Exploring the changing landscape of gambling in childhood, adolescence and young adulthood

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Executive Summary

This report examines how gambling is changing in New South Wales, particularly amongst youth, due to the emergence of new forms of gambling and gambling-like products. New gambling products include those that are regulated as gambling, including betting on esports and betting on fantasy sports (including daily fantasy sports [DFS]). Gambling-like products include gambling-style games, such as social casino games, which are not regulated as gambling. Additional new products including loot boxes and skin gambling meet definitions of gambling, but are not regulated as such in New South Wales. The 2018-2021 Office of Responsible Gambling Strategic Plan states that there is “little evidence into potential harms arising from these forms of gambling”. This report helps to address this gap.

The specific research questions for this study are:
Research question 1: How are the formative gambling experiences of young adults (cohort aged 18-24 years) in New South Wales different from the experiences of an older cohort (aged 25-29 years)?

Research question 2: What association can be made between early experiences with specific emerging technologies (e.g., social casino games, loot boxes, skin gambling, fantasy sports betting, esports betting) and gambling harm?

Methodology

The current study involved a narrative literature review and a survey of people aged 18-29 years of age from NSW. The literature review drew on recent national and international literature from major academic databases (e.g., Scopus, Web of Science, Google Scholar) as well as grey literature, such as commissioned reports. Specifically, the literature review examined youth engagement with traditional and emerging forms of gambling, what is known about links between emerging forms and gambling harm, and why youth might be particularly vulnerable to harm.

Survey respondents were recruited through an online panel which compensated them for their time. The sample of 2,004 respondents was split into two cohorts for analysis (a younger cohort aged 18-24; 54.3%, and an older cohort aged 25-29; 45.7%). Treating age as continuous made no appreciable difference to the results.

Respondents were asked to recall which traditional and emerging forms of gambling and simulated gambling they had engaged in at any point in their life. The eight traditional forms were: scratchies, lotteries, pokies/EGMs, bingo, race betting, sports betting, keno and casino table games. The literature review identified five emerging forms: social casino games, esports betting, loot boxes, skin gambling and fantasy sports (including daily fantasy sports). However, variants of each were identified, including free-to-play options, and activities that may involve exposure to gambling content, even though they may not represent gambling (e.g., watching or playing esports). The eleven variants of emerging forms were: playing video games that contain gambling content, free-to-play social casino games, paid social casino games, watching esports, playing esports, esports betting, opening free loot boxes, buying loot boxes, skin gambling, free-to-enter fantasy sports, and pay-to-enter fantasy sports.

Respondents were asked how frequently they took part in each selected form in the last 12 months, and to recall the age at which they first took part. Respondents also reported their recall of early exposure to gambling, such as through parental gambling. The Problem Gambling Severity Index was used as a proxy for current gambling harm, and the NODS-CLiP as a proxy measure for lifetime gambling harm.

This retrospective methodology was used because it enabled data about the past to be captured in a single, short survey. Prospective longitudinal techniques are preferred where possible, but carry their own limitations: substantial respondent attrition, huge cost and time commitments, and the requirement to predict what will need to be studied into the future. The retrospective technique used here was deemed the most appropriate method to determine findings *now*, rather than starting a longitudinal study now and learning the results years into the future.

Literature review

Defining gambling and gaming, and the convergence of gaming and gambling
The literature review first examined definitions of gambling to identify its three fundamental components:

1) The consideration: staking something of value (usually money)
2) The chance: The outcome being determined (at least in part) by chance
3) The prize: Winning something of value if the outcome is realised (King, 2018).

These characteristics of gambling help to distinguish it from gaming (playing video games or gaming apps), but a general observation in the literature was the growing convergence between gaming and gambling. This convergence involves both video games incorporating gambling features (such as loot boxes), and gambling products incorporating gaming features (such as skill-based electronic gaming machines).

Emerging forms, their popularity, and links to gambling harm
The literature review found a growing body of research on social casino games. These are gambling-themed games that are free-to-play, but payments can be made to unlock certain features or levels, or to buy in-game currency. No winnings can be withdrawn from these games, so they are not regulated as gambling products. They are therefore legally available to people under 18 years, with studies estimating between 10-20% of adolescents having played them (e.g. King et al, 2014). Research has raised concerns that playing social casino games may facilitate migration to gambling products, and this has been observed in Australia and elsewhere (e.g., Gainsbury, Hing, et al., 2015; Wohl et al., 2017).

There is also growing research into watching and betting on esports (professional video game competitions played in large stadiums with spectators that are broadcast online). The core market for watching esports is young people, particularly young males, including those under 18 years. Esports viewers are regularly exposed to gambling advertising, which makes up a large proportion of esports revenue. Importantly, esports betting is available to those over 18 in Australia. Those who bet on esports tend to be more engaged in other forms of gambling (Gainsbury et al., 2017b), and esports betting is highest amongst moderate risk gamblers (Browne, Rockloff, et al., 2019).

The review also found an increasing number of studies on loot boxes. Loot boxes in video games can be purchased, and involve an element of chance through the use of randomised prizes, such as “skins” (virtual items). Some skins have value outside of the game, and thus loot boxes are regulated as gambling in some countries (e.g., Belgium), but not in Australia. Despite at least some loot boxes meeting definitions of gambling, there is a lack of consensus, both amongst academics and legal bodies, about whether loot boxes constitute gambling (King & Delfabbro, 2019). Approximately 34% of 8-17 year olds have made in-game purchases (eSafety Commissioner, 2018). Paying for in-game items, including loot boxes, has been linked to gambling harm (Zendle & Cairns, 2018, 2019) and problem gaming/ internet gaming disorder (King & Delfabbro, 2018), suggesting they should be regulated.

Websites have emerged that accept skins as forms of currency for gambling (skin gambling). The global skin gambling market was worth an estimated $4.8 billion in 2016 (Greer et al., 2019), but declined after some websites were forcibly closed. Skin gambling is not available to Australians, except through offshore providers. In the UK, participation amongst youth was approximately 10% in 2016 (Parent Zone, 2018), but has declined to around 3% (Gambling Commission, 2018). Links between skin gambling and gambling harm are emerging, although this may be because people who bet on skins also tend to bet on other forms of gambling (Wardle, 2019).

Several studies have been conducted into betting on fantasy sports. Fantasy sports may be free to play, but often involve entry fees, particularly the fast-paced variant of DFS. Prizes can be won, and there is debate as to whether the outcome is determined by chance (see Easton & Newell, 2019; Marchica & Derevensky, 2016). In Australia, fantasy sport betting is regulated, so operators require a license, and prevalence is around 0.3% (Browne, Rockloff, et al., 2019). DFS in particular have been linked to gambling harm (e.g., Browne, Rockloff, et al., 2019; Nelson et al, 2019), including amongst youth (Marchica et al, 2017).

Not all of the emerging forms are gambling, and some include free-to-play versions, such as earning loot boxes through playing video games, or free-to-enter fantasy sports competitions. However, they do *simulate* gambling products, either through the way that they look and feel, or the underlying mechanics of how they work (e.g., chance-based reward mechanisms), or may include exposure to gambling themes. Research indicates that simulated gambling products may normalise gambling and act as a gateway to traditional gambling products (King, 2018).

Why are young people vulnerable to harm from these emerging forms?
A major theme in the literature was the risk of harm to young people from their exposure to and engagement with emerging forms of gambling and simulated gambling. Several reasons were proposed. Young people are exposed to these activities early in life, with early exposure to gambling increasing the risk of subsequent gambling-related problems and harm. Simulated forms of gambling also introduce players to how gambling products work, but operate on different rules to regulated gambling activities (e.g., different return-to-player percentages). They may mislead young people into developing a false sense of confidence in their ability. Young people are able to play some of these emerging forms (e.g., skin gambling) due to lax age verification standards. Further, these activities can be accessed via

personal mobile devices, making parental supervision and monitoring more difficult. Many of these activities provide opportunities to socialise with and compete against peers, providing both a sense of belonging and peer recognition. Finally, because emerging forms of gambling involve electronic cash or non-cash items (that may still have a monetary value, such as skins), the cost of taking part may be obscured.

Survey results

- The older cohort (25-29) was more likely to have taken part in each traditional form of gambling in the last 12 months, and (based on recall) over their lifetime.
- The younger cohort (18-24) was more likely to have taken part in most emerging forms of gambling and simulated gambling, apart from forms that involve expenditure (paid social casino games, paid fantasy sports, betting on esports).
- The younger cohort was more likely to recall first taking part in each traditional form while under the age of 18.
- The younger cohort was also more likely to recall first taking part in each emerging form while under the age of 18.
- The older cohort was more likely to recall being exposed to gambling via adults in their household, including parents, although the younger cohort still recalled being exposed to gambling in this way.
- Recalled lifetime use and frequency of engagement during the last 12 months were associated with lifetime and recent gambling-related harm, for all of the eleven emerging forms.
- Those who recalled first engaging in each emerging form while underage were not significantly more likely to have experienced gambling related harm. Those who recalled first engaging while over the age of 18 were significantly more likely to have experienced harm in the last 12 months.
- The associations between each emerging form and harm remained statistically significant when controlling for age, impulsivity and engagement in traditional forms of gambling, and using nonparametric analyses, indicating robust effects.

Discussion and conclusions

The findings from this study reflect the changing landscape of gambling where newer forms of gambling and simulated gambling have recently emerged alongside the continued availability of traditional forms of gambling.

This emergence provides the potential for substitution of traditional forms for newer forms amongst young adults who grew up with these emerging activities. Compared to the older cohort, the findings indicate that the younger cohort was less engaged in traditional gambling forms. While they were more likely than the older cohort to recall first taking part in traditional forms while underage, this had not necessarily translated into sustained engagement into adulthood. These findings suggest that traditional gambling products may be less appealing to this younger cohort who have grown up playing interactive games. The younger cohort was also less likely to report exposure to gambling through adults in their household compared to the older cohort. This lower exposure may also help to explain the lower engagement in traditional forms of gambling by the younger group.

However, the emergence of newer forms of gambling has provided the potential for early exposure to gambling and gambling-like activities, potentially providing a

gateway to monetary gambling in adulthood. This study found higher uptake of the free-to-play emerging forms amongst younger people, and engagement in these forms was associated with higher levels of gambling-related harm. It is unclear whether changes in engagement in traditional and emerging forms will have a net positive or negative effect on gambling harm in the long run. Of concern is that these free-to-play versions allow young people to learn about gambling and gain confidence through practice. While the cost of traditional forms of gambling and of the monetary versions of newer forms may deter younger adults from taking part, they may migrate to traditional gambling and monetary versions of the newer forms as they get older. More research is required to examine migration from these free-to-play activities both to traditional gambling forms and to monetised emerging forms.

The younger cohort had lower levels of gambling-related harm compared to their older counterparts. This may be due to lower uptake of traditional forms, particularly some of the more harmful forms like pokies, as well as lower uptake of monetary versions of emerging forms. This finding may also reflect the time it may take to develop a gambling problem. It would be useful to conduct a follow-up study to see if the lower level of harm amongst this younger cohort is sustained.

It is important to note that these emerging forms of gambling and simulated gambling do not appear to be benign, in that each of them, including the free-to-play options, were linked with gambling-related harm – both during the last 12 months and recalled harm during their lifetime. Surprisingly, people who first engaged in each emerging form while underage were *not* more likely to experience gambling-related harm, potentially because emerging forms can be lower cost than traditional forms. However, because younger people may be substituting traditional forms of gambling with these emerging forms, the emerging forms should be examined to determine how they can be adjusted or regulated to reduce their potential for harm. It will also be important to further examine how traditional gambling products change in response to changes in demand for products, particularly through the inclusion of game-based features, such as in skill-based electronic gaming machines.

In conclusion, while lower uptake of traditional forms of gambling amongst young people may help to reduce gambling harm, the higher uptake of emerging forms may sustain or even increase gambling harm in the future. Each gambling form was associated with gambling-related harm in the present study. Our conclusions are that these emerging forms are not benign, and warrant additional attention because they appeal to younger people, who are vulnerable to harm. Because gambling technologies can change quickly, it will be important to continue to study new forms of gambling and simulated gambling going forward. Since each form differs in terms of how it operates and how it is currently regulated, any changes to regulations will need to be considered on a form-by-form basis.

Limitations

The sample was drawn from an online panel and may not represent the population. However, the sample was not intended to be representative. While the cohorts differ in age, they also differ in a range of other variables such as life experiences, and it is unclear if the differences found are related only to age. Because gambling harm takes time to emerge, the nature of the associations between these emerging forms

and harm may be underestimated, particularly amongst the younger cohort. The present results are based on recall, through a retrospective survey, and recall may be stronger for the younger cohort. However, both cohorts were young, meaning that participants did not have to remember too far into the past, reducing recall bias. Finally, while the findings from the analyses are robust, it is not possible to infer causation.

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Introduction

Background

The introduction of new, innovative gambling technologies has resulted in a gambling industry that is rapidly evolving; offering new pathways for gambling participation and challenges for gambling regulation. As the most avid consumers of online digital media (Australian Communications and Media Authority, 2018), youth are being exposed to a vastly different gaming/gambling space compared to older generations of gamblers. These technological innovations include social casino games, esports, loot boxes, skin gambling and fantasy sports (and the faster variant known as daily fantasy sports). While there are some investigations exploring social casino games, research into esports , loot boxes, skin gambling and fantasy sports is in its infancy. The 2018-2021 Office of Responsible Gambling Strategic Plan states that there is "little evidence into potential harms arising from these forms of gambling" (pg 15). Thus, to address this gap, the main aims of this study were to explore the formative experiences of gambling in childhood and adolescence, and how these new products have altered the environment for younger gamblers.

As an initial step in the investigation, this literature review first discusses definitions of gambling and gaming. Subsequently, the review explores what these new products are, who uses them, and how they relate to gambling behaviour and gambling-related harm. Because most of these forms, with the exception of fantasy sports, relate to video games, and because gaming appeals to young people (including adolescents), the literature review then discusses video gaming and gambling amongst young people. It focuses on the environmental, social and structural features of online environments that may promote gambling amongst youth. This narrative literature review was conducted through searches of major academic databases (e.g., Scopus, Web of Science, Google Scholar), with a focus on recent literature, due to this being a fast-moving research area.

Gambling, gaming and convergence

Defining gambling

Legal definitions of gambling vary across jurisdictions, although all definitions tend to include three basic components: staking something of value (usually money) upon an outcome determined at least in part by chance or some future event not directly controlled by the participant (e.g., a sporting event or race), and something of value that will be won if that outcome is realised (King, 2018). Rose (2006) describes these as the consideration, the chance and the prize. A key component of the prize is that it must be something *of value*. This is an important consideration for emerging forms such as social casino games (where items won in the game cannot be sold and therefore have no monetary value) compared to loot boxes (where some virtual

goods won in loot boxes can be sold on marketplaces for monetary gain, or used for betting to win real money, and therefore have monetary value).

Legal definitions of gambling have generally also considered the relative roles of chance and skill in determining whether an activity is gambling or not. In Australia, the Interactive Gambling Act (*Interactive Gambling Act*, 2001) defines a game (meaning a gambling product operated by a gambling service) as gambling if it is a game of chance, or of mixed chance and skill. Thus, any element of chance is potentially enough for something to be considered gambling, provided all other factors are met (such as the staking of something of value, and the ability to win something of value). This contrasts with the view in most USA jurisdictions, whereby it is not the presence of chance that determines if a product is gambling, but whether chance or skill are the dominant factor (the Dominant Factor Test or the Predominance Test) (Justia Law, 1973). The distinction as to how games are defined as gambling is important for determining which of these emerging forms may or may not be considered gambling and the regulatory implications of that definition.

Defining gaming

The definition of a video game can be broad, including "any interactive playable form of digital entertainment" (Esposito, 2005). More recent definitions go into more detail, such as Bergonse's (2017) definition which states that a video game is

> "a mode of interaction between a player, a machine with an electronic visual display, and possibly other players, that is mediated by a meaningful fictional context, and sustained by an emotional attachment between the player and the outcomes of her actions within this fictional context." (p. 253)

While this latter definition has been criticised because it seems to exclude some types of games (Arjoranta, 2019), these two definitions are provided to show that what is and is not considered a video game differs depending on which definition is used. This is important, because if we are to discuss the relationship between gaming and gambling, then it is crucial to have a clear definition of what is and is not included in each category. Further complicating matters, as King (2018) notes, the boundaries that define video games are constantly shifting, due to improvements in both hardware and software.

Importantly, games vary in the psychological needs that they can fulfil. For example, games that involve role-playing can allow for factors such as identity expression or escape from reality, while games that involve completing missions or developing skills allow for a sense of mastery and achievement (Ryan et al., 2006). A key component across many types of video games is that they offer a sense of progression (King, 2018). In some cases, progression depends on substantial time spent in the game and mastery of skills, whereas in others, in-game purchases can unlock features that make it easier or faster to progress (Hamari et al., 2017). In some games, in-game payments provide players with competitive advantages - so-

called “pay-to-win” features (Hamari et al., 2017). The shift towards in-game purchases (compared to up-front payment for games, which was the norm until around a decade ago) is described in more detail in discussion around loot boxes below, as some loot boxes are obtained through these in-game purchases.

Convergence of gaming and gambling

The inconsistencies in the definitions of both gambling and gaming, particularly in terms of legal definitions, are important because they make it difficult to compare legal rulings across jurisdictions, as well as comparisons across academic studies. However, despite these inconsistencies, there has been much discussion of the convergence of gaming and gambling (Gainsbury, 2019; Gainsbury, King, Abarbanel, et al., 2015; Wardle, 2019; Zendle & Bowden-Jones, 2019).

Discussions around this convergence refer not just to gaming gaining gambling-like characteristics, but also to gambling increasingly incorporating elements of skill, social interaction and competition (Gainsbury, 2019). However, it appears to be the development of gambling-like themes and features within games that has garnered the most concern. Games now often include prizes that are determined by random factors, and entry for some of these prizes requires payment. Similarly, games that look and feel like gambling, but do not meet criteria for gambling because no prize of value can be won (such as social casino games), have raised concerns because they are available to adolescents, and are available to them precisely because they do not meet the definition of gambling (Derevensky & Gainsbury, 2016). It is also now possible to bet on professional video game competitions (esports) (Macey & Hamari, 2018, 2019), and to use prizes gained in some video games (e.g., skins) to bet against other players in the game (Wardle, 2019), to sell them for real money (thus giving them a real world value), or to use as currency for betting on skin gambling websites from which real money can be extracted (Grove, 2016b; Hardenstein, 2017; Haskell, 2017). The other somewhat distinct emerging form is fantasy sports, particularly daily fantasy sports, which now include the ability both to pay to enter and to win a prize, potentially meeting the criteria of gambling in at least some jurisdictions (Easton & Newell, 2019; Fletcher, 2016).

Together, these emerging forms are either clearly new forms of gambling (e.g., betting on esports, skin gambling), or may be gambling depending on the legal definition in a jurisdiction (e.g., loot boxes and daily fantasy sports), or look and feel like gambling but do not meet the definition of gambling because no prize of value can be won (e.g., social casino games). These fall within King’s (2018) taxonomy of gaming-gambling cross-over. Specifically, social casino games are “monetised simulated gambling”, loot boxes fall under “monetised video gaming”, skin gambling is “unregulated online gambling using virtual goods”, and fantasy sports and daily fantasy sports, as well as esports gambling, have their own distinct categories in this

taxonomy. Consequently, all are recognised as emerging forms of gambling, or gambling-like products, and are therefore considered in this literature review.

Social casino games, esports betting, loot boxes, skin gambling, fantasy sports and daily fantasy sports

This section of the literature review discusses the nature of each of these relatively new activities. First we discuss social casino games, followed by esports, loot boxes and skin gambling. We note that esports, loot boxes and skin gambling can overlap in some games. Then we discuss fantasy sports and its faster-paced variant: daily fantasy sports. In each section, we define each activity, and then discuss what is known about people who engage in each activity. We also discuss the relationship between each activity and gambling, including gambling-related harm.

Social casino games

Definition

Social casino games are gambling-themed games that are usually free-to-play, but players may also make in-game purchases to unlock features (Wohl et al., 2017). However, while these games look and feel like gambling (slots, bingo and card games are common), winnings cannot be withdrawn from the game (King, 2018). This is an important factor, because it means that these games do not fulfil most definitions of gambling, since nothing of value can be won, and so they are not restricted to those of legal age. This is a cause for concern, because these games involve gambling-themed games, and they therefore potentially normalise gambling, even though the games themselves are not classified as gambling (Wohl et al., 2017).

Popularity and revenue

Social casino games are amongst some of the most popular games on social networking sites. In 2013, for example, games such as Heart of Vegas and Hit It Rich Casino Slots were amongst the “Best New Games” listed by Facebook, and Facebook staff favourites included DoubleU Casino, while Hall of Fame games included Slotomania and DoubleDown Casino (Takahashi, 2013). In 2020, the top game is Texas Hold’Em Poker (GameHunters Club, 2020). Revenue from social casino games was estimated to include US$1.05 billion from Facebook alone, and another US$3.46billion from mobile platforms in 2017 (Gough, 2019). While this revenue is predicted to decline for Facebook, it is projected to increase for mobile platforms, with an estimate of US$5.89billion on mobile platforms by 2022 (Gough, 2019). Wohl and colleagues (2017) note that gaming operators have therefore gained interest for investment from gambling operators, such as the partnership of Zynga (a social casino game publisher) and Bwin Interactive (an online gambling operator) in the UK in 2012 (Taylor, 2012).

Social casino games are popular amongst young people. A survey of 1,287 Australian adolescents (aged 12-17) found that around 1 in 10 had tried social casino games on Facebook (King et al., 2014), while Gainsbury and colleagues (2015) found that one third of adults and one fifth of adolescents in their samples had played social casino games. However, in contrast with forms such as esports, there is tentative evidence that the average social casino gamer appears to be older, in their early 40s, and female (Dickins & Thomas, 2016). However, we note that these findings are from a 2012 industry report, and as such should be treated with caution More recent findings indicate that males and females are equally likely to play social casino games (Gainsbury, King, Delfabbro, et al, 2015). Despite this profile, while this type of game is more popular amongst an older audience, and is not technically a form of gambling, it is still potentially concerning because adolescents can play them for free, and because they are available in places that adolescents frequent, such as social media sites including Facebook and in smartphone app stores.

Links with gambling and gambling-related problems

One of the major concerns about social casino games is that they offer a potential pathway to gambling by exposing people, particularly youth, to gambling-like products (Gainsbury, Hing, et al., 2015; Gainsbury, King, Delfabbro, et al., 2015; Kim et al., 2016; King et al., 2014; King & Delfabbro, 2016b; Wohl et al., 2017). Migration from social casino games to online gambling behaviour has been observed amongst those who did not previously gamble online (Gainsbury, Russell, et al., 2016; Kim et al., 2015). The link between social casino games and gambling is also evident through player exposure to copious amounts of gambling advertising while playing these games (Gainsbury, King, Abarbanel, et al., 2015; Kim et al., 2016). Since social casino games can involve in-game purchases, it is perhaps unsurprising to find that those who have made in-game purchases in social casino games (rather than simply playing them for free) were also more likely to have greater involvement in gambling (Gainsbury, King, et al., 2016).

A study by Gainsbury and colleagues (2016) also found that the players who had made in-game purchases in social casino games were significantly more likely to exhibit gambling-related *problems*. However, whether or not there is a *causal* link between social casino games and gambling-related problems is somewhat unclear. Some research has found that social casino games may contribute to gambling, including gambling-related problems (e.g., Gainsbury, Hing, et al., 2015), while others have found that social casino games may reduce gambling and gambling-related problems (Hollingshead et al., 2016). However, gambling-related problems can take time to develop, and social casino games are relatively new to the market. A recent retrospective study in Australia found that children under 13, and young people aged 13-18, who had played gambling-themed apps on mobile devices were more likely to gamble for money, and to have earlier involvement with gambling (Rockloff et al., 2018). Early exposure is a key risk factor for subsequent gambling

behaviour and motivations to gamble, which in turn predict gambling-related problems and harm (Browne, Hing, Rockloff, et al., 2019).

In summary, while social casino games are not technically gambling products because prizes of value cannot be won, they represent potential early exposure to gambling because they are available to youth through (virtual) places they frequent: online social networks and apps. The evidence suggests that they may potentially be a pathway to subsequent gambling behaviour and harm.

Esports, including esports betting

Definition, popularity, revenue

Esports refer to video game competitions in which players can compete against each other. At its highest level, professional video game players (gamers; either in teams, or playing individually) compete in an arena in front of a large audience, similar to a physical sporting contest. Just like sporting contests, these esports competitions can be streamed online or broadcast on television (YouGov, 2018). While the term esports is generally used for competitions, the games that are typically played in those competitions can themselves also be described as esports. The most popular genres are first-person shooter games, followed by sports and multiplayer online battle arena games (MOBAs) (Superdata, 2015).

Worldwide, esports is surging in popularity. In 2015, the global esports market was estimated to be $612 million (61% from Asia), with an audience of 134 million, and $111 million in corporate sponsorships in North America (Superdata, 2015). By 2017, esports revenue had reached $1.5 billion, and was estimated to continue to climb to $2.3 billion by 2022 (Superdata, 2017). The rise in esports is on the back of a more general rise in revenue from interactive entertainment including gaming in general, and virtual and augmented reality. Together, these markets were estimated to have a total revenue of $108.4 billion in 2017, climbing to $119.6 billion in 2018 (Superdata, 2018, 2020). Australia is lagging behind the US and Asian markets for esports, but recent events such as the Melbourne Esports Open in September 2018 are driving further interest in esports in Australia (Australian Communications and Media Authority, 2020).

Esports revenue is derived from a number of sources. In 2017, 70% of esports revenue came from sponsorships and ads, 11% from prize pools, 10% from betting and amateur tournaments, and 9% from merchandise and ticket sales (Superdata, 2018). The most well-received advertisements are those related to technology, including hardware, software and services (Nielsen, 2018), although advertisements for gambling and liquor are also common. More recently, esports have drawn large investments, initially including brands such as Kraft and Mercedes-Benz (Superdata, 2018), and more recently Coca-Cola and Intel (Abacus3, 2018). Connections have been made with traditional sports, through investments by sporting teams and high

profile sporting identities such as Michael Jordan (Huddleston, 2018). Large investments have been made, matching revenue figures (Superdata, 2018).

Prize pools in professional esports tournaments continue to climb, and top-ranking esports professional players can win millions of dollars each year. At the time of writing, the top-paying game was Dota 2, with 44 of the top 50 earners in 2019 earning more than US$1.5million each from playing this game professionally, and the highest earner making US$6.88million (Esports Earnings, 2019). In Australia, an estimated 4% of 8-17 year olds have participated in amateur or professional esports tournaments (eSafety Commissioner, 2018).

Esports engagement can consist of simply viewing esports contests (either via online streaming, broadcast television, or in person at venues), playing esports non-competitively, playing esports in competitions (either professionally or not), and betting on esports. The discussion below focuses on esports viewing, and esports betting.

Esports viewing

Professional esports competitions resemble sporting contests. They are conducted in large venues, with players on stage, commentators describing the action and the games portrayed on large screens (Newzoo, 2018). Audiences of up to tens of thousands may watch the action live in the venue, and the contests are also broadcast on television and streamed online via services such as Youtube and Twitch (Superdata, 2018).

In Australia, over 44% of adults are aware of esports, and a third of those who are aware have watched esports (YouGov, 2018). This figure of 44% is higher than in the UK (35%), and similar to the USA (41%) and Germany (44%), but lower than countries such as Singapore (55%) and China (77%). The YouGov study (2018) also found that viewers were mostly younger, with around half of those 18-34 reporting having watched esports, and for the 18-24 age range in particular, most of those had watched esports at least monthly (YouGov, 2018). Most respondents who watched esports classified themselves as hardcore or keen gamers, however there is interest amongst average and occasional gamers as well (YouGov, 2018). Amongst adult Australian video gamers, 41% have watched esports and 30% have attended an esports event in person (Brand, Jervis, Huggins, & Wison, 2019), compared to 33% and 26% respectively from two years prior (Brand et al., 2017).

Most esports fans are young (median age 26) and male (74-85% depending on the report) (Nielsen, 2018; Superdata, 2015). They tend to be engaged gamers, purchasing and playing games as well as viewing esports, particularly shooter and MOBA games (Nielsen, 2018), mostly viewing esports to learn from the best players. While 55% of esports fans have streamed a live event online, only 15% have

attended a live event. In the next 12 months, 56-60% intended to watch esports events on TV or stream live or non-live events, whereas 37% intended to attend a live event (Nielsen, 2018).

Esports betting - links with traditional gambling and gambling-related problems

Just like regular sporting contests, esports contests have become events on which bets are often placed. Australian-based online wagering operators, such as Sportsbet, offer markets on esports, but so far they only offer bets based on which player or team will win on a small number of contests. Dedicated esports wagering operators have emerged offshore, such as Unikrn (Macey & Hamari, 2018). These offshore markets offer more esports markets (i.e., more events to bet on), and more betting options. Based on the most recent New South Wales prevalence study, esports betting was not particularly popular in 2019, with only 0.6% of New South Wales adults engaging in this form (Browne, Rockloff, et al., 2019), but was most popular amongst 18-24 year olds (3.3%).

Relatively little research has investigated the prevalence, characteristics and gambling behaviours of esports bettors, partly because most esports betting appears to be conducted with offshore, illegal or unregulated operators (Greer et al., 2019). However, one Australian study compared those who bet on sports to those who bet on both sports and esports. This study found that both groups were predominantly male, but the esport bettor group were younger, better educated, employed, with a higher income, more ethnically diverse and had a preference for offshore betting sites due to the diversity of products on offer (Gainsbury et al., 2017a). They were also significantly more likely to have higher levels of gambling engagement, and gambling-related problems (Gainsbury et al., 2017b). More recent studies have found that greater frequency of esports betting is associated with greater levels of problem gambling (Gainsbury et al., 2019; Zendle, 2019a). However, one study found that while esports betting frequency was linked to gambling problems, this relationship was no longer significant when controlling for other types of gambling (Gainsbury et al., 2019). Apart from these studies, very little is known about esports bettors given that this is a relatively new product.

In summary, esports share very similar characteristics with traditional sporting contests, but appeal to younger people. Like traditional sporting contests, the ability to bet on esports exists, although few studies have examined key outcomes from this form of betting.

Loot boxes

Definition

Loot boxes have been defined as “virtual items in video games that contain randomised contents” (Zendle & Cairns, 2018). They originated in free-to-play games

but have since expanded to most genres of games (Macey & Hamari, 2019). Loot boxes can be gained in various ways: as a daily bonus for playing a game, as rewards for completing objectives within a game, or through purchasing loot boxes with real-world currency, often through microtransactions (small transactions, often only a dollar or two) (King & Delfabbro, 2019). Major concerns around real money microtransactions are that these games often solicit players to make these transactions, and that the transactions are repeatable - with continued payments sometimes necessary to advance in the game (Civelek et al., 2018). Compared to traditional one-off game purchases, this monetisation strategy appears likely to encourage at least some players to spend much more than originally intended, and potentially to a degree that incurs financial harm (King & Delfabbro, 2018).

Loot boxes themselves have become popular forms of entertainment. On YouTube, various “social influencers” create video content related to games that show how loot boxes operate. Gaming-related content is second in popularity only to music videos as a category on YouTube (Superdata, 2018), and popular gaming streaming site Twitch now overtaking YouTube in terms of turnover (Superdata, 2020).

Players can win various virtual goods within loot boxes, such as items that offer increased functionality (e.g., better weapons or better armour in shooter games), or items that change a player cosmetically, such as a new outfit or a new victory dance (King, 2018). Some skins are particularly rare, and therefore carry prestige (Gądek, 2019). Until fairly recently, these virtual goods were either restricted to a player’s account, or tradeable with other players within a game, and therefore did not necessarily have a monetary value. However, in 2013, game publisher Valve made it possible to trade skins with other players through its Steam Marketplace. Rare skins became particularly sought-after and skins became a virtual currency, with some rare skins worth thousands of dollars, even though they may not offer a competitive advantage within the game (i.e., items are usually cosmetic only). Subsequently, websites have emerged that buy and sell skins, and even accept skins as a form of currency for gambling games (see below). Therefore, some loot boxes now offer the ability for players to put money into the game (often through a microtransaction), risk it on a game of chance (opening a loot box), and then potentially profit from any winnings (by trading or selling skins or using them as currency for gambling). Consequently, loot boxes appear to strongly resemble a gambling product.

Loot boxes as gambling products

King and Delfabbro (2019) note a lack of consensus, both amongst academics and legal bodies, as to whether loot boxes are a gaming product (i.e., video-game) or a gambling product. Belgium and the Netherlands have declared loot boxes to be a form of gambling, and have ordered that games with loot boxes that require real money purchases be removed from games sold in those countries. Severe penalties apply for non-compliance: up to €800,000 or five years in prison, with fines doubled if

they involve minors (BBC News, 2018). However, legislators in other jurisdictions have yet to make a determination on loot boxes.

One concern about loot boxes is the ability to spend small amounts repeatedly through microtransactions, similar to small but repeated bets placed through electronic gaming machines (King & Delfabbro, 2019). Notably, the monetisation of many video games has changed in the past 10 years from a “pay-to-play” design, where users paid a larger price once to play the game, to a “free-to-play” design, whereby players can play for free, but must pay to unlock certain features or to gain in-game items (Tomić, 2017). Tomic argues that when customers are required to pay a high up-front price for a game, such as in the pay-to-play design, they are more likely to take more time choosing which game they will buy. This therefore presents more risk for a game publisher, because consumers will choose a smaller number of games due to the upfront cost, and may therefore not choose the games made by that developer. However, if a game is initially free, a customer can try a game without any initial risk, and the publisher relies on enough players being interested in the game to pay with microtransactions once they begin playing (Tomić, 2017).

If loot boxes are considered a gambling product, then a key concern is that they are present in video games that particularly appeal to youth, including adolescents. Around 34% of 8-17 year olds have made an in-game purchase, and around 6 in 10 8-17 year olds have played online multiplayer games (eSafety Commissioner, 2018). Up to 94% of games that feature loot boxes are deemed suitable for children aged 12 or older, which is particularly concerning given their parallels with gambling (Zendle & Bowden-Jones, 2019).

Links with gambling behaviour and gambling-related problems

One of the main concerns around loot boxes (and other similar video game mechanisms that resemble gambling) is that they potentially provide a pathway to gambling (Gainsbury, Hing, et al., 2015; Gainsbury, Russell, et al., 2016; Kim et al., 2015, 2016, 2017; King et al., 2016; Wohl et al., 2017). Paying for in-game items has been linked with both problem gambling severity (King et al., 2016) and problem gaming/internet gaming disorder (King & Delfabbro, 2018) .

Zendle and Cairns (2018) surveyed 7,422 gamers and found a link between the amount spent on loot boxes and problem gambling severity. The link between loot boxes and problem gambling was stronger than links with any other in-game purchases, although the authors note that the causal pathway is unclear. It is possible that loot boxes form a pathway to gambling-related problems, but it is also possible that loot boxes appeal to those already experiencing gambling-related problems. Importantly, this finding was replicated in a separate sample of 1,172 by the same authors (Zendle & Cairns, 2019), once again finding a link between expenditure on loot boxes and problem gambling severity. The authors argued that,

regardless of the causal direction, the presence of the link indicates a good reason for regulating loot boxes. Subsequent studies in Australia, New Zealand, the USA and the UK have continued to find links between loot boxes and problem gambling (Drummond et al., 2020; Kristiansen & Severin, 2020; Zendle, 2019a, 2019b; Zendle, Ballou, et al., 2019; Zendle et al., 2020; Zendle, Meyer, et al., 2019).

Taken together, loot boxes appeal to mostly young male players who play the types of games in which they appear. Loot boxes are linked to gambling, particularly boxes that contain items that have a monetary value, and are present in games that are commonly available to, and played by, adolescents and young adults. Some items contained within loot boxes, such as skins, can be used for gambling, as described below.

Skin gambling

Definition

The skins that are won in some loot boxes, won in-game or otherwise purchased (such as through skins marketplaces), can be used as a currency for betting on some gambling sites. Skins are items in video games that generally offer only purely cosmetic functions to a player's character, such as changing the appearance of equipment or the player's avatar, although some skins may be associated with functional changes, such as improving a weapon (Macey & Hamari, 2019). Macey and Hamari outline two ways in which skins can be used in gambling: either by replacing real-world currency as stakes/considerations in gambling activities, or as a way to access new forms of gambling which generally cannot be accessed with other forms of money (see also Martinelli, 2017). That is, because some skins have a monetary value, they can be offered as stakes in gambling activities, and players can either win other skins, or real-world currency as a prize.

While customisations to avatars have been available for decades, skins as currently construed became available in 2013 in the game Counter-Strike: Global Offensive as introduced by Valve Corp (Haskell, 2017). Valve subsequently released a skin marketplace within its Steam platform, followed by the release of an application programming interface (API), which allowed third-party sites to transfer skins from a Steam account to their website (Greer et al., 2019). Because some skins are particularly rare, players were willing to pay large sums for them, often up to thousands of dollars. The skin gambling market was estimated to be $4.8 billion in 2016, compared to the esports cash betting market of $649 million (Greer et al., 2019; Grove, 2016b). However, the market has since dropped dramatically due to Valve restricting transfer-access to some skin gambling websites, including the prominent operator: CSGO Lounge (Grove, 2016a).

Who gambles using skins?

Many skin gambling websites have since shut down due to Valve restricting some skins trading (Greer et al., 2019). However, many remain, and all are non-Australian websites, or were offshore when they operated. For many of these websites, proving one's age involves simply ticking a checkbox to confirm being18 years or older (Greer et al., 2019).

While there are limited data on who engages in skin gambling, given the lax approach to age restriction (discussed further below), it is perhaps unsurprising that some studies have shown underage participation (Gambling Commission, 2017, 2018). In the UK in 2017, 11% of 11-16 year olds had engaged in skin gambling; most commonly boys (Gambling Commission, 2017). A similar British survey found the figure to be 10% (Parent Zone, 2018). This number dropped in 2018 to only 3% (Gambling Commission, 2018), due at least in part to the aforementioned Valve restrictions on the use of skins outside of its platform. While skin gambling may be decreasing in popularity, prominent skins marketplaces still exist, as do some skin gambling websites.

Links to gambling and gambling-related problems

Using the previous definition of gambling, which requires a consideration (i.e., something of value being staked), a chance (i.e., some role of chance) and a prize (i.e., something of value can be won), it is clear that skin-betting is a form of gambling. Some skins do have a monetary value and can therefore be staked, just as other non-monetary items such as food or cigarettes can be staked in forms of gambling. Skin gambling websites involve games such as coin flips and roulette, which clearly involve a degree of chance, and players can win either money or skins.

Evidence of the link between skins betting and gambling-related problems is emerging. Wardle (2019) found that, amongst a sample of 11-16 year olds, those who bet on skins had a much higher rate of at-risk or problem gambling (23%) compared to those who did not (8%). However, those who gambled with skins were also more likely to gamble on other forms, and when skin gambling alone was considered, the link with problem gambling was not found. This may reflect the general finding that more engaged gamblers tend to be more at risk of gambling-related problems (e.g., Russell et al., 2019). However, because this form is not well regulated, and easily accessible for underage people, it carries a threat that traditional forms of gambling do not. Moreover, early exposure to gambling products is a key risk factor for gambling-related problems and harm (Browne, Hing, Rockloff, et al., 2019).

Fantasy sports and daily fantasy sports

Definition, popularity, revenue

Fantasy sports refer to competitions whereby participants construct a virtual or fantasy team in sports such as basketball or football, using real-life players. Participants are awarded points for their hypothetical team based on how well each real-life player performs each week in real sporting competitions. Each player is allocated a salary, and must select players under a salary cap, so that players do not simply select only the very best players.

The first fantasy sport appears to have been developed in the USA in the 1950s using the (physical) mail-system to communicate between players. Golf was a relatively simple fantasy sport to administer, because fantasy teams of golfers were judged based on which team scored the lowest combined number of strokes (Green, 2014). Baseball followed (Bowman et al., 2012), and finally an eight team football fantasy league was conducted in 1963 (Green, 2014). Fantasy points for these more complex sports are based on standardised scoring systems that consider in-game events, rather than potentially subjective measures of a player's performance. For example, an interception by a defensive player in American football gains that player 2 points, while an offensive player who throws the pass that is intercepted loses 2 points (Perniciaro, 2019). Fantasy sports provide an outlet for particularly avid sports fans to put their knowledge of a sport to the test, through competing with other participants (Bowman et al., 2012). Some competitions feature added levels of complexity, such as draft-rounds and a drafting procedure to add to complexity (Swinson & Gyton, 2016).

Each individual fantasy competition is called a league. Fantasy leagues are typically played over a season of a sport, although daily fantasy sports have emerged in recent years as an alternative, which are discussed in more detail below (Perniciaro, 2019). Different seasonal leagues exist, including: redraft leagues, where participants choose an entirely new team each year; keeper leagues, where participants keep 2-4 players per year but are free to rechoose the rest, and dynasty leagues, where the entire team is maintained from season to season (Perniciaro, 2019). These variations allow new participants to get involved without longer term consequences based on their starting choices (e.g., by using redraft leagues, where they can start again the following season if their team does not do well), but also allowing participants to remain invested in fantasy sports if they choose to use keeper or dynasty leagues. Season-long fantasy sports competitions may or may not require entry fees, and prize money may or may not be available.

Daily fantasy sports (DFS) are a specific type of league, where participants pay entry fees, and prizes are on offer. The main difference is that DFS do not occur over an entire season. They instead occur over a far shorter period of time, typically a day or a week, allowing for a relatively high speed competition (O'Farrell, 2015).

Fantasy sports is a growing phenomenon, with two companies (DraftKings and FanDuel) owning most of the global fantasy sports market (Farquhar, 2018). Between them, these two companies process billions of dollars in entry fees for DFS each year. Recent estimates indicate that 59.3 million Americans and Canadians took part in fantasy sports in 2017, increasing year on year since 1988, when there were 500,000 players (Fantasy Sports Trade Association, 2017). Valuations of the industry indicate that it is worth tens of billions, but vary somewhat from US$13.9 billion (Orbis Research, 2019) to between $40-70 billion (Goff, 2013).

In Australia, approximately 1.6 million fantasy players compete across all sports (6.5% of the population), with approximately 650,000 participating in fantasy AFL each year (2.6% of the population) (ABN Newswire, 2019). DFS events have been heavily promoted by DraftKings, including the “Biggest Bash” event, which was a DFS tournament conducted at Melbourne’s Crown Casino in February 2019. Players attended a live screening of the Big Bash cricket final, hoping to win the $50,000 grand prize, the largest offered to date in Australian DFS leagues (Duggan, 2019). This event highlights how DFS in particular can be used to heighten sports viewership, with one fantasy sports company using the slogan “Don’t just watch it, play it” (Draftstars, 2019).

Fantasy sports and DFS offer a way for participants to test their knowledge and to become more engaged in sports viewership and fandom. In some cases, participants pay to enter and can win prizes, and due to this, the line between fantasy sports and gambling has become blurred.

Fantasy sports and daily fantasy sports as a form of gambling

Internationally, there is some contention about whether fantasy sports or DFS are gambling products. Most DFS competitions and some fantasy sports competitions require an entry fee (something of value being staked; Marchica & Derevensky, 2016), to win part or all of a prize pool (something of value won). It is argued that the outcome involves a degree of chance, therefore meeting the definition of gambling in Australia. Thus, in Australia, fantasy sports operators require a bookmaking license (Das, 2018). However, some fantasy sports and DFS competitions can also be free to enter, or may not involve a prize pool, and can therefore be unregulated.

The issue is more complex internationally, which is where much of the current academic research has been conducted. In the USA for example, the definition of gambling depends not on whether *any* amount of chance is involved, but whether chance is the dominant factor in determining the outcome, rather than skill. Some authors have argued that DFS in particular may not be a form of gambling, because they are predominantly skill-based, despite some USA jurisdictions declaring them a game predominantly of chance (Easton & Newell, 2019). The matter is also unclear

from a legal perspective. In 2015 the New York Attorney General brought proceedings alleging that fantasy sports, including DFS, were prohibited under New York State law (at the time), based on the argument that, while skill was involved, the outcome was essentially driven by events in real-life sporting events over which fantasy sports participants had no control, essentially resulting in a game of chance (Swinson & Gyton, 2016). Importantly, the Attorney General also differentiated fantasy sports and DFS, noting that fantasy sports sites exist to provide a service beyond betting, while this is not necessarily the case for DFS sites. Ultimately, New York state lawmakers moved to explicitly legalise fantasy sports and DFS (McKinley & Drape, 2016). These international differences in terms of legality and regulation mean that care must be taken in terms of comparing research across jurisdictions.

As the relevant technology has developed, almost all fantasy sports and DFS behaviour now occurs online (Fletcher, 2016). Consequently, the most relevant legislation in Australia is the Interactive Gambling Act (*Interactive Gambling Act*, 2001) and its 2017 amendment (*Interactive Gambling Amendment Act*, 2017). These laws prohibit forms of gambling online unless they have specific exemptions provided by the Federal Minister. However, bets made on fantasy sports, particularly daily fantasy sports, could in essence be seen as a bet placed on an underlying sporting event, and therefore no exemption would be required (Swinson & Gyton, 2016). Nevertheless, the Northern Territory government has provided a license for the world's biggest DFS company, DraftKings, to operate in Australia (Farquhar, 2018). The first fantasy sports and DFS operator in Australia was Moneyball, which opened in 2015 (Das, 2018). Prior to this, Australian fantasy sports and DFS players could only use offshore sites, and were therefore subject to regulations from other jurisdictions.

Who plays, and the link with gambling behaviour and gambling-related problems

The Fantasy Sports Trade Association published figures from 2017 showing that most fantasy sports players in the USA and Canada were male (71%), with an average age of 32 (Fantasy Sports Trade Association, 2017). Half had a college degree or higher education, and 53% had a household income of US$75K or more. The average expenditure for those aged 18 or older was $653 per year, with (American) football being the most popular sport. Importantly, 70% of players had paid a fee to enter a league. These figures indicated that 18% of USA adults and 34% of USA teens had played fantasy sports (19% and 21% respectively for Canadians).

Marchica and Derevensky (2016) used data from national surveys of college student athletes in 2004, 2008 and 2012 to examine participation in fantasy leagues. Their study found that engagement in fantasy leagues had increased between 2004 and 2008 but plateaued in 2012. Approximately 50% of male college athletes had engaged in free fantasy leagues, and 18.7% in fee-based fantasy leagues,

compared to 8.4% and 1.8% for females. Notably, these college athletes tended to engage in fantasy sports related to the sports that they played, typically baseball, football or ice hockey. Participation in free fantasy leagues was more common than fee-based leagues (for both males and females, and for both non-problem and at-risk/problem gamblers), but 25% of female at-risk/problem gamblers and 48.1% of male at-risk/problem gamblers engaged in fantasy sports, compared to 1.8% and 18.4% of female and male non-problem gamblers, respectively. Those in the at-risk/problem groups took part in 2-5 different fantasy leagues, reflecting greater involvement, although overall expenditure was relatively minimal, at $10-$149 spent on fees over a 12 month period. The authors noted that fantasy sports and gambling share similar features. Money may be won or lost on fantasy sports, based on entry fees and prize pools. While monetary expenditure may be relatively low, excessive *time* may be spent on fantasy sports. Despite this apparent connection between fantasy sports and gambling, Marchica and Derevensky reported that most respondents (between 65% and 83%, depending on gender and problem gambling status) did not consider fantasy sports to be a form of gambling, even if entry fees and prizes were involved. Nevertheless, they found that participation in fantasy sports was linked to at-risk or problem gambling for both males and females, and this was the case for both free fantasy leagues and fee-based fantasy leagues.

A study of 2,146 gamblers from New Jersey found that 299 (13.9%) had played DFS in the past year (Nower et al., 2018). The DFS players in the sample were more likely to be male, younger, single and to be more engaged gamblers, both in terms of number of forms played, and frequency of gambling, including sports betting. DFS players were more likely to be in higher risk problem gambling groups, particularly the problem gambler group, in bivariate analyses. This relationship between FS/DFS and gambling behaviour, as well as gambling-related problems, was mirrored in a study of 941 college students in the USA (Martin et al., 2018). Importantly, while these studies indicate a relationship between FS/DFS and gambling behaviour (and problems), these are correlational results and the causal relationship is unclear.

Nelson and colleagues (2019) studied 10,385 daily fantasy sports participants in the USA and Canada and found that participants entered a median of two contests each day on which they played DFS, and paid median entry fees of $87 across the 2014 season, for a median net loss of $30.70. They also identified a heavily involved group of DFS players, who spent far more time playing DFS overall, and played across a higher number of different sports, but also won a higher proportion of the contests in which they entered. The authors argued that these results are similar to those observed in traditional sports betting behaviours. Mean age of the sample was 34 years.

The above studies examined fantasy sports and DFS play amongst adults, but some studies have also considered adolescent engagement. Marchica and colleagues

(2017) studied a sample of 6,818 high school students from Ohio. They found that for older students in their sample, particularly those aged 16-19, engagement in sports betting was the strongest predictor of at-risk gambling, while for younger students (13-15), engagement in DFS was the strongest predictor. While males were more likely to engage in FS, females who did so were more likely to be at-risk of gambling problems compared to males. Age appears to be an important risk factor, which may be due to differing motivations for engaging with FS, both between adolescents and adults, and between younger and older adolescents (Ruihley et al., 2014). Furthermore, engagement in fantasy and daily fantasy sports amongst adolescents is more likely to be driven by peer influence, rather than family influence (Ruihley et al., 2014). Rahman and colleagues (2012) note that in addition to their susceptibility to peer influence, adolescents are also far more impulsive, and more susceptible to addiction than adults, raising concerns about relatively high speed, social forms of activities such as DFS.

Together, the above studies indicate that while fantasy sports and DFS may be viewed as non-gambling activities by at least some participants, there is a high correlation between engaging in fantasy sports and DFS, and traditional forms of gambling. Furthermore, the link between engagement in fantasy sports and DFS with gambling-related problems is concerning. The findings above also indicate that these forms are appealing to younger males in particular, a demographic that is most at risk of developing gambling-related problems.

Why are youth vulnerable to these emerging forms?

One major reason for the susceptibility of youth to emerging forms of gambling is that these new forms are online, in cyberspaces and embedded in products that youth frequent. According to the Australian Communications and Media Authority (2018), the frequency of internet use is directly related to age, with 92% of those aged between 18-24 using the internet three or more times a day, compared to 43% of those aged 65 years and over. Social media use was highest amongst those aged 18-24 years, with use decreasing with age. Figures show that 2.3 million Australians (12%) have watched or played games online (such as esports and fantasy sports), with those aged 14-34 being the biggest users of esports in the 12 months prior to the study (26%) (Australian Communications and Media Authority, 2018). Findings from a study exploring the gaming habits of 3,228 people (all ages) showed that on average, people spend over an hour each day playing games (average 81 minutes), with children having the highest average of 100 minutes per day (Brand, Jervis, Huggins, & Wison, 2019). Using ABS statistics in conjunction with their figures, Brand and colleagues (2019) estimate that almost all people aged between 5 to 24 play games.

Due to their high internet use and participation in (video) gaming, youth and adolescents are likely exposed to gambling content as part of their regular online presence (Abarbanel et al., 2017; Armstrong et al., 2019; Ipsos MORI, 2009; King, 2018). As described above, since these emerging technologies are relatively new, there is limited understanding of how they might contribute to engagement with gambling products amongst youth and adolescents, and subsequently, their contribution to gambling-related harm. A number of authors have voiced concern about the changes to online gambling spaces and the impact on children, adolescents and youth (Delfabbro et al., 2016; Derevensky & Gupta, 2007; Griffiths, 2003; King et al., 2010, 2014, 2016; Williams & Wood, 2007). Several instances of underage consumers experiencing substantial monetary losses and struggling to control their gambling on new online forms have been uncovered (Assael, 2017; Campbell, 2016; Greer et al., 2019; Kollar, 2016). Despite limited research identifying how emerging technologies impact the gambling of younger consumers, potential contributing factors may encourage or influence gambling involvement by youth and adolescents. The remainder of this literature review will discuss the prevalence of youth gambling, with a particular focus on these emerging forms; as well as the environmental, social and structural features that are likely to promote gambling involvement amongst youth who are immersed in online, interactive spaces.

Prevalence of Youth Gambling

Research suggests that adolescents commonly gamble with real money (Delfabbro et al., 2016; Dowling et al., 2017; Lambos et al., 2007; Volberg et al., 2010). Delfabbro and colleagues' (2016) review of research on adolescent gambling showed that 50-70% of youth gamble at least annually for money, despite being under the legal gambling age. Similarly, Delfabbro, King and Griffiths's (2014) review found that 60-80% of youth aged 13-17 years gamble at least once a year for money. Studies from Australia have reported similar prevalence rates for youth gambling. For example, in 2007, Lambos and colleagues found that, amongst 2,669 adolescents aged 13-17 years, 56% had gambled in the previous 12 months. More recently, a slightly higher prevalence rate of 67.5% was reported by Dowling and colleagues (2017) in a sample of 612 Victorian secondary students aged 12-18 years. International studies report slightly lower prevalence rates, with 41% of adolescent gambling in the past year in Canada (Wijesingha et al., 2017), and 39% in the UK (Gambling Commission, 2018). However, longitudinal research suggests that youth involvement with gambling tends to be inconsistent, with game preferences and gambling frequency cycling over time (Delfabbro et al., 2014). As they transition into adulthood, gambling becomes more stable and involvement tends to increase, likely due somewhat to greater accessibility (Delfabbro et al., 2014, 2016).

Population studies indicate that the highest rates of problem gambling tend to be experienced amongst those aged 18-30 years (Volberg et al., 2010), while Delfabbro et al. (2016) report that prevalence rates of problem gambling amongst youth are

higher than in adult populations (3-4% or greater compared to less than 2% in adults). These figures are consistent with earlier research that reported between 3-5% of youth demonstrate problematic gambling behaviours (Delfabbro et al., 2014). There is a general consensus that, along with demonstrating greater gambling involvement in both monetary and simulated gambling (Delfabbro et al., 2016; Gainsbury, Russell, et al., 2016; King & Delfabbro, 2016b), males are also more likely to experience gambling problems compared to females (Delfabbro et al., 2016)

The types of gambling activities youth engage in are believed to be strongly influenced by what forms are most easily available, as well as current social trends (Delfabbro et al., 2016). Most common are lotteries and instant scratch tickets, private card games, placing bets on games of skill and sports wagering (Delfabbro et al., 2016; Dowling et al., 2017; Lambos et al., 2007). Studies exploring the gambling habits of Australian adolescents aged 13-17 years (n=2,669; Lambos et al., 2007), and 12-18 years (n=612; Dowling et al., 2017), found that scratchies were consistently the most popular form of gambling (40%; 48%), followed by card games (27%; 42%), race betting (19%, 22%) and sports betting (15%, 19%). Youth also engage in simulated gambling activities. Amongst 1,287 students aged 12-17 years, 13% had played a simulated gambling game in the past 12 months, with 31% claiming to have played at least once in their life (King et al., 2014). Youth most commonly played simulated gambling games within a video game (25%), rather than a social casino game or standalone app (6.3%), or a demo or practice game (4.7%). In a large scale British prevalence study of 8,958 youth aged 12-15 years, conducted in 2009, 28% had played a gambling simulation in the 7 days prior to the study, and this involvement was the strongest predictor of real gambling in the same 7 day period (Ipsos MORI, 2009). Others have similarly found that those who gamble for money are more likely to report playing free or demo games (Gainsbury et al, 2016; Griffiths & Wood, 2007) and engage in a greater number of simulated gambling activities (King et al., 2014). Taken together, the above results indicate that a relatively large proportion of youth take part in both traditional and simulated forms of gambling, and that these findings have been observed for more than a decade.

Contributing factors for vulnerability amongst youth

Accessibility and Exposure

Where traditionally people would need to visit physical venues to access gambling, wireless internet connections, smartphones and portable digital media devices mean that gambling content is far more accessible, especially to youth. Increased availability of, and access to, gambling products has been associated with greater gambling participation, and subsequently, experiences of gambling problems and gambling harm (Breen & Hing, 2014; Delfabbro et al., 2016; Gainsbury et al., 2013; Productivity Commission, 2010). Youth spend a lot of time on the internet engaging with social media and playing video games (Australian Communications and Media

Authority, 2018; Brand, Jervis, Huggins, & Wison, 2019). Consequently, they are more likely to be exposed to gambling content as a result of their everyday media use (King et al., 2010).

Advertising

Advertising of gambling content online has been shown to encourage people to participate in gambling activities (Browne et al., 2019; Russell, Hing, et al., 2018), including amongst emerging forms like esports (Abarbanel & Phung, 2019). Some advertising specifically targets children and young people (Ipsos MORI, 2019). Real-money gambling companies often advertise free or demo versions of their gambling products since non-monetary forms are not subject to the same regulations as monetary gambling sites (Abarbanel et al., 2017; Derevensky & Gainsbury, 2016). Since many new forms of gambling are largely unregulated, restrictions on advertising, inducements and how they operate are largely non-existent. Many gambling advertisements glamorise gambling and perpetuate erroneous gambling beliefs, often by comparing free play experiences with real money gambling and misrepresenting the role of chance in gambling events (Abarbanel et al., 2017; Derevensky et al., 2010; Derevensky & Gainsbury, 2016; Frahn et al., 2015; King et al., 2010; McBride & Derevensky, 2009; Sévigny et al., 2005). As a result, many advertisements give the impression that winning is the most likely outcome and thus entice people to try their luck and gamble with real money (Abarbanel et al., 2017; Frahn et al., 2015; King et al., 2010; Sévigny et al., 2005).

Research has shown that shifts towards monetary gambling are aided by greater exposure to gambling advertising (Hayer et al., 2018). Daily social media users aged 25 years and under are most likely to be exposed to gambling advertisements for social casino games that appear to be designed for younger users (Abarbanel et al., 2017). In their study, Gainsbury, Hing and colleagues (2015) found that advertising was key in determining whether or not people played social casino games, with users noting the “continuous nature of solicitations to play and the prominence and ubiquity of advertising in social media” (pg. 142). Gambling is also embedded into other online games and gaming environments (Floros et al., 2013; Gainsbury et al., 2014), making it difficult for consumers to escape the pull of gambling culture. For instance, some online games include gambling components that mimic real gambling, often used as a way to receive in-game rewards or unlock features to progress to higher levels, but do not necessarily involve real money (Floros et al., 2013). In-game advertisements encourage video gamers and esports viewers to gamble, either by cash betting on esports or participating in skin gambling (Greer et al., 2019; King, 2018). There is growing concern that an increasing gambling presence online is normalising gambling, within what were traditionally non-gambling environments (Abarbanel et al., 2017; Derevensky & Gainsbury, 2016; Gainsbury, Hing, et al., 2015; McMullan & Kervin, 2012; Monaghan et al., 2008; Phillips & Blaszczynski, 2010; Sévigny et al., 2005).

Early Exposure

While everyday use of the internet means that youth now have greater exposure to gambling content, it also means that exposure is likely to occur at a much earlier age compared to exposure to traditional forms of gambling (Abarbanel et al., 2017; de Freitas & Griffiths, 2008). Early engagement with gambling is a risk factor for problem gambling during later stages of life, with those who experience difficulty controlling their gambling often reporting gambling from a much earlier age compared to those without gambling problems (Holdsworth et al., 2013; King, 2018; Turner et al., 2006; Volberg et al., 2010; Wanner et al., 2006). That is, problems that develop in early adulthood, tend to have origins in adolescence (Delfabbro et al., 2014; Holdsworth et al., 2013; Turner et al., 2006; Wanner et al., 2006). A longitudinal study by Delfabbro and colleagues (2014) exploring the gambling habits of youth and adolescents showed that those with some level of problem gambling risk (a non-zero PGSI score) at the final wave of data collection (four years post initial contact), were more likely to have started gambling earlier compared to those reporting no gambling problems (PGSI score of zero).

However, early involvement in gambling does not necessarily mean that people will gamble in early adulthood or develop gambling problems, and during the early stages, youth gambling tends to be inconsistent and varies considerably for each individual (Delfabbro et al., 2009, 2014). For instance, Delfabbro and colleagues (2009) tracked 578 youth from aged 15 into adulthood (18-19 years of age) and found that only 1 in 4 participants who gambled at age 15 gambled consistently across all four years of the study. In fact, gambling patterns from later stages of adolescence (i.e., school-leavers) were more predictive of later gambling involvement than those earlier on. It may be that early exposure in isolation is not problematic, unless accompanied by other factors such as individual differences, social and environmental factors that cause people to struggle with transitions from adolescence to adulthood (Breen & Hing, 2014; King, 2018). Gambling products that can be easily accessed in early stages of development may put people at greater risk of developing gambling problems during early adulthood.

Lax Age Verifications

A large contributor to underage access and exposure to gambling is inadequate age verification (Griffiths, 2003; King et al., 2010; Poulin, 2000; Smeaton & Griffiths, 2004), in that either age verification is not attempted at all (i.e., some sites are entirely unregulated), or the age verification methods used are easy to circumvent. Concerns around age verification has long been observed, and still appears to be a problem. In their study of simulated and free-play gambling products, Smeaton and Griffiths (2004) found that there were minimal restrictions to stop underage users of simulated versions transitioning to the monetary version of the game. For many of these emerging forms, players are only required to be over 13 years and log in with

their player account - that often does not require any age verification or identification checks to set up (King, 2018). Drummond and Sauer (2018) surveyed games that contained loot boxes and discovered that, despite being rated as appropriate for those 13 years or younger, many of the games included content that met the criteria for gambling, allowing players to cash out for real money. Underage users can access third-party websites to cash out and gamble with skins. For example Steam, a skin gambling website, only requires users to be aged over 13 years, have a valid email address, and register an active debit/credit or gift card for online purchases (Greer et al., 2019). As many of these products are unregulated and involve poor age verification measures, those not of legal age to gamble on traditional gambling forms are now at risk of experiencing gambling related harm due to being able to access gambling content via these new forms.

Social Contributors to Youth Gambling

A common finding in the gambling literature is the substantial impact a person's social environment can have on their gambling involvement, and risk of developing a gambling problem (Andronicos et al., 2015; Breen & Hing, 2014; Gainsbury, Hing, et al., 2015; Holdsworth et al., 2013, 2015; Turner et al., 2006). While strong social networks can increase resilience and the ability to cope with adversity (Holdsworth et al., 2013, 2015), they can also promote pro-gambling environments that encourage gambling participation (Gainsbury, Hing, et al., 2015; Holdsworth et al., 2015). Those who associate with more people who gamble tend to have higher levels of gambling, and gambling-related harm (Russell, Langham, et al., 2018). Qualitative interviews exploring the use of social casino games indicated that both family members and peers are not only instrumental in the decision to engage with social casino games, but that the recognition and attention received from peers and relatives by sharing game experiences and achievements were strong motivators to play (Gainsbury, Hing, et al., 2015). A person's social environment is therefore instrumental, not only in the uptake of gambling, but in maintaining a person's involvement with gambling products. As gambling becomes more prevalent within social networks, it is likely that any stigma associated with gambling decreases, making gambling a more socially acceptable form of entertainment (King et al., 2010; Ladd & Petry, 2002; Volberg et al., 2010).

Parental and Family Influences

Parental and family values relating to gambling and their gambling behaviours tend to shape the values, attitudes and behaviours of youth, whose social circle later expands to include friends and peers (Breen & Hing, 2014; Holdsworth et al., 2013; King & Delfabbro, 2016a). Parental influences are key to facilitating monetary gambling (Derevensky & Gupta, 2007; King & Delfabbro, 2016a). Studies show that youth gamble with their parents and family members (Derevensky & Gupta, 2007; Ipsos MORI, 2009). Those who report that their first gambling experience was with their parents are also more likely to display an interest in gambling (Ipsos MORI,

2009; Splevins et al., 2010). In earlier research by Gupta and Derevensky (1997), 86% of regular gamblers between the ages 9 and 14 years (N=477) reportedly gambled with family members. People with parents who gamble or who have pro-gambling attitudes are also significantly more likely to gamble themselves (Delfabbro & Thrupp, 2003; Ipsos MORI, 2009; King & Delfabbro, 2016a). Children raised in homes with family members experiencing gambling problems, are also more likely to experience problems controlling their gambling (Dowling et al., 2010; Ipsos MORI, 2009), with children of problem gamblers 2 to 4 times more likely to develop problems themselves (Dowling et al., 2010).

Despite parental monitoring and supervision during childhood helping to protect against the development of problem gambling in adolescence (King, 2018), it is unlikely that parents are entirely aware of the gambling spaces evolving online. In their study on gaming habits and attitudes, Brand and colleagues (2019) showed that when asked about the available media that concerned them the most, the majority stated social media and movies as areas of concern, with the least amount of concern given to interactive games. Of the parents surveyed, less than half (41%) were concerned with loot boxes and only 33% with in-app purchases. Anecdotal reports of youth who have struggled with gambling problems suggest that those who lose money often use parents' credit cards to fund online purchases, and as a result, are unlikely to be comfortable confiding in their parents if their gambling gets out of control (Campbell, 2016). Comparatively, adolescents who report greater parental monitoring and care, are also likely to report lower problem gambling severity (King, 2018).

Sense of Community

A common motivator for people to play games is the social nature and shared sense of community that gaming often brings (Brand, Jervis, Huggins, & Wison, 2019). This too can be true for some forms of gambling, as the transition to gambling can be related to whether gambling exists within social networks (Gainsbury, Hing, et al., 2015; Hayer et al., 2018). Some forms of games, and emerging or simulated gambling products, include the ability to play against other people, and to communicate within the product. These products are becoming more prevalent, and it seems inevitable that online spaces traditionally used to connect with others are now becoming intertwined with gambling. For example, social casino games often include features like "refer-a-friend" that can be personalised and repeated in order for users to receive incentives like free credits, additional tokens or in game bonuses (Abarbanel et al., 2017; Gainsbury, Hing, et al., 2015; McMullan & Kervin, 2012). Such schemes not only serve as advertising, but given the personal nature and often the reliance on the invitee to play in order for the user to benefit, such inducements encourage others to conform and engage in gambling as well (King et al., 2010; Ladd & Petry, 2002). Despite many of these games giving the illusion of being social, users ultimately find the games are not as social as expected (Gainsbury, Hing, et

al., 2015). Thus, while these games offer a sense of community through the ability to connect with others, it appears that the social components of these games may be less about socialising, and more a way to advertise the product.

Increased Competition and Recognition

Emerging technologies that are embedded within social media and digital communities allow for game play to be broadcast amongst social networks (Griffiths & Parke, 2002; King et al., 2010). The ability to publicise gambling experiences is thought to boost self-esteem and the need for gratification and recognition via social reinforcement for winning or doing well on an activity (Griffiths & Parke, 2002). Traditionally, internet gambling was considered to be asocial, potentially isolating people from their social circles (Hing et al., 2015). However, now that wins and game play can be shared and broadcast on virtual notice boards and social networking sites, people can more easily share their gambling experiences amongst their peers (Griffiths & Parke, 2002). Sharing in-game experiences is likely to encourage others to play since people are most likely to share gambling successes, but it may also spark competition amongst peers, potentially resulting in great risk taking in order to outperform friends. Internet gamblers are reported to be more competitive than traditional gamblers as it is believed that the one-on-one design of most internet gambling games appeals to the competitive nature of many gamblers (Griffiths & Parke, 2002), although not all gamblers, as some prefer more solitary gambling forms, such as EGMs. In fact, emerging forms of gambling not only allow for gambling between friends (King, 2018), but features like loot boxes directly appeal to people's competitive nature by offering an advantage in multiplayer games (Drummond & Sauer, 2018). With the increasing importance of online environments for social connection and recognition, users may feel pressured to conform and make purchases they wouldn’t otherwise make in fear of being at a disadvantage in their gameplay (Drummond & Sauer, 2018).

Social Influencers

An emerging trend in online environments is the role of online celebrities or “social influencers” to promote or push products or services. Social influencers are people who acquire an online following, usually due to some celebrity status, and then accept endorsements and payments for promoting products and other services. Generally speaking, social influencers tend to be youthful and appealing, and can manipulate or sway their audiences based on the content they post online (King, 2018).

A number of prominent online gamers have become famous for streaming their game play, and have received millions of dollars in endorsements to promote online games, including gambling. Several gaming influencers have been accused of promoting gambling by streaming videos of themselves gambling with large amounts of money and winning (Assael, 2017; Campbell, 2016; Greer et al., 2019; King,

2018). They have also been criticised for promoting their own gambling sites, allowing them to alter gambling outcomes and use money that does not belong to them to make the game look more rewarding than it actually is (Assael, 2017; Campbell, 2016). For example, a prominent online gamer allegedly admitted to using his own skins for betting only 70% of the time, choosing to gamble with skins obtained on the website from customers' losses (Assael, 2017; Campbell, 2016). Videos posted were those where the gambling paid off, giving the impression that gambling was an easy way to make money. Given the increasing interest in and competitive nature of online gaming and esports, these gamers have many followers who idolise them, often including those who are underage. Reports from players as young as 13 suggest that such videos encourage viewers to gamble, as they believe they can win money too, and subsequently result in substantial financial losses to some of the most vulnerable consumers (Campbell, 2016). Since many of these sites are unregulated, operators can offer sponsorships to online gamers or streamers to promote their products (Greer et al., 2019), regardless of the potential audience or consumer they are targeting.

Simulated Gambling

Social casino games are one form of simulated gambling product (Gainsbury, King, Delfabbro, et al., 2015). Simulated gambling products are often promoted to youth as fun and entertaining (Griffiths & Parke, 2010). As these games do not meet the monetary criteria to be classified as gambling (i.e., no prize can be won), they are not regulated as gambling. While too young to gamble for money, adolescents can and do play these simulated gambling games (Derevensky & Gupta, 2007; Griffiths & Wood, 2007; Hardoon et al., 2002; Ipsos MORI, 2009; King et al., 2014; McBride & Derevensky, 2009). As described above, research shows that simulated gambling and gambling with money tend to co-occur (Forrest et al., 2015; Griffiths & Wood, 2007; Ipsos MORI, 2009; King & Delfabbro, 2016a), with involvement in free-play games being a predictor of monetary gambling in youth samples and associated with gambling problems (Gainsbury, Russell, et al., 2016; Hardoon et al., 2002; Ipsos MORI, 2009; King et al., 2014; King & Delfabbro, 2016a). However, not all people who play simulated gambling-games gamble for money (King & Delfabbro, 2016a).

Simulated Gambling as a Gateway to Monetary Gambling

A key concern is that simulated gambling products may serve as a "gateway"; predisposing people to gambling, and encouraging youth to transition from simulated gambling to gambling with real money (Gainsbury, Russell, et al., 2016; Griffiths & Barnes, 2008; Hardoon et al., 2002; King et al., 2016). Simulated gambling sites offer an opportunity for people to practise gambling and explore gambling features without financial risk (Bednarz et al., 2013; Derevensky & Gainsbury, 2016; Frahn et al., 2015; Gainsbury et al., 2012; Griffiths, 2003). As most free play or simulated gambling sites do not require age verification measures, such games make gambling-like activities accessible to underage consumers (Abarbanel et al., 2017). Links examining migration between simulated gambling products and monetary

gambling have generally found that use of simulated gambling products precedes use of monetary gambling products (Hayer et al., 2018; Kim, Wohl, et al., 2017; King et al., 2016).

Not everyone who plays on simulated gambling sites transitions to monetary gambling. In a sample of adult users of simulated gambling who had never gambled for money, just over a quarter (26%) had transitioned to monetary gambling at the 6 month follow up (Kim et al., 2015). These findings were replicated in a sample of 14-18 year olds who had never gambled with money, with 28.8% transitioning to real money gambling over the course of a year (Dussault et al., 2017). However, this transition was from simulated poker to playing poker with real money. For poker, a game that involves some skill, simulated games may encourage greater confidence that results in a transition to real monetary gambling.

Practice Increases Confidence

Free-play and practice sites may be used to hone gambling skills and experiment before transitioning to real monetary products (Gainsbury, Hing, et al., 2015; King, 2018). Using gambling simulations as a training ground is likely to increase familiarity with the game and increase confidence, which may enhance false perceptions regarding chance, probability and the role of skill (Bednarz et al., 2013; Griffiths, 2003; King, 2018; King et al., 2010). Those who engage with free-play or simulated gambling products are also exposed to a large volume of promotional material encouraging users to transition to real gambling versions (Sévigny et al., 2005). This advertising material often focuses on the winning outcomes experienced during free-play, and suggests that the practice and skills attained will increase the user's chances of winning when applied to real gambling versions of the game (Sévigny et al., 2005). Some social media games, and most free-play games are developed to mimic real versions of the game in appearance, meaning that when people transition to gambling with money, they feel like they are playing the same game as when playing with simulated credits. These types of games have been shown to increase risk taking behaviour, promoting greater expenditure when gambling with real money as opposed to simulated credits (Bednarz et al., 2013).

Misrepresents the Chances of Winning

Since free-play games are unregulated, operators are free to determine the return to player provided by the game. Many free-play gambling simulations inflate the odds of winning compared to real gambling products (Gainsbury et al., 2014; King et al., 2010; Monaghan, 2009), making simulations look far more lucrative (Frahn et al., 2015; King et al., 2010; Sévigny et al., 2005). They can also tailor in-game outcomes based on personal game play (Gainsbury et al., 2014), causing people to mistake the level of personal skill involved in game outcomes (King et al., 2010; Monaghan, 2009). Such configurations of game parameters gives the illusion that gambling is more profitable than it is, which is often used to market the monetary version of the game (McBride & Derevensky, 2009; Sévigny et al., 2005).

Virtual Currency and Desensitisation to Money

Electronic Cash

With gambling taking a digital form, the ways in which people place bets, make purchases and handle bank rolls are also digitised. Evidence suggests that people do not value electronic cash the way they value physical cash (Griffiths, 1999; Griffiths et al., 2006; Griffiths, 2003; Hing et al., 2015). Traditionally, people used physical cash to bet, and would see their bankroll decrease as they gambled, serving as a way of regulating expenditure (Griffiths et al., 2006). Once all physical cash was exhausted, the gambler would need to go to a banking facility to make an additional withdrawal to continue gambling - providing a break to reflect on losses and an opportunity to stop gambling. Gambling with electronic money allows people to make bets and purchases without necessarily seeing their balance decline or receiving any cue to reflect on gambling expenditure.

Gambling with Simulated Credits & In-App Purchases

Simulated games often allow people to gamble without risk of losing money. However, some simulated games allow players to purchase credits. Simulated credits are often presented in a similar format to real money on gambling websites. This simulated currency has the potential to desensitise users to the value of real money, especially if they are transitioning from simulated games to monetary versions as they are used to gambling with credits that have no monetary value. When consumers play with free credits, there are no consequences from losses. In this situation, simulated games encourage people to focus on their wins, allowing them to make riskier decisions without concern for losses (Floros et al., 2013; King et al., 2010). This may then translate to similar risky decisions when buying credits in simulated games, leading to actual losses, and may also translate to riskier play in real-money gambling. Armstrong and colleagues (2018) suggest that when gambling for money, those who have transitioned from simulated gambling products may be more likely to focus on the outcome (winning or not), rather than the expenditure (the losses).

Demo gambling products and social casino games do not require any financial investment, but they encourage financial expenditures in other ways through in-app purchases that are used to add to the gaming experience (Derevensky & Gainsbury, 2016; Gainsbury, Hing, et al., 2015; King & Delfabbro, 2018). For example, some games provide a starting credit balance, and once exhausted, players are required to purchase more credits if they wish to keep playing (Gainsbury et al., 2014; King et al., 2016). While these types of in-app purchases are not integral to game play, without making these purchases, game play is often restricted, usually until a specified period of time has elapsed (Derevensky & Gainsbury, 2016; King et al., 2016). People tend to make in-app purchases in order to extend game play, unlock different game functions, or speed up game play (Brand, Jervis, Huggins, & Wison,

2019). Some evidence suggests that people who make in-app purchases are more likely to participate in monetary gambling, and be at greater risk of developing gambling problems (Gainsbury, Russell, et al., 2016; Kim et al., 2015; King et al., 2016). For example, social casino gamers (aged 12-17 years) who made in-app purchases reported greater frequency and expenditure on real monetary gambling, and more problem gambling symptoms, compared to non-paying gamers (King et al., 2016). King and Delfabbro (2018) suggest that some microtransaction schemes can be considered predatory, as they disguise the long term losses associated with in-game purchases until a point where the user is committed, either financially or psychologically (pg. 113). They use the example of loot boxes, since they often have a low probability of containing items of any significant value, but people feel drawn to purchasing them in the hope of obtaining a valuable item.

Gambling with Virtual Items

Where previously, simulated credits or in-game purchases had no value outside the game itself, skin gambling has moved these outside the confines of individual games. Skin gambling allows people to place bets using virtual items they have collected via game play, purchases or loot boxes. Technically, people are not gambling with real money as the expenditure has already occurred via the purchase of the skin or loot box. This means that the gamble itself is not associated with the loss of money (although gambling can still occur with other non-monetary items, such as food or cigarettes). Skins can also be purchased via gift cards and vouchers, rather than using real money (King, 2018). This means that the purchase of the skin and its cost may not be associated with a loss of real money. When people then gamble with these skins, their value may not be associated with any cost of actually purchasing the skins in the first place. Anecdotal reports suggest that skin gamblers realise that skins have value, but they do not feel like they are losing real money when they use them for gambling (Campbell, 2016). King and Delfabbro (2018) suggest that some predatory schemes entrap users, as players will often spend money and feel they have invested too much to stop. That is, increased expenditure is used to justify continued expenditure in an attempt to retrieve value lost. This is despite the fact that, because the skins are virtual, their perceived value is lower than their actual value (King & Delfabbro, 2018). As a result, losses may not register as being consequential until later when people may reflect on the net value of skins lost or the money spent purchasing loot boxes to attain skins for gambling.

Summary and research questions

Emerging forms of gambling and simulated gambling appeal to youth because they are accessible, and are advertised extensively in places that youth frequent, including by popular social influencers on sites such as YouTube. Youth are exposed to these gambling activities early in life, with early exposure to gambling being a key risk factor for subsequent gambling-related problems and harm. Young people are able to play these emerging forms due to lax age verification standards. Further,

these activities can be accessed via personal mobile devices, making parental supervision and monitoring more difficult. Many of these activities provide opportunities to socialise with and compete against peers, providing both a sense of belonging and peer recognition.

Some of these emerging activities are regulated as gambling (esports betting, betting on FS/DFS, skin gambling, and loot boxes in some jurisdictions), and those who take part in them tend to also take part in traditional forms of gambling. While other emerging forms do not meet criteria for gambling (e.g., social casino games, practice games), they do *simulate* gambling, and simulated gambling products have acted as a gateway to traditional gambling products for some people. These simulated forms provide an opportunity to develop an understanding of how gambling products work, but this may be misleading as these activities are not required to adhere to the legislated return to player percentages that apply to gambling. Playing these simulated forms may therefore lead to a false sense of confidence. Finally, because emerging forms of gambling involve electronic cash or non-cash items (that may still have a monetary value, such as skins), the cost of taking part may be obscured.

Given the popularity of all of these emerging forms of gambling and simulated gambling amongst youth, particularly young men, and the apparent links with participating in traditional gambling activities and with gambling-related problems and harm, these emerging forms may be potentially and uniquely dangerous for youth. Because most of these activities have only emerged over the last decade, people in different age cohorts have grown up in different gambling environments. This study compares people who have participated in emerging forms of gambling and simulated gambling in their adolescence compared to those who have not. Of key interest is any difference between their gambling behaviour and gambling-related problems and harm during their early adulthood. Specifically, the study aims to answer these two research questions:

Research question 1: How are the formative gambling experiences of young adults (cohort aged 18-24 years) in New South Wales different from the experiences of an older cohort (aged 25-29 years)?

Research question 2: What association can be made between early experiences with specific emerging technologies (e.g., social casino games, loot boxes, skin gambling, DFS, esports betting) and gambling harm?

Methodology

Recruitment and ethics

Respondents were recruited to an online survey that was hosted on the Qualtrics platform. A soft launch occurred between 23rd-24th November 2019, with the full launch commencing on the 26th of November and completed on the 31st of December 2019. The first page of the survey was an information sheet, which advised that respondents' answers were anonymous and confidential, and that they could withdraw during the survey. The information sheet stated that the survey asked about "your experiences of gaming and gambling during your childhood and adolescence, up to now, including any problems or harms arising from your gaming or gambling." Respondents were recruited via existing market research panels and were reimbursed in line with their panel's usual practices; typically points that can be collected towards a reward. The survey was designed by the researchers independently of New South Wales Office of Responsible Gambling, and approved by the CQUniversity Human Research Ethics Committee (ethics clearance number 22104). At the end of the survey, and on pages with potentially difficult questions (such as the Problem Gambling Severity Index), contact details for the Gambling Helpline were made available. Please see Appendix A for the information sheet and survey instrument.

Inclusion criteria and quotas

Respondents were eligible if they lived in New South Wales and were aged between 18-29 years. To ensure a diverse sample in terms of age and gender, a soft quota was set so that the proportion of either males or females could not be more than 65%, and the proportion of either 18-24 or 25-29 year olds in the sample could not be more than 55%. While these criteria were meant to make the sample broadly similar to the population, representative samples are difficult and expensive to obtain, and we do not claim that this sample is representative.

The survey included questions about both traditional forms of gambling (e.g., sports betting, lotteries, pokies) and emerging forms of gambling and simulated gambling (e.g., esports betting, loot boxes and social casino games), but respondents who had not engaged in *any* forms of gambling (traditional and emerging) were also of interest as a comparison group. A quota was set so that no more than 25% of the sample would be respondents who had not gambled on any traditional or emerging forms. Once any quota was full, any subsequent respondents who were in a "full" category were thanked for their willingness to take part and screened out of the survey. In this survey, the quota for females was reached, however the panel partners then turned to recruiting males only, so no respondents were excluded.

Completion rates, data quality checks, completion time
A total of 5,032 potential respondents started the survey (please see Table 1). Of those, 1,254 were screened out due to not consenting, not being within the appropriate age limits, or not living within New South Wales (either their answers were not within the inclusion criteria, or they did not complete these questions). A further 505 did not pass attention checks within the survey, and 26 were excluded due to poor quality data (see next paragraph). Of the remaining 3,247 respondents, 1,243 exited the survey before completion, with most doing so in the early stages of the survey (completion rate = 61.7%). Median completion time amongst the 2,004 final respondents was 12.2 minutes.

Data quality was checked by both Qualtrics and the lead author (AR). These checks included possible straightlining (e.g., selecting the same response option through scales, whereby 18 respondents were excluded), IP address lookups (not being in New South Wales based on IP address, 3 excluded) and keyboard mashing in open-ended responses (4 excluded). Importantly, straightlining was not assessed on scales where answering the same answer throughout is reasonable or even expected (e.g., PGSI, where most respondents would answer 0). Other checks included potential duplicate responses and excessive expenditure responses. No respondents were excluded for either of these reasons. While some high expenditure was detected, it is difficult to put an upper limit on what is appropriate expenditure. Instead, as outlined in the data analysis section below, steps were taken to minimise the impact on results of self-reported extreme spenders.

Table 1: Ineligible and incomplete survey response breakdown

Question	Quit at this point	Excluded because of answer	Remaining
Start of survey	-	-	5,032
Did not consent	0	295	4,737
Age	151	52	4,534
Postcode (not in NSW)	58	698	3,778
Failed attention check	-	505	3,273
Poor quality data	-	26	3,247
Started but did not complete the survey	1,243	-	2,004

Note: Most of the 1,243 respondents who quit prior to the end of the survey did so during very early stages of the survey.

Sample characteristics

The 2,004 respondents included for the data analyses were mostly female (62.3%, *n* = 1,249), whereas 37.0% were male (*n* = 742) and 13 respondents (.6%) indicated 'other'. Respondents were aged 18-29, per recruitment criteria, with a mean age of 23.65 (*SD* = 3.55), median = 24. The younger cohort consisted of 1,089 people (54.3% of the sample), and the older cohort 915 people (45.7% of the sample). The vast majority of respondents (93.3%, *n* = 1,869) indicated taking part in at least one of the eight traditional gambling forms within their lifetime (see list in measures below), and 85.1% (*n* = 1706) indicated taking part in one or more of the emerging forms at some point within their lifetime. When asked about the last 12 months, 80.2% (*n* = 1,607) indicated taking part in at least one traditional form, and 72.1% (*n* = 1,444) in an emerging form, within the last 12 months.

Measures

Demographics

Age (in years), gender (male, female, other) and postcode of primary residence (to determine New South Wales residency) were asked as part of the initial screening and quota questions. In addition, at the end of the survey, respondents were asked their marital status (single/never married, living with partner/de facto, married, divorced or separated, widowed), household status (who they lived with, see Appendix C for response options), highest level of education completed (less than year 12, year 12 or equivalent, trade/technical certificate or diploma, undergraduate qualification, postgraduate qualification), and the main language they speak at home (English or a language other than English). Personal pre-tax income was also assessed, using weekly or equivalent annual brackets, including options for negative or nil income.

Lifetime engagement in traditional forms of gambling

Respondents were asked if they had ever engaged in each of eight traditional gambling forms in their lifetime (response options: never in my life, yes at some point in my life). These forms were:

- Bought lottery tickets
- Bought instant scratch tickets
- Played the pokies
- Bet on a sporting event
- Bet on a racing event
- Played bingo
- Played keno
- Played casino table games

These eight forms of gambling included all types in the *2019 NSW Gambling Survey* (Browne, Rockloff, et al., 2019) where participation was above 1% in the adult population.

Lifetime engagement in emerging forms of gambling and simulated gambling
Respondents were asked if they had ever engaged in each of eleven emerging forms of gambling and simulated gambling in their lifetime (response options: never in my life, yes at some point in my life). Because respondents may not have been aware of what some of these forms were, they were told that if they did not know what a particular form was, to select "never in my life" for that form. Some forms may not technically be gambling, such as playing a video game with gambling content in it, but still capture exposure to gambling-like content in and around video games and were therefore of interest. The eleven forms were (bold text below was presented as bold in the survey for emphasis):

- Played a video game with gambling content in it, like GTA's casino level
- Played a video game which is also an esport
- Watched an esports event (online or in person)
- Bet on an esports event
- Opened a loot box that you earned during a game
- Bought a loot box with real money or via virtual currency that you purchased with real money
- Entered into a **free** fantasy sports or daily fantasy sports competition (ie one with no entry fee)
- Entered into a **paid** fantasy sports or daily fantasy sports competition (ie one with an entry fee)
- Gambled using skins or skin deposits
- Played gambling-like games (eg simulated pokies, poker, roulette) **for free** via an app or on social networking sites
- **Paid to play** gambling-like games (eg simulated pokies, poker, roulette where you can't win real money) via an app or on social networking sites (eg buying a simulated gambling app from an App Store, or paying to play via in-game purchases).

Frequency and expenditure on traditional and emerging forms
For each form that respondents said that they had gambled on in their lifetime, respondents were then asked how frequently they had taken part in each activity during the last 12 months. For the traditional forms, it was specifically stated that this engagement had to be for money. This requirement was only the case for some emerging forms, as some emerging forms (playing free-to-play video games for example) may not require expenditure. Instead, the requirement for expenditure was specified for each form. Response options for frequency responses were: never in

the last 12 months, less than once a month, about once a month, 2-3 times a month, about once a week, 2-3 times a week and 4 times or more a week.

Respondents were then asked about expenditure during the last 12 months on each form, defined as the amount of money, not including winnings, spent on each activity in a typical month. This was asked of each of the eight traditional forms, as well as six of the emerging forms:

- **Watching** an esports event (online or in person, eg entry fees, subscription costs)
- **Betting** on an esports event
- **Buying a loot box** with real money or via virtual currency that you purchased with real money
- **Paying** to enter a fantasy sports or daily fantasy sports competition
- **Gambling** using skins or skin deposits for currency
- **Paying to play** gambling-like games (eg simulated pokies, poker, roulette) via an app or on social networking sites (eg buying a simulated gambling app from an App Store, or paying to play through in-game purchases)

Early exposure to gambling

All respondents were asked to recall exposure to gambling when they were growing up. Specifically, how often (never, sometimes, often, very often) they recalled: any of the adults in their household gambled, accompanying their parents when they gambled, and gambling with their parents. They were also asked to recall whether, when they were growing up, any of the adults in their household experienced difficulties with gambling (no, mild, moderate or severe gambling difficulties).

Age of first engagement with each form

Respondents were asked to recall the age at which they first took part in each form. Respondents were only asked these questions for each of the 8 traditional and 11 emerging forms they said that they recalled doing in their lifetime. Respondents were made aware prior to entering their answers that their response could not be higher than their current age. This is because each question was validated against their current age, and indicating this validation ahead of entering their response was designed to reduce frustration.

For traditional forms in particular, this may have meant that respondents were asked to indicate illegal behaviour. To reduce reporting biases, respondents were reminded each time that the survey was anonymous. Images were also provided with each form to ensure that respondents realised which form was being asked about. These images also served as a prompt to aid recall.

Gambling-related problems: Problem Gambling Severity Index
Respondents who had indicated that they gambled on one or more traditional forms, or on the emerging forms of betting on esports, buying loot boxes, entering paid fantasy sports competitions or skin gambling, in the last 12 months were asked to answer the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001). Respondents were specifically asked to answer these questions in relation to their engagement in *traditional* gambling forms over the last 12 months. Participants were reminded that the survey was anonymous and were provided with contact details for the Gambling Helpline should they need this.

The PGSI measures risk of gambling-related problems over the last 12 months, with nine items such as “In the last 12 months, how often have you needed to gamble with larger amounts of money to get the same feeling of excitement?” Response options are “never” (0), “sometimes” (1), “most of the time” (2) and “almost always” (3). Scores are summed for a total between 0 and 27, with respondents classified as non-problem gamblers (PGSI = 0), low-risk gamblers PGSI = 1 to 2), moderate-risk gamblers (PGSI = 3 to 7) or problem gamblers (PGSI = 8 to 27). Cronbach’s alpha for this scale was .95.

Gambling-related harm: Short Gambling Harms Screen
The Short Gambling Harms Screen (Browne et al., 2017) was also asked of all respondents who had gambled on one or more traditional forms, or on the emerging forms of betting on esports, buying loot boxes, entering paid fantasy sports competitions or skin gambling, in the last 12 months. The SGHS asks whether respondents have experienced each of 10 items related to their gambling within the last 12 months, such as “felt ashamed of my gambling” or “increased credit card debt”, with response options no (0) or yes (1) for each. Scores are summed for a total between 0-10. No classification criteria are used for the SGHS, and instead scores are interpreted as a continuum of gambling-related harm, with higher scores indicating more severe harm. Cronbach’s alpha for this scale was .89.

Lifetime gambling-related problems: NODS-CLiP
Respondents who had gambled on one or more traditional and/or the emerging forms of betting on esports, buying loot boxes, entering paid fantasy sports competitions or skin gambling at any point in their life were asked about their experience of gambling-related harm in one last way: The NORD Diagnostic Screen for Gambling Disorders, relating to the loss of Control, Lying and Preoccupation (Toce-Gerstein et al., 2009). The NODS-CLiP consists of three items, all framed in relation to the respondent’s lifetime, rather than the last 12 months. These items are “Have there ever been periods lasting 2 weeks or longer when you spent a lot of time thinking about gambling experiences, or planning out future gambling ventures or bets?”, “Did you ever try to stop, cut down, or control your gambling (regardless of your success)?” and “Did you ever lie to family members, friends, or others about

how much you gambled or how much money you lost gambling?". Response options are no (0) and yes (1) for each item. A score of one or more indicates gambling-related problems at some point in the respondent's lifetime.

Age of worst gambling-related problems or harm

Any respondent who indicated gambling-related problems or harm based on the PGSI, SGHS and/or NODS-CLiP were informed that their answers indicated that they had experienced some harm or problems with gambling. They were then asked to recall the age at which their gambling-related problems or harms were at their worst (open-ended text box, validated so that their response could not be higher than their current age).

Trait impulsiveness: Barratt Impulsivity Scale - Brief version

Trait impulsiveness was measured using the Barratt Impulsiveness Scale - Brief (BIS-Brief; Steinberg et al., 2013). The BIS-Brief is an eight-item scale with items such as "I plan tasks carefully" and "I say things without thinking". Response options are rarely/never (1), occasionally (2), often (3) and almost always/always (4). Four items are positively worded (higher scores indicating higher impulsivity) and four items negatively worded (higher scores indicating lower impulsivity). The negatively worded items were reverse scored so that higher scores on all items, and the total scale, indicated higher impulsivity. Cronbach's alpha for this scale was .76.

Additional measures were captured during the survey but were not required to answer the research questions. These measures are described in Appendix I.

Data analysis

The data analysis plan was designed to answer the two research questions:

1) How are the formative gambling experiences of young adults (aged 18-24 years) in New South Wales different from the experiences of an older cohort (aged 25-29 years)?

2) What association can be made between early experiences with specific emerging technologies (e.g., social casino games, loot boxes, skins gambling, DFS, esports betting) and gambling harm?

The first research question requires comparing respondents based on age. Age could be treated as either a continuous variable or by splitting respondents into groups (18-24, 25-29). Splitting respondents into groups loses some explanatory power, but the advantage of this approach is that it allows reporting of means and proportions by group, making the results easier to interpret. Initial analyses were conducted comparing treating age as either categorical or continuous on engagement with each of the emerging forms (a key analysis), and results were largely the same (see Appendix B). Given this, age was treated as categorical in subsequent analyses. The results section below focuses on the analyses required to

answer the research questions. Additional analyses comparing the groups in terms of their demographics are reported in Appendix C.

To answer research question 1, the groups were compared in terms of their engagement with traditional and emerging forms of gambling. This includes lifetime engagement with each form (no/yes) and frequency of engagement during the last 12 months for each form (amongst those who have engaged during their lifetime). Further, these analyses include the age at which respondents first reported taking part in each activity (split into whether they first took part in each activity when under the age of 18 or not). In addition, these analyses include exposure to gambling and gambling-related problems during childhood by parents or other adults in the household. Analyses were also considered for expenditure during the last 12 months, but they largely reflected the results for frequency of engagement within the last 12 months. Statistical comparisons between the groups consist of chi-square tests of independence for categorical variables, with pairwise tests of proportions for variables with more than two levels, and independent samples t-tests for continuous variables (or Welch t-tests, which are robust to unequal variances between the groups).

For research question 2, general linear model analyses were conducted to determine associations between lifetime gambling-related harm (using NODS-CLiP as a proxy measure for lifetime harm) and recent gambling-related harm (using PGSI as a proxy for gambling-related harm), with engagement in each of the eleven emerging forms used in this study. Engagement with each form was considered both in terms of lifetime engagement, frequency of engagement during the last 12 months, and whether respondents had first used each form while under the age of 18. We also considered interactions between engagement and age, which are reported in Appendix G. Further, we considered the Short Gambling Harms Screen (SGHS), as this scale measures harm. However, given that the SGHS and the PGSI are highly correlated, we opted to report the PGSI in these analyses.

All questions were compulsory for survey completion, and respondents who had not answered a question on a page of the survey could not move to the next page. This is because non-compulsory questions often result in unanswered questions, which may either indicate refusal to answer the question, or simply missing the question. Questions that were potentially sensitive, such as income, included wording that reminded the respondent that the survey was anonymous. As such, there were no missing data for any questions, apart from questions that were not asked of certain respondents. For example, respondents who did not take part in a particular form were not asked what age they first did so. All analyses were conducted in SPSS, R, and Excel.

Justification of approach and how methods affect results

Most cross-sectional studies examine behaviour within the last 12 months. This study examines some behaviour within the last 12 months, but also takes into account previous behaviour, and particularly behaviour during adolescence. The approach requires a retrospective design, the main limitation of which is the potential impact of recall bias, or forgetting. However, we believe recall bias was minimised in the current study, because the respondents were relatively young (maximum age 29), were asked whether or not they had engaged in each form during their lifetime, and the exact age in which they first engaged with each form was considered in a broad manner (i.e., whether they were underage or not). Still, it is possible that some recall bias could have occurred, and that this may have been more the case for the older group. However, as shown below, since variables such as gambling behaviour in the last 12 months (which would not have been as affected by recall bias, and would have been affected in the same way for both groups) showed similar overall results to lifetime gambling, we believe that recall bias was minimised.

Some retrospective approaches have required participants to report each behaviour for each year of their life, which is onerous for respondents. The present approach reduced onus on respondents by asking only how old they were when they first performed each behaviour.

Normally, prospective longitudinal studies are preferred. In these studies, researchers recruit a panel of participants and survey them repeatedly over time. This approach reduces recall bias, because data are captured close to the behaviour of interest (e.g., gambling in each year). The trade-off is that such data collection methods require a much larger investment of time and money, through repeated surveys, and there will be inevitable attrition of respondents over time, which may not be random and may therefore bias results. Finally, prospective studies require researchers to identify problems almost before they are a problem. In the current study, if a prospective design has been used, we would have had to start capturing data when participants were underage, and then followed them until they were 29, meaning that results would not have been available for at least 12 years.

Apart from this somewhat novel technique, the survey employed commonly used and/or validated measures throughout. Because the retrospective data measures (age at which they first took part in each activity) only constitute a small proportion of the results, the methods in the present study are expected to have limited impact on the results. However, we note that, like all surveys, this survey is self-report and is potentially open to self-report biases and errors. Efforts were made to reduce presentation bias by reminding participants throughout the survey that their responses were anonymous, and by checking for poor quality responding.

In summary, we employed a retrospective design because it was efficient to do so. The main downside of a retrospective design is recall bias, and our research design aimed to minimise recall bias. The results indicate that these attempts were successful.

Results

Preliminary comparisons between the groups

Comparisons between the groups in terms of demographics are given in Appendix C. In general, the groups (18-24 and 25-29 year olds) were comparable in terms of main language spoken at home and gender, although a small significant difference was observed in that the older cohort were slightly more likely to be female. The older group were significantly less likely to be single/never married and more likely to be living with their partner or in a de facto relationship, married or divorced, separated or widowed. The older group also differed in terms of household composition, in that they were more likely to be living with a partner and/or with child(ren). Furthermore, the older group had significantly higher levels of education and income. These results were expected, given that marital status, household composition, education and income are related to age.

Research question 1. How are the formative gambling experiences of young adults (18-24) in New South Wales different from the experiences of an older cohort (25-29)?

Traditional forms

More than half of the respondents in each group recalled taking part at some time in their life with scratchies, lotteries, pokies and bingo. More than half of the older cohort recalled taking part in race and sports betting at some point in their life. Respondents in the older cohort recalled taking part in an average of 5.18 traditional forms during their lifetime (SD = 2.15), which was significantly higher than the number of forms for those aged 18-24 (M = 3.60, SD = 2.26), *Welch* $t(2002) = -15.88$, $p < .001$.

For all traditional forms of gambling, the older cohort of 25-29 year old respondents were significantly more likely to recall taking part both at some point in their life, and during the last 12 months, compared to the younger cohort (see Appendix E for statistical results). Older respondents were also significantly more likely to have engaged in a higher number of traditional forms (M = .88, SD = .33) during the last 12 months, compared to the younger cohort (M = .74, SD = .44), *Welch* $t(1977.08) = -7.99$, $p < .001$.

However, as indicated in Figure 3, the younger cohort were significantly more likely to recall first taking part in each traditional form of gambling while under the age of 18, except for pokies. Please see Appendix G for detailed statistical results.

Further details about differences between the groups in terms of frequency of engagement during the last 12 months and expenditure on traditional forms are given in Appendix D. Analyses about participation in the last 12 months, and recall of

first participating while underage, are based on subgroups (only those who reported gambling on that form in their lifetime). For context, the total number of participants in each group involved in these analyses are reported in Appendix K.

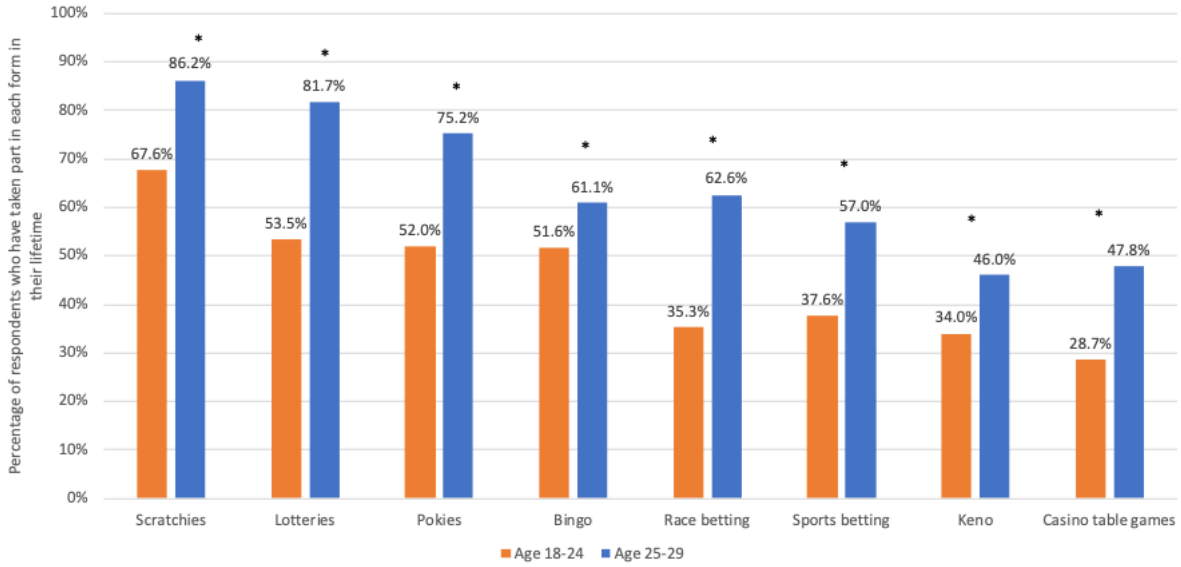

Figure 1: Lifetime participation in each traditional form by age group

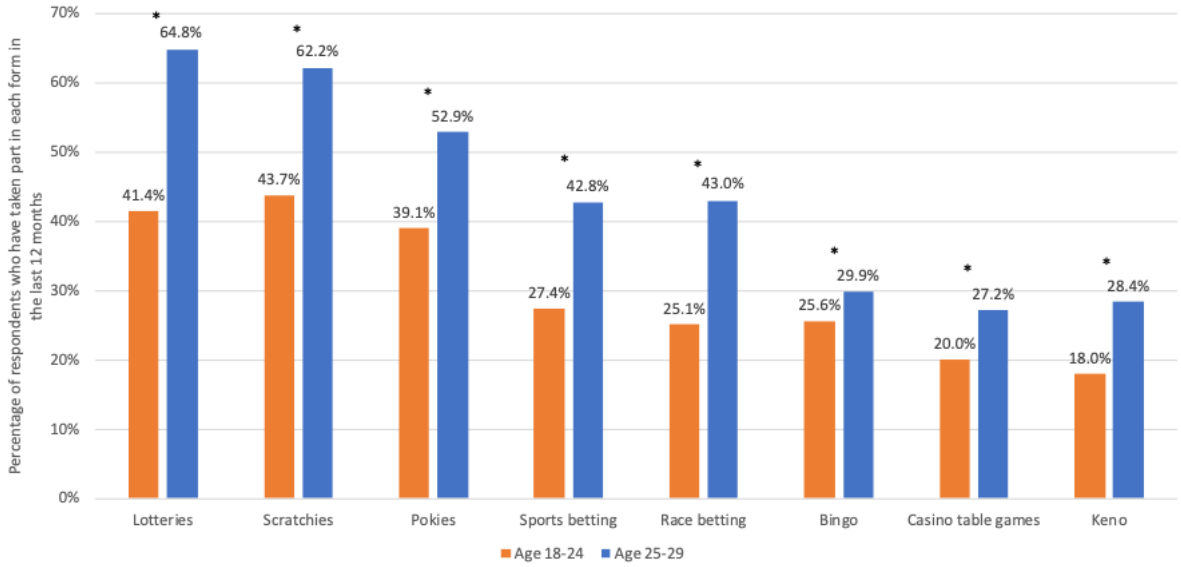

Figure 2: Last 12 months participation in each traditional form by age group

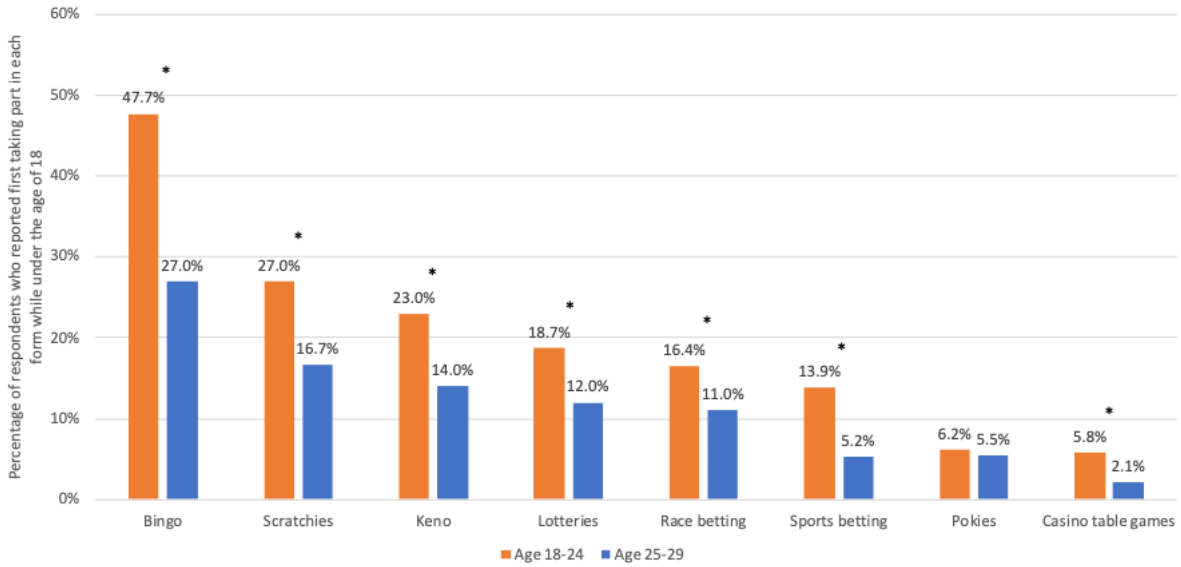

Figure 3: First participation in each traditional form while under 18 by age group

Emerging forms

While the traditional forms were more likely to be engaged in by respondents in the older cohort, most emerging forms appealed more to the younger cohort. In terms of lifetime engagement (see Figure 4), the younger cohort were significantly more likely to recall: playing video games with gambling content, opening loot boxes, playing esports, buying loot boxes, and taking part in skins gambling. However, the older cohort were significantly more likely to recall taking part in forms that involved payment, such as paying for social casino games, betting on esports and paying to play fantasy sports. Respondents aged 18-24 recalled taking part in 4.06 (*SD* = 2.83) emerging forms on average during their lifetime, which was significantly higher than the 3.79 (*SD* = 3.06) reported by the 25-29 year old respondents, *Welch* $t(1882.87) = 2.00$, $p = .046$.

The results for engagement over the last 12 months were largely similar. The younger cohort were significantly more likely to take part in opening loot boxes, playing video games with gambling content, playing esports and buying loot boxes. The older cohort were significantly more likely to pay to play fantasy sports. Overall, the younger cohort reported taking part in a higher number of forms ($M = .76$, $SD = .43$) compared to the older cohort ($M = .67$, $SD = .47$), *Welch* $t(1868.53) = 4.31$, $p < .001$.

The younger cohort were significantly more likely to recall first taking part in all emerging forms while under the age of 18, compared to the older cohort. See Appendix F for statistical results. Further details about differences between the groups in terms of frequency of engagement during the last 12 months and expenditure on traditional forms are given in Appendix D.

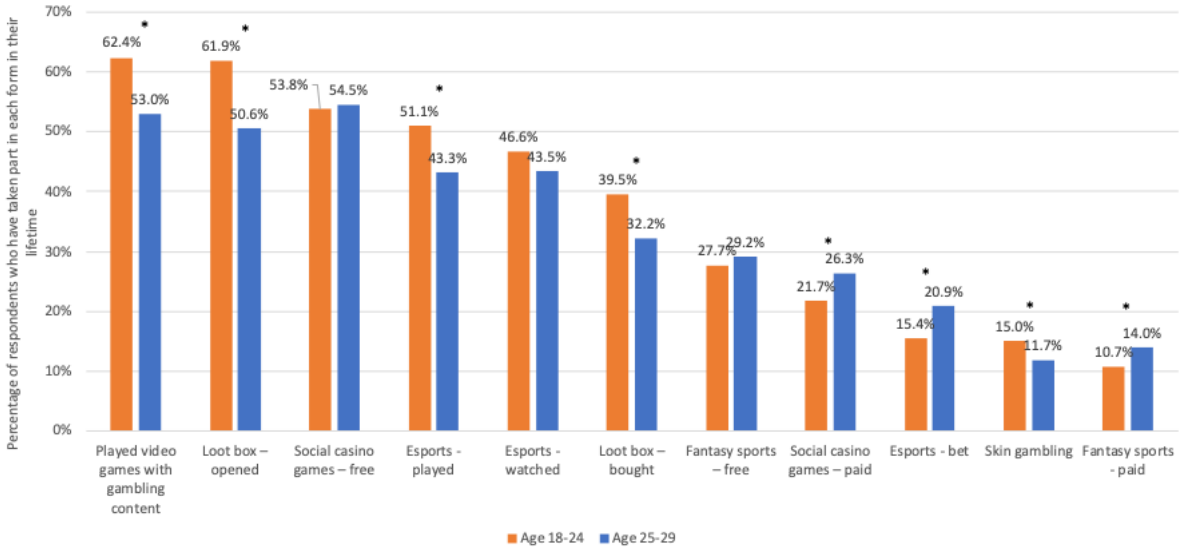

Figure 4: Lifetime participation in each emerging form by age group

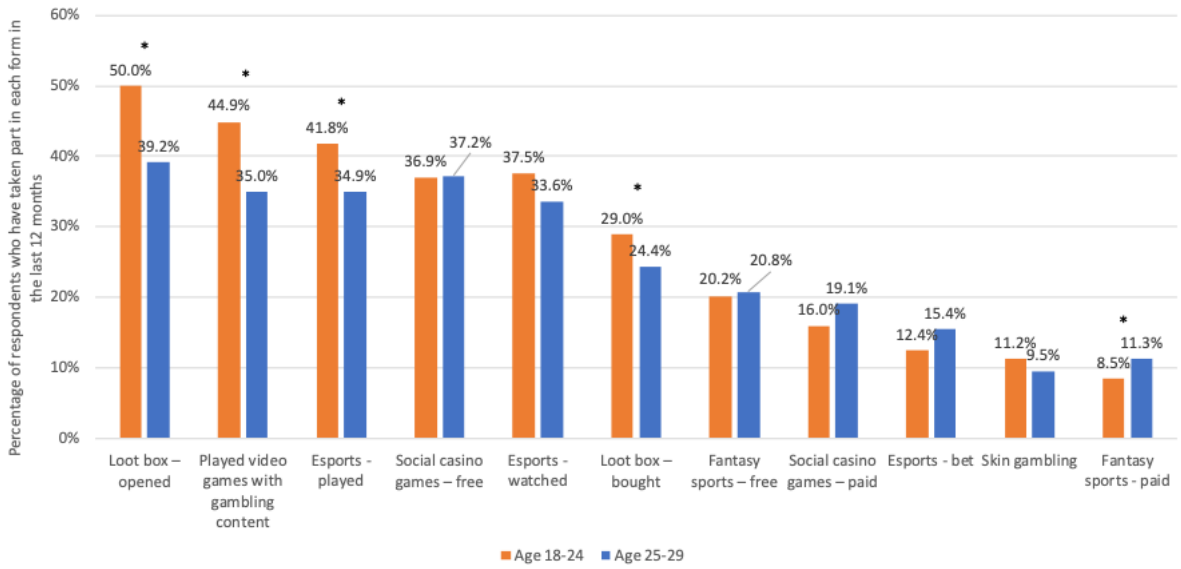

Figure 5: Last 12 months participation in each emerging form by age group

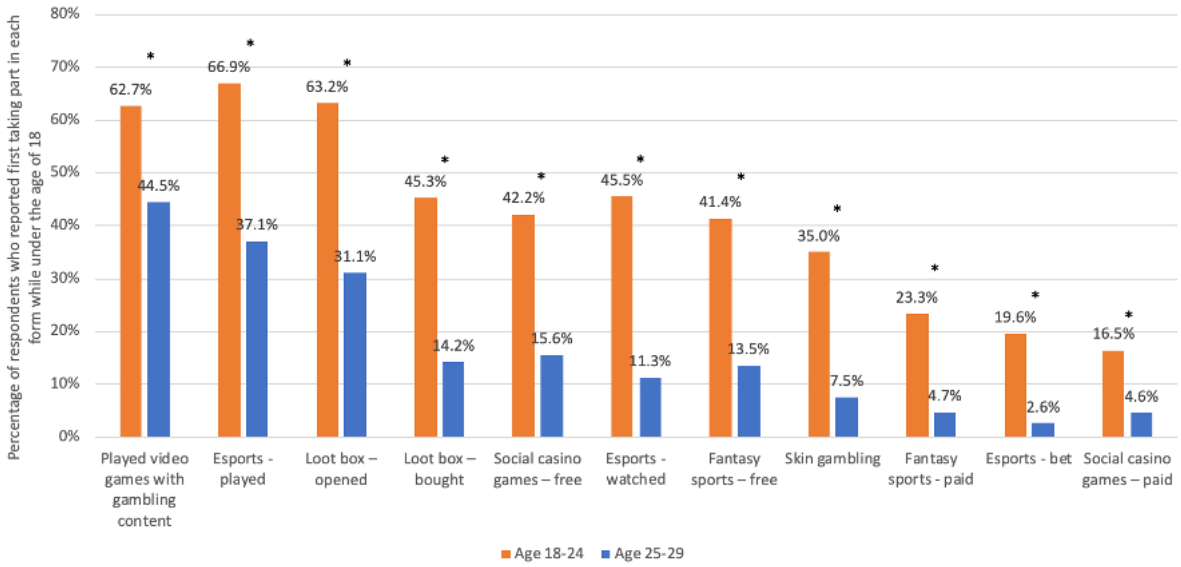

Figure 6: First participation in each emerging form while under 18 by age group

Recalled exposure to gambling through childhood and adolescence

Respondents in the older cohort (25-29) were significantly more likely to recall exposure to gambling through their parents or other adults in their household while growing up, either by gambling with them, accompanying their parents when they gambled, or gambling with their parents. Those in the older cohort were also significantly more likely to recall that adults in the household in which they grew up experienced at least mild gambling difficulties (see Figures 7-10 below). Inferential statistics are reported in Appendix F.

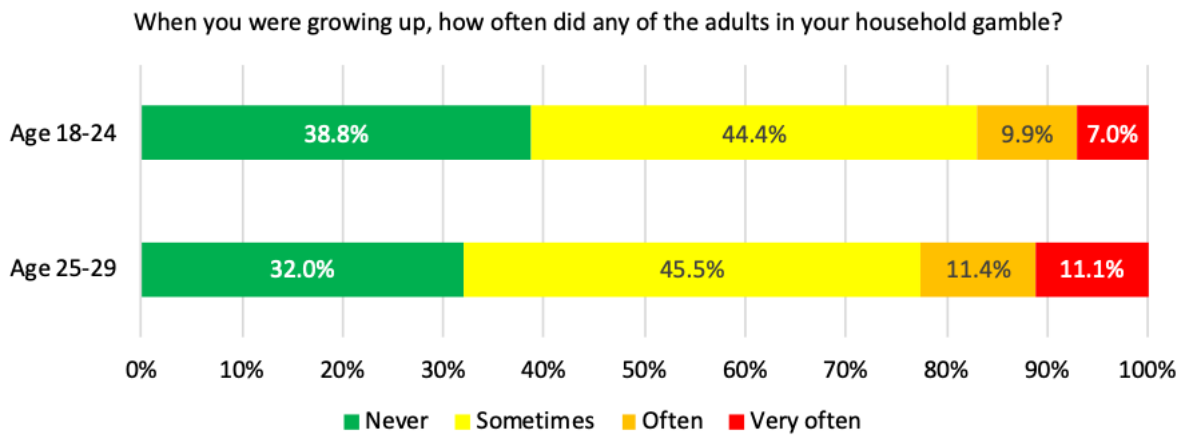

Figure 7: Frequency of adults gambling in the house while growing up, by age group

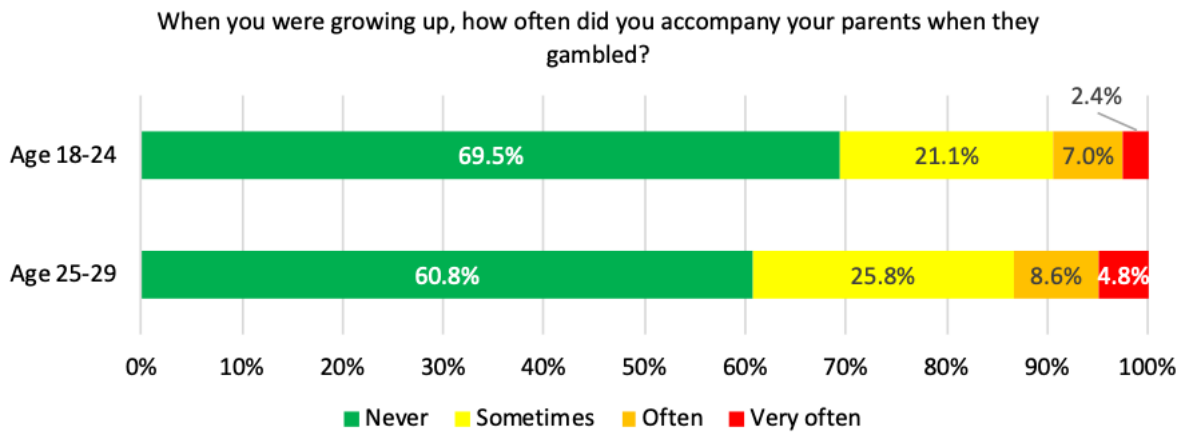

Figure 8: Frequency of accompanying parents when they gambled while growing up, by age group

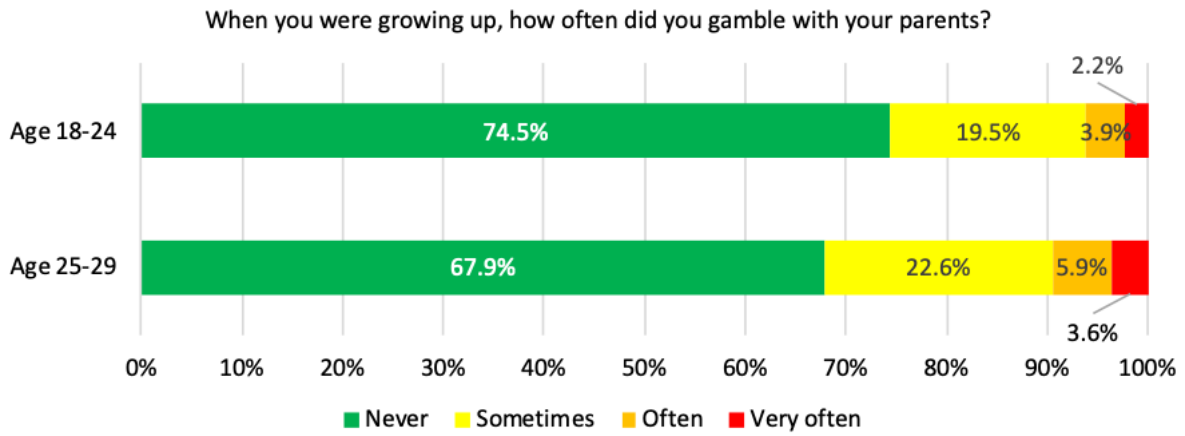

Figure 9: Frequency of gambling with parents when growing up, by age group

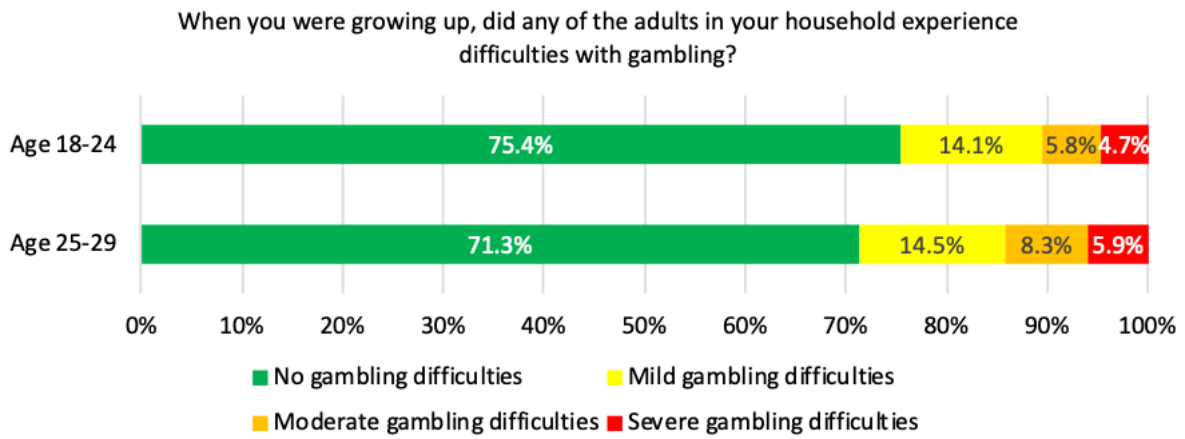

Figure 10: Severity of gambling problems amongst adults in the household while growing up, by age group

Research Question 2. What association can be made between early experiences with specific emerging technologies (e.g., social casino games, loot boxes, skin gambling, DFS, esports betting) and gambling harm?

Before answering this research question, it was necessary to compare the groups in terms of their scores on the PGSI and the NODS-CLiP. The older cohort was significantly more likely to be classified as a problem gambler based on the PGSI and significantly less likely to be classified as a non-problem or low-risk gambler, compared to the younger cohort, with no significant difference for the moderate-risk category. In the 18-24 cohort, 499 respondents were classified as non-problem gamblers, 194 as low-risk, 144 as moderate-risk and 142 as problem gamblers. For the 25-29 cohort, 393 were classified as non-problem gamblers, 140 as low-risk, 154 as moderate-risk and 185 as problem gamblers (see Figure 11 for percentages).

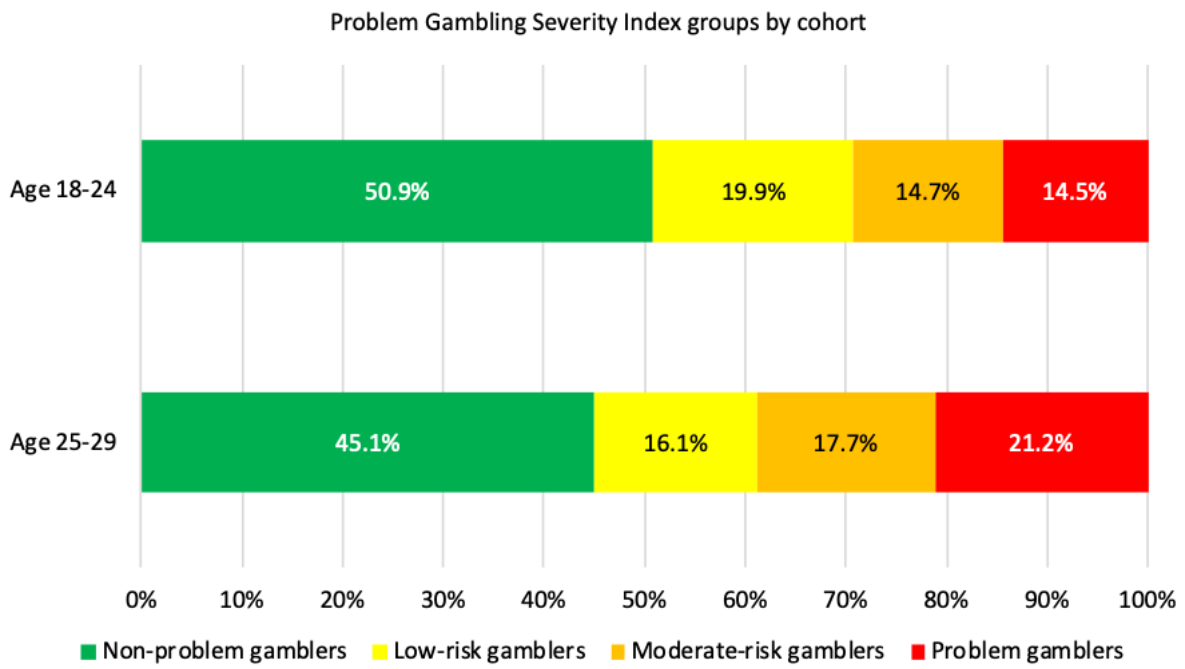

Figure 11: Problem Gambling Severity Index groups by cohort. Note: Chi-square(3,*N*=2004) = 21.39, $p < .001$, phi = .11.

In terms of lifetime harm, 384 respondents in the 18-24 cohort were classified as pathological gamblers and 596 were classified as non-pathological gamblers. In the 25-29 cohort, 357 were classified as pathological gamblers, and 515 as non-pathological gamblers. No significant differences were observed between the groups for the NODS-CLiP; lifetime harm (see Figure 12 for percentages).

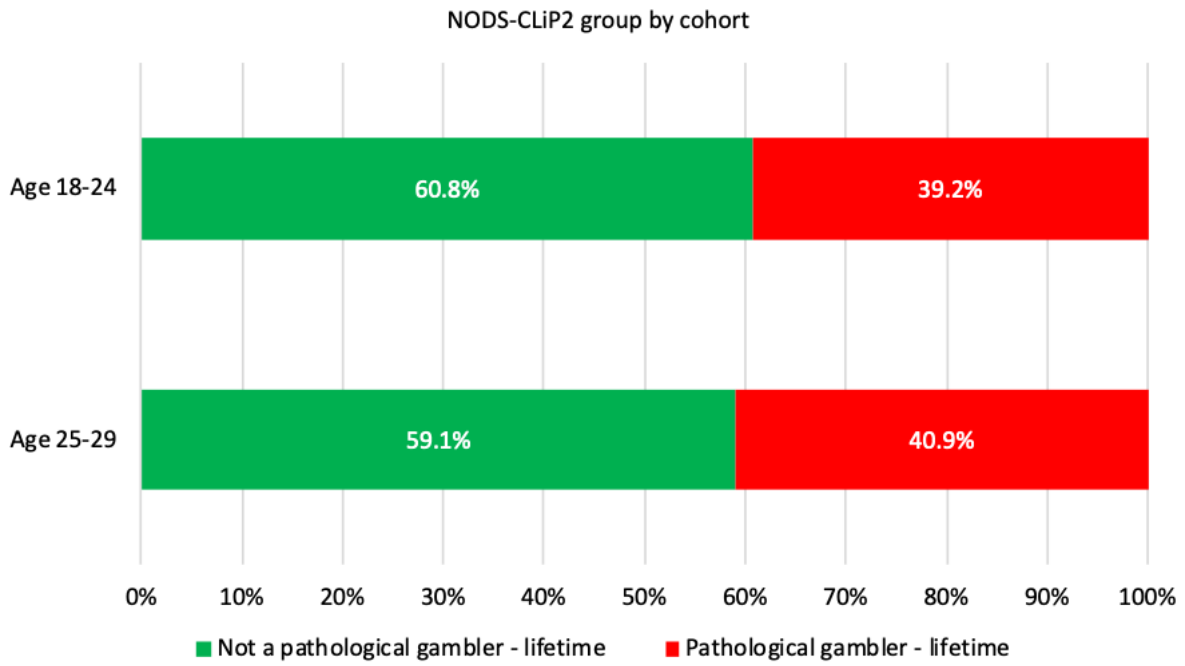

Figure 12: NODS-CLiP2 group by cohort. Note: Chi-square(1,*N*=2004) = 0.59, *p* = .441, phi = .02.

In order to answer this research question, general linear models were conducted with two dependent variables: PGSI (gambling risk severity over the last 12 months; a proxy for gambling harm) and NODS-CLiP (a proxy measure of gambling harm during the lifetime). Please see below for a description of alternative analysis methods for this question, which generally found the same results as the present analyses. Engagement in each emerging form of gambling was considered as an independent variable in three ways: lifetime use of each emerging form (no vs yes), frequency of use of each emerging form during the last 12 months (never during the last 12 months to 4 or more times per week), and whether the respondent recalled first using each form while under the age of 18 (no vs yes). A positive coefficient indicates that gambling-related harm is associated with: using that form at some time during the lifetime, using the form more frequently during the last 12 months, and recalling first using the form while underage.

As indicated by Table 2, both lifetime use and more frequent use in the last 12 months was associated with gambling-related harm during the last 12 months for all eleven emerging forms, including merely playing video games that contain gambling-related content. However, recall of first using the form while under the age of 18 was not associated with gambling-related harm during the last 12 months for any forms. In fact, NOT recalling using the form until aged 18 or older was associated with gambling-related harm for seven of the eleven forms: playing video games with gambling content, playing or watching esports, opening or buying loot boxes, entering free fantasy sports competitions, and skin gambling.

Table 3 considers the same relationships, but with a measure of gambling harm during the lifetime. Once again, lifetime use and frequency of use during the last 12 months was associated with lifetime gambling-related harm for every form. However, recall of first using the form while underage was not associated with gambling-related harm for any form, and first using video games with gambling-related content after turning 18 was associated with lifetime gambling-related harm.

It may seem counterintuitive that the associations with harm for the recall of underage use variable were statistically significant for the last 12 months measure, but not the lifetime measure. This may be due to the sensitivity of the proxy harm measures. The PGSI consists of nine items, while the NODS-CLiP only consists of three items with a smaller response scale. As such, the NODS-CLiP may be less sensitive.

A separate set of analyses was also conducted, which also took into account the age of the respondents. These results are presented in Appendix G. These analyses also considered interactions between engagement in each form, and the age of the respondent, which indicate whether the relationship between engagement in each form and gambling-related harm is different for the different age groups. As indicated in Appendix G, only two such interactions were statistically significant, indicating that frequency of watching esports and of buying loot boxes during the last 12 months was more strongly associated with gambling-related harm in the last 12 months for the older cohort (25-29 year olds).

We also considered these associations while controlling for age, impulsivity and the number of traditional forms on which they bet. As can be seen in Appendix H, the findings were once again similar for lifetime use and last 12 months frequency of use of each emerging form and both the PGSI and the NODS-CLiP. That is, these associations remain significant when controlling for traditional gambling.

Finally, we also considered a version of the results for Table 2 using nonparametric analyses, specifically Spearman correlations. These are reported in Appendix J, and once again the pattern of statistically significant and non-significant results, and their directions, were identical to the results in Table 2. The consistency of results across the analysis variations indicate their robustness.

Table 2: Associations between use of each emerging form and gambling-related harm in the last 12 months.

	Lifetime use (no vs yes)	Last 12 months frequency (higher score more frequent use)	First used while under 18 (no vs yes)
Video games with gambling content	**0.347*** (0.252, 0.443)**	**0.153*** (0.120, 0.187)**	**-0.387* (-0.512, -0.262)****
Esports - play	**0.412*** (0.319, 0.505)**	**0.080*** (0.047, 0.113)**	**-0.328*** (-0.468, -0.188)**
Esports - watch	**0.451*** (0.358, 0.544)**	**0.160*** (0.121, 0.198)**	**-0.273*** (-0.428, -0.117)**
Esports - bet	**0.837*** (0.723, 0.950)**	**0.194*** (0.132, 0.255)**	0.086 (-0.290, 0.461)
Loot box - open	**0.223*** (0.128, 0.319)**	**0.073*** (0.042, 0.105)**	**-0.227*** (-0.354, -0.101)**
Loot box - buy	**0.364*** (0.268, 0.460)**	**0.190*** (0.145, 0.234)**	**-0.214* (-0.383, -0.046)**
Fantasy sports - free	**0.576*** (0.475, 0.676)**	**0.177*** (0.128, 0.226)**	**-0.306** (-0.513, -0.099)**
Fantasy sports - paid	**0.926*** (0.792, 1.060)**	**0.194*** (0.118, 0.269)**	0.186 (-0.233, 0.604)
Skin gambling	**0.884*** (0.756, 1.013)**	**0.231*** (0.165, 0.297)**	**-0.319* (-0.634, -0.004)**
Social casino games - free	**0.418*** (0.324, 0.512)**	**0.217*** (0.183, 0.251)**	**-0.225** (-0.363, -0.088)**
Social casino games - paid	**0.860*** (0.758, 0.961)**	**0.243*** (0.191, 0.294)**	-0.052 (-0.386, 0.281)

Note: Bold text indicates that a statistically significant difference was observed.

Table 3: Associations between use of each emerging form and gambling-related harm during the lifetime.

	Lifetime use (no vs yes)	Last 12 months frequency (higher score more frequent use)	First used while under 18 (no vs yes)
Video games with gambling content	**0.617*** (0.423, 0.812)**	**0.275*** (0.205, 0.344)**	**-0.402*** (-0.641, -0.163)**
Esports - play	**0.783*** (0.593, 0.973)**	**0.120*** (0.058, 0.182)**	-0.185 (-0.447, 0.077)
Esports - watch	**0.851*** (0.661, 1.041)**	**0.250*** (0.171, 0.328)**	0.013 (-0.279, 0.304)
Esports - bet	**1.010*** (0.773, 1.246)**	**0.309*** (0.173, 0.445)**	0.282 (-0.424, 0.988)
Loot box - open	**0.569*** (0.377, 0.761)**	**0.142*** (0.081, 0.202)**	-0.074 (-0.315, 0.167)
Loot box - buy	**0.582*** (0.392, 0.773)**	**0.324*** (0.230, 0.418)**	-0.102 (-0.413, 0.209)
Fantasy sports - free	**0.846*** (0.642, 1.049)**	**0.164*** (0.068, 0.260)**	0.130 (-0.244, 0.505)
Fantasy sports - paid	**0.931*** (0.656, 1.206)**	**0.158* (0.011, 0.305)**	0.498 (-0.293, 1.289)
Skin gambling	**1.121*** (0.853, 1.389)**	**0.305*** (0.158, 0.452)**	-0.441 (-1.008, 0.127)
Social casino games - free	**0.816*** (0.622, 1.011)**	**0.269*** (0.195, 0.344)**	-0.089 (-0.353, 0.176)
Social casino games - paid	**1.096*** (0.881, 1.311)**	**0.342*** (0.223, 0.462)**	-0.028 (-0.630, 0.574)

Note: Bold text indicates that a statistically significant difference was observed

Summary

- The older cohort (25-29) was more likely to have taken part in each traditional form of gambling in the last 12 months, and based on recall over their lifetime.
- The younger cohort (18-24) was more likely to have taken part in most emerging forms of gambling and simulated gambling, apart from forms that involve expenditure (paid social casino games, paid fantasy sports, betting on esports).
- The younger cohort was more likely to recall first taking part in each traditional form while under the age of 18.
- The younger cohort was also more likely to recall first taking part in each emerging form while under the age of 18.
- The older cohort was more likely to recall being exposed to gambling via adults in their household, including parents, although the younger cohort still recalled being exposed to gambling in this way.
- Recalled lifetime use and frequency of engagement during the last 12 months were associated with lifetime and recent gambling-related harm, for all of the eleven emerging forms.
- Those who recalled first engaging in each emerging form while underage were not significantly more likely to have experienced gambling related harm. Those who recalled first engaging while over the age of 18 were significantly more likely to have experienced harm in the last 12 months.
- The associations between each emerging form and harm remained statistically significant when controlling for age, impulsivity and engagement in traditional forms of gambling, and using nonparametric analyses, indicating robust effects.

Discussion

This research project explored the potential for harm associated with emerging gambling products. The landscape of gambling involvement has changed over the past decade. Young adults (18-24) have been exposed to newer forms of gambling and simulated gambling and recall having had relatively greater exposure to traditional gambling games in adolescence through their access to online forms. The culture and product landscape that they have experienced in adolescence are linked to their unique current experiences in product use, gambling problems and gambling harm.

The current study focused on two cohorts of early adults, including a younger cohort of 18-24 year-olds and an older cohort of 25-29 year-olds. Although this exact division is somewhat arbitrary, it served as a useful device to explore recent changes in the gambling environment and its consequences for gambling involvement and harm. The same results generally held when treating age as a continuous variable, negating concerns about the use of a somewhat arbitrary age split.

Research Question 1: How are the formative gambling experiences of young adults (aged 18-24) in New South Wales different from the experiences of an older cohort (aged 25-29)?"

The first research question focused on how these cohorts differ in terms of their gambling experiences. For *traditional* forms of gambling, the younger cohort (18-24) were less likely to recall engaging in each form, either in their lifetime or in the last 12 months, compared to the older cohort (25-29). This finding parallels the more general observation of declining adult involvement in most traditional forms of gambling in New South Wales and nationwide (Browne, Rockloff, et al., 2019), and further suggests that this decline in participation may have a generational component. Nevertheless, the younger cohort of gamblers generally recalled having more of their *first* experiences with traditional gambling while under the legal age of 18. This potentially reflects their greater exposure to online versions of these products, increased advertising, and the normalisation of gambling. Surprisingly, however, these first experiences did not translate into greater involvement in these same forms during adulthood. This may reflect experimentation with these products during adolescence, which is not necessarily sustained into adulthood.

In contrast, most *emerging* forms were more popular amongst the younger cohort, both in the last 12 months and over their lifetime. Most of these forms appeal to youth, and are not restricted amongst those who are under 18 years of age. This finding suggests that the landscape of gambling is changing, by degrees, to incorporate young people's interest in these newer forms, and potentially to the exclusion of the older traditional forms. We tentatively suggest that some newer

types of gambling are supplanting traditional forms and thereby creating a new and emerging marketplace of games that are appealing to these younger customers.

However, some emerging forms were more popular amongst the older cohort, specifically betting on esports, paying to play social casino games, and paying to play fantasy sports. These products all differ from the forms that were more popular amongst the younger cohort in that they cost money to play, indicating price sensitivity amongst younger people. The forms that were more popular amongst the younger cohort are often free to play, but usually have a paid counterpart (King, 2018; Zendle, Ballou, et al., 2019). For example, loot boxes may be earned during a game, but can also be obtained through payment. Initial experience of a free version of these products may pave the way for later expenditure on that form, and similar concerns have been raised about practice versions of gambling games (Gainsbury, King, Delfabbro, et al., 2015). However, these free emerging forms are far more popular than practice gambling forms, particularly amongst youth, because they exist in places that young people frequent, such as video games (King, 2018). That the younger cohort were more likely to recall first engaging in these forms when under 18 compared to the older cohort further reflects the increasing appeal of these emerging forms to a younger audience. This also raises the point that some of these forms are not regulated, because they do not constitute gambling, or are poorly regulated, such as skin gambling on offshore sites. Thus, underage people can legally play most of these forms, including free-to-play options. This may normalise gambling through exposure to gambling mechanisms and themes. The fact that some of these forms are initially free to play does not necessarily mean that they cannot cause harm.

Emerging forms feature important structural differences to many traditional forms. Traditional forms of gambling can be solitary pursuits (Hing et al., 2015). However, many of these emerging forms include social elements that may provide a sense of community, or an opportunity to compete against each other, earning social recognition in the process (Griffiths & Parke, 2002). While parental influences have generally been seen as key risk factors for gambling behaviour and harm, these appear to be lower for younger people. However, the decreasing risk from exposure to gambling through parents could be replaced by exposure to gambling and simulated gambling through social connections, such as friends. Associating with people who gamble is a risk factor for gambling-related harm, particularly if gambling is a part of socialising with that person (Russell, Langham, et al., 2018). Because many of these emerging forms involve social elements, such as playing video games together, social influences are likely to be key drivers of uptake of emerging forms amongst youth going forward.

It is difficult to estimate if this trend of reduced consumption of traditional forms, but increased consumption of emerging forms, by the younger cohort, represents a net

positive or negative with respect to gambling problems and harm in the long run. While the younger group (18-24 yrs-old) had substantially fewer problem gamblers (14.5% estimated) than the older group (25-29 yrs-old, 21.2%), harm can take time to develop, and older people have had more time to experience harm from their gambling. Since financial losses are the core component of gambling problems, substitute products that cost less could help reduce subsequent gambling harm. Caution is warranted, though, because it has been found that engagement in these games is linked to gambling behaviour (Rockloff et al., 2018). Furthermore, each of the emerging forms has been found to be linked to harm, both in this study and elsewhere, indicating that in their present form, and with present regulations, they may not be benign.

It is important to recognise that younger gamblers are generally less established in their careers and thus their relatively greater involvement in the new low-cost gambling options may reflect their weaker finances. Nevertheless, past research has generally shown younger gamblers, and particularly young men, to be the most prone to developing severe gambling problems. The opposite was the case within this particular sample, although this is likely to be a product of the narrowness of the age range, and samples across a broader age range will still likely find that younger people are more at risk from harm. However, it is possible that the availability of new gambling and gambling-like entertainment products are substitutes that save people from greater financial losses. More importantly, the results suggest that younger adults in New South Wales are demonstrating a lower risk profile in terms of gambling problems and their involvement in the most risky forms of traditional gambling such as EGMs, casino games, and wagering.

In summary, in answer to research question 1, the results indicate that younger people are more likely to try traditional gambling products while underage, but less likely to maintain this into adulthood. In contrast, younger people are more likely to take part in emerging forms of gambling, except for forms that require money to play.

Research Question 2. What association can be made between early childhood experiences with specific emerging technologies (e.g., social casino games, loot boxes, skins gambling, DFS, esports betting) and gambling harm?

The study found that all forms of gambling, both traditional and emerging, were associated with gambling harm, both within the last 12 months, and at some point in the lifetime. These effects were robust, even when controlling for age, impulsivity and level of engagement in traditional forms, or when using nonparametric analyses. This contrasts with other previous research which found that associations between esports betting and problem gambling were no longer significant when controlling for other types of gambling (Gainsbury et al., 2019). This is true even for forms that do

not constitute gambling, since nothing of value can be put at stake. However, most of these emerging forms constitute *exposure* to gambling-related concepts. Thus, while it is promising that youth are engaging less in traditional forms, these emerging forms as they currently exist may not be the best substitute. It is important to understand what it is about these forms that becomes addictive and harmful (King et al., 2019), just as we know what it is about EGMs that make them addictive.

Importantly, the association between these emerging forms and gambling harm appears to depend on when first engagement occurs. One of the main goals of the project, as outlined in the second research question, was to examine if adolescent involvement in the newer emerging forms of gambling and simulated gambling is predictive of greater current gambling problems in adulthood. Surprisingly, the results suggest just the opposite. People who recall being involved with emerging forms in adolescence were less likely to have current gambling problems in relation to people who first tried these games as adults. There are at least two obvious explanations for this novel finding. First, as noted previously, these generally lower-cost emerging gambling options might be effective substitutes to traditional gambling that help limit financial losses. Second, the causal flow might be opposite to what had been assumed. People who are involved in traditional gambling as adults may seek out new types of gambling where they otherwise would not have been interested in, and are harmed by their greater involvement in the use of both traditional and emerging products. It is tempting to suggest that adolescents should be encouraged to take part in these forms during adolescence, to reduce harms. However, there are concerns beyond gambling-related harm, including gaming-related harm (King, 2018). Thus it is important to consider not just how these emerging forms might be regulated, but also whether the current version of emerging forms could be modified to reduce harm, such as limits on microtransactions in games, and age restrictions on certain forms of loot boxes. Similarly, social casino games could be regulated so that they more closely resemble their traditional gambling counterparts, including factors such as return-to-player percentages, so as not to mislead consumers.

Crucially, the associations between emerging forms and harm remain statistically significant when controlling for factors such as age, impulsivity and engagement in traditional forms, and when using nonparametric analyses. That is, engagement in these forms accounts for unique variance in gambling harm beyond engagement in traditional forms.

Therefore, the landscape of gambling is changing in Australia, particularly amongst youth. However, the apparent substitution of emerging forms for traditional forms are likely to come with their own harms. It is crucial that we study more about these forms to understand what it is that makes them addictive, and how they can be better regulated, to minimise this harm.

COVID-19

During the COVID-19 pandemic, the gambling landscape in Australia changed even further. During lockdowns (late March to late May, 2020), there were very few sports to bet on, and venues were closed, meaning that most traditional forms of gambling were not available, or were difficult to obtain given that most people were instructed to stay at home as much as possible.

There was a surge in purchasing of games consoles and games during this time, as people in New South Wales and Australia looked for things to do to pass the time (Dring, 2020). Because many of the more popular emerging forms of gambling are related to video games, this meant that people may have been more exposed to these forms as they played more, or may have been exposed for the first time. With increased interest in the games themselves, there may also have been subsequent interest in gambling and simulated gambling activities related to these games, such as esports betting. With few legal domestic gambling activities available, people in New South Wales may have looked to bet offshore, both on traditional forms that are not available in Australia, such as online poker, and on emerging forms, such as skin gambling.

Because many traditional forms of gambling were unavailable, or access was limited, it might be expected that gambling-related harm could decrease during this time. However, the increase in engagement with these emerging forms may have partially offset this expected decrease in harm, since these forms are all associated with gambling-related harm. However, these comments are somewhat speculative, and are intended to guide potential future research in this area.

Limitations

It is important to recognise that the sample is not population representative, and samples a narrow set of persons interested in completing these online surveys. Consequently, these participants were more computer-literate and likely to be more interested in gambling that is offered online than other young adults in New South Wales. This could influence the prevalence of answers for the emerging products, since many of these involve betting online. Nevertheless, the analyses principally compared two groups, 18-24 year olds and 25-29 year olds, and this potential for this type of bias presumably affected both groups equally.

In interpreting the results, it is important to recognise the inherent limitations in comparing different cohorts. There is a host of underlying differences in life experience for these two age-groups, including many differences that were not measured. Advertising around gambling, school education, and media campaigns can all influence people's exposure to gambling and emerging products. Thus, the exact reasons for why the youngest cohort had less engagement with traditional

gambling and fewer gambling-related problems cannot be confidently attributed to just their exposure to emerging products and/or lower exposure to gambling through adults in their household. There may be other, as yet unexplored, influences that contributed to the differences in gambling experiences between these two sets of young adults. However, the important findings, such as links between emerging forms and harm, held despite controlling for age and other factors, or using nonparametric approaches. As such, the present results appear to be robust.

It is important to recognise the potential issue of recall bias. Participants were asked to reflect back on their life and recall which types of gambling they had engaged in, and when they first started. For the older cohort, this meant reflecting back over a longer period compared to the younger cohort, and thus forgetting may have been more prominent for the older group. This is likely to have had the biggest effect in terms of the age at which they first took part in each form, and the age at when their problems were the worst, although it may have had a smaller impact on lifetime gambling questions too. We note that lifetime gambling results generally lined up with gambling results from the last 12 months, and as such think that there is little evidence of recall bias here. However, the results for the age at which they first took part may be more impacted by recall bias for the older cohort vs the younger cohort. As such, the underage gambling results, and early exposure results, should be treated with a degree of caution. We also note that, had we opted to do a prospective longitudinal design starting this year, we would not have had results for another 11 years, the cost would have been far more expensive, the time commitment for researchers and participants would have been far higher, and in 11 years, there would likely be other new products that were not included from the start of the study. We therefore believe that the retrospective approach is appropriate for this particular study, but note that some results (particularly underage gambling) may be somewhat impacted by recall bias.

Gambling harm takes time to emerge, and some of these emerging forms are relatively new, so the full extent of the association between each form and harm may not be known from the present data. However, this is likely to lead to an underestimate of the relationship. As such, it will be important to continue to study associations between these forms and harm going forward, especially given interruptions due to COVID-19.

Finally, it is always difficult to infer causation in studies such as this. To determine causation, it would be necessary to conduct an experiment, where people are randomly allocated to play these forms or not, and then measure subsequent differences in harm. This would be unethical, but also impossible given the widespread popularity of some of these emerging forms.

Conclusions

It is encouraging to see that younger people appear to be less involved in traditional forms of gambling. However, they appear to be more involved in free-to-play emerging forms of gambling. While this might seem like a good thing, each of these emerging forms has been linked to harm in the present study, including when controlling for engagement in traditional forms. As such, our conclusions are that emerging forms are not benign, and that interest in them amongst youth, instead of traditional forms, may not be ideal. Since these forms change quickly, it will be important to study them going forward. Because the emerging forms differ in how they are currently regulated, and how they operate, it will be necessary to examine each on a form-by-form basis to determine appropriate courses of action.

Appendix A - Information sheet and survey instrument

Information sheet
The changing landscape of gambling

Project Team: Dr Alex Russell (Chief Investigator), Professor Matthew Rockloff, Nancy Greer, Professor Nerilee Hing, A/Professor Matthew Browne and Tess Armstrong.

INFORMATION SHEET
Thanks for your interest in this project examining the behaviour of individuals in relation to gambling and gambling-like games. It is funded by the New South Wales Office of Responsible Gambling and conducted by Central Queensland University.

What you will be asked to do
Participation requires completing an online survey which should take no more than 20 minutes.

We will ask you some questions about yourself and any gambling or gaming activities that you have done, either in the last 12 months or your lifetime. We will also ask about any exposure to gambling during childhood and adolescence, and any problems or harms arising from your gaming or gambling.

How your confidentiality will be protected
Your survey responses will be completely anonymous, and we will not ask for your name or any identifying information. Your responses will be combined with hundreds of other survey participants so no one will be able to tell what your individual answers were.

The anonymous data will be kept securely by CQUniversity for potential further analysis. In accordance with the Productivity Commission's recommendations to improve research into gambling, the de-identified data (the data collected without any way of identifying you) will be data warehoused and may be used by other researchers in the future. These researchers would need to supply an appropriate research proposal and have obtained approval from the Human Research Ethics Committee before access to the de-identified data would be given.

Participation will not prejudice you in any way
Please be advised that your participation in this study is completely voluntary. Should you wish to withdraw at any stage you are free to do so without prejudice or penalty.

How you will receive feedback

This research is being conducted for CQUniversity. We will publicise our aggregated findings at facebook.com/cquegrl

Where you can get further information
Should you require any further information or have some questions about participation, or any broader queries or concerns about the research, please do not hesitate to contact the Chief Investigator (Dr Alex Russell) on a.m.russell@cqu.edu.au . You are also welcome to contact the Ethics and Compliance Officer at the Office of Research on +61 7 4923 2603.

Some of the questions may be sensitive in nature. The details for relevant helplines will be displayed on any pages involving sensitive questions.

If you would like to participate, you will be asked to indicate that you have read and understood this information by checking the acknowledgement accompanying the consent form. You will then be asked some questions to determine your eligibility and, if selected, you can then take part in our online survey.

Consent page
*I consent to participation in this research project and agree that:

1. I have read and understood the Information Sheet that describes this study
2. Any questions I had about the project were answered by either the Information Sheet or the researchers
3. I understand I have the right to withdraw from the survey at any time
4. The research findings, which will not identify me, will be included in the researchers' publication(s) on the project which may include conference presentations and research articles as well as any other media described in the Information Sheet
5. To protect my privacy, my name will not be used in publication(s)
6. I am providing informed consent to participate in this project
7. I am 18 years of age or over

(Yes, no) - Screen out if no

Screeners:

What is your current age? (Please enter numerals only)

(Text box, validation 0-100)

- Screen out if under 18, or older than 29
- (Soft quota, no more than 60% 18-24 or 25-29)

What is your gender?

- Male, female, other
- (Soft quota on gender, no more than 60% male or female)

What is the postcode of your primary residence? (Text box, AU Postcode verification)

- Screen out if not in NSW (postcodes 1000—1999 *(LVRs and PO Boxes only),* 2000—2599, 2619—2899, 2921—2999)

Have you done any of the following **for money at any time in your life**?

	No	Yes
Bought lottery tickets		
Bought instant scratch tickets		
Played the pokies		*
Bet on a sporting event		*
Bet on a racing event		*
Played bingo		*
Played keno		*
Played casino table games		*

Note: Considered a traditional gambler if yes for any of those marked with *

(One more over the page)

Have you done any of the following **at any time in your life**?
Note: If you are unsure of the answer to any, or don't know what the question refers to, please select "No"

	No	Yes
Played a video game which is also an esport		
Watched an esports event (either online or in person)		
Bet on an esports event		*
Opened a loot box that you earned during a game		
Bought a loot box with real money or via virtual currency that you purchased with real money		*
Entered into a **free** fantasy sports or daily fantasy sports competition		
Entered into a **paid** fantasy sports or daily fantasy sports competition		*
Gambled using skins or skin deposits for currency		*
Played gambling-like games (e.g., simulated pokies, poker, roulette) **for free** via an app or on social networking sites		
Paid to play gambling-like games (e.g., simulated pokies, poker, roulette) via an app or on social networking sites (e.g., buying an app from an app store, or paying to play through in-game purchases)		

Note: Considered a gambler on emerging forms if yes for any of those marked with *

Quota: No more than 25% who are not either a gambler on traditional forms, or on emerging forms (or both)

Demographics

What is your marital status?
(Please select one response)

- Single/never married
- Living with partner/de facto
- Married
- Divorced or separated
- Widowed

Which of these best describes your household?
(Please select one response)

- You live alone
- Single person living with children
- Living with your partner and children
- Living with your partner and not with children
- Living with your parent(s)
- Living in a group household
- Other (please specify____)

What do you estimate your personal weekly (or annual) income before taxes was last year?
(Please remember that this survey is anonymous. Please select one response)

- Negative income
- Nil income
- $1-$199 ($1-$10,399)
- $200-$299 ($10,400-$15,599)
- $300-$399 ($15,600-$20,799)
- $400-$599 ($20,800-$31,199)
- $600-$799 ($31,200-$41,599)
- $800-$999 ($41,600-$51,999)
- $1,000-$1,249 ($52,000-$64,999)
- $1,250-$1,499 ($65,000-$77,999)
- $1,500-$1,999 ($78,000-$103,999)
- $2,000 or more ($104,000 or more)

What is the highest level of education that you have completed?
(Please select one response)

- Did not complete year 12 or equivalent
- Completed year 12 or equivalent
- Completed trade or technical certificate or diploma
- Completed an undergraduate qualification
- Completed a postgraduate qualification

How old (in years) were you when you completed this highest level of education?
(Text box, accept 0 to current age)

What is the main language that you speak at home?
(Please select one response)

- English
- A language other than English

Gambling behaviour - traditional forms - last 12 months

During the last 12 months, about how often did you gamble for money on each of the following activities?
Please note that this includes gambling in land-based venues and online.
(Please select one option for each gambling form)
(Only show which forms they selected "yes" to during the screeners).

	Never in the last 12 months	Less than once a month	About once a month	2-3 times a month	About once a week	2-3 times a week	4 times or more a week
Bought lottery tickets							
Bought instant scratch tickets							
Played the pokies							
Bet on a sporting event							
Bet on a racing event							
Played bingo							
Played keno							
Played casino table games							

Have you gambled on any of these forms online (including using smartphone apps)?
(Please select one response)

- No/yes

During the last 12 months, about how much money in total, not including winnings, did you spend on each of these activities in a typical month?
(Please enter whole numbers only)

- Text box, validate for numerals, with the words “per month” afterwards

(Only show which forms they selected “yes” to during the screeners).

	Monthly expenditure
Bought lottery tickets	
Bought instant scratch tickets	
Played the pokies	
Bet on a sporting event	
Bet on a racing event	
Played bingo	
Played keno	
Played casino table games	

Gambling behaviour - traditional forms - lifetime

We would like to understand your behaviour during your entire life

How old were you when you first took part in each activity, for money? (please remember that this survey is anonymous)
And how old were you when you most recently took part in each activity, for money?
(Only show which forms they selected “yes” to during the screeners - each is a text box, accepting 0 to current age. Age last gambled must be higher than age first gambled).

	Age first gambled	Age last gambled
Bought lottery tickets		
Bought instant scratch tickets		
Played the pokies		
Bet on a sporting event		
Bet on a racing event		
Played bingo		
Played keno		
Played casino table games		

Think about the time in your life when you were most engaged in each of these activities.
How often were you taking part in each activity during this time?
(Only show which forms they selected “yes” to during the screeners).

	Less than once a month	About once a month	2-3 times a month	About once a week	2-3 times a week	4 times or more a week
Bought lottery tickets						
Bought instant scratch tickets						
Played the pokies						
Bet on a sporting event						
Bet on a racing event						
Played bingo						
Played keno						
Played casino table games						

How old were you when you were most engaged in each of these activities?
(Only show which forms they selected “yes” to during the screeners). Validate between first and last age for each.

	Age most engaged
Bought lottery tickets	
Bought instant scratch tickets	
Played the pokies	
Bet on a sporting event	
Bet on a racing event	
Played bingo	

Played keno	
Played casino table games	

Gambling behaviour - emerging forms - last 12 months

During the last 12 months, about how often did you take part in each of the following activities?

(Please select one option for each gambling form)

(Only show which forms they selected "yes" to during the screeners).

	Never in the last 12 months	Less than once a month	About once a month	2-3 times a month	About once a week	2-3 times a week	4 times or more a week
Played a video game which is also an esport							
Watched an esports event (either online or in person)							
Bet on an esports event							
Opened a loot box that you earned during a game							
Bought a loot box with real money or via virtual currency that you purchased with real money							
Entered into a **free** fantasy sports or daily fantasy sports competition							
Entered into a **paid** fantasy sports or daily fantasy sports competition							
Gambled using skins or skin deposits for currency							

Played gambling-like games (e.g., simulated pokies, poker, roulette) **for free** via an app or on social networking sites							
Paid to play gambling-like games (e.g., simulated pokies, poker, roulette) via an app or on social networking sites (e.g., buying an app from an app store, or paying to play through in-game purchases)							

During the last 12 months, about how much money in total, not including winnings, did you spend on each activity in a typical month?
(Please enter whole numbers only)

- Text box, validate for numerals, with the words “per month” afterwards

(Only show which forms they selected “yes” to during the screeners).

	Expenditure
Watched an esports event (either online or in person)	
Bet on an esports event	
Bought a loot box with real money or via virtual currency that you purchased with real money	
Entered into a **paid** fantasy sports or daily fantasy sports competition	
Gambled using skins or skin deposits for currency	
Paid to play gambling-like games (e.g., simulated pokies, poker, roulette) via an app or on social networking sites (e.g., buying an app from an app store, or paying to play through in-game purchases)	

Gambling behaviour - emerging forms - lifetime

We would like to understand your behaviour during your entire life

How old were you when you first took part in each activity? (please remember that this survey is anonymous)
And how old were you when you most recently took part in each activity?
(Only show which forms they selected "yes" to during the screeners - each is a text box, accepting 0 to current age. Age last gambled must be higher than age first gambled.)

	Age first took part	Age most recently took part
Played a video game which is also an esport		
Watched an esports event (either online or in person)		
Bet on an esports event		
Opened a loot box that you earned during a game		
Bought a loot box with real money or via virtual currency that you purchased with real money		
Entered into a **free** fantasy sports or daily fantasy sports competition		
Entered into a **paid** fantasy sports or daily fantasy sports competition		
Gambled using skins or skin deposits for currency		
Played gambling-like games (e.g., simulated pokies, poker, roulette) **for free** via an app or on social networking sites		
Paid to play gambling-like games (e.g., simulated pokies, poker, roulette) via an app or on social networking sites (e.g., buying an app from an app store, or paying to play through in-game purchases)		

Think about the time in your life when you were most engaged in each of these activities.
How often were you taking part in each activity during this time?
(Only show which forms they selected “yes” to during the screeners).

	Less than once a month	About once a month	2-3 times a month	About once a week	2-3 times a week	4 times or more a week
Played a video game which is also an esport						
Watched an esports event (either online or in person)						
Bet on an esports event						
Opened a loot box that you earned during a game						
Bought a loot box with real money or via virtual currency that you purchased with real money						
Entered into a **free** fantasy sports or daily fantasy sports competition						
Entered into a **paid** fantasy sports or daily fantasy sports competition						
Gambled using skins or skin deposits for currency						
Played gambling-like games (e.g., simulated pokies, poker, roulette) **for free** via an app or on social						

networking sites						
Paid to play gambling-like games (e.g., simulated pokies, poker, roulette) via an app or on social networking sites (e.g., buying an app from an app store, or paying to play through in-game purchases)						

How old were you when you were most engaged in each of these activities?
(Only show which forms they selected “yes” to during the screeners). Validate between first and last age for each.

	Age most engaged
Played a video game which is also an esport	
Watched an esports event (either online or in person)	
Bet on an esports event	
Opened a loot box that you earned during a game	
Bought a loot box with real money or via virtual currency that you purchased with real money	
Entered into a **free** fantasy sports or daily fantasy sports competition	
Entered into a **paid** fantasy sports or daily fantasy sports competition	
Gambled using skins or skin deposits for currency	
Played gambling-like games (e.g., simulated pokies, poker, roulette) **for free** via an app or on social networking sites	
Paid to play gambling-like games (e.g., simulated pokies, poker, roulette) via an app or on social networking sites (e.g., buying an app from an app store, or paying to play through in-game purchases)	

Childhood exposure to gambling

When you were growing up:

	Never	Sometimes	Often	Very often
How often did any of the adults in your household gamble?				
How often did you accompany your parents when they gambled?				
How often did you gamble with your parents?				

When you were growing up, did any of the adults in your household experience difficulties with gambling?

(Please select one response)

- No gambling difficulties
- Mild gambling difficulties
- Moderate gambling difficulties
- Severe gambling difficulties

PGSI - gambling-related problems last 12 months

Please answer the following questions about your gambling over the last 12 months (remember, this survey is anonymous, so please be as honest as you can).

In the last 12 months, how often:

	Never	**Sometimes**	**Most of the time**	**Almost always**
Have you needed to gamble with larger amounts of money to get the same feeling of excitement?				
Have people criticised your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?				
Have you felt that you might have a problem with gambling?				
When you gambled, did you go back another day to try to win back the money you lost?				
Has gambling caused you any health problems, including stress or anxiety?				
Have you felt guilty about the way you gamble or what happens when you gamble?				
Has your gambling caused any financial problems for you or your household?				
Have you bet more than you could really afford to lose?				
Have you borrowed money or sold anything to get money to gamble?				

Gambling-related harms to self (SGHS) - last 12 months

Considering the last 12 months, did you experience any of the following as a result of your gambling?

	No	**Yes**
Reduction of my available spending money		
Reduction of my savings		
Less spending on recreational expenses such as eating out, going to the movies or other entertainment		
Had regrets that made me feel sorry about my gambling		
Felt ashamed of my gambling		
Sold personal items		
Increased credit card debt		
Spent less time with people I care about		
Felt distressed about my gambling		
Felt like a failure		

NODS-CLIP - gambling-related problems lifetime

	No	**Yes**
Have there ever been periods lasting 2 weeks or longer when you spent a lot of time thinking about gambling experiences, or planning out future gambling ventures or bets?		
Did you ever try to stop, cut down, or control your gambling (regardless of your success)?		
Did you ever lie to family members, friends, or others about how much you gambled or how much money you lost on gambling?		

How old were you when your gambling-related problems were at their worst?

- Enter age, validate between age first gambled and current age.

Gaming harm - Petry et al's DSM-5 criteria. Need a score of 5 or more, and it must include the ninth item (as per Dan King's recommendations).

	No	**Yes**
Do you spend a lot of time thinking about games even when you are not playing, or planning when you can play next?		
Do you feel restless, irritable, moody, angry, anxious or sad when attempting to cut down or stop gaming, or when unable to play?		
Do you feel the need to play for increasing amounts of time, play more exciting games, or use more powerful equipment to get the same amount of excitement you used to get?		
Do you feel you should play less, but are unable to cut back on the amount of time you spend playing games?		
Do you lose interest in or reduce participation in other recreational activities (hobbies, meetings with friends) due to gaming?		
Do you lie to family, friends or others about how much you game, or try to keep your family or friends from knowing how much you game?		
Do you continue to play games even though you are aware of negative consequences, such as not getting enough sleep, being late to school/work, spending too much money, having arguments with others, or neglecting important duties?		
Do you game to escape from or forget about personal problems, or to relieve uncomfortable feelings such as guilt, anxiety, helplessness or depression?		
Do you risk or lose significant relationships, or job, educational or career opportunities because of gaming?		

Read each statement and mark the appropriate number on the right side of each item. Do not spend too much time on any statement. Answer quickly and honestly.

	Rarely/ never	Occasionally	Often	Almost always/ always
I plan tasks carefully				
I do things without thinking				
I don't "pay attention"				
I am self-controlled				
I concentrate easily				
I am a careful thinker				
I say things without thinking				
I act on the spur of the moment				

How satisfied are you with your life as a whole?

- (Scale from 0-10, with anchors "No satisfaction at all" for 0 and "Completely satisfied" for 10)

The next questions ask about how you have been feeling during the **past 30 days**. About how often during the **past 30 days** did you feel…

	None of the time	A little of the time	Some of the time	Most of the time	All of the time
… nervous?					
… hopeless?					
... restless or fidgety?					
… so depressed that nothing could cheer you up?					
… that everything was an effort?					
… worthless?					

Final page
Thank you very much for taking part in our survey.

If gambling is currently an issue for you, please call the Gambling Help line on 1800 858 858 or go to gamblinghelponline.org.au . Help is available 24/7 and is 100% confidential.

If some of these questions have raised issues for you, please call 13 11 14 for help.

Our findings will be publicised on our research group's Facebook page - https://www.facebook.com/cquegrl/

Thank you once again for taking part in our research. Your participation is invaluable to us.

Appendix B - Comparisons between age as continuous and categorical variables

Normally, age would be treated as a continuous variable. However, for this particular project, we were interested in comparisons between a younger and older cohort and wished to report age-based statistics (e.g., % engaged in each activity), which was not as simple when age was treated continuously. However, first it was necessary to confirm that the results were essentially the same between both versions of the age variable. Tables 4 and 5 below indicate that the pattern of statistical significance was almost identical for analyses determining the relationship between engagement in each of the eleven emerging forms, and age, whether age was treated as continuous or categorical. The only difference was for the relationship between age and engaging in paid fantasy sports, which was statistically significant when age was treated as groups, but not when treated as a continuous variable. Together, the results indicate little differences between the approaches, and as such we have opted to work with age as a categorical variable because the results will be more easily interpretable.

Table 4: Comparisons between engagement with emerging forms by age (in years) and by age group, part 1.

Form		Play video games with gambling content	Esports - play	Esports - watch	Esports - bet	Loot box - open	Loot box - buy
Age in years	Coeff	**-0.059*****	**-0.051*****	-0.020	**0.057*****	**-0.085*****	**-0.052*****
	95% CI	**(-0.084, -0.034)**	**(-0.076, -0.026)**	(-0.045, 0.005)	**(0.024, 0.089)**	**(-0.111, -0.060)**	**(-0.078, -0.027)**
Age groups	Coeff	**-0.384*****	**-0.313*****	-0.127	**0.369****	**-0.461*****	**-0.316*****
	95% CI	**(-0.563, -0.206)**	**(-0.489, -0.136)**	(-0.304, 0.049)	**(0.140, 0.598)**	**(-0.639, -0.283)**	**(-0.500, -0.131)**

Note: * $p < .05$, ** $p < .01$, *** $p < .001$. Coeff = coefficient.

Table 5: Comparisons between engagement with emerging forms by age (in years) and by age group.

Form		Fantasy sports - free	Fantasy sports - paid	Skin gambling	Social casino games - free	Social casino games - paid
Age in years	Coeff	0.007	0.026	**-0.038***	0.021	**0.046****
	95% CI	(-0.020, 0.034)	(-0.012, 0.064)	**(-0.074, -0.002)**	(-0.004, 0.046)	**(0.017, 0.075)**
Age groups	Coeff	0.071	**0.311***	**-0.285***	0.029	**0.256***
	95% CI	(-0.124, 0.266)	**(0.042, 0.579)**	**(-0.546, -0.023)**	(-0.147, 0.206)	**(0.051, 0.462)**

Note: * $p < .05$, ** $p < .01$, *** $p < .001$. Coeff = coefficient.

Appendix C - Demographic comparisons between age groups

Tables 6 and 7 below indicate the results from statistical significance tests between the age groups on demographic variables. The groups differ mostly on variables that are likely to vary by age. The older group were significantly more likely to be living with a partner/de facto, married, or divorced, widowed or separated. They were more likely to be in a household with either a partner, their child, or both. They were more likely to have completed tertiary education, and more likely to have higher incomes. But in variables that were not related to age, the groups were very similar. There was a small difference in gender (the older group included a significantly higher proportion of females, although the difference was small), and no difference in terms of main language spoken at home.

Table 6: Demographic comparisons between respondents aged 18-24 and 25-29.

	Age 18-24		Age 25-29	
	N	**%**	**N**	**%**
Gender				
Male	424	38.9%	318	34.8%
Female	655	60.1%	594	64.9%*
Other	10	0.9%	3	0.3%
Marital status				
Single/never married	814	74.7%*	371	40.5%
Living with partner/de facto	229	21.0%	290	31.7%*
Married	39	3.6%	236	25.8%*
Divorced, separated or widowed	7	0.6%	18	2.0%*
Household composition				
Live alone	156	14.3%	121	13.2%
Single person living with children	25	2.3%	44	4.8%*
Living with partner and children	62	5.7%	231	25.2%*
Living with partner, no children	152	14.0%	250	27.3%*
Living with parent(s)	537	49.3%*	165	18.0%
Living in a group household	157	14.4%*	104	11.4%
Education (highest completed level)				
Did not complete year 12 or equivalent	113	10.4%*	62	6.8%

Year 12 or equivalent	557	51.1%*	155	16.9%
A trade or technical certificate or diploma	175	16.1%	216	23.6%*
An undergraduate qualification	181	16.6%	322	35.2%*
A postgraduate qualification	63	5.8%	160	17.5%*
Main language spoken at home				
English	971	89.2%	800	87.4%
A language other than English	118	10.8%	115	12.6%
Income (personal weekly (annual) pre tax)				
Negative income	25	2.3%	13	1.4%
Nil income	145	13.3%*	45	4.9%
$1-$199 ($1-$10,399)	170	15.6%*	46	5.0%
$200-$299 ($10,400-$15,599)	127	11.7%*	42	4.6%
$300-$399 ($15,600-$20,799)	98	9.0%*	46	5.0%
$400-$599 ($20,800-$31,199)	139	12.8%*	91	9.9%
$600-$799 ($31,200-$41,599)	110	10.1%	92	10.1%
$800-$999 ($41,600-$51,999)	79	7.3%	111	12.1%*
$1,000-$1,249 ($52,000-$64,999)	76	7.0%	139	15.2%*
$1,250-$1,499 ($65,000-$77,999)	54	5.0%	107	11.7%*
$1,500-$1,999 ($78,000-$103,999)	30	2.8%	112	12.2%*
$2,000 or more ($104,000 or more)	36	3.3%	71	7.8%*

Note: * indicates a significantly higher percentage in that row. If no asterisk is present on a line, no statistically significant difference was observed.

Table 7: Statistical test results for demographic comparisons between respondents aged 18-24 and 25-29.

Dependent variable	Chi-square	df	p
Gender	**6.835**	**2**	**.033**
Marital status	**305.943**	**3**	**<.001**
Household composition	**326.265**	**5**	**<.001**
Education	**315.120**	**4**	**<.001**
Main language spoken at home	1.453	1	.228
Income	**287.917**	**11**	**<.001**

Note: Bold text indicates that a statistically significant difference was observed.

Appendix D - Comparisons between the age groups in traditional forms of gambling.

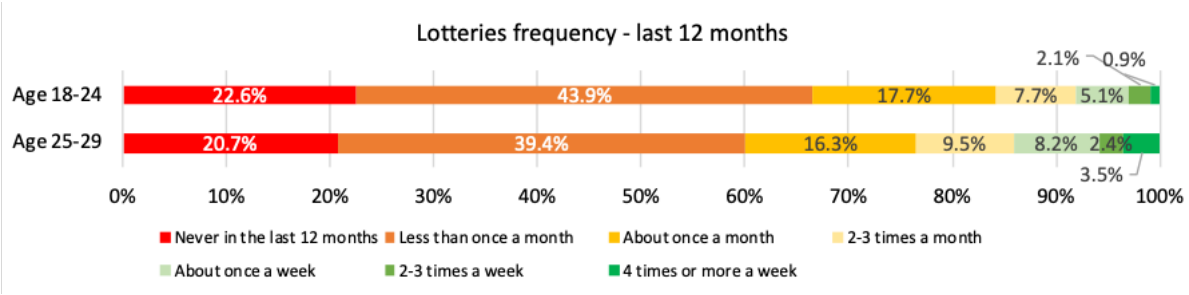

Figure 13: Lottery frequency (last 12 months) by age group.

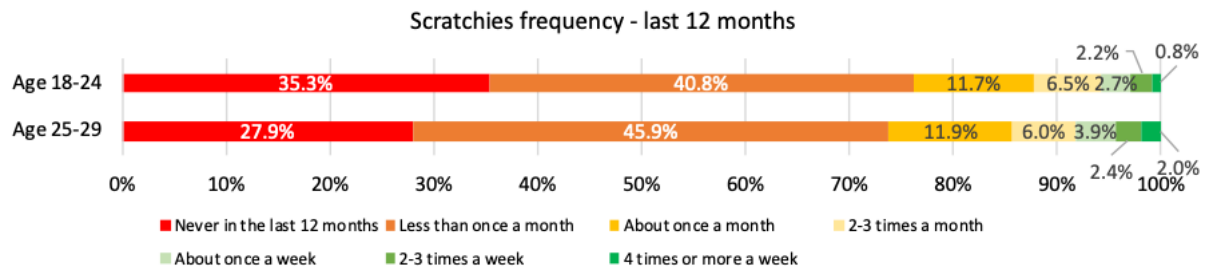

Figure 14: Scratchies frequency (last 12 months) by age group

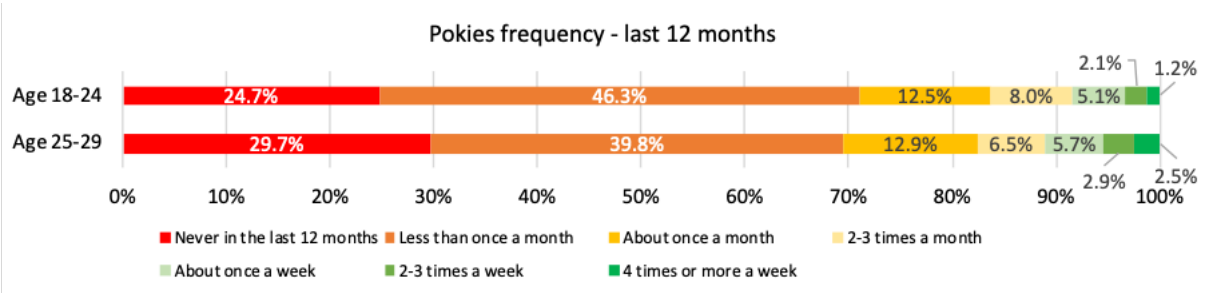

Figure 15: Pokies frequency (last 12 months) by age group.

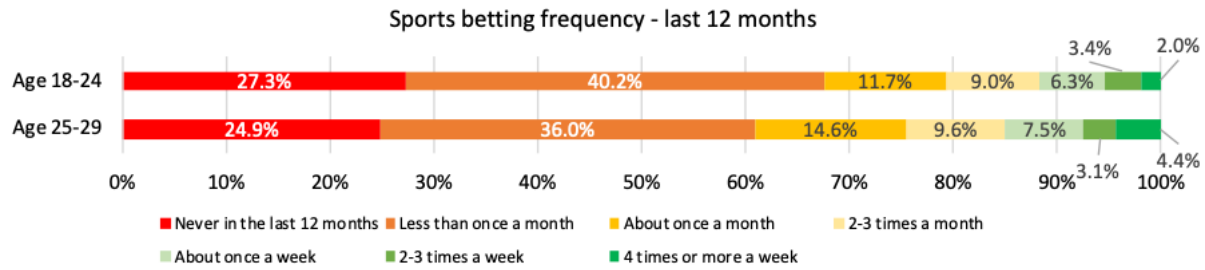

Figure 16: Sports betting frequency (last 12 months) by age group.

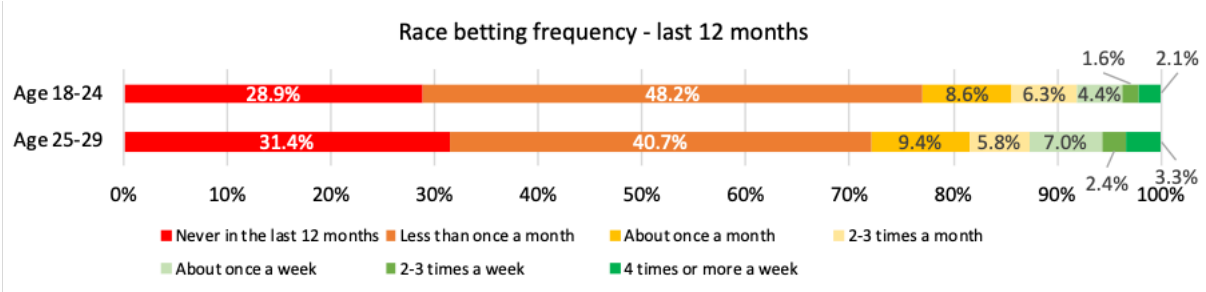

Figure 17: Race betting frequency (last 12 months) by age group.

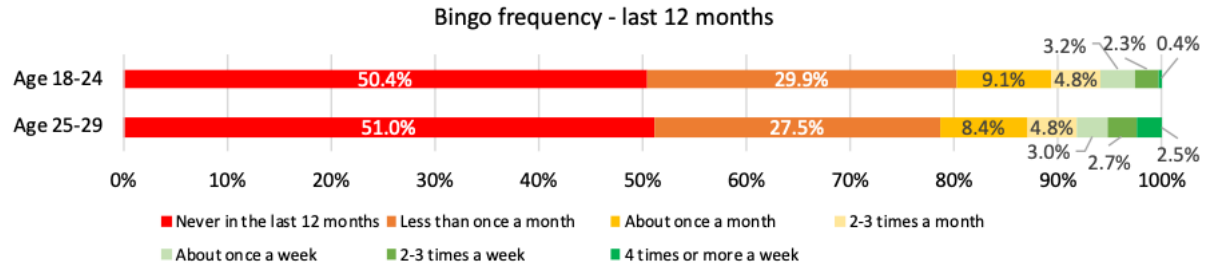

Figure 18: Bingo frequency (last 12 months) by age group.

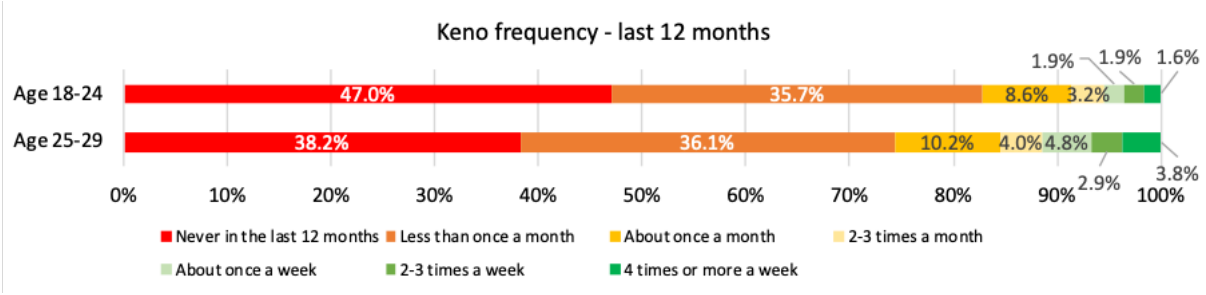

Figure 19: Keno frequency (last 12 months) by age group.

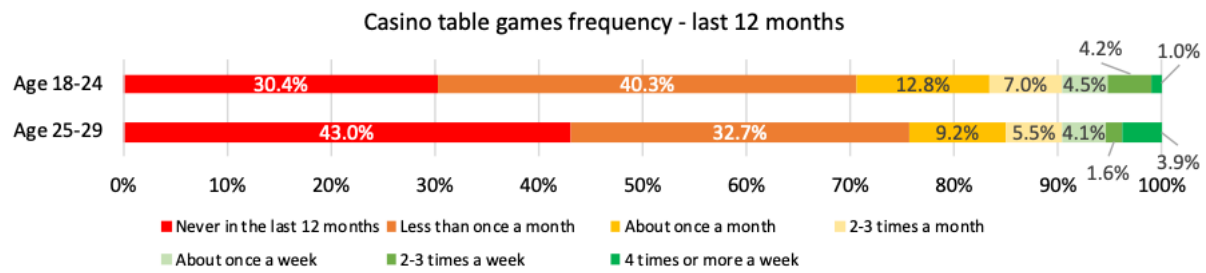

Figure 20: Casino table game frequency (last 12 months) by age group.

Table 8: Inferential statistics for relationships between frequency of engagement in each traditional gambling activity and age group.

Form	Chi-square	df	p
Lottery	**17.842**	**6**	**.007**
Scratchies	**14.857**	**6**	**.021**
Pokies	10.064	6	.122
Sports betting	7.747	6	.257
Race betting	8.324	6	.215
Bingo	9.942	6	.127
Keno	**13.276**	**6**	**.039**
Casino table games	**23.977**	**6**	**.001**

Note: Bold text indicates that a statistically significant difference was observed.

Table 9: Median typical monthly expenditure on each traditional gambling activity (amongst those who engage in each) and inferential statistics comparing expenditure by age group.

Form	Age 18-24		Age 25-29		Mann-Whitney U	Z	p
	Median	Mean Rank	Median	Mean Rank			
Lotteries	**20**	**490.6**	**20***	**546.8**	**119326**	**-3.01**	**.003**
Scratchies	10	535.9	10	512.2	129292.5	-1.28	.201
Pokies	20	443.4	20	466.2	97926.5	-1.32	.189
Sports betting	20	346.9	20	344.4	57992	-0.16	.872
Race betting	15	331.5	10	334.9	53092	-0.23	.820
Bingo	10	274.6	10	279.4	37562	-0.36	.722
Keno	10	216.1	10	237.8	23051	-1.77	.077
Casino table games	30	224.3	50	242.5	25015	-1.47	.142

Note: Bold text indicates that a statistically significant difference was observed. While both groups have the same median for lotteries, the older cohort spend statistically significantly higher based on mean ranks.

Appendix E - Comparisons between the age groups in emerging forms of gambling.

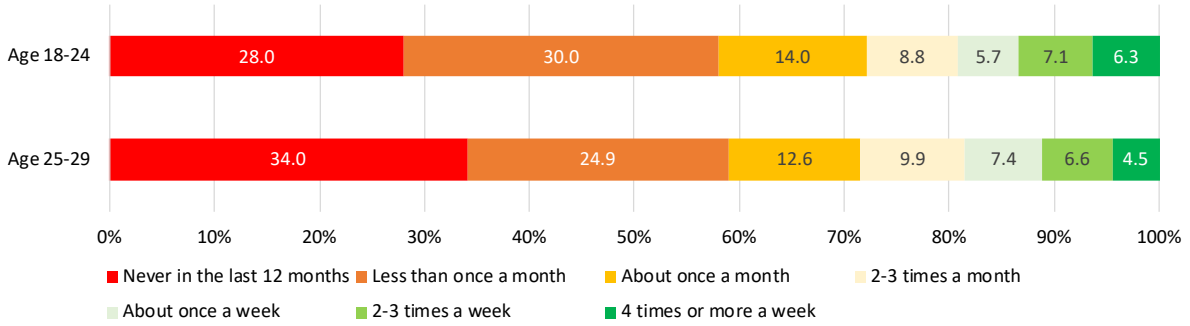

Figure 21: Playing video games with gambling content frequency (last 12 months) by age group.

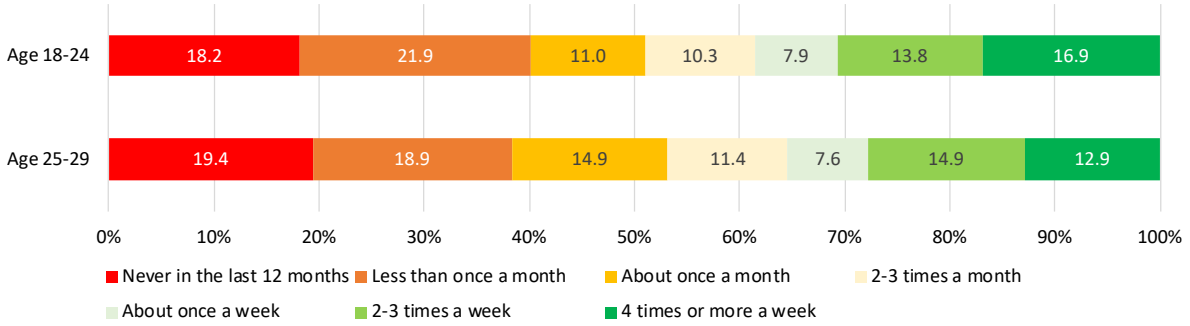

Figure 22: Playing esports frequency (last 12 months) by age group.

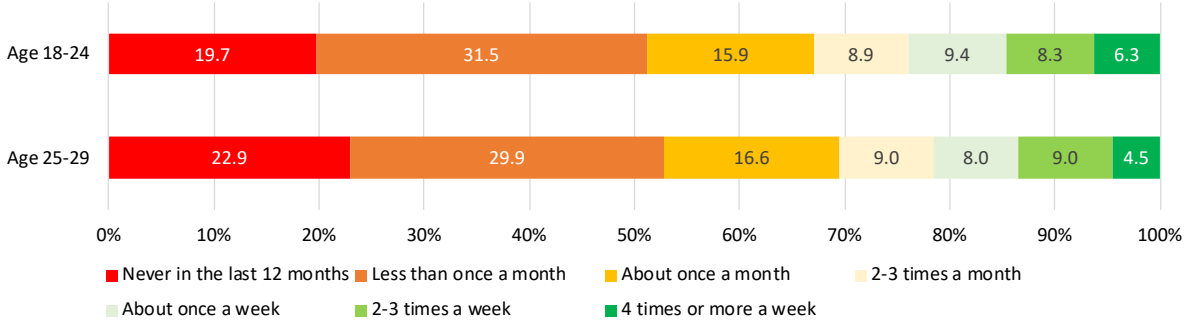

Figure 23: Watching esports frequency (last 12 months) by age group.

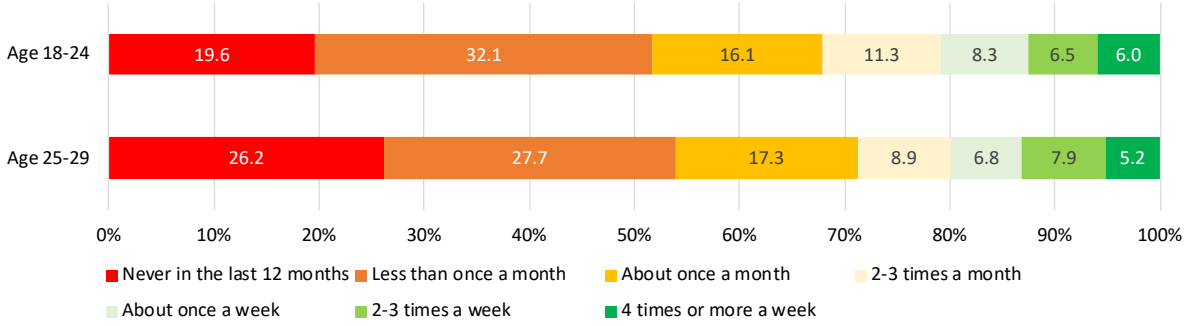

Figure 24: Betting on esports betting frequency (last 12 months) by age group.

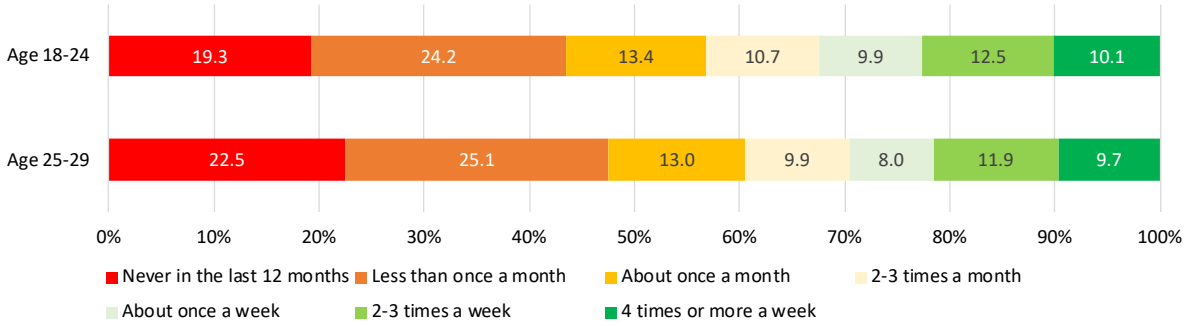

Figure 25: Opening loot boxes betting frequency (last 12 months) by age group.

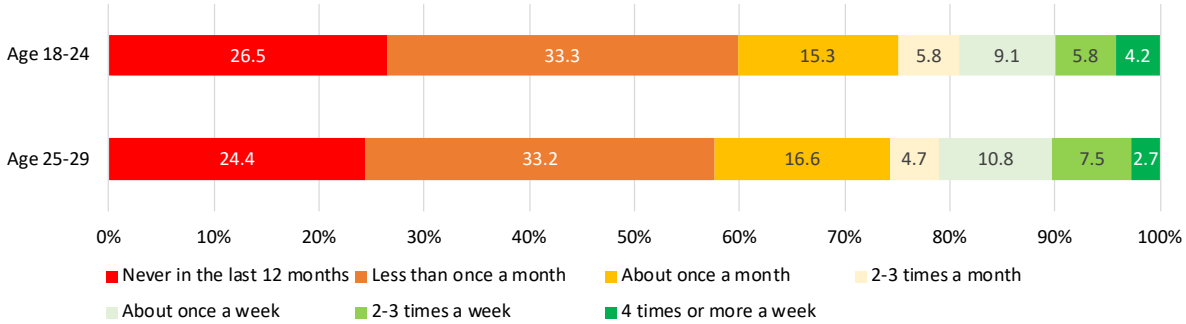

Figure 26: Buying loot boxes frequency (last 12 months) by age group.

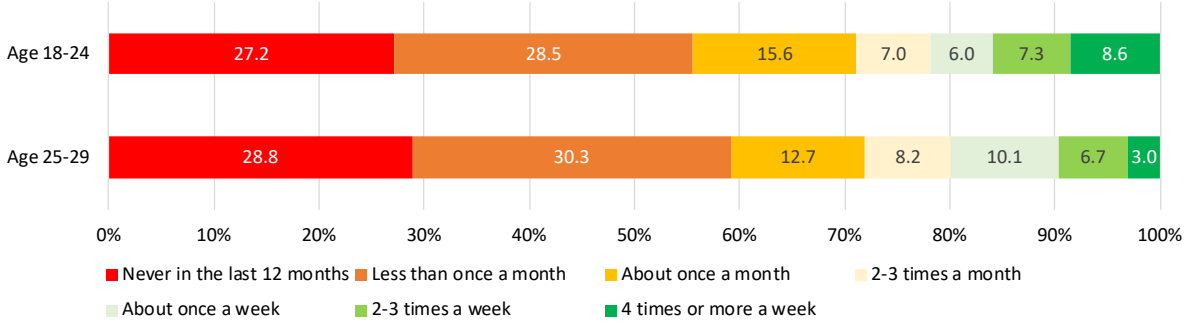

Figure 27: Entering free fantasy sports frequency (last 12 months) by age group.

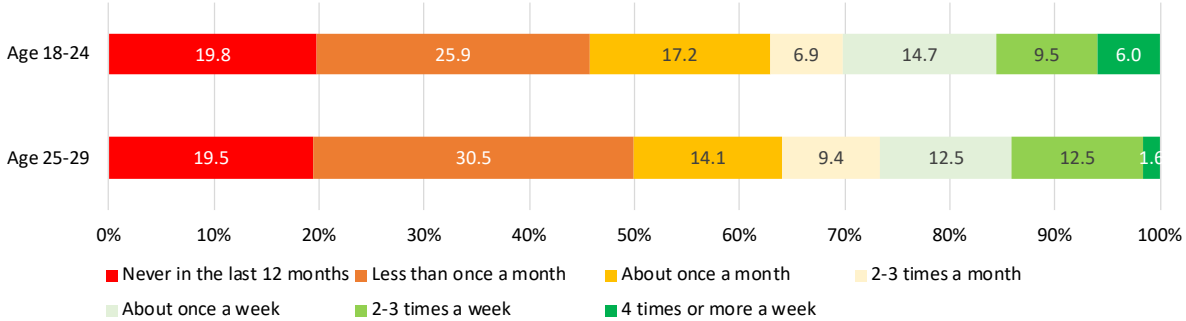

Figure 28: Entering paid fantasy sports frequency (last 12 months) by age group.

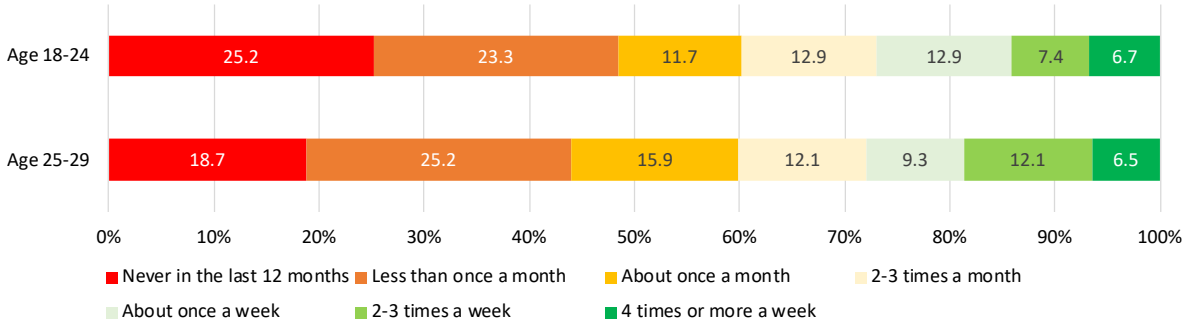

Figure 29: Skin gambling frequency (last 12 months) by age group.

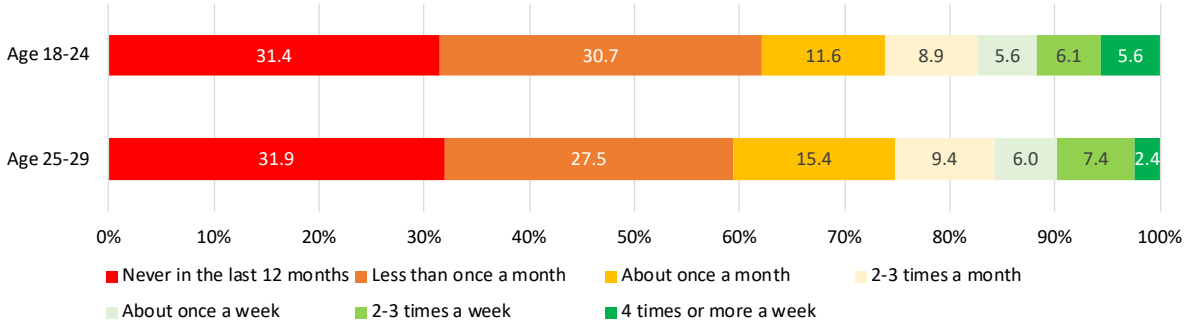

Figure 30: Playing free social casino games frequency (last 12 months) by age group.

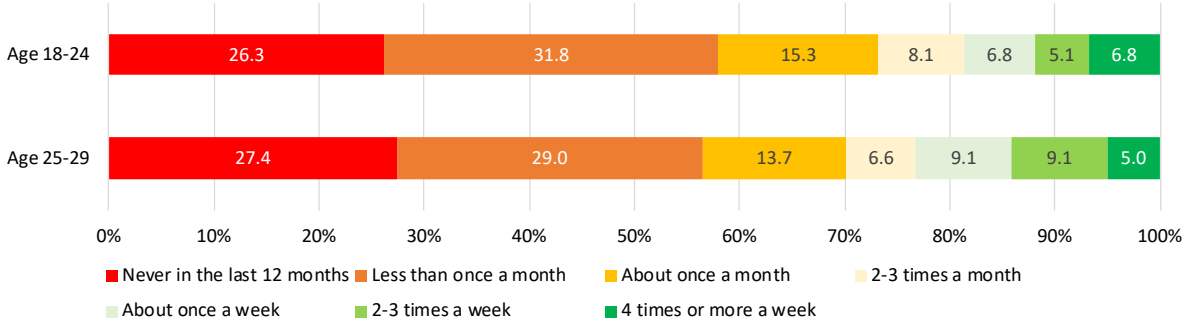

Figure 31: Playing paid social casino games frequency (last 12 months) by age group.

Table 10: Inferential statistics for relationships between frequency of engagement in each emerging gambling activity and age group.

Form	Chi-square	df	p
Video games with gambling content	9.74	6	.136
Esports - play	6.98	6	.322
Esports - watch	3.25	6	.776
Esports - bet	3.40	6	.758
Loot box - open	2.86	6	.826
Loot box - buy	3.20	6	.783
Fantasy sports - free	12.04	6	.061
Fantasy sports - paid	5.32	6	.504
Skin gambling	4.50	6	.610
Social casino games - free	11.52	6	.074
Social casino games - paid	5.09	6	.532

Table 11: Median typical monthly expenditure on each emerging gambling activity (amongst those who engage in each) and inferential statistics comparing expenditure by age group.

Form	Age 18-24		Age 25-29		Mann-Whitney U	Z	p
	Median	Mean Rank	Median	Mean Rank			
Esports - watch	0	347.3	3	372.2	58265	-1.71	.087
Esports - bet	20	138.7	20	138.3	9494.5	-0.04	.972
Loot box - buy	10	271.1	20	268.5	34892.5	-0.19	.847
Fantasy sports - paid	20	98.2	10	98.8	4758	-0.08	.936
Skin gambling	15	101.5	20	109.9	4878.5	-1.00	.317
Social casino games - paid	15	170.8	15	179.2	14492.5	-0.78	.434

Appendix F – Statistical results for comparisons between the groups

Table 12: Traditional forms - lifetime use.

Form	Chi-square	df	p
Lotteries	**177.44**	**1**	**<.001**
Scratchies	**95.027**	**1**	**<.001**
Pokies	**114.15**	**1**	**<.001**
Sports betting	**75.22**	**1**	**<.001**
Race betting	**149.20**	**1**	**<.001**
Bingo	**18.15**	**1**	**<.001**
Keno	**30.14**	**1**	**<.001**
Casino table games	**76.79**	**1**	**<.001**

Note: Bold text indicates that a statistically significant difference was observed.

Table 13: Traditional forms - last 12 months use.

Form	Chi-square	df	p
Lotteries	**109.05**	**1**	**<.001**
Scratchies	**68.02**	**1**	**<.001**
Pokies	**38.08**	**1**	**<.001**
Sports betting	**52.76**	**1**	**<.001**
Race betting	**71.66**	**1**	**<.001**
Bingo	**4.66**	**1**	**.031**
Keno	**30.70**	**1**	**<.001**
Casino table games	**14.40**	**1**	**<.001**

Note: Bold text indicates that a statistically significant difference was observed.

Table 14: Traditional forms - first use when under 18.

Form	Chi-square	df	p
Lotteries	**11.44**	**1**	**.001**
Scratchies	**23.81**	**1**	**<.001**
Pokies	0.25	1	.619
Sports betting	**21.34**	**1**	**<.001**
Race betting	**5.89**	**1**	**.015**
Bingo	**51.18**	**1**	**<.001**
Keno	**10.61**	**1**	**.001**
Casino table games	**7.16**	**1**	**.007**

Note: Bold text indicates that a statistically significant difference was observed.

Table 15: Emerging forms - lifetime use.

Form	Chi-square	df	p
Video games with gambling content	**17.84**	**1**	**<.001**
Esports - play	**12.06**	**1**	**.001**
Esports - watch	1.99	1	.158
Esports - bet	**10.03**	**1**	**.002**
Loot box - open	**25.82**	**1**	**<.001**
Loot box - buy	**11.31**	**1**	**.001**
Fantasy sports - free	0.51	1	.474
Fantasy sports - paid	**5.18**	**1**	**.023**
Skin gambling	**4.57**	**1**	**.033**
Social casino games - free	0.11	1	.746
Social casino games - paid	**5.97**	**1**	**.015**

Note: Bold text indicates that a statistically significant difference was observed.

Table 16: Emerging forms - last 12 months use.

Form	Chi-square	df	p
Video games with gambling content	**20.37**	**1**	**<.001**
Esports - play	**10.04**	**1**	**.002**
Esports - watch	3.32	1	.069
Esports - bet	3.80	1	.051
Loot box - open	**23.08**	**1**	**<.001**
Loot box - buy	**5.46**	**1**	**.019**
Fantasy sports - free	0.10	1	.756
Fantasy sports - paid	**4.16**	**1**	**.041**
Skin gambling	1.53	1	.216
Social casino games - free	.01	1	.910
Social casino games - paid	3.43	1	.064

Note: Bold text indicates that a statistically significant difference was observed.

Table 17: Emerging forms - first use when under 18.

Form	Chi-square	df	p
Video games with gambling content	**37.90**	**1**	**<.001**
Esports - play	**82.75**	**1**	**<.001**
Esports - watch	**122.97**	**1**	**<.001**
Esports - bet	**27.37**	**1**	**<.001**
Loot box - open	**113.15**	**1**	**<.001**
Loot box - buy	**76.97**	**1**	**<.001**
Fantasy sports - free	**54.40**	**1**	**<.001**
Fantasy sports - paid	**17.98**	**1**	**<.001**
Skin gambling	**26.71**	**1**	**<.001**
Social casino games - free	**90.33**	**1**	**<.001**
Social casino games - paid	**18.18**	**1**	**<.001**

Note: Bold text indicates that a statistically significant difference was observed.

Table 18: Exposure to gambling at home during childhood.

Form	Chi-square	df	p
When you were growing up, how often did any of the adults in your household gamble?	**17.16**	**3**	**.001**
When you were growing up, how often did you accompany your parents when they gambled?	**20.58**	**3**	**<.001**
When you were growing up, how often did you gamble with your parents?	**13.18**	**3**	**.004**
When you were growing up, did any of the adults in your household experience difficulties with gambling?	7.17	1	.067

Note: Bold text indicates that a statistically significant difference was observed. While the omnibus test was not significant for the last item in table F7, the pairwise tests of independence, which are more sensitive, found significant differences.

Appendix G – Interaction effects for engagement with each form and age group, on gambling related harm

Table 19: Associations between lifetime engagement with each emerging form and gambling-related harm in the last 12 months, interacting with age group.

	Form	Age	Form*age
Video games with gambling content	**0.354*** (0.221, 0.488)**	**0.228** (0.082, 0.375)**	0.039 (-0.152, 0.229)
Esports - play	**0.366*** (0.239, 0.493)**	**0.181** (0.053, 0.310)**	0.141 (-0.044, 0.327)
Esports - watch	**0.403*** (0.277, 0.530)**	**0.176** (0.050, 0.302)**	0.123 (-0.062, 0.308)
Esports - bet	**0.737*** (0.573, 0.900)**	**0.142** (0.042, 0.242)**	0.167 (-0.060, 0.395)
Loot box - open	**0.207** (0.074, 0.341)**	**0.190** (0.046, 0.335)**	0.094 (-0.098, 0.285)
Loot box - buy	**0.333*** (0.204, 0.461)**	**0.203*** (0.085, 0.322)**	0.130 (-0.063, 0.322)
Fantasy sports - free	**0.517*** (0.379, 0.655)**	**0.175** (0.066, 0.284)**	0.121 (-0.079, 0.321)
Fantasy sports - paid	**0.868*** (0.677, 1.060)**	**0.176*** (0.079, 0.273)**	0.089 (-0.177, 0.356)
Skin gambling	**0.829*** (0.663, 0.994)**	**0.227*** (0.130, 0.324)**	0.190 (-0.069, 0.449)
Social casino games - free	**0.390*** (0.261, 0.519)**	**0.181* (0.040, 0.322)**	0.063 (-0.124, 0.250)
Social casino games - paid	**0.835*** (0.693, 0.978)**	**0.174*** (0.071, 0.277)**	0.031 (-0.171, 0.233)

Note: Coefficients and 95% confidence intervals. Bold text indicates that a statistically significant difference was observed.

Table 20: Associations between frequency of engagement during the last 12 months with each emerging form and gambling-related harm in the last 12 months, interacting with age group.

	Form	Age	Form*age
Video games with gambling content	**0.143*** (0.100, 0.187)**	0.204 (-0.019, 0.426)	0.030 (-0.037, 0.098)
Esports - play	**0.058** (0.015, 0.100)**	0.114 (-0.168, 0.395)	0.059 (-0.007, 0.126)
Esports - watch	**0.121*** (0.071, 0.171)**	0.028 (-0.239, 0.296)	**0.097* (0.021, 0.173)**
Esports - bet	**0.191*** (0.100, 0.281)**	0.301 (-0.122, 0.723)	0.012 (-0.111, 0.135)
Loot box - open	**0.067** (0.026, 0.107)**	0.220 (-0.027, 0.467)	0.022 (-0.040, 0.085)
Loot box - buy	**0.131*** (0.074, 0.187)**	-0.075 (-0.364, 0.215)	**0.144** (0.055, 0.234)**
Fantasy sports - free	**0.149*** (0.086, 0.213)**	0.113 (-0.217, 0.443)	0.076 (-0.023, 0.174)
Fantasy sports - paid	**0.150** (0.045, 0.256)**	-0.004 (-0.551, 0.543)	0.095 (-0.056, 0.245)
Skin gambling	**0.219*** (0.135, 0.302)**	0.312 (-0.190, 0.815)	0.021 (-0.113, 0.154)
Social casino games - free	**0.192*** (0.148, 0.237)**	0.096 (-0.118, 0.311)	0.062 (-0.006, 0.130)
Social casino games - paid	**0.196*** (0.122, 0.270)**	-0.064 (-0.409, 0.280)	0.086 (-0.016, 0.189)

Note: Coefficients and 95% confidence intervals. Bold text indicates that a statistically significant difference was observed.

Table 21: Associations between first using each emerging form while underage and gambling-related harm in the last 12 months, interacting with age group.

	Form	Age	Form*age
Video games with gambling content	**-0.281**** **(-0.450, -0.111)**	**0.284**** **(0.100, 0.468)**	-0.158 (-0.413, 0.097)
Esports - play	**-0.295**** **(-0.489, -0.102)**	0.204 (-0.001, 0.409)	0.089 (-0.205, 0.383)
Esports - watch	**-0.262**** **(-0.453, -0.070)**	**0.174*** **(0.004, 0.344)**	0.335 (-0.049, 0.720)
Esports - bet	0.163 (-0.258, 0.584)	**0.324**** **(0.079, 0.569)**	0.513 (-0.555, 1.582)
Loot box - open	**-0.209*** **(-0.379, -0.039)**	**0.178*** **(0.0003, 0.357)**	0.132 (-0.138, 0.402)
Loot box - buy	-0.131 (-0.336, 0.074)	**0.282**** **(0.090, 0.473)**	0.074 (-0.334, 0.481)
Fantasy sports - free	-0.257 (-0.517, 0.003)	0.209 (-0.013, 0.431)	0.106 (-0.368, 0.579)
Fantasy sports - paid	0.089 (-0.396, 0.574)	0.233 (-0.075, 0.541)	1.039 (-0.005, 2.082)
Skin gambling	-0.333 (-0.691, 0.025)	0.260 (-0.045, 0.565)	0.876 (-0.002, 1.754)
Social casino games - free	**-0.216*** **(-0.390, -0.042)**	**0.161*** **(0.010, 0.311)**	0.167 (-0.140, 0.474)
Social casino games - paid	0.050 (-0.341, 0.440)	**0.217*** **(0.003, 0.432)**	-0.149 (-0.934, 0.636)

Note: Coefficients and 95% confidence intervals. Bold text indicates that a statistically significant difference was observed.

Table 22: Associations between lifetime engagement with each emerging form and lifetime gambling-related harm, interacting with age group.

	Form	Age	Form*age
Video games with gambling content	-0.076 (-0.440, 0.288)	0.114 (-0.237, 0.464)	-0.131 (-0.620, 0.359)
Esports - play	-0.107 (-0.468, 0.254)	0.254 (-0.132, 0.640)	-0.126 (-0.678, 0.427)
Esports - watch	0.154 (-0.634, 0.943)	0.006 (-0.314, 0.327)	0.737 (-0.013, 1.488)
Esports - bet	-0.053 (-0.380, 0.274)	-0.058 (-0.509, 0.393)	0.885 (-1.462, 3.232)
Loot box - open	-0.013 (-0.394, 0.368)	0.136 (-0.205, 0.476)	0.074 (-0.443, 0.590)
Loot box - buy	0.125 (-0.346, 0.597)	0.265 (-0.091, 0.621)	0.005 (-0.752, 0.762)
Fantasy sports - free	0.306 (-0.599, 1.212)	-0.001 (-0.402, 0.399)	0.021 (-0.839, 0.880)
Fantasy sports - paid	-0.325 (-0.977, 0.328)	-0.090 (-0.644, 0.465)	1.006 (-1.352, 3.363)
Skin gambling	-0.025 (-0.361, 0.310)	0.332 (-0.249, 0.913)	0.003 (-1.628, 1.633)
Social casino games - free	0.077 (-0.633, 0.787)	0.115 (-0.175, 0.405)	-0.110 (-0.701, 0.482)
Social casino games - paid	0.113 (-0.127, 0.353)	0.091 (-0.297, 0.480)	-0.336 (-1.745, 1.072)

Note: coefficients and 95% confidence intervals.

Table 23: Associations between frequency of engagement during the last 12 months with each emerging form and lifetime gambling-related harm, interacting with age group.

	Form	Age	Form*age
Video games with gambling content	**0.260*** (0.169, 0.350)**	0.247 (-0.115, 0.609)	0.040 (-0.102, 0.181)
Esports - play	**0.104* (0.023, 0.185)**	0.053 (-0.404, 0.510)	0.044 (-0.083, 0.172)
Esports - watch	**0.233*** (0.130, 0.336)**	0.087 (-0.453, 0.626)	0.045 (-0.115, 0.204)
Esports - bet	**0.430*** (0.210, 0.650)**	0.034 (-0.508, 0.576)	-0.208 (-0.489, 0.073)
Loot box - open	**0.139*** (0.060, 0.219)**	0.530 (-0.335, 1.394)	0.010 (-0.112, 0.133)
Loot box - buy	**0.321*** (0.200, 0.441)**	0.166 (-0.319, 0.651)	0.008 (-0.185, 0.201)
Fantasy sports - free	**0.164* (0.037, 0.290)**	0.247 (-0.351, 0.845)	0.001 (-0.193, 0.194)
Fantasy sports - paid	0.191 (-0.021, 0.402)	-0.011 (-0.640, 0.619)	-0.066 (-0.361, 0.229)
Skin gambling	**0.365*** (0.174, 0.556)**	0.112 (-0.923, 1.147)	-0.166 (-0.468, 0.136)
Social casino games - free	**0.235*** (0.139, 0.332)**	0.882 (-0.153, 1.918)	0.083 (-0.069, 0.234)
Social casino games - paid	**0.285*** (0.117, 0.452)**	-0.084 (-0.547, 0.380)	-0.246 (-0.960, 0.468)

Note: Coefficients and 95% confidence intervals. Bold text indicates that a statistically significant difference was observed.

Table 24: Associations between first using each emerging form while underage and lifetime gambling-related harm, interacting with age group.

	Form	Age	Form*age
Video games with gambling content	-0.076 (-0.440, 0.288)	0.114 (-0.237, 0.464)	-0.131 (-0.620, 0.359)
Esports - play	-0.107 (-0.468, 0.254)	0.254 (-0.132, 0.640)	-0.126 (-0.678, 0.427)
Esports - watch	0.154 (-0.634, 0.943)	0.006 (-0.314, 0.327)	0.737 (-0.013, 1.488)
Esports - bet	-0.053 (-0.380, 0.274)	-0.058 (-0.509, 0.393)	0.885 (-1.462, 3.232)
Loot box - open	-0.013 (-0.394, 0.368)	0.136 (-0.205, 0.476)	0.074 (-0.443, 0.590)
Loot box - buy	0.125 (-0.346, 0.597)	0.265 (-0.091, 0.621)	0.005 (-0.752, 0.762)
Fantasy sports - free	0.306 (-0.599, 1.212)	-0.001 (-0.402, 0.399)	0.021 (-0.839, 0.880)
Fantasy sports - paid	-0.325 (-0.977, 0.328)	-0.090 (-0.644, 0.465)	1.006 (-1.352, 3.363)
Skin gambling	-0.025 (-0.361, 0.310)	0.332 (-0.249, 0.913)	0.003 (-1.628, 1.633)
Social casino games - free	0.077 (-0.633, 0.787)	0.115 (-0.175, 0.405)	-0.110 (-0.701, 0.482)
Social casino games - paid	0.113 (-0.127, 0.353)	0.091 (-0.297, 0.480)	-0.336 (-1.745, 1.072)

Note: coefficients and 95% confidence intervals.

Appendix H – Association between each form and harm controlling for age, impulsivity and traditional gambling

Table 25: Associations between lifetime engagement with each emerging form and gambling-related harm in the last 12 months, controlling for age, impulsivity and traditional gambling.

Predictor	Form	Age	Impulsivity	Number of traditional forms
Video games with gambling content	**0.237*** (0.148, 0.325)**	0.080 (-0.012, 0.171)	**0.071*** (0.060, 0.081)**	**0.139*** (0.118, 0.160)**
Esports - play	**0.354*** (0.269, 0.438)**	0.082 (-0.008, 0.172)	**0.071*** (0.060, 0.081)**	**0.140*** (0.120, 0.161)**
Esports - watch	**0.374*** (0.289, 0.458)**	0.074 (-0.016, 0.163)	**0.071*** (0.061, 0.081)**	**0.137*** (0.117, 0.158)**
Esports - bet	**0.591*** (0.481, 0.701)**	0.061 (-0.028, 0.150)	**0.069*** (0.059, 0.079)**	**0.115*** (0.094, 0.136)**
Loot box - open	**0.205*** (0.118, 0.292)**	0.072 (-0.019, 0.163)	**0.072*** (0.062, 0.082)**	**0.145*** (0.124, 0.166)**
Loot box - buy	**0.288*** (0.200, 0.376)**	0.078 (-0.013, 0.169)	**0.069*** (0.059, 0.080)**	**0.143*** (0.122, 0.164)**
Fantasy sports - free	**0.409*** (0.316, 0.503)**	0.064 (-0.026, 0.154)	**0.069*** (0.059, 0.079)**	**0.131*** (0.110, 0.152)**
Fantasy sports - paid	**0.650*** (0.523, 0.777)**	0.058 (-0.031, 0.146)	**0.068*** (0.057, 0.078)**	**0.123*** (0.103, 0.144)**
Skin gambling	**0.666*** (0.546, 0.787)**	**0.096* (0.007, 0.185)**	**0.065*** (0.055, 0.075)**	**0.129*** (0.108, 0.149)**
Social casino games - free	**0.232*** (0.143, 0.320)**	0.067 (-0.024, 0.158)	**0.071*** (0.061, 0.082)**	**0.132*** (0.111, 0.154)**
Social casino games - paid	**0.628*** (0.529, 0.726)**	0.066 (-0.022, 0.154)	**0.065*** (0.055, 0.075)**	**0.113*** (0.092, 0.134)**

Note: Coefficients and 95% confidence intervals. Bold text indicates that a statistically significant difference was observed.

Table 26: Associations between frequency of engagement during the last 12 months with each emerging form and gambling-related harm in the last 12 months, controlling for age, impulsivity and traditional gambling.

Predictor	Form	Age	Impulsivity	Number of traditional forms
Video games with gambling content	**0.127*** (0.096, 0.157)**	0.095 (-0.024, 0.214)	**0.067*** (0.054, 0.081)**	**0.150*** (0.123, 0.176)**
Esports - play	**0.076*** (0.046, 0.105)**	0.136 (-0.0003, 0.273)	**0.071*** (0.056, 0.087)**	**0.151*** (0.121, 0.181)**
Esports - watch	**0.131*** (0.097, 0.166)**	**0.135* (0.003, 0.267)**	**0.072*** (0.056, 0.087)**	**0.153*** (0.124, 0.182)**
Esports - bet	**0.172*** (0.114, 0.229)**	**0.264* (0.051, 0.477)**	**0.073*** (0.049, 0.096)**	**0.097*** (0.044, 0.150)**
Loot box - open	**0.063*** (0.036, 0.091)**	0.087 (-0.035, 0.209)	**0.068*** (0.055, 0.082)**	**0.157*** (0.131, 0.183)**
Loot box - buy	**0.131*** (0.090, 0.171)**	0.136 (-0.012, 0.283)	**0.068*** (0.051, 0.084)**	**0.149*** (0.118, 0.180)**
Fantasy sports - free	**0.150*** (0.105, 0.194)**	**0.204* (0.031, 0.377)**	**0.085*** (0.065, 0.105)**	**0.124*** (0.085, 0.163)**
Fantasy sports - paid	**0.167*** (0.095, 0.238)**	**0.279* (0.015, 0.543)**	**0.090*** (0.056, 0.123)**	**0.070* (0.008, 0.132)**
Skin gambling	**0.175*** (0.112, 0.238)**	**0.283* (0.039, 0.528)**	**0.076*** (0.046, 0.106)**	**0.114*** (0.060, 0.168)**
Social casino games - free	**0.180*** (0.148, 0.211)**	0.106 (-0.010, 0.222)	**0.067*** (0.054, 0.081)**	**0.124*** (0.097, 0.151)**
Social casino games - paid	**0.206*** (0.157, 0.254)**	0.134 (-0.046, 0.313)	**0.074*** (0.053, 0.094)**	**0.105*** (0.062, 0.148)**

Note: Coefficients and 95% confidence intervals. Bold text indicates that a statistically significant difference was observed.

Table 27: Associations between first using each emerging form while underage and gambling-related harm in the last 12 months, controlling for age, impulsivity and traditional gambling.

Predictor	Form	Age	Impulsivity	Number of traditional forms
Video games with gambling content	**-0.237*** (-0.354, -0.120)**	0.037 (-0.085, 0.159)	**0.072*** (0.058, 0.086)**	**0.150*** (0.122, 0.177)**
Esports - play	**-0.150* (-0.285, -0.015)**	0.094 (-0.047, 0.235)	**0.073*** (0.058, 0.089)**	**0.145*** (0.114, 0.176)**
Esports - watch	-0.080 (-0.231, 0.071)	0.084 (-0.059, 0.226)	**0.077*** (0.062, 0.093)**	**0.160*** (0.129, 0.190)**
Esports - bet	0.274 (-0.087, 0.636)	**0.273* (0.044, 0.501)**	**0.077*** (0.053, 0.102)**	**0.113*** (0.058, 0.169)**
Loot box - open	-0.077 (-0.197, 0.042)	0.055 (-0.072, 0.183)	**0.070*** (0.056, 0.084)**	**0.157*** (0.130, 0.183)**
Loot box - buy	-0.011 (-0.169, 0.147)	0.117 (-0.040, 0.274)	**0.074*** (0.056, 0.091)**	**0.166*** (0.134, 0.197)**
Fantasy sports - free	-0.154 (-0.352, 0.044)	0.136 (-0.049, 0.321)	**0.093*** (0.072, 0.113)**	**0.128*** (0.087, 0.169)**
Fantasy sports - paid	0.389 (-0.021, 0.800)	**0.313* (0.033, 0.593)**	**0.099*** (0.064, 0.134)**	**0.091** (0.025, 0.156)**
Skin gambling	0.011 (-0.296, 0.319)	**0.271* (0.005, 0.537)**	**0.084*** (0.053, 0.115)**	**0.152*** (0.096, 0.209)**
Social casino games - free	-0.080 (-0.211, 0.052)	0.041 (-0.084, 0.167)	**0.075*** (0.061, 0.088)**	**0.145*** (0.117, 0.174)**
Social casino games - paid	0.097 (-0.216, 0.410)	0.142 (-0.053, 0.336)	**0.081*** (0.059, 0.104)**	**0.134*** (0.089, 0.180)**

Note: Coefficients and 95% confidence intervals. Bold text indicates that a statistically significant difference was observed.

Table 28: Associations between lifetime engagement with each emerging form and lifetime gambling-related harm, controlling for age, impulsivity and traditional gambling.

Predictor	Form	Age	Impulsivity	Number of traditional forms
Video games with gambling content	**0.502*** (0.300, 0.704)**	-0.055 (-0.263, 0.154)	**0.086*** (0.062, 0.110)**	**0.162*** (0.114, 0.211)**
Esports - play	**0.746*** (0.550, 0.942)**	-0.048 (-0.258, 0.161)	**0.087*** (0.063, 0.111)**	**0.169*** (0.120, 0.217)**
Esports - watch	**0.801*** (0.605, 0.997)**	-0.067 (-0.276, 0.142)	**0.089*** (0.064, 0.113)**	**0.163*** (0.114, 0.212)**
Esports - bet	**0.777*** (0.527, 1.027)**	-0.105 (-0.312, 0.102)	**0.086*** (0.062, 0.110)**	**0.137*** (0.087, 0.187)**
Loot box - open	**0.559*** (0.359, 0.758)**	-0.056 (-0.264, 0.153)	**0.088*** (0.064, 0.112)**	**0.174*** (0.126, 0.222)**
Loot box - buy	**0.502*** (0.304, 0.700)**	-0.068 (-0.276, 0.139)	**0.084*** (0.060, 0.108)**	**0.171*** (0.123, 0.219)**
Fantasy sports - free	**0.692*** (0.481, 0.903)**	-0.095 (-0.303, 0.112)	**0.084*** (0.060, 0.109)**	**0.153*** (0.104, 0.202)**
Fantasy sports - paid	**0.642*** (0.354, 0.930)**	-0.114 (-0.320, 0.092)	**0.085*** (0.060, 0.109)**	**0.155*** (0.106, 0.204)**
Skin gambling	**0.896*** (0.617, 1.174)**	-0.058 (-0.266, 0.151)	**0.080*** (0.055, 0.104)**	**0.156*** (0.107, 0.205)**
Social casino games - free	**0.647*** (0.443, 0.851)**	-0.067 (-0.275, 0.141)	**0.087*** (0.062, 0.111)**	**0.140*** (0.091, 0.190)**
Social casino games - paid	**0.874*** (0.649, 1.100)**	-0.099 (-0.307, 0.110)	**0.080*** (0.056, 0.105)**	**0.132*** (0.083, 0.182)**

Note: coefficients and 95% confidence intervals.

Table 29: Associations between frequency of engagement during the last 12 months with each emerging form and lifetime gambling-related harm, controlling for age, impulsivity and traditional gambling.

Predictor	Form	Age	Impulsivity	Number of traditional forms
Video games with gambling content	**0.258*** (0.187, 0.329)**	-0.028 (-0.296, 0.240)	**0.061*** (0.030, 0.092)**	**0.152*** (0.091, 0.213)**
Esports - play	**0.123*** (0.059, 0.187)**	0.058 (-0.234, 0.351)	**0.070*** (0.036, 0.104)**	**0.154*** (0.089, 0.219)**
Esports - watch	**0.231*** (0.151, 0.312)**	-0.039 (-0.340, 0.262)	**0.078*** (0.043, 0.114)**	**0.170*** (0.103, 0.238)**
Esports - bet	**0.295*** (0.155, 0.435)**	-0.140 (-0.613, 0.332)	**0.094*** (0.041, 0.148)**	**0.138* (0.022, 0.255)**
Loot box - open	**0.139*** (0.077, 0.201)**	-0.045 (-0.318, 0.228)	**0.071*** (0.040, 0.103)**	**0.190*** (0.130, 0.250)**
Loot box - buy	**0.278*** (0.181, 0.375)**	0.076 (-0.258, 0.410)	**0.064** (0.025, 0.102)**	**0.160*** (0.088, 0.231)**
Fantasy sports - free	**0.142** (0.045, 0.239)**	-0.127 (-0.497, 0.243)	**0.067** (0.024, 0.110)**	**0.111** (0.027, 0.195)**
Fantasy sports - paid	0.147 (-0.002, 0.296)	-0.087 (-0.622, 0.448)	0.036 (-0.033, 0.105)	0.017 (-0.108, 0.143)
Skin gambling	**0.265*** (0.110, 0.420)**	0.352 (-0.213, 0.917)	**0.110** (0.040, 0.180)**	0.09 (-0.031, 0.211)
Social casino games - free	**0.242*** (0.166, 0.318)**	-0.003 (-0.273, 0.267)	**0.060*** (0.029, 0.091)**	**0.109*** (0.045, 0.174)**
Social casino games - paid	**0.317*** (0.197, 0.438)**	-0.008 (-0.405, 0.389)	**0.048* (0.001, 0.094)**	0.083 (-0.012, 0.178)

Note: Coefficients and 95% confidence intervals. Bold text indicates that a statistically significant difference was observed.

Table 30: Associations between first using each emerging form while underage and lifetime gambling-related harm, controlling for age, impulsivity and traditional gambling.

Predictor	Form	Age	Impulsivity	Number of traditional forms
Video games with gambling content	**-0.294*** **(-0.546, -0.043)**	-0.123 (-0.387, 0.141)	**0.068*** ** **(0.038, 0.098)**	**0.153*** ** **(0.093, 0.213)**
Esports - play	-0.023 (-0.308, 0.262)	0.039 (-0.258, 0.337)	**0.072*** ** **(0.038, 0.105)**	**0.150*** ** **(0.085, 0.216)**
Esports - watch	0.195 (-0.134, 0.525)	-0.031 (-0.340, 0.278)	**0.083*** ** **(0.048, 0.118)**	**0.186*** ** **(0.118, 0.253)**
Esports - bet	0.345 (-0.427, 1.117)	-0.129 (-0.601, 0.342)	**0.098*** ** **(0.045, 0.151)**	**0.152** ** **(0.038, 0.266)**
Loot box - open	0.071 (-0.192, 0.334)	-0.050 (-0.330, 0.229)	**0.074*** ** **(0.043, 0.105)**	**0.191*** ** **(0.131, 0.251)**
Loot box - buy	0.108 (-0.237, 0.454)	0.066 (-0.273, 0.405)	**0.074*** ** **(0.036, 0.112)**	**0.191*** ** **(0.121, 0.261)**
Fantasy sports - free	0.214 (-0.195, 0.622)	-0.104 (-0.483, 0.275)	**0.072** ** **(0.029, 0.115)**	**0.124** ** **(0.039, 0.208)**
Fantasy sports - paid	0.534 (-0.311, 1.380)	-0.027 (-0.572, 0.517)	0.042 (-0.026, 0.111)	0.042 (-0.087, 0.170)
Skin gambling	-0.174 (-0.817, 0.468)	0.279 (-0.291, 0.849)	**0.116*** ** **(0.048, 0.184)**	**0.132* ** **(0.012, 0.252)**
Social casino games - free	0.016 (-0.269, 0.300)	-0.060 (-0.332, 0.211)	**0.067*** ** **(0.036, 0.097)**	**0.137*** ** **(0.074, 0.200)**
Social casino games - paid	0.078 (-0.554, 0.710)	-0.003 (-0.393, 0.387)	**0.056* ** **(0.011, 0.101)**	**0.119* ** **(0.028, 0.211)**

Note: coefficients and 95% confidence intervals. Bold text indicates that a statistically significant difference was observed.

Appendix I - Description of survey measures not used in the present analyses

Demographics

In addition to reporting the highest level of education they had completed (less than year 12, year 12 or equivalent, trade/technical certificate or diploma, undergraduate qualification, postgraduate qualification), respondents were asked how old they were when they completed this highest level of education (in years).

Abbreviated life course calendar - age of first, last and most engagement with each form, and highest frequency of engagement

In addition to capturing the age at which they first took part in each form, respondents also reported the age at which they most recently took part in each form, and the age at which they were most engaged in each form. Responses were validated so that their answers could not be higher than their current age, and so that logical impossibilities could not occur (e.g., respondents stating that they engaged in a form from 16-20, but that they were most engaged at age 5). The accepted range of answers was given for each question, so as not to frustrate participants. For example, when asked when they had most recently engaged in a behaviour, the survey stated that their answer must be between the age that they said they had first taken part in that form, and their current age, with those numbers piped through from their previous answers.

Finally, respondents were asked about the frequency at which they engaged in each activity at the age that they indicated they were most involved. Response options were: less than once a month, about once a month, 2-3 times a month, about once a week, 2-3 times a week, 4 times or more a week.

Gambling-related harm: Short Gambling Harms Screen

The Short Gambling Harms Screen (Browne et al., 2017) was also asked of all respondents who had gambled on one or more traditional forms, or on the emerging forms of betting on esports, buying loot boxes, entering paid fantasy sports competitions or skin gambling, in the last 12 months. The SGHS asks whether respondents have experienced each of 10 items related to their gambling within the last 12 months, such as “felt ashamed of my gambling” or “increased credit card debt”, with response options no (0) or yes (1) for each. Scores are summed for a total between 0-10. No classification criteria are used for the SGHS, and instead scores are interpreted as a continuum of gambling-related harm, with higher scores indicating more severe harm. Cronbach’s alpha for this scale was .89.

Age of worst gambling-related problems or harm

Any respondent who indicated gambling-related problems or harm based on the PGSI, SGHS and/or NODS-CLiP were informed that their answers indicated that they had experienced some harm or problems with gambling. They were then asked at what age their gambling-related problems or harms were at their worst (open-ended text box, validated so that their response could not be higher than their current age).

Video game-related problems: Gaming Disorder scale

The list of emerging forms of gambling includes some types of video games (esports, or video games with gambling-related content), but does not include all types of video games. Thus, before assessing problems related to video games, respondents who had not indicated engagement with any of the emerging forms related to video games were first asked if they had ever played a video game, other than those including gambling content, at some point in their life. This question, in addition to engagement with emerging forms related to video games, were used to determine which respondents had played video games, and therefore which respondents should be asked about experiencing gaming-related problems.

To measure video game-related problems, the nine-item scale by Petry et al (2014) was used. This scale is based on DSM-V criteria, and includes items such as “Do you spend a lot of time thinking about games even when you are not playing, or planning when you can play next?” and “Do you feel you should play less, but are unable to cut back on the amount of time you spend playing games?”. Response options are no (0) or yes (1). Endorsement of five items is required for classification of gaming disorder, with a recent requirement that the last item (“Do you risk or lose significant relationships, or job, educational or career opportunities because of gaming?”) is one of the items selected (see Billieux et al., 2017). Cronbach’s alpha for this scale was .86.

Wellbeing: Personal Wellbeing Index

Wellbeing was assessed through the Personal Wellbeing Index (International Wellbeing Group, 2013). The PWI includes seven items, each measuring seven domains of wellbeing, such as safety, health and future security. A single global question can also be used, which asks “How satisfied are you with your life as a whole?”, with respondents answering on an 11-point scale from no satisfaction at all (0) to completely satisfied (10). In this study, the single item was used due to space constraints, and because knowledge about the seven dimensions was not deemed necessary for the goals of this project. Because this is a single item, no Cronbach’s alpha can be calculated.

Psychological distress: Kessler 6

The Kessler 6 scale (Kessler et al., 2002) measures nonspecific psychological distress by asking respondents how often during the past 30 days they felt: nervous, hopeless, restless or fidgety, so depressed that nothing could cheer you up, that everything was an effort, worthless. Response options are: none of the time (0), a little of the time (1), some of the time (2), most of the time (3) and all of the time (4). While the Kessler 6 is widely used, no clear standard scoring rules have been developed, and scoring rules may differ by where the study is conducted (Kessler et al., 2010). Thus, the most commonly-used thresholds were employed for this study. Scores were summed for a total between 0 and 24. Scores of 0 to 12 indicated no distress, and scores of 13 to 24 were taken to indicate mild to high levels of distress. Cronbach's alpha for this scale was .92.

Appendix J – Nonparametric (Spearman) correlations for associations between each form and gambling-related harm

The Problem Gambling Severity Index scores were positively skewed, and an alternative analysis using nonparametric tests was also run to determine whether the pattern of statistically non-significant and significant results were the same as the GLM analyses reported in the body of the report. Table 31 below shows the results from Spearman correlations between engagement with each form (either during their lifetime, during the last 12 months, and recall of first using each form while underage) and PGSI scores. Spearman correlations are nonparametric analyses, meaning the skewed distribution of the Problem Gambling Severity Index scores does not impact on the results.

The results are the same as those seen in the main body of the report. That is, lifetime and last 12 month use of each form is associated with higher gambling harm, whereas first using some forms while underage is associated with *lower* gambling harm.

We note that we did not run nonparametric correlations for lifetime gambling-related harm (based on the NODS-CLiP), because the outcome variable was binary, so there was no skew to the outcome variable.

Table 31: Associations between use of each emerging form and gambling-related harm in the last 12 months

Form	Lifetime use (no vs yes)	Last 12 months frequency (higher score more frequent use)	First used while under 18 (no vs yes)
Video games with gambling content	**0.168*****	**0.264*****	**-0.162*****
Esports - play	**0.200*****	**0.165*****	**-0.141*****
Esports - watch	**0.223*****	**0.278*****	**-0.114****
Esports - bet	**0.304*****	**0.325*****	0.026
Loot box - open	**0.109*****	**0.149*****	**-0.096****
Loot box - buy	**0.170*****	**0.295*****	**-0.089***
Fantasy sports - free	**0.244*****	**0.311*****	**-0.125****
Fantasy sports - paid	**0.275*****	**0.335*****	0.065
Skin gambling	**0.277*****	**0.404*****	**-0.120***
Social casino games - free	**0.220*****	**0.351*****	**-0.092****
Social casino games - paid	**0.343*****	**0.409*****	-0.012

Note: Bold text indicates that a statistically significant relationship was observed.

Appendix K – Number of respondents in each group for sub-group analyses

Some questions were only asked of particular respondents. For example, if a respondent indicated that they had not gambled on a particular for during their lifetime, they were not asked if they had gambled on that form during the last 12 months, or the age at which they had first gambled. Therefore, the number of respondents from each group differs by form for these questions.

Adding each n for each group to all of the figures in the text would mean that the figures would become more complex, and not easily interpretable. Instead, to assist with interpretability of results, the total n in each group (18-24 cohort and 25-29 cohort) are reported here for each form. Traditional forms are listed in Table 32 and emerging forms in Table 33.

Table 32: Total number of respondents in each cohort for analyses examining past 12 month gambling, and recall of first gambling when underage – traditional forms.

Form	Age 18-24	Age 25-29
Lotteries	583	748
Scratchies	736	789
Pokies	566	688
Sports betting	410	522
Race betting	384	573
Bingo	562	559
Keno	370	421
Casino table games	313	437

Table 33: Total number of respondents in each cohort for analyses examining past 12 month gambling, and recall of first gambling when underage – emerging forms.

Form	Age 18-24	Age 25-29
Video games with gambling content	679	485
Esports - play	556	396
Esports - watch	508	398
Esports - bet	168	191
Loot box - open	674	463
Loot box - buy	430	295
Fantasy sports - free	302	267
Fantasy sports - paid	116	128
Skin gambling	163	107
Social casino games - free	586	499
Social casino games - paid	236	241

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