

A Behaviour Sequence Analysis of Young People and Gambling-Related Harm

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Abstract

Gambling is a worldwide issue that requires continued, extensive investigation. Most people have gambled at some point in their lives, and many do so without incurring problems. However, a number of individuals do experience gambling-related harm, and understanding the pathways or life histories these individuals have experienced may elucidate how and why their gambling became harmful. The current research uses a novel method, Behaviour Sequence Analysis, to understand the temporal pathways that young people experience when first gambling. Behaviour Sequence Analysis takes multiple qualitative accounts, first-person interviews in the current study, and collates the data into statistical pathway models that show the chains between behaviours and events. A sample of 66 participants provided details of their life experiences regarding what led them to first gamble. Results indicated that parents and peers had a large influence and were facilitators in the first-time gambling episode, which was expected. However, the results also showed that many participants suggested that receiving scratch cards in their birthday cards was their first experience of gambling, and this seemingly innocuous act was the first step towards a pathway into gambling-related harm. The findings, therefore, support previous literature, while highlighting a novel method for future research, and various key intervention points for which strategies could be developed to reduce the potential for developing gambling-related harm behaviours.

Keywords: gambling, gambling-related harm, young people, Behaviour Sequence analysis, developmental

Résumé

Les jeux de hasard constituent un problème mondial qui nécessite des études approfondies et continues. La plupart des gens ont joué à un moment de leur vie et beaucoup le font sans problème. Cependant, un certain nombre de personnes subissent des préjudices liés au jeu. Comprendre les parcours ou les histoires de vie de ces personnes peut expliquer comment et pourquoi leur jeu est devenu préjudiciable. Les recherches actuelles utilisent une méthode innovante, la Behaviour Sequence Analysis (analyse séquentielle de comportement) pour comprendre les parcours temporels qu'empruntent les jeunes lorsqu'ils commencent à jouer. Cette forme d'analyse séquentielle se fonde sur plusieurs analyses qualitatives et des entretiens à la première personne, et les données sont regroupées dans des modèles de parcours statistique qui mettent en évidence les liens entre les comportements et les événements. Soixante-six participants ont fourni des détails sur leur première expérience de jeu et sur ce qui les a amenés à jouer la première fois. Les résultats indiquent que les parents et les pairs ont une grande influence sur le premier épisode de jeu, ce à quoi l'on s'attendait. Cependant, les résultats montrent également que de nombreux participants ont indiqué que des cartes à gratter en guise de cadeau d'anniversaire étaient leur première expérience de jeu, et que cet acte apparemment anodin était le premier pas dans une voie menant à une dépendance au jeu. Les résultats corroborent donc la littérature antérieure, tout en soulignant une méthode innovante pour les recherches futures et divers points d'intervention clé pour lesquels des stratégies pourraient être élaborées afin de réduire le potentiel de développement de comportements préjudiciables liés au jeu.

Introduction

While many persons have gambled at at least one point in their lives, problem gambling is becoming an increasing concern to our society, especially in regards to how it affects younger people (Volberg, Gupta, Griffiths, Olason, & Delfabbro, 2010). Recent research has suggested that gambling rates in 11–15 year olds have remained relatively static over time, and other studies, also recent, imply that the prevalence of problem gambling in young people now stands at approximately 1–2% (Valentine 2016). The most popular form of gambling continues to be Electronic Gaming Machines (EGMs, Category D) (Ipsos MORI, 2015), which are acknowledged to be the form of gambling most associated with gambling-related harm (Productivity Commission, 2010). While the rates of gambling may have remained stable over time, it is nevertheless unclear which pathways lead people at first into gambling, and then specifically into problem gambling.

Multiple competing suggestions now operate to explain why young people may gamble, including whether it is an opportunity affordance, the desirable social spaces

gambling centres provide, or the emulation of adults (Valentine, 2016). Clearly, the ultimate cause is likely to be a complex interaction between various precipitating factors, ones that lead young people to gamble. One of the more robust relationships observed in the research literature regarding adolescent gambling engagement and the development of problem gambling in adolescence and young adulthood is the risk factor of parental gambling (McComb & Sabiston, 2010). An individual with a parent who has a gambling disorder, the research suggests, is more than five times more likely to be at risk of developing a gambling disorder, and more than ten times more likely to be a problem gambler (Dowling et al., 2017).

One of the proposed explanatory factors for the strong association between problem parental and young person gambling is a relaxed and tolerant attitude towards gambling from the young person's parents (Forrest & McHale, 2012; Tepperman et al., 2009; Valentine, 2009), perhaps introducing gambling as a fun, enjoyable game. In the UK context, the vast majority of treatment-seeking problem gamblers state that they initiated their disordered gambling behaviour before they were adults (Forrest & McHale, 2012). It is probable that growing up in a household with a gambling culture (Forrest & McHale, 2012), where children and adolescents were exposed to gambling and opportunities to gamble (Tepperman et al., 2009, the young person is more likely to commence gambling at a younger age than would otherwise be the case. Indeed, Jacobs (2000) reported that three-quarters of those who had a parent with a gambling disorder gambled for the first time before the age of 11 years, in comparison to their peers without such a parent (34% commenced gambling by age 11).

As well as initiating their gambling "careers" earlier in response to exposure to gambling opportunities in the home, and tolerant parental attitudes towards gambling, it is probable that young persons, via the Social Modelling hypothesis (Tepperman et al., 2009), are adopting positive expectancies with gambling behaviour, a shift which is in turn likely to encourage continued participation in gambling. Dowling et al. (2017) observed that emotional impact expectancies, and enhancement and coping motives, significantly mediated the relationship between parental problem gambling and young person gambling. Essentially, young persons in such environments may be learning to use gambling as a mechanism to meet certain psychological needs. If young people are attempting to emulate adult behaviours (e.g., gambling), then the role of parents' behaviours is important in influencing young people, and a developmental, longitudinal research approach is needed (Dowling et al., 2017).

In addition, Tepperman et al. (2009) proposed, as an alternative to the Social Modelling hypothesis, the Childhood Distress hypothesis to account for the transmission of problem gambling from parent to offspring. Effectively, it is possible that a young person's exposure to stressors in the home environment, directly as a consequence of parental problem gambling, may motivate a need for mood modification, and may promote the use of gambling as a maladaptive coping strategy (Dowling et al., 2017). Evidence from the adolescent substance abuse

literature clearly supports the Childhood Distress hypothesis, with adolescents who have been exposed to abuse (physical, sexual and emotional) or neglect within the family environment, being at much greater risk of abusing substances themselves¹ (Yoon, Kobulsky, Yoon, & Kim, 2017). Fundamentally, young people with poor parental attachment relationships as a result of parental substance abuse are accordingly likely to experience difficulty regulating their emotions leading to the application of maladaptive coping strategies such as a substance use (Reinart & Edwards, 2009). Research is required that provides a clear sequential timeline between parents first involving their children in gambling, and later gambling behaviours of the young person.

Scholarship has shown that those young people who decide to gamble for a variety of reasons, including monetary rewards (Gillespie, Derevensky, & Gupta, 2007; Wood, Griffiths, Derevensky, & Gupta, 2017); sensation and thrill seeking (Gupta & Derevensky, 1998); and escape from stress (Gupta & Derevensky, 1998). Additional motivations include accompanying excitement, and fun in the sense of entertainment (Dowling et al., 2017; Sarti & Triventi, 2016). However, intention to gamble for adolescents and young adults, aside from parental gambling, has been demonstrated to be predominantly associated with frequency of peers' gambling behaviour (Delfabbro & Thrupp, 2003; Hira & Monson, 2000). It is argued that, for young adults and adolescents, both the intention to gamble and gambling behaviour itself are each influenced by peer gambling and peer attitudes to gambling by creating perceived social norms for gambling (Moore & Ohtsuka, 1999; Sarti & Triventi, 2016). Goldstein et al. (2013) observed that youths who participate in, or are exposed socially or in the community to, delinquent behaviours, such as substance use and violence, operate at significantly elevated risk of problem gambling than do their counterparts within this population.

A large corpus of research has consistently indicated the aforementioned risk factors can be causes of problem gambling (Dowling et al., 2017). The current research adds to a growing trend in the literature to understand how these factors interact in sequence and over time (e.g., Blaszczynski & Nower, 2001). Essentially, this scholarship maps the pathways of problem gambling risk factors over a temporal period, and shows how previous behaviours and events affect future gambling behaviours (Valentine, 2009). The current research will add to understanding of the sequential interaction between risk factors over time. For instance, does parental involvement or friend involvement preceding gambling lead to further gambling? It should be noted that many children participate in games with parents, games which, though they do mimic adult-gambling, are nevertheless played only for fun and enjoyment, and never for financial gain. For the sake of brevity, "gambling"

¹However, it is key to note that relationship between substance use and maladaptive or delinquent outcomes is not clear. Depending on substance type and frequency of use, for example, outcomes may vary between individuals.

in relation to children includes games such as cards and poker with children—though it is different in nature relative to adult gambling.²

The sequence of events and behaviours that influence young people to begin gambling is important in terms of knowing where to focus early interventions, or how best to educate young people about the long-term risks of gambling. To understand further the complex pathways of causal factors leading to gambling, we are here presenting a new approach, Behaviour Sequence Analysis (BSA; Keatley, 2018). BSA (also called, simply, Sequence Analysis) is already used in a number of applied domains, including social psychology, developmental psychology, and criminology (Bakeman & Gottman, 1997; Bakeman & Quera, 2011; Beale, Cox, Clarke, Lawrence, & Leather, 1998; Clarke, Forsyth, & Wright, 1998; Fossi, Clarke, & Lawrence, 2005; Keatley, Barsky, & Clarke, 2017; Lawrence, Fossi, & Clarke, 2010). In the simplest form, BSA is the recording and analysis of behaviours and events over time. Essentially, the researcher or practitioner monitors and records the chain of behaviours that a person performs, and records the sequence that they occurred in. This process is repeated for a number of people's chains (in this case, people with problem gambling). Such a method provides the researcher with a lengthy outline of highly detailed biographical accounts. Autobiographical accounts can also be used to provide a timeline of behaviours that can be analyzed using BSA (see Keatley, 2018; Townsend et al., 2016). This qualitative start, rich in idiosyncratic data, is essential for gaining an in-depth understanding of an individuals' life history. It is, however, it is difficult to summarize or outline that data in any concise way. The BSA method is a strong alternative, as it does allow for a meaningful and compressive quantification of this type of data.

Categorization of (auto) biographical accounts begins by parsing or splitting the record, called “unitizing” in BSA (Clarke & Crossland, 1985; Keatley, 2018). This means finding behaviours or events that are separated by break-points, or points at which one behaviour is succeeded by another. A list of discreet behaviours and events are then formed, allowing for linguistic or stylistic differences. For instance “met my mates” and “met-up with my friends” may be categorized as “meeting with friends”—this concern is an issue for inter-rater reliability, which is also conducted at the categorization stage.

Once a mutually exclusive and exhaustive list is formed, participants' data are recoded using the BSA list (see Ellis et al., 2017; Keatley et al., 2017). This component of the method permits a uniformity between participants' responses, removing, as it does, linguistic differences. Finally, the relative prevalence of particular behaviour strings are analyzed (e.g., *abc*, *acd*, *abd* and so on). Behaviour Sequence Analysis starts by focusing on pairs of behaviours, for example *ab* and *bc*. The transitions from *a* to *b* and from *b* to *c*, for example, are tallied and put into tables called transitional frequency matrices. These tables can then be analyzed to

²We express our gratitude to an anonymous reviewer for making this distinction clear to us.

examine which pairs of behaviours are occurring above the level of chance—essentially, which pairs of behaviours show significant sequential organization.

The aim of the current research was to investigate the pathways of influences and behaviours that lead young people to gamble. The aim of the current research is to explore how risk factors and behaviours interact across time to predict the onset of gambling behaviours. The current research uses a relatively novel method (BSA) to map the complex interaction of antecedent behaviours leading up to, and surrounding young people gambling. Given the novel nature of the current research, no formal hypotheses were made regarding the temporal pathways (which is normal in BSA research); however, based on previous research a number of risk factors were likely to be seen in the current data, such as parental influence, peer influence, and intrapersonal issues. The ordering of these risk factors, however, was not hypothesized a priori.

Method

Participants

Purposive sampling was conducted in the current study, focusing on locations of higher gambling for young people (e.g., coastal areas of high tourism in Great Britain³) as well as inland city locations within the East Midlands Region of Great Britain. A total of 66 participants (21 females, 45 males, $M_{\text{age}} = 22.26$, $SD = 3.46$, range = 18–30) completed the research and provided detailed accounts of their first time gambling. To attain a more comprehensive and generalizable account, we also contacted service centres and addiction groups (e.g., Addaction, GamCare). This approach provided not only access to individuals with a history of problem gambling and associated comorbid behaviours, but also a more diverse sample in terms of geographic locations. Participants were attending help centre sessions at the time of sampling, and scored in the moderate-to-problem gambling range according to the Problem Gambling Severity Index (PGSI). The PGSI consists of nine item scales assessing gambling problems. The PGSI shows high test-retest reliability and the ability to discriminate between recreational/social gamblers, and problem gamblers (Ferris & Wynne, 2001). Cut-offs are used to assess gamblers' categories from “non-problem gamblers” (PGSI = 0); “low risk” (PGSI = 1-2); “moderate risk” (PGSI = 3-7), or “problem gambler” (PGSI > 7). However, moderate and problem gambler categories are often merged (Afifi, Cox, Martens, Sareen, & Enns, 2010; Crockford et al., 2008), and 59 participants were in this merged category in the present research.

Data

The data consisted of 66 statements from participants. Participants were asked to provide detailed responses of the time period leading-up to their first experience of gambling themselves, including any and all events and behaviours they thought

³In coastal regions of high tourism in Great Britain there is a high density of arcades that are legally permitted to offer EGM gambling to adolescents (specifically, Cat. D machines with relatively low maximum stake and maximum prize levels).

relevant to their decision to gamble. Participants recalled memories from their childhood ages (typically 7–14 years of age). An average of 8–15 years therefore existed since time of first gambling and recall.⁴ Participants were encouraged to be factual and state the memories they possess, rather than try to presume or fill in unknown blanks. While this may have limited the qualitative depth and breadth of responses, it also helped to ensure that all behaviours and events were as close to fact as recollection allowed. In this way, the BSA begins with a highly in-depth, qualitative approach. Participants were given time to elaborate on their life history, thereby providing insights that might have been missed by other methods.

Statements were selected for analysis if they met the following two criteria. (1): they were detailed enough to perform BSA—typically involving 3 or more individual unique behaviours. While this is not a necessity of BSA, *per se*, the researchers used this as a criteria to show that participants had at least a few real recollection of events and details and has previously been used in the literature (Keatley, 2018; Keatley et al., 2017). (2): participants could remember their first experience of gambling. This is to ensure that a sequence of events of actual behaviours for a distinct event were being given—rather than vague generalised accounts. Beyond these criteria, all responses from participants were coded. The coding list is extensive; however, it means that no responses from participants were omitted.

Coding

A coding scheme was developed based on the statements given. The coding phase created categories that were mutually exclusive and exhaustive, which is a prerequisite for BSA (Bakeman & Quera, 2011; Keatley, 2018). This process ensured all important behaviours from the participants' accounts were included in the final analyses, without overlap of ambiguity. Coders with experience in psychological research methods, qualitative data analysis, and BSA were selected to develop coding schemes and then reach a consensus on the final coding scheme. Coders agreed on the categories and once a final list had been made, the coding of participants' data began in full. Initially, two independent researchers coded the statements and created a behaviour list to turn the autobiographies into sequence chains. The researchers then came together to discuss their behaviour lists and ensure agreement in terms. Where there were disagreements the researchers easily overcame them as they were typically superficial differences (e.g., choice of terms to describe a behaviour). Therefore, there was complete agreement for coding.⁵

⁴Although this range may seem like a long time, it is with the normal range of life-history, autobiographical study timelines. Therefore, it still provided comprehensive, detailed accounts. An alternative, of course, would be to study children who have recently gambled or playing gambling games; however, this approach would require a large sample, and the longitudinal need to wait and see which children turned into moderate-to-problem gamblers.

⁵If disagreements emerged that could not easily be reconciled, then a third researcher was ready to become involved. However, as the coding task and behaviours were relatively straightforward, the two initial coders were able to reach full agreement, and the third researcher reviewed all of the terms in the back-translation part of the research to ensure that an accurate list had in fact been made.

Finally, a back-translation test (see Keatley, 2018) was conducted to ensure that codes captured the essence of statements, without loss of important behavioural data. The back-translation test essentially takes the final coded statement, and translates it back into a full-written statement; the original participant's statement and the coded statement are then compared for conceptual and behavioural similarity. Researchers agreed that the coding scheme fulfilled the criteria for a successful BSA.

Procedure

Participants were contacted through a purposive sampling approach. First, staff at local and national service centres and help centres were contacted to inform them of the purpose of the study, and whether they would be willing to help with its promotion. Several centres from around England agreed to promote the study (through posters, emails, and word-of-mouth). Researchers then arranged testing times with individuals who were currently seeking help from these centres.

Once participants had contacted through email, telephoned, or otherwise agreed to participate in the study (e.g., by verbal agreement if they were met on the street), they were introduced to the purpose of the study, and given an information sheet and consent form to complete. When participants were ready, the data collection stage began. First, participants completed questions relating to their gambling behaviours, habits, and PGSI. After completing the questionnaire section, participants began started the project through a semi-structured interview related to their views about gambling in general. This method was used mainly as a method to encourage participants to speak freely, and begin thinking about their experiences of gambling and life history. Once participants had answered several questions, they moved on to the sequence analysis section of the study, and were prompted throughout the process to give as much detail as possible, and clarify responses wherever ambiguity or inconsistencies emerged. Participants were not rushed, and were instead encouraged to take their time and be as descriptive as possible. Statements were taken from participants regarding their first gambling experiences, reasons for gambling, who they were with, and associated behaviours and events. Participants were asked to tell the researchers, in as much detail as they could accurately remember, about the first time they gambled. In particular, participants were asked to recall the events and behaviours leading up to that first time gambling. Participants were given sheets of paper to write and record their statements and build-up a timeline of behaviours. Participants were then encouraged to go back through the timeline and add-to or edit any section. No time limit put on this part of the data collection, and once participants felt they had given a clear account they were asked to talk through it with the researcher, to ensure all information was written down clearly and to prompt further any meaningful recall.

Statistical Analysis

Once statements were coded into sequences of categories, data were input into the statistical package R (R Core Team, 2013), and analysed into BSA. The statistical

analyses gave several outputs. First, frequencies of individual behaviours and events were output. This component of the method gave the researchers an indication of types of events and behaviours that were occurring frequently in the data set. This approach also allowed for a quick representation of, for example, “risk factors,” as well the most frequent forms of gambling. The more important output in BSA was the sequence analysis. This part of the analysis involved examination of conditional transitional probabilities. Essentially, the program analyzed which behaviours were more likely to follow other behaviours. Chi-square analyses were performed on the transition frequency table to show significant transitions between one behaviour, called the *antecedent*, and a following behaviour, called the *sequitur*.

To make results easier to comprehend (Keatley, 2018), stated transition diagrams were developed from the transition frequency matrices. The diagrams demonstrated the overall progression of events and behaviours as outlined by participants. The diagrams could be read like a flow diagram, moving in one-step increments at a time (i.e., $a \rightarrow b$; $b \rightarrow c$) rather than as multiple steps (i.e., $a \rightarrow b \rightarrow c$). The state transition diagrams displayed only the significant transitions for which standardized residual scores deviate significantly from their expected or chance values.

Results

The first part of the analyses focused on which persons reported initially introduced them to gambling when they were younger. At this stage, to make results easier to understand the analysis grouped causes into “Parents” (outlining that participants had written either “Mother” or “Father” as a cause); “Friends” (e.g., outlining that friends had been the cause of the time of first gambling); or, “Other” (e.g., gambling alone, grandparents etc.), respectively also, all types of gambling activity were at this time grouped into “Gambling.” Therefore, the analyses allowed a direct contrast between Family, Friends, and Other influences on young people’s respective first time gambling experiences.

The results indicated that many more participants suggested parents were a significant influence of their first experience of gambling ($n = 21$, $SR = 5.99$), compared to friends ($n = 12$, $SR = 4.91$), and “Other” relationship influences ($n = 12$, $SR = 3.50$). This finding provided an initial impression that young children were introduced to gambling through their parents. Parental influence was a concern that will be discussed in more detail in later sections of this paper. It is nonetheless necessary, however, to begin “zooming in” and examination these chains in greater detail. One example of these chains is Mother vs Father influences on gambling.

Responses from participants were broken down into Mother or Father as antecedents of gambling behaviour in general. In this analysis, twice as many participants suggested their father had individually introduced them to gambling ($n = 8$, $SR = 2.05$) than did their mother ($n = 4$, $SR = 1.78$). Comparing the last two analyses, this also indicated that introduction to gambling is more typically a joint influence of both the mother and father.

The next part of the BSA concerned the complete, full sequence analyses of participants' reported life histories in relation to their first experience of gambling. To begin, frequencies of all behaviours outlined by participants are shown here (see Table 1).

Frequencies of events and behaviours in first-time gambling

To gain an insight into the types of events and behaviours that participants suggested, the researchers first conducted a frequency analysis (see Table 1).

Table 1 reveals how many times individual behaviours were seen in the data. Table 1 indicates that approximately half of the sample enjoyed gambling activities, with approximately equal numbers suggesting they had won and lost. Gambling with friends was fairly common, and gambling with the father occurred more times than gambling with the mother. Certain of the most frequently named gambling activities were: EGMs, poker and sports wagering.

Table 1
Frequency table for categories suggested by participants

| Category | Frequency |
|---|-----------|
| Gambling (undefined); Enjoy playing | 30 |
| Won | 21 |
| Lost | 20 |
| Friends | 17 |
| Gambled with Father | 14 |
| Gambled more | 14 |
| Machines (undefined) | 11 |
| Became interested; Boredom relief; Excitement building (during playing); Birthday | 10 |
| Football; Poker; Scratch card | 9 |
| Other (family) | 8 |
| Betting shops; Horses; Excitement (before playing) | 7 |
| Gambled with Mother; Get money from family; Felt grown-up | 6 |
| Lottery; Left venue; Drink alcohol; Curiosity/novelty; Watched friends gambling | 5 |
| In town; Slot machines; Casino; Enjoy anticipation of winning; Felt disappointed; Impulse | 4 |
| Gambled with parents (combined); Stayed until lost all money | 3 |
| Gambled with Brother; Watched TV; Belief in winning; Roulette; Dislike losing; Enjoy the risk | 2 |
| Gambled with Boy/Girlfriend; At home; Get money from Bank/Savings; Loss chasing; Mobile App; Dogs; Bingo; Card games; Lack self-control; Unemployed; Employed; Removed online account; Lost all money; Claiming jobseekers; Returned to venue; Play to win; Normal daily activity; Recapture past feelings; Arranged meeting with friends; Began selling possessions; Began borrowing money; Felt guilty; Against gambling | 1 |

Note. Behaviours with the same frequency are grouped together. So, for example, "Began borrowing money" was only mentioned once, the same as "felt guilty"; whereas, "football" and "poker" occurred in the dataset nine times.

State Transition Diagram of events and behaviours in first-time gambling

The next stage of the sequence analysis was to map the chains of behaviours that individuals claimed they had lived in their life histories. Participants provided accounts related to their memories of their first gambling experience. For this part of the report, all of the behaviours from the participants' accounts were subject to the sequence analysis. This approach yielded a considerable more complex diagram than the examples produced in previous sections. However, the same analysis had been conducted, and the diagrams can accordingly be read in the same way.

Therefore, whereas the diagram illustrated many links between multiple behaviours, the analyses were between behaviour pairs only. The diagram should be read, therefore, by moving from one behaviour (the antecedent) to the next behaviour, an arrow linking the former to the latter. This component of the figure represents lag-one sequence analysis. For the concept of various behaviours, multiple arrows stem forward. This aspect indicates different participants suggesting different sequitur (following) behaviours. This part of the figure is where the standardized residuals (SRs) are important, as those residuals offer an indication of which sequitur is more likely than chance to occur. Standardized residuals effectively a measure of the strength of difference between expected and observed values (Keatley, 2018); therefore, the larger the SR the greater the difference between observed and expected. Arrow thickness indicate standard residuals. We provide a key alongside the diagram. The heuristic for this state transition diagram is: (1) only move from one behaviour, to a directly linked behaviour, one step at a time; (2) arrow thickness indicates which following behaviour is more likely than chance to occur.⁶

Specific points stand out immediately when looking at the state transition diagram. First, a clear distinction exists between the types of gambling that Mothers and Fathers are likely to engage in with their children. We have already established that parents are a principal antecedent of gambling behaviour; now, the findings suggest that mothers are more likely to play the Lottery with their children, whereas fathers are more likely to begin by playing Poker types games.

One of the strongest links in the diagram is the connection between birthdays and scratch cards. This connection occurred greatly above the level of chance, and shows the importance of understanding how seemingly innocent and innocuous actions, such as putting scratch cards into birthday cards, can create a long-lasting effect. Receiving a scratch card typically made participants feel grown-up, and more participants reflected on that sequitur, rather than the fact they lost with the scratch card. This again suggests the significance of the role of adults in shaping young people's views and attitudes towards gambling.

⁶For the interested reader, the exact frequencies of transitions between behaviours, and precise SRs, are available from the correspondence author, on request.

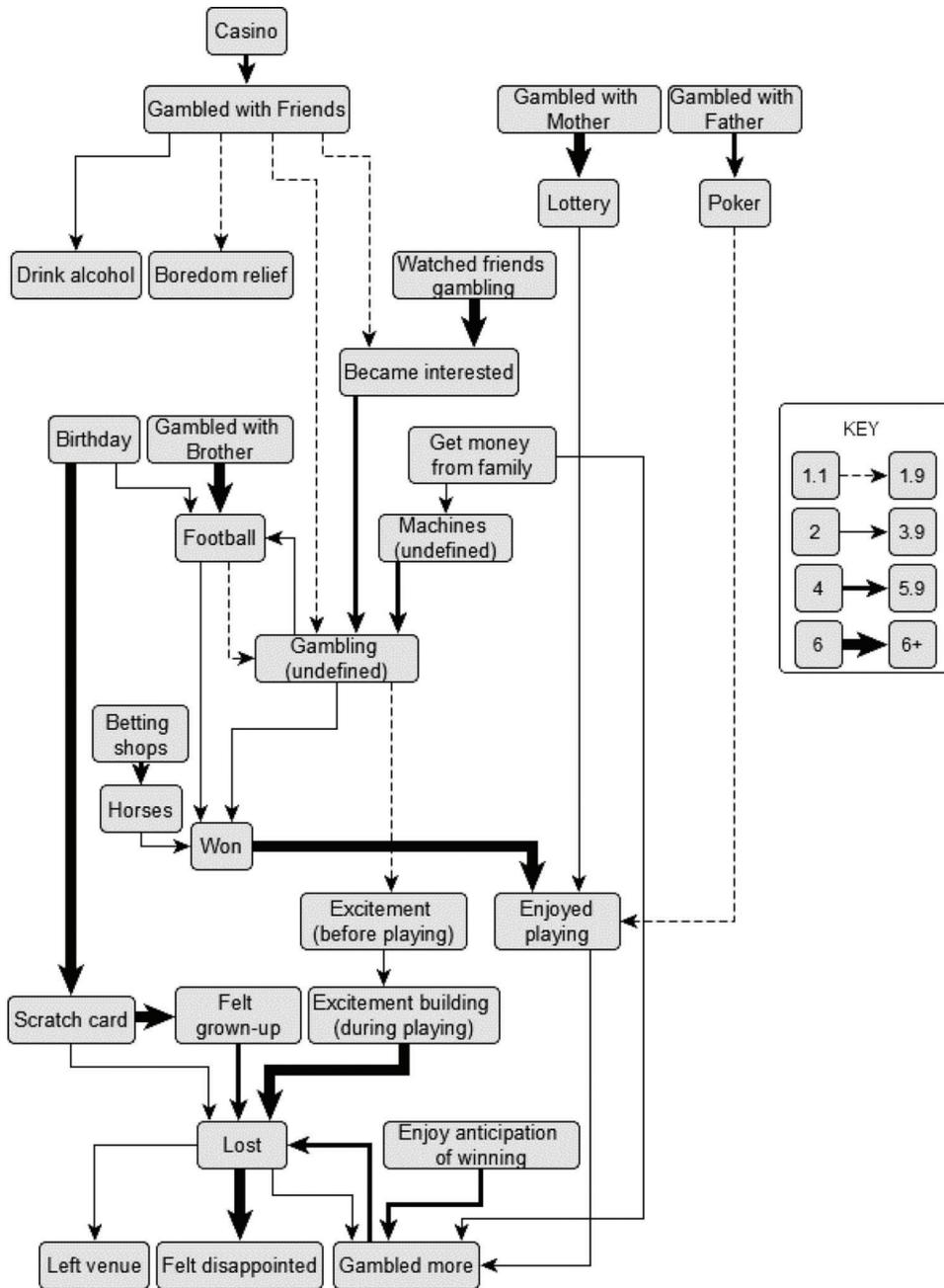


Figure 1. State transition diagram of behaviours and events relating to first-time gambling in young people.

Behaviour transitions that would be expected in relation to gambling do of course operate. For instance, enjoyment of the anticipation of winning, as an antecedent, made individuals correspondingly more likely to gamble more. Similarly, if a participant won, that person would be more likely to enjoy playing. Enjoyment of playing would then lead to greater frequency of gambling. This fact is also why

“gamble more” and “gambling” were separately defined, as it was important to distinguish the unique behavioural patterns of repeated or continued gambling.

Losing at gambling typically resulted in feelings of disappointment, with certain participants suggesting that they left the venue. For particular subjects, however, subjects continued to gamble more, and this is an important benefit of BSA. Behavioural profiles of individuals can be built from these sequence diagrams, indicating the difference between those individuals who lost and left the venue, and those who continued to gamble more (possibly loss chasing). Indeed the behavioural lock-in of *Lost* → *Gambled more* and *Gambled more* → *Lost* demonstrated the early indicators of loss chasing.

Discussion

The aim of the current research was to provide an insight into the behavioural chains that lead to first-time gambling in young people. The current research supports previous findings in gambling studies that outline the principal risk factors for participation in gambling in young people. The current data clearly support the predominant finding in the existing literature that young gamblers’ first engagement with gambling is via their friends (Delfabbro & Thrupp, 2003; Hira & Monson, 2000; Sarti & Triventi, 2016) and via their parents (Forrest & McHale, 2012; McComb & Sabiston, 2010; Tepperman et al., 2009; Valentine, 2009). The first, and most important antecedent of gambling behaviour was the involvement of parents in introducing their children to gambling. Participants highlighted that it was through their parents’ involvement and influence that they were first introduced to different forms of gambling behaviours. In particular, Fathers were more likely to introduce poker games to their children; whereas Mothers were more likely to introduce lottery gambling.

One of the main results coming from the current study is that parents play a principal role in introducing their children to gambling behaviours. While this is usually done as a harmless means of entertainment, parents should remain vigilant about the message framing they are portraying of gambling. Of course, parents are typically playing card games or gambling-related games as a source of entertainment with their children, and the financial issues related to gambling are not realised by the children. However, the current research does suggest that those individuals who develop problem gambling recall a time in their childhood when a parent first introduced them to gambling, and this initial interaction with gambling is perhaps the starting point for later gambling. It may be that the way in which parents introduce these games has an effect later in life—for instance, is they introduced as fun regardless of outcome, then perhaps they are framed in the wrong way. This area is clearly one for future research and development.

Another important introduction to gambling was the giving of scratch cards, typically through birthday cards. This traditional behaviour may at first seem to the observer innocuous; however, it was highlighted as an antecedent to other gambling

behaviours, and was therefore a valid concern for friends, parents, and other members of the family. The issue here is *not* that parents should not play gambling games with their children, or avoid giving scratch cards. In simple terms, parental introduction to gambling could be valuable and a positive effect on the child, if done appropriately. Therefore, a more reasonable idea would be that parents introduce their children to gambling with the same caution and vigilance that other potentially addictive behaviours are introduced and warned about (e.g., alcohol).

Scratch cards were a significant gambling behaviour, and this discovery underpinned the importance of focusing on *all* types of gambling behaviours, not just betting shops, bookies, and machines. Subjects did suggest they went to arcades to gamble, especially those participants in seaside locations, where arcades are more abundant. However, the majority of subjects indicated that parental involvement was the first memory they had had of gambling, and arcade use typically came later in the sequence. This finding did not undermine the effect of category D machines and arcade venues. It did, however, highlight the role that parental influences may have in later behaviours. Indeed, it is important to note that the current research was focused on pathways into gambling, rather than most frequent gambling in young people. Therefore, category D machines might have been more frequent; but, the current sample suggested they were not the first form of gambling.

The current research provides the foundations for understanding the life history of individuals with varying degrees of problem gambling. It gives the basis for understanding how Behaviour Sequence Analysis (BSA) may be used in future studies. Of course, BSA typically focuses on behaviours, rather than cognitions and emotions, and this aspect of BSA might seem to the reader superficial, or otherwise not representative the richer picture of emotional interaction with gambling. The literature on gambling includes antecedent issues that are not addressed in BSA, and should not be ignored. For example, sociodemographic variables and psychological factors have been shown to affect gambling behaviour (Blaszczynski and Nower, 2001). Future research may seek to combine the BSA approach with other non-behavioural factors and when and how those factors may in turn affect the chains.

However, BSA does allow a clear and systematic chain of behaviours to emerge that can be more readily observed or reported. The subjectivity of experiencing, becoming personally aware of, and recalling emotions means that BSA provides a perhaps more rigorous approach to autobiographical research. Furthermore, the BSA approach can be applied to future research that is based on important behaviours, such as gambling styles or amounts, frequency of gambling, length of duration of gambling, and so on. Therefore, the present study provided a new method for gambling research, despite being focused on behaviours. Of course, future research may also add a follow-up section, one in which participants are asked to suggest what emotions and thoughts they had during each stage of the sequence.

Such an undertaking, as research, might in turn provide a more holistic approach to the concerns just expressed.⁷

A clear limitation of the current study, and need for future research, concerns the investigation of younger youths and indeed children. Many of the participants in the current study were reflecting on events sometimes many years prior to the current testing age. Interviewing younger children might allow for clearer identification of defining events and behaviours. We suggest that testing pre-adolescents in the age range of 7–10 would provide clearer accounts, as well as offer insight into how these age groups view the gambling behaviours they are participating in. However, previous research using autobiographical recall has shown validity and accuracy using a BSA approach to facilitate memory (see Townsend et al., 2016); therefore, there is certain evidence to suggest that the life history accounts in the current study are valid. A further sample-based limitation was using purposive sampling in help centres, while the research was based on first-experiences of gambling, it may be that individuals who experience problem gambling and do not seek help or treatment have a different entry pathway into gambling—further research should seek to address this compelling question.

Further research should also be conducted on individuals with known co-morbidities (e.g., alcohol, drugs). The current sample were largely drawn purposively from centres that help individuals with a range of addictions; however, most of the participants did not comment on their other addictions (if indeed they had any). This could be because gambling provides exceptionally different concerns relative to those of alcohol and drugs; or, it may be that participants simply did not see with effectiveness the link between them. This area is clearly one that requires further and comprehensive investigation.

Conclusions

The current research outlines a new method for understanding the pathways into problem gambling that young people experience. Behaviour Sequence Analysis takes qualitative, in-depth accounts of life histories and provides clear flow diagrams (state transition diagrams) that outline common pathways. The results revealed certain expected findings, such as parental and peer influence, as well as specific, identifiable, and novel areas of first-time gambling experiences, such as the inclusion of scratch cards in birthday cards. A benefit of the BSA approach is that it parses the life history accounts into discrete temporal events and thus show pivotal choice points or “hot spots” in which interventions can be best-placed. BSA can also be used in other areas of gambling research, such as frequency and duration of different types of gambling, interactions with others (friends, family, and colleagues) and how this impacts gambling-related behaviours, as well as help-seeking behaviours and post-treatment behaviours.

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References

- Affi, T. O., Cox, B. J., Martens, P. J., Sareen, J., & Enns, M. W. (2010). The relation between types and frequency of gambling activities and problem gambling among women in Canada. *Canadian Journal of Psychiatry, 55*, 21–28. doi:10.1177/070674371005500104
- Bakeman, R., & Gottman, J. M. (1997). *Observing interaction: An introduction to sequential analysis* (2nd ed.). New York, NY: Cambridge University Press.
- Bakeman, R., & Quera, V. (2011). *Sequential analysis and observational methods for the behavioral sciences*. New York, NY: Cambridge University Press.
- Beale, D., Cox, T., Clarke, D. D., Lawrence, C., & Leather, P. (1998). Temporal architecture of violent incidents. *Journal of Occupational Health Psychology, 3*, 65–82. doi:10.1037/1076-8998.3.1.65. Retrieved from: <https://pdfs.semanticscholar.org/f00d/323ab6c4b313c50195dd17540c931f692504.pdf>
- 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. Retrieved from: <https://www.uv.es/~choliz/ModeloJuego.pdf>
- Clarke, D. D. & Crossland, J. (1985). *Action systems: An introduction to the analysis of complex behaviour*. New York, NY: Methuen.
- Clarke, D. D., Forsyth, R., & Wright, R. (1998). Behavioural factors in accidents at road junctions: The use of a genetic algorithm to extract descriptive rules from police case files. *Accident Analysis and Prevention, 30*, 223–234. doi:10.1016/S0001-4575(97)00080-8
- Crockford, D., Quickfall, J., Currie, S., Furtado, S., Suchowersky, O., & El-Guebaly, N. (2008). Prevalence of problem and pathological gambling in Parkinson's disease. *Journal of Gambling Studies, 24*, 411–422. doi:10.1007/s10899-008-9099-3
- Delfabbro, P., & Thrupp, L. (2003). The social determinants of youth gambling in South Australian adolescents. *Journal of adolescence, 26*(3), 313–330
- Derevensky, J. & Gupta, R. (2000). Prevalence estimates of adolescent gambling: A comparison of the SOGS-RA, DSM-IV-J, and the GA: 20 questions. *Journal of Gambling Studies, 16*, 227–251. doi:10.1023/A:1009485031719
- Dowling, N. A., Merkouris, S. S., Greenwood, C. J., Oldenhof, E., Tombourou, J. W., & Youssef, G. J. (2017). Early risk and protective factors for problem gambling: A systematic review and meta-analysis of longitudinal studies. *Clinical Psychology*

Review, 51, 109–124. doi:10.1016/j.cpr.2016.10.008. Retrieved from: <https://core.ac.uk/download/pdf/82628710.pdf>

Dowling, N. A., Shandley, K., Oldenhof, E., Youssef, G. J., Thomas, S. A., Frydenberg, E., & Jackson, A. C. (2016). The intergenerational transmission of problem gambling: The mediating role of parental psychopathology. *Addictive Behaviours*, 59, 12–17. doi:10.1016/j.addbeh.2016.03.002

Ellis, H. E., Clarke, D. D., & Keatley, D. A. (2017). Perceptions of behaviours in stranger rape cases: a sequence analysis approach. *Journal of Sexual Aggression*. <https://doi.org/10.1080/13552600.2017.1361618>

Ferris, J., & Wynne, H. (2001). *The Canadian Problem Gambling Index: Final report*. Ottawa, ON: Canadian Centre on Substance Abuse.

Forrest, D., & McHale, I. G. (2012). Gambling and problem gambling among young adolescents in Great Britain. *Journal of gambling studies*, 28(4), 607–622.

Fossi, J. J., Clarke, D. D., & Lawrence, C. (2005). Bedroom rape sequences of sexual behavior in stranger assaults. *Journal of Interpersonal Violence*, 20, 1444–1466. doi:10.1177/0886260505278716

Gillespie, M., Derevensky, J., & Gupta, R. (2007). II: The utility of outcome expectancies in the prediction of adolescent gambling behaviour. *Journal of Gambling Issues*, 19, 69–85. doi:10.4309/jgi.2007.19.4. Retrieved from: <http://jgi.camh.net/index.php/jgi/article/view/3762/3727>

Goldstein, N. E., Serico, J. M., Romaine, C. L. R., Zelechowski, A. D., Kalbeitzer, R., Kemp, K., & Lane, C. (2013). Development of the juvenile justice anger management treatment for girls. *Cognitive and behavioral practice*, 20(2), 171–188.

Gupta, R., & Derevensky, J. (1998). Adolescent gambling behaviour: A prevalence study and examination of the correlates associated with excessive gambling. *Journal of Gambling Studies*, 14, 319–345. doi:10.1023/A:1023068925328

Hira, T. K., & Monson, K. W. (2000). A social learning perspective of gambling behaviour among college students at Iowa State University, USA. *Journal of Consumer Studies & Home Economics*, 24(1), 1–8.

Ipsos MORI. (2015). *The prevalence of underage gambling: A research study on gambling amongst 11–15 year olds on behalf of the Gambling Commission*. London, England: Author. Retrieved from: <https://www.gamblingcommission.gov.uk/PDF/survey-data/The-Prevalence-of-Underage-Gambling-November-2015.pdf>

Keatley, D. A. (2018). *Pathways in crime: An introduction to Behavior Sequence Analysis*. London, England: Palgrave Macmillan.

Keatley, D. A., Barsky, A. D., & Clarke, D. D. (2017.). Driving under the influence of alcohol: A sequence analysis approach. *Psychology, Crime and Law*, *23*, 135–146. doi: 10.1080/1068316X.2016.1228933

Lawrence, C., Fossi, J., & Clarke, D. (2010). A sequential examination of offenders' verbal strategies during stranger rapes: the influence of location. *Psychology, Crime and Law*, *16*, 381–400. doi:10.1080/10683160902754964

McComb, J. L., & Sabiston, C. M. (2010). Family Influences on Adolescent Gambling Behavior: A Review of the Literature. *Journal of Gambling Studies*, *26*(4), 503-520. <https://doi.org/10.1007/s10899-010-9181-5>

Moore, S. M., & Ohtsuka, K. (1999). The prediction of gambling behavior and problem gambling from attitudes and perceived norms. *Social Behavior and Personality: an international journal*, *27*(5), 455–466.

Productivity Commission (2010). *Gambling: Productivity Commission Inquiry report: Volume 1*. Report No. 50. Canberra, Australia: Productivity Commission.

Reinert, D. F., & Edwards, C. E. (2009). Childhood physical and verbal mistreatment, psychological symptoms, and substance use: Sex differences and the moderating role of attachment. *Journal of Family Violence*, *24*(8), 589–596.

Sarti, S., & Triventi, M. (2017). The role of social and cognitive factors in individual gambling: An empirical study on college students. *Social Science Research*, *62*, 219–237.

Team, R. (2013). R Development Core Team. *R: A Language and Environment for Statistical Computing*, *55*, 275–286.

Townsend, E., Wadman, R., Sayal, K., Armstrong, M., Harroe, C., Majumder, P., ... Clarke, D. D. (2016). Uncovering key patterns in self-harm in adolescents: Sequence analysis using the Card Sort Task for Self-Harm (CaTS). *Journal of Affective Disorders*, *206*, 161–168. doi:10.1016/j.jad.2016.07.004

Wood, R., Griffiths, M., Derevensky, J., & Gupta, R. (2002). Adolescent accounts of the UK National Lottery and scratchcards: An analysis using Q-Sorts. *Journal of Gambling Studies*, *18*, 161–183. doi:10.1023/A:1015576731887. Retrieved from: <http://youthgambling.mcgill.ca/en/PDF/Publications/2003-1999/adolescent2.pdf>

Valentine, G. (2009). *Literature review of children and young people's gambling*. Birmingham, England: Gambling Commission.

Valentine, G. (2016). *Children and young people's gambling: Research review*. London, England: Responsible Gambling Trust. Retrieved from: <https://about.responsiblegambling.org/>

gambleaware.org/media/1274/1-june-update-children-young-people-literature-review.pdf

Volberg, R. A., Gupta, R., Griffiths, M. D., Olason, D. T., & Delfabbro, P. (2010). An international perspective on youth gambling prevalence studies. *International Journal Adolescent Medicine and Health*, 22, 3–38. doi:10.1515/IJAMH.2010.22.1.3. Retrieved from: <https://pdfs.semanticscholar.org/f39d/938f1af59aaaf3c8a642e6963444ddec527e.pdf>

Yoon, S., Kobulsky, J. M., Yoon, D., & Kim, W. (2017). Developmental pathways from child maltreatment to adolescent substance use: The roles of posttraumatic stress symptoms and mother-child relationships. *Children and youth services review*, 82, 271–279.

Zangeneh, M., Suissa, A. J., Reed, S., & Haydon, E. (in press). The portrayal of gambling in advertising. *Journal of International Gambling Studies*.

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