INNOVATION IN GAMBLING RESEARCH

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Over the past two decades, researchers have increasingly used online methods to gather their data, rather than traditional offline research approaches (Wood & Griffiths, 2007; Griffiths, 2010). Psychological research that can be done online includes experimental, self-report, and/or observational research. However, one of the newer forms of online methodologies is the use of online tracking data, a method which I first wrote about in Casino and Gaming International ten years ago (i.e., Griffiths, 2009).

Every company selling online products or services has direct access to every click and keystroke that their customers provide when they are on their website. For instance, the online retailer Amazon tracks everything a consumer does on their website including what the consumer buys, what the consumer looks at, how long the consumer looks at products, etc. and uses the information to compile customer profiles and make personalized recommendations as to what the consumer can buy next.

In the gambling world, behavioural tracking data either from online data, loyalty cards and/or player cards can tell the gaming operator exactly how gamblers are spending their time and money in any given transaction (i.e., which games their customers are gambling on, for how long, how much money they are spending, what games are profitable, etc.). Using the latest sophisticated software, online gaming companies can

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tailor its service to the customer's known interests. When first playing on gambling websites, players supply lots of information including name, address, telephone number, date of birth, and gender. Gambling operators know more about the gambler's playing behaviour than the gamblers, themselves. They are able to send the gambler bonuses, redemption vouchers, and other incentives. These are done to enhance customer experience but have been argued by some to be potentially exploitative (Griffiths & Wood, 2008a). However, over a decade years ago, I argued that behavioural tracking data could potentially be used to help identify problem gamblers rather than exploit them, and to use behavioural tracking data for research purposes (Griffiths, 2009; Griffiths & Wood, 2008b; Griffiths, Wood, Parke & Parke, 2007; Griffiths & Whitty, 2010).

Examples of behavioural tracking methods in gambling research

There have been several different approaches to collecting data from and about gamblers. This has traditionally included self-report methods (e.g., surveys, focus groups, interviews), experiments (in the laboratory or in gambling venues), and participant and/or non-participant observation. More recently, a number of research teams in the gambling studies field have been given direct access to gambling data collected by gaming companies from their commercial online gambling sites. These types of data (i.e., behavioural tracking data) are providing insights into gamblers' behaviour that is helping to better understand how such people act and behave online and over long periods of time.

Research using actual gambling data began when one team of researchers affiliated with Harvard University were given access to a large behavioural tracking data set of over 47,000 online gamblers by the Austrian gaming company bwin. This led to many papers examining the actual behaviour of online

gamblers based on these behavioural tracking data mainly looking at basic sociodemographic information within specific forms of gambling such as online casino gambling (e.g., Broda, LaPlante, Nelson, LaBrie, Bosworth & Shaffer, 2008; LaBrie, Kaplan, LaPlante, Nelson & Shaffer, 2008).

Behavioural tracking data have also been used in other innovative ways. Studies have used tracking data to demonstrate that what money individuals say they have spent gambling is different from their actual gambling behaviour with all studies showing that the more someone gambles, the less reliable they are about estimating what they have financially spent gambling (Auer & Griffiths, 2017a; Braverman et al., 2014; Wohl, Davis & Hollingshead, 2017). More recently, we used online tracking data to test classic psychological theory in the form of 'cognitive dissonance' – the psychological stress experienced by an individual who holds two or more contradictory beliefs, ideas, or values (Auer & Griffiths, 2017b). We argued that providing personalized feedback about the amount of money that gamblers had actually spent may – in some cases – result in cognitive dissonance due to the mismatch between what gamblers actually spent and what they thought they had spent.

Using a participant sample drawn from Norwegian gamblers that had played at the Norsk Tipping online gambling website (N=11,829), players were told that they could retrieve personalized information about the amount of money they had lost over the previous six-month period. Out of the 11,829 players, 4,045 players accessed this information and were asked whether they thought the amount they lost gambling was (i) more than expected, (ii) about as much as expected, or (iii) less than expected. We hypothesized that players who claimed that the amount of money lost gambling was more than they had expected were more likely to experience a state of cognitive dissonance and would attempt to reduce their subsequent

gambling expenditure more than other players who claimed that the amount of money lost was as much as they expected. Overall, the results contradicted the hypothesis because players without any cognitive dissonance decreased their gambling expenditure more than players experiencing cognitive dissonance. However, a more detailed analysis of the tracking data supported the hypothesis because specific playing patterns of six different types of gambler using a learning tree algorithm explained the paradoxical overall result.

Another useful thing about tracking data is that it can be used to identify the geographical location of where the gambler is. My colleagues and I have used these data in innovative ways to study contextual factors concerning gambling behaviour. For instance, using data from Norsk Tipping player cards, we compared the relationship between gambling behaviour in alcohol-serving venues (ASVs) and non-alcohol serving venues (NASVs) (Leino et al., 2017). The aim of the study was to examine individual gambling. Our sample comprised 1452 observations of 726 individuals (25.2% female). We examined individual differences in gambling behaviour (number of days, sessions, bets made, stake, time spent, money lost, and average bet size) of gamblers in ASVs and NASVs. We found that individuals gambled regularly in NASVs and occasionally in ASVs. Compared to NASVs, in-session gambling behaviour was more variable in ASVs. In-session analysis showed that gamblers staked less money in ASVs than in NASVs but lost more money in ASVs than in NASVs. Based on the findings, we argued that some gamblers appear to be more willing to take more risk in ASVs compared to NASVs.

In another study using Norsk Tipping player card data, we examined gambling behavior in venues based on the number of gambling terminals in the venue (i.e., venues with one terminal; 2–5 terminals; 6–10 terminals; 11–16 terminals). We examined 153,379 sessions from 93,034 gamblers. We found that gambling frequency was highest in venues with 2–5 terminals (54.5%) and lowest in venues with 11–16 terminals (1.6%). Compared to venues with one terminal, venues with two or more terminals were associated with gamblers placing more bets, and spending more time and money per session. However, gamblers had higher losses in venues with one terminal compared to venues with 2–5 terminals (although no differences in net outcome were found between venues with one terminal and those with 6–10 and 11–16 terminals. Overall, our study demonstrated that in the natural gambling environment, gambling behaviour appears to be reinforced in venues with multiple terminals.

Evaluation of responsible gambling tools using tracking data
Another innovative use of behavioural tracking is using the data to evaluate the efficacy of responsible gambling tools. These

tools (e.g., limit-setting tools, pop-up messages, personalized feedback, temporary self-exclusions) are a way that online gambling operators facilitate their players to gamble in a more responsible manner (Harris & Griffiths, 2017). However, very few of these tools have been evaluated empirically in real gambling environments. We used behavioural tracking data to evaluate whether the setting of voluntary time and money limits helped players who spent the most time and money gambling (Auer & Griffiths, 2013). Data were collected from a representative random sample of 100,000 online players who gambled on the Austrian win2day gambling website during a three-month test period. This sample included 5,000 registered gamblers who chose to set themselves limits while playing on win2day. The results of this study showed that voluntary limit setting had a specific and statistically significant effect on high intensity gamblers (i.e., voluntary limit setting significantly reduced the amount of time and money gambled amongst the most gambling intense players).

In a very recent study (Auer et al., 2019), we used tracking data to investigate the effects of responsible gambling tools (in this instance, voluntary limit setting) on customer loyalty. We were given access to an anonymised dataset of 175,818 players who had gambled at least once with online gambling operator Kindred. Because we could track a gambler's behaviour over time, we found that the percentage of active players in the first quarter of 2017 was significantly higher in the group of players who had set voluntary money limits in the first quarter of 2016 compared to players that did not (suggesting players that set voluntary spending limits are more loyal to the gambling operator compared to those who do not).

We also investigated the effect of a pop-up message that appeared after 1,000 consecutive online slot machine games had been played by individuals during a single online gambling session (i.e., "You have now played 1,000 slot games. Do you want to continue? [YES/NO]") (Auer, Malischnig & Griffiths, 2014). The study analysed 800,000 gambling sessions (400,000 sessions before the pop-up had been introduced and 400,000 after the pop-up had been introduced comprising around 50,000 online gamblers). The study found that the pop-up message had a limited effect on players (less than 1% of the gamblers who played 1,000 games consecutively ceased playing after viewing the pop-up message).

In a follow-up study, we argued that the original pop-up message was very basic and that re-designing the message using normative feedback and self-appraisal feedback may increase the efficacy of gamblers ceasing play (Auer & Griffiths, 2015a). We designed a new enhanced pop-up message which read: "We would like to inform you, that you have just played 1,000 slot games. Only a few people play more than 1,000 slot games. The chance of winning does not increase with the

duration of the session. Taking a break often helps, and you can choose the duration of the break". In this study we examined 1.6 million playing sessions comprising two conditions (i.e., simple pop-up message [800,000 slot machine sessions] versus an enhanced pop-up message [800,000 slot machine sessions]) with approximately 70,000 online gamblers. The study found that the message with enhanced content more than doubled the number of players who ceased playing (1.39% who received the enhanced pop-up compared to 0.67% who received the simple pop-up). However, as in our previous study, the enhanced pop-up only influenced a small number of gamblers to cease playing after a long continuous playing session.

In a study of the efficacy of personalised feedback (Auer & Griffiths, 2016), we examined whether the use of three types of information (i.e., personalized feedback, normative feedback, and/or a recommendation) could enable players to gamble more responsibly. A total of 17,452 players were randomly selected from 69,631 players who had gambled on at least one game for money. Gambling activity among the control group (who received no personalized feedback, normative feedback or no recommendation) was also compared with five other groups that received information of some kind (personalized feedback, normative feedback and/or a recommendation). Compared to the control group, all groups that received some kind of messaging significantly reduced their gambling behaviour. The results supported the hypothesis that personalized behavioural feedback can enable behavioural change in gambling.

In another study, we investigated whether the receiving of personalized feedback about exceeding 80% of a personally set monetary personal limit had an effect on subsequent playing behaviour compared to those gamblers that did not receive personalized feedback (Auer et al., 2018). Utilizing a dataset of 54,002 Norsk Tipping players, a total of 7,884 players (14.5%) received at least once piece of feedback that they had exceeded 80% of their personal global monthly loss limit between January and March 2017. Using a matched pairs design, our study found that those gamblers receiving personalized feedback in relation to limit-setting showed significant reductions in the amount of money the subsequently gambled.

Conclusions

Behavioural tracking data has many advantages such as providing a totally objective record of an individual's gambling behaviour on a particular online gambling website (whereas gamblers in self-report studies may be prone to social desirability and memory recall biases). Furthermore, such data usually comprise very large sample sizes whereas self-report studies typically have much smaller sample sizes. However, behavioural tracking data only comprise data from only one gambling site and tells us nothing about the person's gambling behaviour in general because online gamblers typically gamble on more than one site as well as gambling offline too (Wardle, et al, 2011). Despite the large samples sizes, behavioural tracking data always comes from unrepresentative samples (i.e., the players that use one particular internet gambling site). Furthermore, behavioural tracking data does not account for the fact that more than one person can use a particular gambling account, and the data tell us nothing about why people gamble (whereas self-report data can provide greater insight into motivation to gamble).

When it comes to studying online gambling behaviour, behavioural tracking methodologies offer a number of advantages for researchers. However, it should also be noted that there are a number of disadvantages of using tracking data only when compared to other more traditional research methods (i.e., surveys), and that no single methodology is better than another in the collection of data concerning online gamblers. :: **CGi**

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