INTERNATIONAL GAMBLING STUDIES, 2016
VOL. 16, NO. 3, 470–480
http://dx.doi.org/10.1080/14459795.2016.1232433

Routledge
Taylor & Francis Group

An empirical real-world study of losses disguised as wins in electronic gaming machines

Tony Leino[a], Torbjørn Torsheim[b], Ståle Pallesen[b], Alex Blaszczynski[c], Dominic Sagoe[b] and Helge Molde[a]

[a]Department of Clinical Psychology, University of Bergen, Bergen, Norway; [b]Department of Psychosocial Science, University of Bergen, Bergen, Norway; [c]School of Psychology, University of Sydney, Sydney, Australia

ABSTRACT
Losses disguised as wins (LDWs) appear to reinforce gambling persistence. However, little research has examined this phenomenon with real gamblers in natural gambling settings. We aimed to examine the relationship between within-session outcome size and subsequent gambling persistence. Account-based gambling data of individuals playing LDW games over a randomly selected day (2,035,339 bets made by 8636 individuals) was examined. We used a logistic mixed effects model to examine the relationship between the outcome of the previous bet (loss, LDW and real wins) and the odds of continuing betting in a game session. The odds of continuing betting in a game session were positively associated with the outcome of the previous bet. Compared to LDWs, losses lowered the odds of continuing a game session. In contrast, real wins implied greater odds of continuing a game session compared to LDWs. It is concluded that LDWs increase the likelihood of continuing betting compared to losses, but decrease the likelihood of continuing to gamble compared to real wins. As LDWs increase the number of bets made within a gambling session, and hence within-session gambling persistence, LDWs may potentially play an etiological role in the development of gambling problems over time.

ARTICLE HISTORY
Received 1 April 2016
Accepted 31 August 2016

KEYWORDS
Betting; electronic gaming machines; gambling; losses; wagering

Introduction

Modern electronic gaming machines (EGMs) such as slot machines, fruit machines and video lottery terminals (VLTs) often offer opportunities for wagering on multiple pay lines. A winning combination on any line usually triggers a payout that is combined with a celebratory event consisting of audiovisual stimuli. However, in some cases, the size of the win can be less than the spin's wager resulting in a net loss rather than a net win for that spin. This outcome is denoted as 'losses disguised as wins' (LDWs; Dixon, Harrigan, Sandhu, Collins, & Fugelsang, 2010).

Multi-line betting is popular among gamblers (Haw, 2008). The number of pay lines, but not bet multiplication, is a predictor of average bet size (Haw, 2009). The majority of

CONTACT Tony Leino tony.leino@psykp.uib.no

gamblers use a *mini-max* strategy (Livingstone & Woolley, 2008), playing minimum credits on the maximum number of pay lines. By buying extra pay lines, gamblers maximize the chance of obtaining a win in a bet (when there is one) while simultaneously minimizing the probability of missing any winning combination. Although the *mini-max* strategy increases the positive feedback of a spin, the payback percentage remains the same (Harrigan, Dixon, MacLaren, Collins, & Fugelsang, 2011).

Both theoretical considerations and empirical findings suggest that reinforcement frequency and reinforcement magnitude influence gambling behaviour. In line with an operant paradigm, it has been found that individuals who play on games with frequent and small wins gamble longer in the extinction phase (end of wins) compared to gamblers experiencing larger but fewer wins (Dixon, MacLin, & Daugherty, 2006). This suggests that games with frequent and small payouts are well suited to sustain gambling behaviour. Since the number of pay lines in a bet is associated with a higher proportion of positive feedback (Dixon et al., 2010), it is reasonable to assume that LDW games compared to non-LDW games increase number of bets made and time spent in a session.

LDWs appear to influence both physiological reactions and gambling-related cognitions within a game session. Findings show that LDWs are as arousing as regular small wins among novice gamblers (Dixon et al., 2010), but not among more experienced gamblers and pathological gamblers (Lole, Gonsalvez, Barry, & Blaszczynski, 2014). This indicates that gambling experiences potentially mediate the relationship between LDWs and gambling behaviour. It has been shown that LDWs influence gambling-related perceptions and cognitions as individuals who experience more frequent LDWs both overestimate the number of wins they experience as well as reportedly misclassifying LDWs as regular wins (Jensen et al., 2013). Furthermore, individuals appear to enjoy LDW games more than non-LDW games (Sharman, Aitken, & Clark, 2015). Hence, LDW games appear to be associated with more enjoyment than non-LDW games probably due to their perceived high reinforcement rate. It has also been found that the post-reinforcement pause (the time period from the delivery of an outcome to when the player initiates the next spin) in LDWs is significantly longer than losses and similar to small regular wins (Templeton, Dixon, Harrigan, & Fugelsang, 2014). Taken together, the findings suggest that LDW outcomes seemingly have the same influence physiologically, cognitively and behaviourally as net wins, at least among novice gamblers.

In accordance with learning principles, it has been suggested that LDWs may be a pathway to problem and pathological gambling (Dixon et al., 2010). Consistent with several models (Blaszczynski & Nower, 2002; Sharpe, 2002), the combination of intermittent wins delivered at a variable ratio schedule shapes extinction-resistant gambling behaviour. Furthermore, increased gambling participation may be an important determinant of the development of distorted cognitive schemas (Blaszczynski & Nower, 2002). As LDW games are associated with higher rates of positive feedback, in addition to the effect of LDWs on both physiological reactions and gambling-related cognitions, LDWs might increase within-session game persistence and, subsequently, the risk of more intense gambling behaviour and wagering more funds than intended.

Still, relatively few studies have examined the relationship between LDWs and gambling behaviours, particularly in natural gambling environments. Examining the relationship between LDWs and gambling behaviour in gamblers' natural settings is especially important since the long-term effect of LDWs may be difficult to mimic in experimental designs, and since multi-line betting appears to be a popular activity among the majority of EGM gamblers (Dixon et al., 2014; Livingstone & Woolley, 2008). As such, examining the ecological validity of the previous short-term experiments on this topic should be prioritized.

Account-based player gambling refers to gambling from a centralized account that is linked to an identified individual (Gainsbury, 2011). This provides an opportunity for behavioural tracking: recording gamblers' individual behaviour and responses in an objective manner (Griffiths, 2014). By electronically tracking and recording gambling behaviour, researchers non-intrusively obtain data from large gambling populations. Several gambling studies have now utilized account-based player gambling data (Leino et al., 2014; Ma, Kim, & Kim, 2014; Narayanan & Manchanda, 2012; Smith, Levere, & Kurtzman, 2009). Through the use of account-based gambling data, it has been found that gambling behaviour is associated with structural game characteristics (Leino et al., 2014), immediate and long-term gains and losses (Ma et al., 2014; Narayanan & Manchanda, 2012), subsequent gambling style after big wins and losses (Smith et al., 2009) and the decision to close a gambling account due to gambling-related problems (Xuan & Shaffer, 2009).

The objective of the present study was to provide a descriptive account of the relationship between LDWs and individual gambling behaviour in the natural gambling setting by using behavioural tracking data. The aim was to explore the influence of the previous bet's outcome (loss, LDW and real win) and the odds to continue a game session. It was hypothesized that both LDWs and regular wins would increase the likelihood of continuing a game session compared to losses. Furthermore, it was hypothesized that regular wins would increase the likelihood of continuing a game session compared to LDWs due to the increased access to gambling funds.

Method

Sample

The full data consisted of 3,921,572 bets placed by 13,260 individuals on a specific randomly selected day where 21 games were available. Twelve of these games had LDW payouts. In the whole sample, 1605 (12.10%) individuals reached the daily loss limit (NOK 600 [NOK 6 ≈ US$ 1]) of Multix (see below). After removing data from non-LDW games, 2.81% of individuals were found to have reached the daily loss limit and were subsequently removed from the sample. Thus, the final sample consisted of 2,035,339 observations within 28,963 game sessions from a total of 8636 individuals.

Design and procedure

Norsk-Tipping, the state-owned gambling company in Norway, supplied the data for the study. A contract between the University of Bergen and Norsk-Tipping was signed in June 2011 allowing the University of Bergen to use and analyse the data for research purposes. Gambling data of Norwegian Multix gamblers were obtained. Multix is a video lottery terminal (VLT) that replaced traditional EGMs in 2008. The terminal is a fully digitalized network-based multigame platform that offers several types of games, such as slot and casino games within the same terminal. All terminals are interconnected and Multix players need to use an individual player card when playing. Players' cards are linked to a personal player account. Hence, individual gambling behaviour on any gaming terminal and the game responses can be tracked over time. Multix also incorporates mandatory time and loss limits set by Norwegian authorities.

The maximum loss limit in 2013 was set at NOK 600 per day and/or NOK 2500 per month (NOK 6 ≈ US$ 1). If a gambler exceeds these limits, further gambling on any Multix terminal is automatically blocked for that day or month (Ministry of Cultural Affairs, 2014). In addition, a 10-minute cooling-off period is automatically enforced after 60 minutes of continuous gambling. Although naturally occurring gambling behaviour is restricted by the above structural limits, it was not expected that these limitations would influence gambling behaviour among the majority of gamblers.

Data analysis

In Multix, a game session begins when a gambler chooses a game and commences betting. A game session ends when the gambler ceases betting, quits the game and returns to the main Multix screen. In the main screen, the gambler can choose a new game (or the same game) and continue gambling as a new game session or log out from the terminal.

Prior to data analysis, all outcomes were categorized as a loss (0), LDW (1) or regular win (2). Consistent with previous delineation (Dixon et al., 2010), a loss was defined as a net outcome equal to NOK 0, regular wins were outcomes equal to or greater than the stake (outcome ≥ stake), and LDWs defined as outcomes greater than NOK 0 but less than the stake (NOK 0 < outcome < stake).

LDW and non-LDW games were classified in the following manner: games with payouts less than the stake but higher than NOK 0 were classified as LDW games whereas games without such payouts were classified as non-LDW games. To determine which games had LDW payouts, the difference between stake and outcome was calculated. LDW games included slot games (5 Dragons®, Ballpower®, Fisketur®, Jokerdryss Bling Bling®, Jokerdryss Loke®, There is the Gold® and Wolf Run®), casino and card games (Blackjack®, Roulette® and Opp Ned®), a pachinko game (Arishinko®) and a wheel of fortune game (Swing®).

To examine the effect of different outcomes on the likelihood of continuing a game session, a dichotomous variable (gamble) for each bet was computed reflecting whether the gambler ended (0) or continued the game session (1). To examine the effect of LDWs on gambling persistence, the outcome of the previous bet (lagged outcome) served as the predictor variable. The outcomes were categorized as loss (0), LDW (1), and regular wins were categorized as follows: 100 to 199% (2: Wincat1); 200 to 299% (3: Wincat2) and 300% or more (4: Wincat3) of the original bet size.

Accumulated net balance and number of bets in a gambling session served as control variables. Individual gambling behaviour may be influenced by the accumulated net balance (Acc.outcome) in a day. The individual net balance was the sum from the first outcome to the previous bet made over the day. As positive and negative net balances might have different effects on gambling behaviour (Ma et al., 2014), a dummy variable (Acc.win) was created to allow negative and positive net balances to have different slopes. Net balances equal to or greater than NOK 0 were coded as 1 (an accumulated gain) whereas balances less than NOK 0 coded as 0 (an accumulated loss). The variable was first squared and then back-transformed (square root) so that accumulated net balance only contained positive values. An interaction term between accumulated net balances and the dummy variable

(Acc.win) was created to differentiate between negative and positive net balances. As such, larger positive values indicate both larger losses and wins, respectively.

The number of bets in a gambling session might also influence gambling behaviour due to factors such as fatigue. The successively ordered in-session bets (Bets made), from the first to last bet, were therefore inserted as a control variable. In addition, a curvilinear relationship (Bets made^2) was calculated as it was expected that the impact of previous bets would differ across the range from low to high number of bets.

The data was analysed in a mixed effects logistic model. A logistic model was chosen since the response variable was binary (0 and 1). A mixed effects model was chosen due to the hierarchical structure of the data, where each successively ordered bet within the game session (level 1) was nested within the game session (level 2). As such, the model examines the relationship between the lagged outcome category (loss, LDW and win categories) and the odds of continuing the game session. To compare differences in the number of bets made in a game session between LDWs and other outcome categories, the LDW category served as the reference. Odds ratios (OR) were calculated. An odds ratio equal to one (OR = 1.00) suggests that the odds of continuing the game session is identical for other outcomes (loss and the different win categories) compared to the reference category LDW. An odds ratio greater than one (OR > 1.00) shows that other outcomes are associated with more bets relative to the LDWs. Additionally, an odds ratio lower than one (OR < 1.00) shows that the odds of continuing the game session are lower for other outcomes compared to LDWs. Compared to LDWs, it was expected that losses would be associated with lower odds of continuing the game session (OR < 1.00) but that wins would be associated with higher odds (OR > 1.00). Data from individuals reaching the daily loss limit in *Multix* were removed since they were forced to end their game session. None of the game sessions reached the time limit of 60 minutes. Also, game sessions with only one bet were removed since no lag outcomes were available.

Ethical considerations

In the contract between the customer and Norsk-Tipping, participants provided consent for the use of their gambling data for research purposes on condition of anonymity. To guarantee anonymity, Norsk-Tipping provided de-identified data. That is, data could neither be linked to individual accounts, nor could make personal identification of participants possible.

Results

Table 1 presents the proportions of different outcomes within a game. Losses comprised 65.48% (SD = 10.30) of the outcomes, wins 20.04% (SD = 10.55) and LDWs 14.48% (SD = 9.67) of outcomes across games. This indicated that losses were the most common outcome followed by actual wins and LDWs, respectively. The mean for outcomes between 100 and 199% (wincat1) was 7.37% (SD = 4.58), between 200 and 299% (wincat2) was 6.70% (SD = 4.58), and 300% or more (wincat3) was 6.51% (SD = 1.04) across games. Interestingly, Blackjack® did not have any observations of 300% or more (wincat3). Thus, Blackjack® did not have any outcomes equal or larger than three times the stake.

Table 2 presents the results from the logistic mixed effects model. The overall model was significant: Wald χ^2 (9) = 3,207.55, $p < .001$. The full model had a significantly lower

Table 1. Different outcomes by game.

Game	Type	Outcome ratio					
		Loss ratio	LDW ratio	Wincat1 ratio	Wincat2 ratio	Wincat3 ratio	Total win ratio
5 Dragons	Slot	67.16	21.54	3.51	1.47	6.32	11.30
Arishinko	Pachinko	73.36	3.33	10.75	5.76	6.81	23.31
Ballpower	Slot	69.64	17.61	3.82	2.46	6.47	12.75
Blackjack	Card	45.96	7.62	9.84	36.58	–	46.42
Fisketur	Slot	72.76	16.51	3.33	1.56	5.84	10.73
JD Bling Bling	Slot	54.85	31.73	5.38	2.05	6.00	13.42
Jokerdryss Loke	Slot	55.03	30.97	6.10	2.45	5.44	14.00
Opp Ned	Card	61.07	10.46	17.19	5.03	6.25	28.46
Roulette	Casino	58.66	7.45	13.77	11.82	8.30	33.89
Swing	Wheel of fortune	81.19	2.43	3.05	4.87	8.45	16.37
There is the Gold	Slot	72.48	11.23	7.20	3.95	5.14	16.29
Wolf Run	Slot	73.58	12.88	4.54	2.36	6.63	13.54
Mean (SD)		65.48 (10.30)	14.48 (9.67)	7.37 (4.58)	6.70 (4.58)	6.51 (1.04)	20.04 (10.55)

Note: Loss: Outcome = NOK 0. LDW: Outcome > 0 < stake. Wincat1: 100 to 199% of stake. Wincat2: 200 to 299% of stake. Wincat3: ≥ 300% of stake. Total win ratio: The sum of Wincat categories. [a]: All games.

Table 2. Mixed effects logistic regression of the relationship between the likelihood of continuing to gamble and the previous bet's outcome.

Parameter	OR	*SE*	Z	*p* <	95% CI
Fixed part					
LDWs (Ref)	1.000	–	–	–	–
Loss	.795	.020	−14.14	.001	.770 – .821
Wincat1	1.542	.056	11.96	.001	1.436 – 1.655
Wincat2	2.508	.152	15.13	.001	2.227 – 2.826
Wincat3	2.886	.135	22.67	.001	2.633 – 3.163
Acc.win	1.182	.021	9.34	.001	1.141 – 1.224
Acc.win × Acc.outcome (at Acc.win = 0)	.999	.000	−17.57	.001	.999 – .999
Acc.win × Acc.outcome (at Acc.win = 1)	1.001	.000	16.78	.001	1.001 – 1.001
Bets made	1.003	.000	8.58	.001	1.003 – 1.004
Bets made^{2*}	.999	.000	−10.56	.001	.999 – .999
Intercept	61.776	1.395	182.54	.001	59.100 – 64.572
Random part					
υ	.380	.037			.314 –.461
ρ	.042	.008			.029 –.061
−2 × Log likelihood					−298,337.96
AIC					298,359.95
BIC					298,497.74

Notes: $Total_N$ = 2,035,339. $Session_N$ = 28,963. $Participants_N$ = 8,636. OR: Odds ratio. All predictor variables are lagged (previous bet). Loss: Inversed OR = 1.257. OR CI_{low} = 1.218. CI_{high} = 1.298. Wincat1: 100 to 199% of stake. Wincat2: 200 to 299% of stake. Wincat3: ≥ 300% of stake. Acc.outcome: The lagged accumulated net balance. Acc.win: The daily (0) lagged accumulated net balance is a loss, the daily (1) lagged accumulated net-balance is a win. Acc.win × Acc.outcome: The interaction between the size of the accumulated outcome and whether the accumulated outcome is a loss (0) or win (1). Bets made: The linear relationship between number of bets made and the odds of continuing a gambling session. Bets made^2: The curvilinear relationship between the number of bets made and odds of continuing a gambling session. υ: Random intercept. ρ = Interclass correlation. AIC = Aikake information criterion. BIC = Bayesian information criterion.
*OR = .999995; CI_{low} = .999994; CI_{high} = .999995.

deviance compared to the null model [χ^2 (M_0 – FM) = 3,547.21, d*f* = 9, *p* < .001], lower Akaike information criterion (AIC) [(M_{0AIC} – FM_{AIC}) = 3,529.21] and Bayesian information criterion (BIC) [(M_{0BIC} – FM_{BIC}) = 3,416.47] suggesting that the final model had a better fit than the model with no predictors. The odds of continuing a game session had a positive association with the previous bet's outcome size, controlling for daily accumulative net balance in LDW games and the successively ordered bets made in the game session.

Compared to LDWs, the odds of continuing a game session decreased by 26% with previous loss (1/0.795), but increased by 54% with a previous regular win outcome between 100% and 199%. Regular wins between two and three times greater than the previous bet size increased the odds of continuing a game session by 250% and 280% respectively, compared to LDWs. As such, the odds of continuing a game session were greater with regular wins but lower with losses compared to LDWs. The control variables were significant. The odds of continuing a game session was greater if the lagged daily cumulative net balance was positive (Acc.win = 1; e.g. when individuals *had gained* money) compared to when lagged cumulative net balance was negative (Acc.win = 0: when individuals *had lost* money). Furthermore, the size of accumulated net balance influenced the odds of continuing a game session. Greater accumulated net gains increased the odds of continuing the game-session (Acc.win × Acc.outcome when Acc.win = 1), whereas increasing net losses were associated with lower odds of continuing the game session in a day (Acc.win × Acc.outcome when Acc.win = 0). There was a curvilinear relationship between the number of bets made and the odds of continuing a game session. That is, the odds of continuing a game session was greater at the beginning of the game session (bets made was positive), but the odds of continuing a game session decreased progressively as the number of bets increased (bets made^2 was negative).

Discussion

The main aim of the present study was to investigate the relationship between LDWs and gambling behaviour in a natural gambling setting by using account-based individual gambling data. It was hypothesized that LDWs would increase within-session gambling persistence compared to losses, and decrease within-session persistence compared to real wins. Consistent with the hypotheses, the results showed that the relative size of the previous outcome influenced the number of bets made within a game session. More specifically, compared to LDWs, the odds of continuing a game session decreased when the previous outcome was a loss, but increased when the previous outcome was a regular win.

The current study adds further knowledge to the existing understanding of LDWs and their effect on within-session gambling behaviour in a real-world setting. As noted previously, laboratory evidence indicates that individuals prefer games with frequent and small wins to larger and less frequent wins (Dixon et al., 2006). It has also been found that LDWs are physiologically more arousing than losses and similar to small real wins (Dixon et al., 2010). Additionally, individuals appear to overestimate their number of wins by miscategorizing LDWs as real wins (Jensen et al., 2013). Accordingly, individuals reportedly enjoy LDW games more than non-LDW games (Sharman et al., 2015). Extending these previous findings, the results of the present study show that in an ecologically valid setting, LDWs are associated with more persistent within-session gambling behaviour compared to losses, but less persistent gambling behaviour compared to real wins. In line with Dixon et al. (2010), our findings also show that regular wins increase within-session gambling persistence more than LDWs and further that larger wins (relative to bet size), are associated with more persistent subsequent gambling behaviour. However, although LDWs are experienced as small regular wins (Dixon et al., 2010; Templeton et al., 2014), they are still associated with less likelihood of continuing a game session compared to regular wins. This might suggest that although the individual gambler is motivated to continue a game session in a real gambling situation, he or she is forced to end the session as funds run out or he or she reaches the loss limit.

The results of the present study suggest that LDW payouts increase in-session gambling intensity relatively to pure losses. Although speculative, the results might also suggest that individuals gambling on LDW games spend more time playing and are accordingly exposed to gambling situations for a longer time period. Consistent with conceptual models (Blaszczynski & Nower, 2002; Sharpe, 2002) and as suggested by Dixon et al. (2010), LDW-games appear to pose a greater risk for increased within-session gambling persistence than non-LDW-games. This may accordingly play a potential etiological role in the development of gambling problems. Given that LDW games are associated with reinforcing celebratory events, elicit physiological reactions (Dixon et al., 2010), influence gambling-related cognitions (Jensen et al., 2013) and are attractive to gamblers (Sharman et al., 2015), LDWs might increase within-session game persistence and consequently, the risk of more intense gambling behaviour, at least among novice gamblers.

Strengths and limitations

The current study has a number of strengths that deserve mention. To the authors' knowledge, it is the first study to examine the relationship between different outcomes and gambling persistence within-session using account-based individual gambling data. As such, the present findings have high ecological validity. Since the data were based on all players playing *Multix* on one specific day, it may also be argued that the study has high population validity. Despite these strengths, some limitations should be considered when interpreting the results. The structural loss limit in *Multix* might have influenced the natural gambling behaviour of those reaching the daily limit. Furthermore, no subgroups (e.g. novice, experienced and pathological gamblers) were specified in the present study. This should be considered when interpreting our results as gambling experience may potentially mediate the relationship between game preferences and gambling behaviour (Dixon et al., 2010; Lole et al., 2014).

Future directions

We have shown in the present study that LDWs increase the number of bets placed. It is recommended that future studies examine the likelihood of gamblers playing for more money than intended. This may provide further evidence on the effects of LDWs and the development of gambling problems. More research is also needed to examine the long-term effects of LDWs on individual gambling behaviour, including gambling-related cognitions, between-session gambling behaviour and the probability of developing gambling problems. In addition, future studies comparing gambling behaviour in LDW and non-LDW games may provide further elucidation of the effect of LDW on gambling behaviour. Further, the differing results obtained in studies using novice (Dixon et al., 2010) as well as more experienced and pathological gamblers (Lole et al., 2014) underline the potential mediating role of gambling experience in the link between game preferences and gambling behaviour. Future investigations into this phenomenon may provide useful complementary evidence. In sum, future studies should replicate the present findings and analyse as well as compare them across different game types and gambling subgroups.

Conclusion

The likelihood of continuing betting increases following LDWs compared to losses in terms of the subsequent number of bets made. As such, LDW outcomes may heighten the risk of gambling more than intended and heighten the risk of developing gambling problems over time. Both longitudinal and experimental studies should continue to examine the effect of LDWs in different subtypes of gamblers, in addition to replicating the current findings.

Conflicts of interest

Funding sources

This work was supported by the Research Council of Norway project no. 213757. Norsk-Tipping did not provide any form of funding for the project.

Competing interests

Norsk-Tipping did not have any input during the research process including data analysis and writing of the manuscript and stated no constraints on publishing. The funding source had no influence on the study design, data collection and analysis, interpretation of the data, writing of the article or the decision to submit the article for publication.

Constraints on publishing

No constraints on publishing were reported by the authors.

Acknowledgement

The authors would like to acknowledge Norsk-Tipping, the state-owned gambling company in Norway, for supplying the data.

Notes on contributors

Tony Leino is a PhD candidate in the Faculty of Psychology, University of Bergen, and has a background in health promotion and health psychology. His main research interests include gambling, decision-making and statistical modelling.

Torbjørn Torsheim is currently a professor of psychometrics and quantitative research methods in the Department of Psychosocial Science, University of Bergen. His main research interests include measurement using survey methods, with particular attention to health inequalities and behavioural addictions.

Ståle Pallesen graduated from the professional school of psychology, Faculty of Psychology, University of Bergen, in 1997. He defended his PhD thesis at the same institution in 2002, and since 2007 has worked there as a professor. His main research interests include sleep and addictions wherein he has published extensively.

Alex Blaszczynski is currently a professor of clinical psychology and head of the School of Psychology at the University of Sydney, and the director of the Gambling Research Unit and Treatment Clinic. He has a history of over 30 years experience in the clinical treatment and research of pathological gambling. He has published extensively, including manuscripts on self-exclusion, principles and guidelines for responsible gambling.

Dominic Sagoe received his PhD from the University of Bergen in 2015. He is currently a postdoctoral researcher in the Department of Psychosocial Science, University of Bergen. His main area of research is performance- and image-enhancing drugs (PIEDs), particularly anabolic-androgenic steroids. He also works on gambling and other behavioural and chemical addictions.

Helge Molde is a specialist in clinical psychology, with a sub-specialization in work with addictive behaviours. He defended his PhD thesis on pathological gambling in 2009 at the University of Bergen and is currently working as an associate professor at the same institution.

ORCiD

Alex Blaszczynski http://orcid.org/0000-0003-1476-0791

References

Blaszczynski, A., & Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction, 97*, 487–499. doi: 10.1046/j.1360-0443.2002.00015.x

Dixon, M. R., MacLin, O. H., & Daugherty, D. (2006). An evalutaion of responese allocations to concurrently available slot machine simulations. *Behavior Research Methods, 38*, 232–236.

Dixon, M. J., Harrigan, K. A., Sandhu, R., Collins, K., & Fugelsang, J. A. (2010). Losses disguised as wins in modern multi-line video slot machines. *Addiction, 105*, 1819–1824. doi: 10.1111/j.1360-0443.2010.03050.x

Dixon, M. J., Graydon, C., Harrigan, K. A., Wojtowicz, L., Siu, V., & Fugelsang, J. A. (2014). The allure of multi-line games in modern slot machines. *Addiction, 109*, 1920–1928. doi: 10.1111/add.12675

Gainsbury, S. (2011). Player account-based gambling: Potentials for behaviour-based research methodologies. *International Gambling Studies, 11*, 153–171. doi: 10.1080/14459795.2011.571217

Griffiths, M. (2014). *The use of behavioural tracking methodologies in the study of online gambling*. London, United Kingdom: SAGE Publications, Ltd.

Harrigan, K., Dixon, M., MacLaren, V., Collins, K., & Fugelsang, J. (2011). The maximum rewards at the minimum price: Reinforcement rates and payback percentages in multi-line slot machines. *Journal of Gambling Issues, 26*, 11–29. doi: 10.4309/jgi.2011.26.3

Haw, J. (2008). Random-ratio schedules of reinforcement: The role of early wins and unreinforced trials. *Journal of Gambling Issues, 21*, 56–67.

Haw, J. (2009). The multiplier potential of slot machines predicts bet size. *Analysis of Gambling Behavior, 3*(1), 1–6.

Jensen, C., Dixon, M. J., Harrigan, K. A., Sheepy, E., Fugelsang, J. A., & Jarick, M. (2013). Misinterpreting 'winning' in multiline slot machine games. *International Gambling Studies, 13*(1), 112–126. doi: 10.1080/14459795.2012.717635.

Leino, T., Torsheim, T., Blaszczynski, A., Griffiths, M., Mentzoni, R., Pallesen, S., & Molde, H. (2014). The relationship between structural game characteristics and gambling behavior: A population-level study. *Journal of Gambling Studies, 31*, 1–19, doi: 10.1007/s10899-014-9477-y

Livingstone, C. H., & Woolley, R. (2008). *The relevance and role of gaming machine games and games features on the play of problem gamblers*. Retrived from http://www.iga.sa.gov.au/pdf/0801/fnal%20report.print.feb08.pdf

Lole, L., Gonsalvez, C. J., Barry, R. J., & Blaszczynski, A. (2014). Problem gamblers are hyposensitive to wins: An analysis of skin conductance responses during actual gambling on electronic gaming machines. *Psychophysiology, 51*, 556–564. doi: 10.1111/psyp.12198

Ma, X., Kim, S. H., & Kim, S. S. (2014). Online gambling behavior: The impacts of cumulative outcomes, recent outcomes, and prior use. *Information Systems Research, 25*, 511–527. doi: 10.1287/isre.2014.051

Ministry of Cultural Affairs. (2014). *Spilleregler for multix*. Retrieved from https://www.norsk-tipping.no/multix/spilleregler/_attachment/81400?_ts=144d44ebd70.

Narayanan, S., & Manchanda, P. (2012). An empirical analysis of individual level casino gambling behavior. *Quantitative Marketing and Economics, 10*, 27–62. doi: 10.1007/s11129-011-9110-7

Sharman, S., Aitken, M. R. F., & Clark, L. (2015). Dual effects of 'losses disguised as wins' and near-misses in a slot machine game. *International Gambling Studies, 15*, 212–223. doi: 10.1080/14459795.2015.1020959

Sharpe, L. (2002). A reformulated cognitive-behavioral model of problem gambling. *A biopsychosocial perspective. Clinical Psycology Review, 22*(1), 1–25.

Smith, G., Levere, M., & Kurtzman, R. (2009). Poker player behavior after big wins and big losses. *Management Science, 55*, 1547–1555. doi: 10.1287/mnsc.1090.1044

Templeton, J. A., Dixon, M. J., Harrigan, K. A., & Fugelsang, J. A. (2014). Upping the reinforcement rate by playing the maximum lines in multi-line slot machine play. *Journal of Gambling Studies, 31*, 949–964. doi: 10.1007/s10899-014-9446-5

Xuan, Z. M., & Shaffer, H. (2009). How do gamblers end gambling: Longitudinal analysis of internet gambling behaviors prior to account closure due to gambling related problems. *Journal of Gambling Studies, 25*, 239–252. doi: 10.1007/s10899-009-9118-z