive behaviours (Ersche et al 'Creature of Habit Scale'; Lally et al 2009 new habits in 18 – 254 days)
- Although people colloquially refer to a gambling habit, this construct has received minimal attention. 'Habituation' (tolerance? Habit formation?) is a key node in the Pathways Model.



Key features of this study



200 spins
(~15 mins)

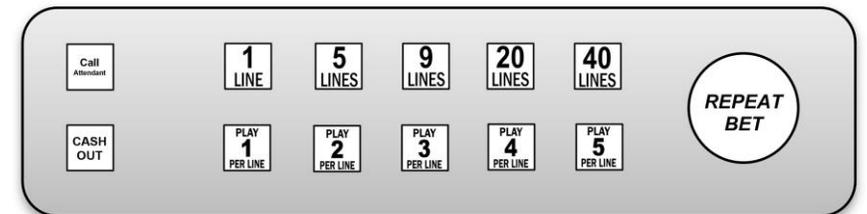
200 spins
(~15 mins)

200 spins
(~15 mins)

1. A highly realistic simulation of a modern slot machine allows us control over the game experience
2. Participants played 3 times, to examine behavioural changes within and across sessions

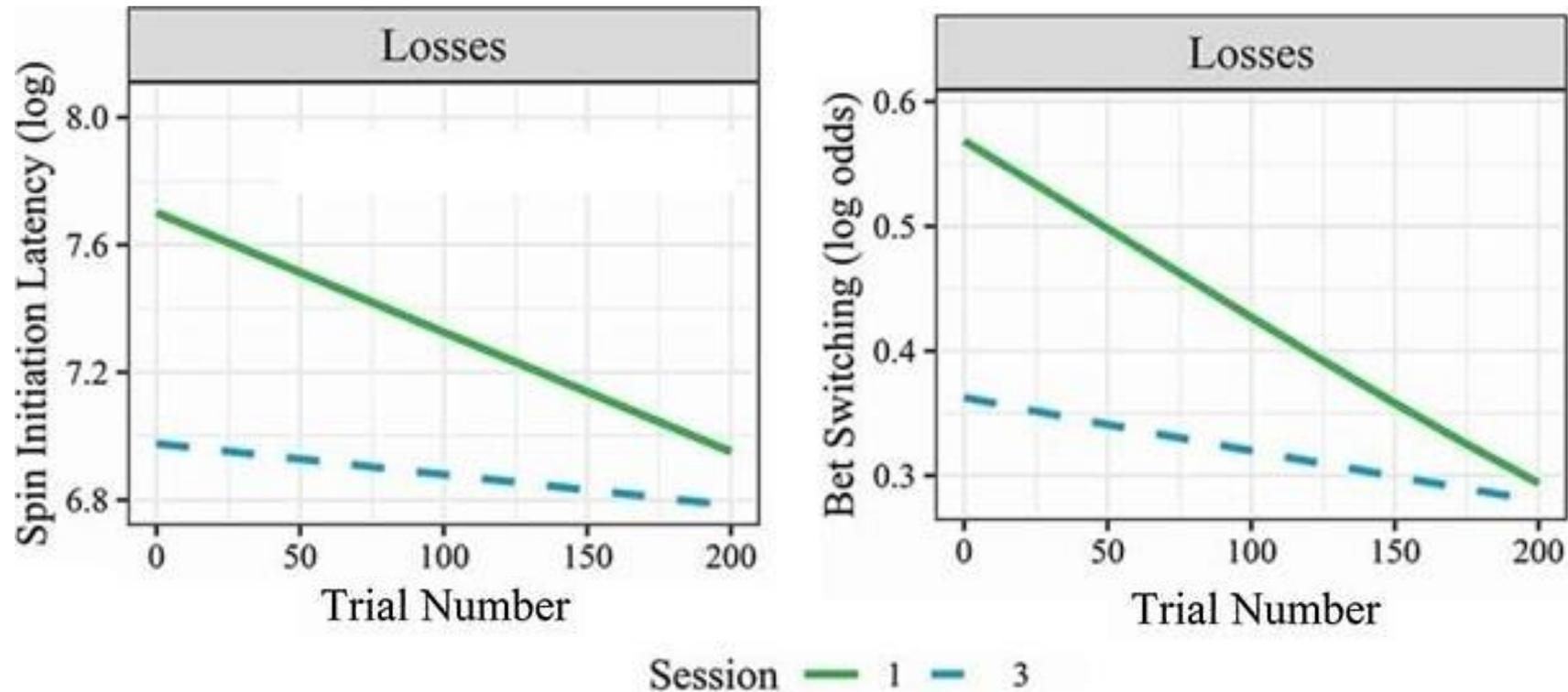
Method

- 56 participants (37F, 19M) with no prior slot machine experience.
- Over 3 sessions spaced 6 - 8 days apart (32,112 usable trials)
- Simulated slot machine game in Unity
 - 3 controlled outcome sequences
 - we recorded the timing and bet amount on each spin, to generate two behavioural variables: i) the spin initiation latency, ii) whether the participant changed their bet configuration ('bet switches')

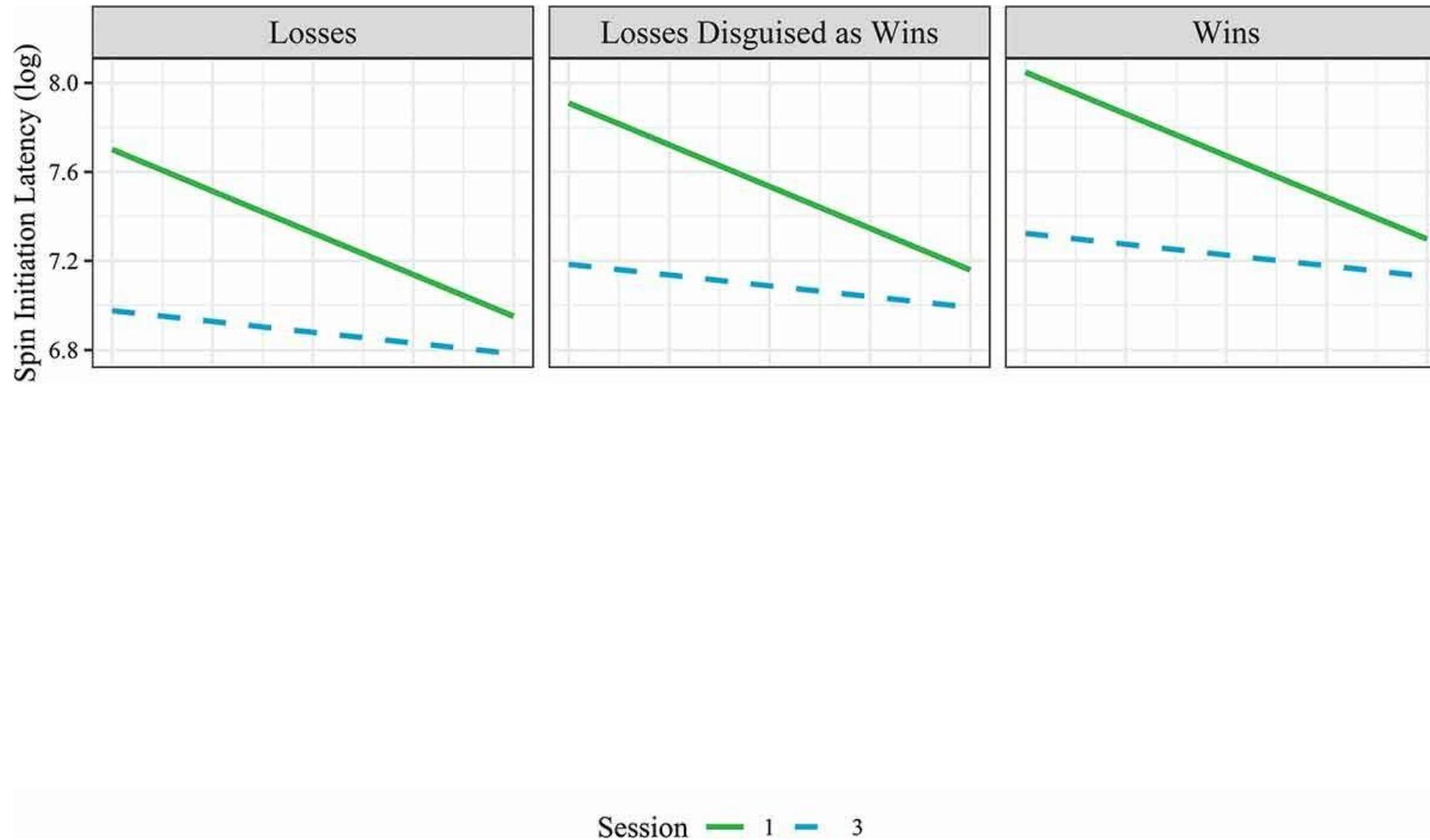


Micro-analysis of slot machine gambling

- We focus on two behavioural expressions, which both align with psychological definitions of habit

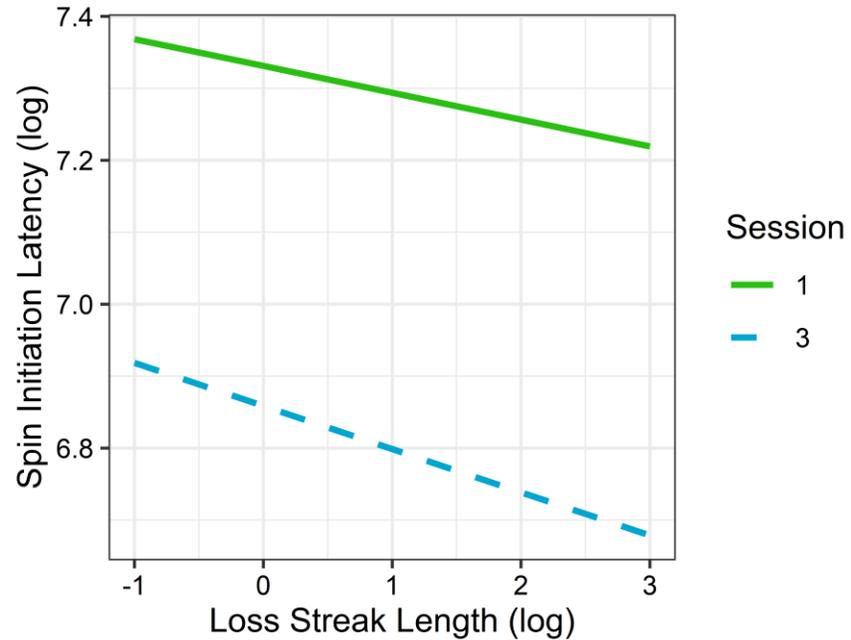
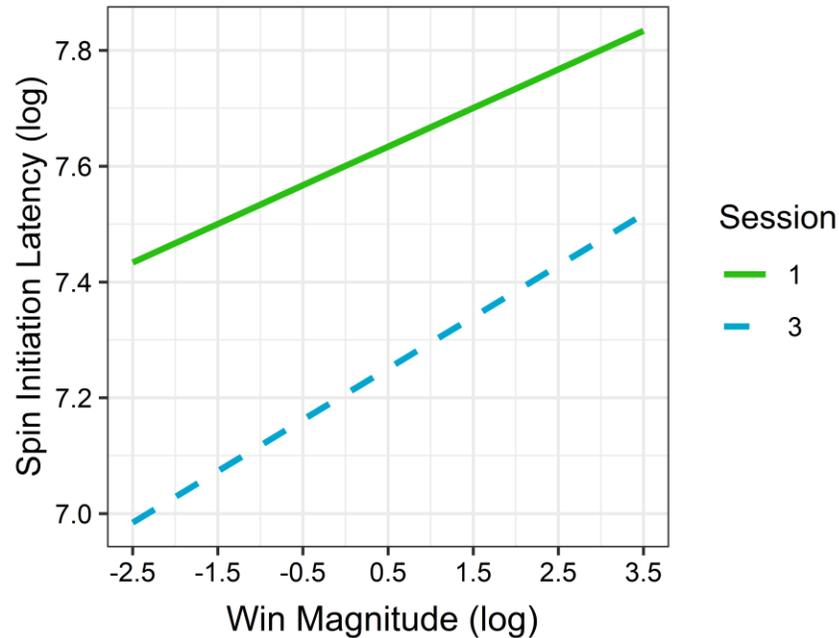


Outcome-related effects



- The Spin Initiation Latency – but less so Bet Switching -- is also sensitive to the prior outcome
- Novice gamblers display 'post reinforcement pause' from the onset of the first session

Spin Initiation Latencies: sensitive to win magnitude and losing streak length



- In the win size model, Session x Win Size interaction is significant: participants speed up with practice but simultaneously, the post-reinforcement pauses get longer!! (i.e. stimulus-led responding)

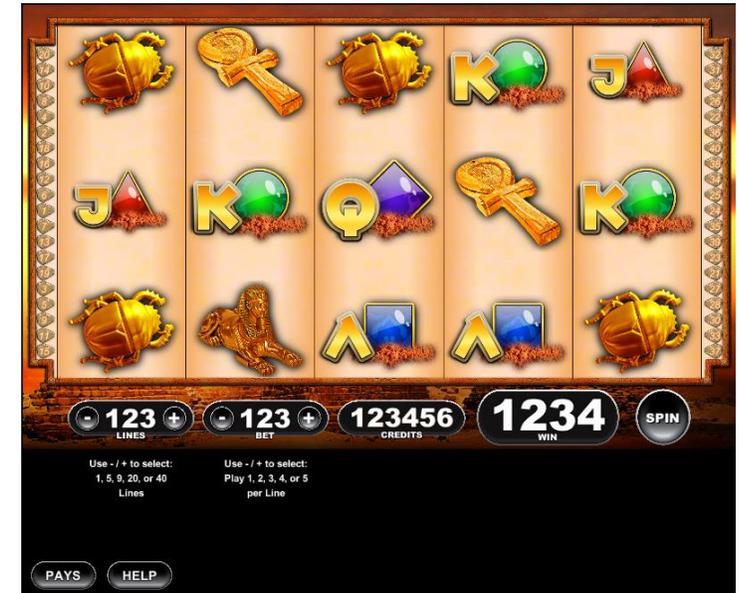
How does the User Interface affect slot machine behavioural measures?



Keyboard / Button Panel
 $n = 57$



Mouse / Button Panel
 $n = 54$

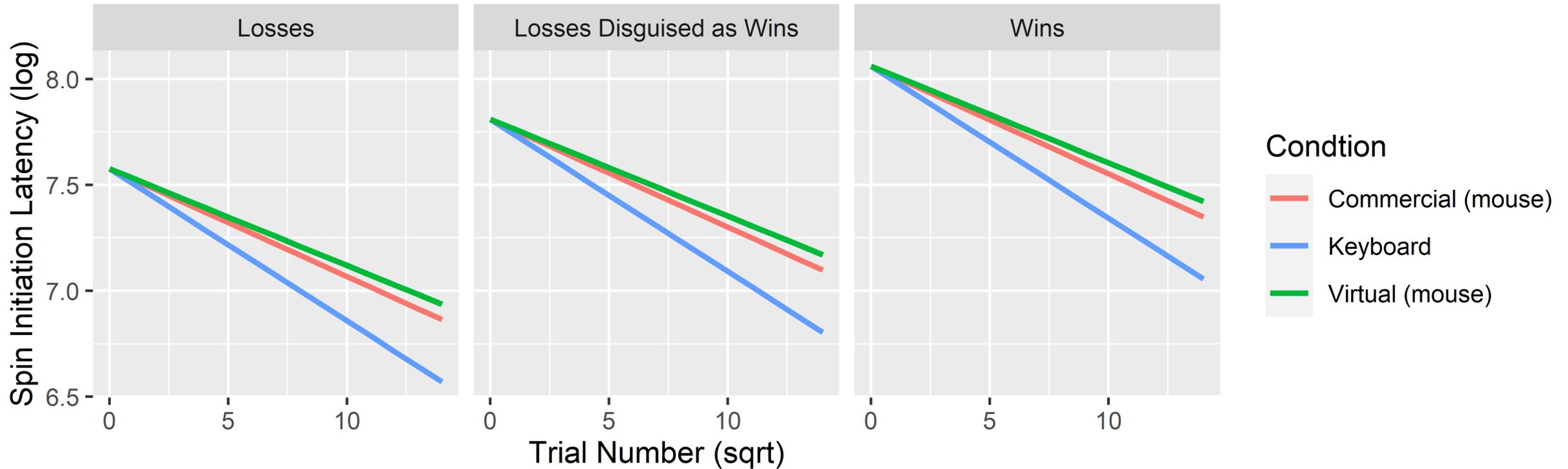


Mouse / Commercial integration
 $n = 58$

No differences in demographics or pre-gambling measures ($p_s > .27$)

*Gambling cognitions, $p = .052$

Speeding and PRPs in online slot machine gambling



- Ps show faster habit formation with keyboard than mouse control

Conclusions

- Although slot machine gambling has a limited behavioural repertoire, detailed analysis offers a number of behavioural signals (see also Chen et al 2022 PlosOne)
- By characterizing changes within and between sessions, we propose two behavioural markers as expressions of habit formation: the speed of play and changes in betting.
- Further work is needed to explore these markers in relation to gambling problems, and established cognitive tests of habit (e.g. devaluation)
- In translating these effects to the online environment, it is likely these behavioural markers may be sensitive to a range of extraneous/UI variables, with implications for predicting high-risk gambling.

CENTRE for GAMBLING RESEARCH at UBC

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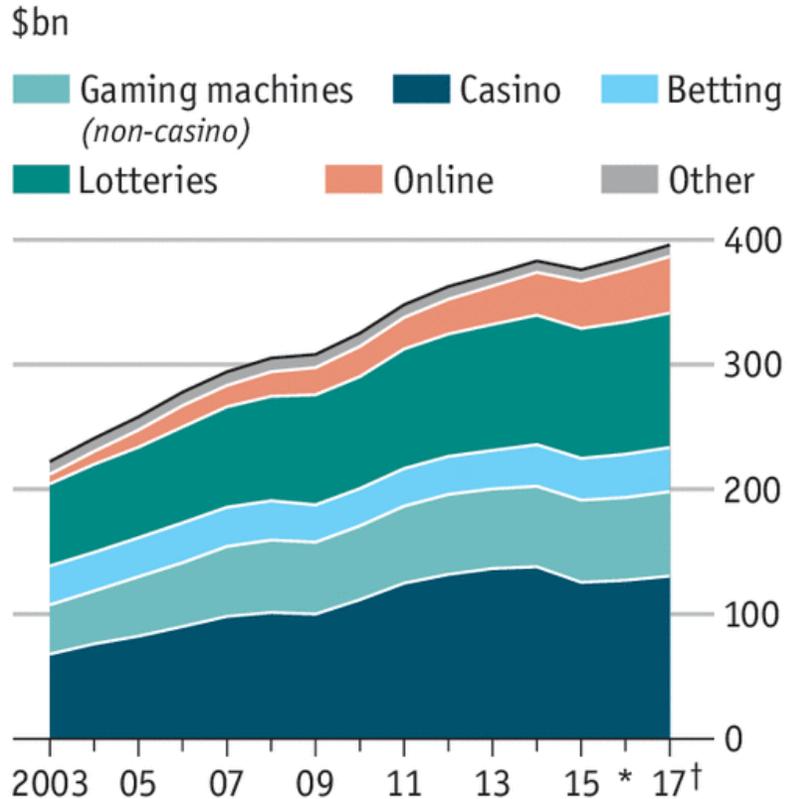


Lecture 23 (18th November 2022)

GAMBLING PRODUCTS pt 3: ONLINE GAMBLING

The Emergence of Online Gambling

Global gambling losses



Source: H2 Gambling Capital *Estimate †Forecast

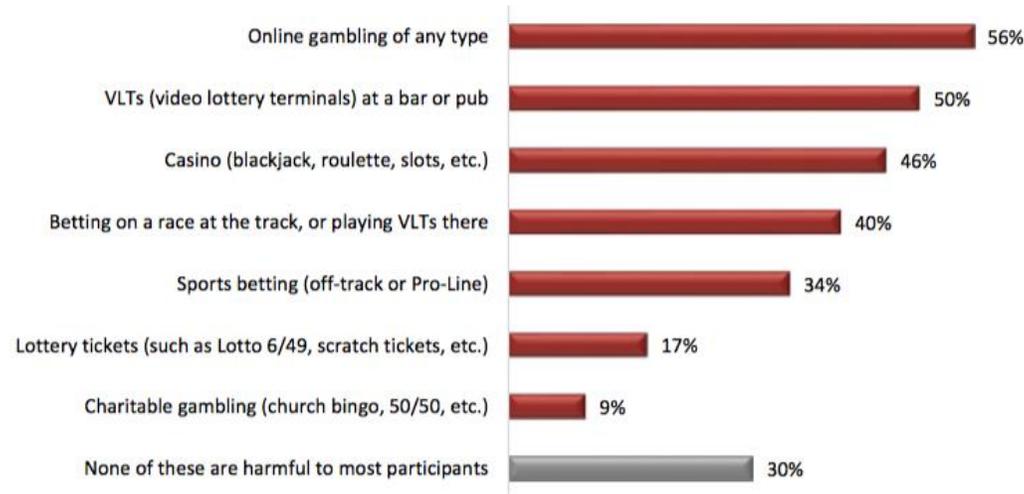
Economist.com

- BC was first Canadian province to introduce online gambling in 2004
- PlayNow.com is the only legal, regulated site for BC residents
- (UK: hundreds of gambling websites)

Image credit: <https://www.economist.com/graphic-detail/2017/02/09/the-worlds-biggest-gamblers>

Online gambling: the concerns

“Which forms of gambling do you think are harmful?” (Angus Reid poll)



(Angus Reid poll in Vancouver Sun, 13 Oct 2016)

- 24/7 accessibility
 - *Mobile* access via phones

Playing on credit card (‘the plastic trap’)

Cannot control alcohol / drug use (gambling while intoxicated)

Social isolation; reduced stigma / less intimidating? (than masculine gambling shops & casinos); highly immersive?

Is online gambling *more addictive?*

- Basic study: find a group of people who gamble online and a group who gamble 'offline' (i.e. don't gamble online). Measure PGSIIs.
 - Online group show higher PGSI (Griffiths et al 2011, Kairouz et al 2012, BC Prev Survey 2014)
- The problem: the online group tend to engage in more forms of gambling, incl. offline games.
- In studies that control for number of different gambling forms, online engagement by itself is not reliably predictive of gambling problems (Laplante et al 2014, Philander & Mackay 2014)

Two unusual programs of research at CGR

Authentic slot machines

- Complex & expensive kit that needs occasional maintenance
- Do not generate behavioural outputs



Tracked data from the BC PlayNow.com website

- 1 yr from eCasino
- VSE as marker of likely harm
- De-identified data (time consuming for operator to prepare)



Half a billion bets teach UBC algorithm how to identify problem gamblers

ARTS & HUMANITIES

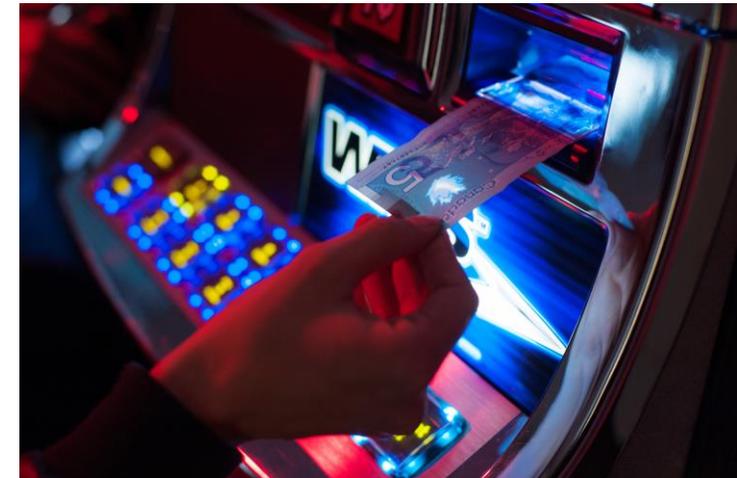
Nov 9, 2020 | For more information, contact [Wan Yee Lok](#)

UBC researchers have successfully used machine learning to identify online gamblers whose betting behaviour could indicate a gambling problem.



Why use authentic products?

- Behavioural research on gambling has mainly relied on highly simplified tasks that lack ecological validity (i.e. gamblers would not voluntarily play such tasks)
- These are complex digital products that contain many structural features (fast speed, audiovisual feedback, opportunities for control etc etc)
- These features may also combine to create powerful states of immersion



Online Gambling in BC

- BC has a single, state-run online gambling platform called PlayNow.com (since 2004)
- Common concerns: 24/7 access, migration during COVID (social isolation, more immersive), hard to monitor alcohol/drug intoxication
- Unlike most land-based gambling, the logging of all transactions against the user's account creates a unique opportunities for detection and intervention

PGSI – Problem Gambling Severity Index	Total Population	Past Year Gamblers	
		All	Online
Sample Size	4,079	3,482	842
Non gambler	15%	0%	0%
Non problem gambler	57%	68% ←	43%
Low risk problem gambler	12%	15%	16%
Moderate risk problem gambler	8%	9% →	16%
High risk problem gambler	7%	9% →	24%
Moderate/High risk problem gambler	15%	18% →	40%

(→ points to statistically higher result)

BC Online Gambling Prevalence Study (Feb 2020), n = 4,079.

22% gambled online in past year

15% moderate/high risk on PGSI

How? SlotsTracker



Logic:

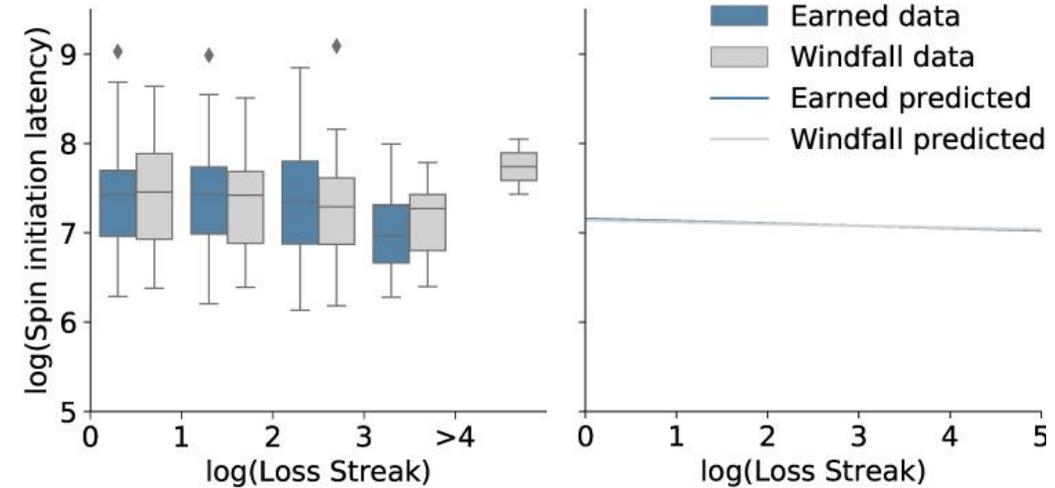
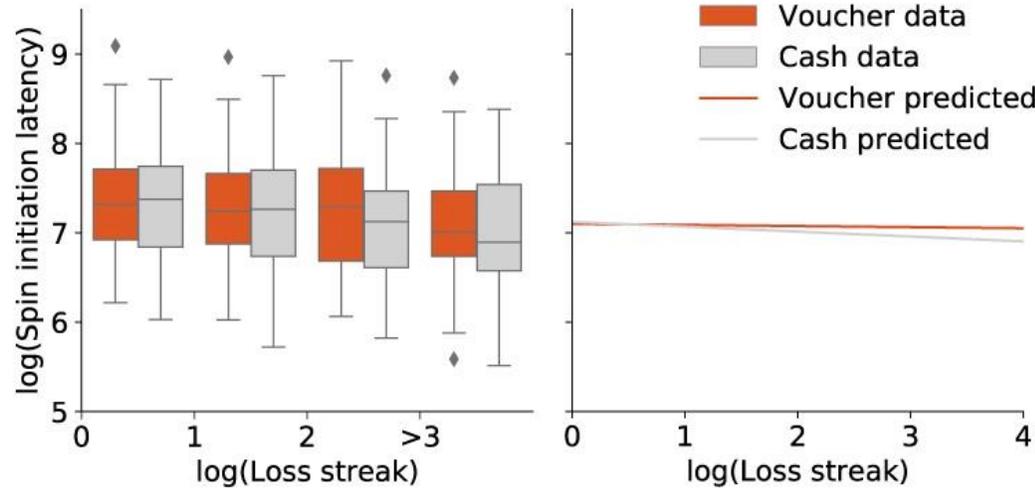
1. high fidelity video capture via HDMI splitter
2. identify specific screen events that signal the onset and offset of the spin and outcome
3. scan video file frame by frame for those events
4. extract key info from screen (timestamp, size of bet, size of win) at those moments

1

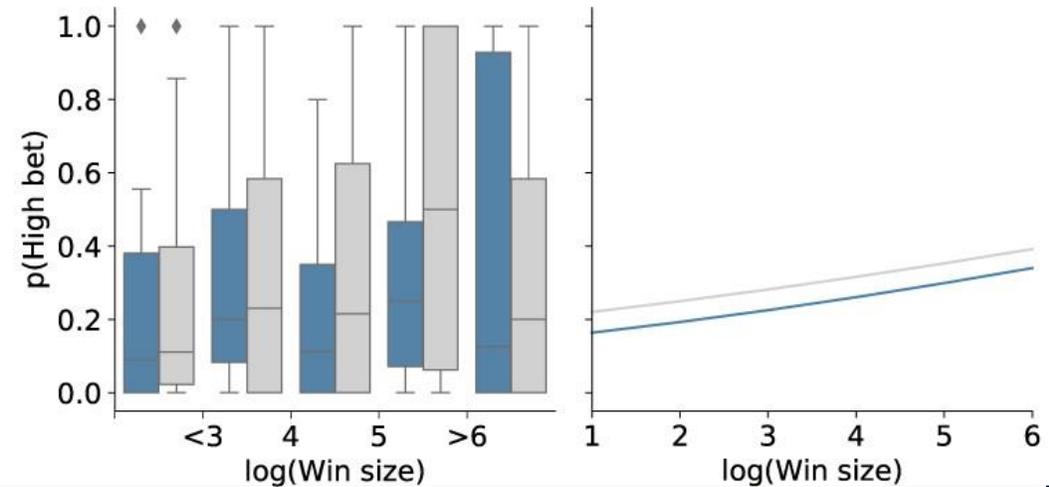
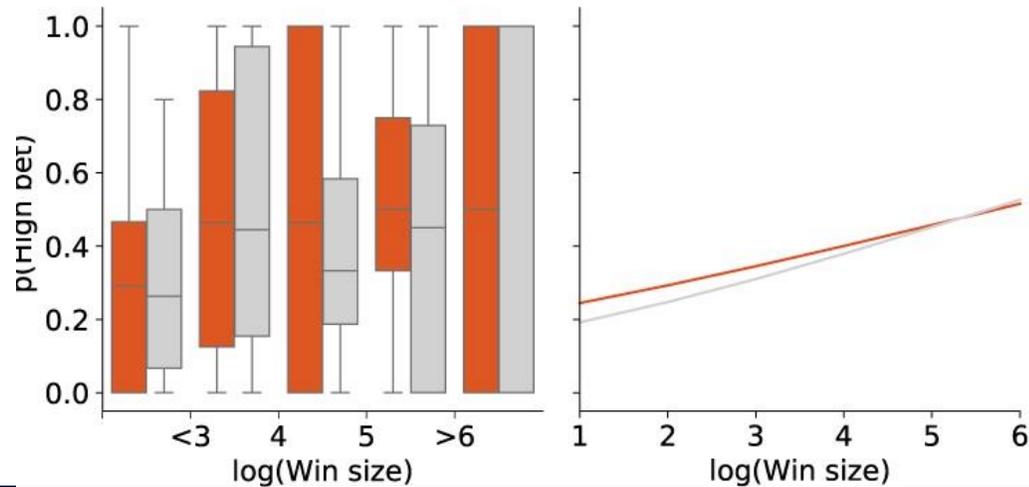
e.g. a game-specific image template for each number as appearing in credit window

Trial-level analyses indicate systematic effects on micro-analysis of slot machine behaviour

Ps play faster with increasing loss streak length (both expts)



Ps bet high (relative to their own mean) following large wins (both expts)



Limbrick-Oldfield, Chua, Cringle, Macdonald, Ferrari, Zhang & Clark, under review