Exploring the Harm Reduction Potential of Cashless Gambling Payment Systems for Electronic Gaming Machines

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Thesis Abstract

Consumers are increasingly using cashless payments for everyday retail purchases. Despite this trend, cash use remains the status quo in physical gambling environments. The accessibility of money plays an important role in regulating gambling behaviour, but little prior literature directly addresses the relative utility of cash and cashless payments for controlling spending. Excessive spending on gambling can have harmful consequences. Focusing on electronic gaming machine (EGM) gambling in Australia, this thesis presents three studies exploring potential impacts of transitioning to cashless payment systems on gambling behaviour and harm, and the optimal design and implementation of such systems for effective harm reduction. In the first study, a meta-analytic review of 94 studies from broader literature on consumer behaviour finds that cashless payments have a small effect in encouraging spending relative to cash use in retail settings. Over more than four decades studied, this effect appears not to have changed in size. In the second study, a qualitative analysis of focus group discussions suggests regular EGM gamblers perceive account-based cashless systems to present opportunities for stronger harm reduction measures by tracking individuals' gambling activity. Concerns about excessive restrictions, privacy, and overspending are identified as potential barriers to uptake of a voluntary system. In the final study, a discrete choice analysis of hypothetical systems with varying harm reduction potential shows that regular EGM gamblers most prefer a smartphone-based system that operates across multiple venues, involves mandatory self-imposed limits, and is linked with loyalty schemes. Modelling suggests at least 42.5%–62.9% of regular EGM gamblers would not opt-in to a voluntary cashless system. Overall, findings provide support for a mandatory cashless system with strong harm reduction features, including requirements for gamblers to set personalised loss limits.

Statement of Originality

This is to certify that to the best of my knowledge the content of this thesis is my own work. This thesis has not been submitted for any degree or other purposes.

I certify that the intellectual content of this thesis is the product of my own work and that all the assistance received in preparing this thesis and sources have been acknowledged.

Thomas B. Swanton

23 June 2023

Authorship Attribution Statement

The research presented in this thesis was conducted under the supervision of Professor Sally M. Gainsbury, Professor Ellen Garbarino, and Professor Sharon B. Collard. My contributions to published material contained in this thesis are outlined below.

Chapter 1

Sections 1.1 and 1.2 contain material that has been published in the following book chapter:

Swanton, T. B., Callaghan, S., Newton, N. C., Starcevic, V., & Gainsbury, S. M. (2023). Social media and gambling. In A. House & C. Brennan (Eds.), *Social media and mental health*. Cambridge University Press. https://doi.org/10.1017/9781009024945

I conducted the literature review, wrote the draft, and revised this material following critical review, commentary, and edits suggested by my co-authors.

Chapter 2

During the process of contacting researchers for unpublished works to be included in the meta-analytic review, I became aware of another doctoral student, Terryn Lee, conducting a similar meta-analysis. After consultation with our respective supervisors, the decision was made to collaborate on the study. I took the lead role (or joint lead role with TL) in all aspects of the study, including the conceptualisation, methodology, investigation, data curation, formal analysis, visualisation, and project administration. I drafted the version of the manuscript presented in this thesis, and revised it following critical review, commentary, and edits suggested by my supervisors.

Findings from this study were accepted for conference presentations including:

Swanton, T. B., Lee, T., Kim, S., Collard, S. B., Garbarino, E., Gainsbury, S. M., & Srivastava, J. (2022, October 20–22). *Evaluating evidence for the cashless premium: A meta-analytic review* [Competitive paper presentation]. Association for Consumer Research, Denver, CO, United States. https://www.acrwebsite.org/assets/PDFs/Proceedings/Vol50FINAL.pdf

Swanton, T. B., Lee, T., Kim, S., Collard, S. B., Garbarino, E., Gainsbury, S. M., & Srivastava, J. (2022, March 3–5). *Evaluating evidence from the cashless premium: A meta-analytic review* [Competitive paper presentation]. Society for Consumer Psychology Annual Conference. Online. https://myscp.org/wp-content/uploads/2023/03/2022.pdf

Chapters 3 & 4

Material from these chapters has been published in the following journal article:

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Findings from this study were accepted for conference presentations including:

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Swanton, T. B., Tsang, S., Collard, S. B., Garbarino, E., & Gainsbury, S. M. (2022, June 29–July 1). *Cashless gambling: Consumer perspectives on the risks and benefits of digital payment systems for electronic gaming machines*. [Paper presentation]. International Gambling Conference, Auckland, New Zealand. https://www.internationalgamblingconference.com/_files/ugd/ea9b93_cda82de51cce4172a1d4de679583484a.pdf

I took the lead role in all aspects of the study, including the conceptualisation, methodology, investigation, data curation, formal analysis, and project administration. I wrote the draft of the manuscript, and revised it following critical review, commentary, and edits suggested by my co-authors.

As the candidate submitting this thesis, I declare that the authorship attribution statements above are correct.

Thomas B. Swanton

23 June 2023

As supervisor for the candidature upon which this thesis is based, I can confirm that the authorship attribution statements above are correct.

Sally M. Gainsbury

23 June 2023

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[1] The editor's main area of specialisation is theology, but her editing experience is broad and not limited to academic theses.

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List of Commonly Used Abbreviations

AIC	Akaike information criterion
ATM	Automated teller machine
AUD	Australian dollar
CAD	Canadian dollar
CI	Confidence interval
COVID-19	Coronavirus disease 2019
EGM	Electronic gaming machine
fMRI	Functional magnetic resonance imaging
IQR	Interquartile range
IRSAD	Index of Relative Socio-economic Advantage and Disadvantage
LL	Lower limit
NSW	New South Wales
PGSI	Problem Gambling Severity Index
PIN	Personal identification number
RCT	Randomised controlled trial
SD	Standard deviation
SE	Standard error
TITO	Ticket in, ticket out
UL	Upper limit
USD	United States dollar

1. Introduction

1.1. Background

In Australia, an estimated 56.9% of adults participate in gambling each year (Hing et al., 2021). Electronic gaming machines (EGMs), more commonly known as "pokies" or poker machines, are used by an estimated 16.4% of Australian adults annually (Hing et al., 2021).[2] EGMs are widely available in community-based venues (hotels and clubs) in all jurisdictions, except Western Australia, as well as in casinos (Stevens & Livingstone, 2019).[3] EGMs are a high-intensity gambling product and the form of land-based gambling most strongly associated with problem gambling (Allami et al., 2021). Spending on EGMs makes up nearly half (48.0%) of the AUD $21 billion lost on gambling each year (Queensland Government Statistician's Office, 2022). Among both land-based-only and mixed-mode (i.e., land-based and online) Australian gamblers, EGMs are the gambling activity most commonly reported as having the greatest contribution to experience of gambling-related harms (Hing, Russell, Black, et al., 2022). Pooled prevalence study data suggest that between 51%–57% of gambling problems in Australia are attributable to EGM use (Browne et al., 2023).

Gambling involves an interaction between a person and a gambling product within a broader environmental context (see Figure 1 for definitions of key terms). Contemporary theories suggest that gambling harm occurs within a complex system of interactions, both within the individual (e.g., biological and psychological factors that drive someone to gamble) and between the individual and their environment (e.g., characteristics of the gambling product and venue/platform, through to the broader sociocultural, political, and regulatory context; Blaszczynski & Nower, 2002; Wardle et al., 2019). Historically, the predominant focus of the gambling field has been on the diagnosis and treatment of individuals experiencing problems with gambling (Wardle et al., 2019). Treatment interventions, such as psychotherapy, are crucial for helping these individuals to change their behaviour and recover from gambling problems. However, these interventions have relatively little value for preventing harm from occurring in the first place (Blank et al., 2021). Only more recently has greater attention been directed towards understanding the role of specific product characteristics and the broader environment on gambling behaviour and risk of harm (Blank et al., 2021; Flayelle et al., 2023; Wardle et al., 2019). Building this evidence base is important for designing policy and regulation that are effective in addressing the systemic factors that contribute to gambling harm.

[2] EGMs are similar to slot machines, fixed odds betting terminals (FOBTs), and video lottery terminals (VLTs) available in international jurisdictions.

[3] In Western Australia, availability of EGMs is restricted to one casino located in Perth (Browne et al., 2023).

Figure 1

Definitions of Key Terms

Gambling is a regulated activity in Australia. Legal definitions of gambling typically refer to the placement of a stake (monetary outlay) on the outcome of a predominantly chance-based event for the possibility of winning a prize of monetary value (e.g., Environment and Communications References Committee, 2018). In the case of EGMs, outcomes are determined completely by chance (i.e., no skill is involved; Dowling et al., 2005). Gambling activities provided by commercial operators involve a house advantage—essentially, the price of playing the game (Woolley et al., 2013). This means that, even though wins are possible, it is highly likely that people who gamble persistently will lose money over time.

Gambling-related harms are negative consequences associated with gambling. Harms occur across a variety of domains, including financial (e.g., debt), psychological (e.g., stress), physical health (e.g., disruption to sleep), social (e.g., relationship breakdown), disengagement from other activities (e.g., reduced engagement in other hobbies), employment or study (e.g., reduced performance), and critical events (e.g., criminal activity, bankruptcy, suicide; Langham et al., 2016; Shannon et al., 2017). Harms lie on a spectrum of severity, ranging from relatively mild to severe. Gambling-related harms affect not only the individual engaging in gambling but can be experienced by their family and friends, as well as people in the broader community (Goodwin et al., 2017; Hing, Russell, Browne, et al., 2022).

Problem gambling refers to a pattern of gambling behaviour in which an individual has difficulty controlling how much they gamble and experiences negative consequences (harms) as a result of their gambling (Blaszczynski & Nower, 2002; Ferris & Wynne, 2001). A person can vary in their level of risk of problem gambling based on the degree to which they are experiencing negative consequences from their gambling (Potenza et al., 2019). Someone who gambles recreationally and on occasion might experience little to no negative consequences and is said to be at low or no risk of problem gambling. In contrast, someone who gambles regularly, spending large amounts of time and money relative to their personal situation, might experience severe negative consequences and have trouble controlling their gambling. This person is said to be engaging in problem gambling. Problem gambling can also occur when a person's gambling patterns result in harms being experienced by another person (e.g., a family member; Riley et al., 2021).

Gambling disorder is a formal diagnosis under international classification systems for psychiatric disorders published by the American Psychiatric Association (2022) and World Health Organisation (2019). The diagnosis is applied by a registered clinician, such as a psychologist or medical doctor, based on a person meeting specific diagnostic criteria. The defining features of gambling disorder involve the person feeling unable to reduce or stop gambling despite trying to do so, and experiencing severe negative consequences (harms) as a result of their gambling (Potenza et al., 2019). A person experiencing gambling disorder becomes so focused on gambling that it takes priority over other activities and interests in their daily life. Even though the person experiences negative consequences from gambling, they typically keep gambling at the same rate or with even greater intensity, resulting in a downward spiral (K. Zhang & Clark, 2020). Gambling disorder denotes a more severe pattern of hazardous gambling and is a narrower term than problem gambling.

1.2. Research Questions

Digital technologies, such as the internet and smartphones, have radically changed the gambling landscape in recent decades (Gainsbury et al., 2014). To date, payment systems in land-based gambling environments have been a noteworthy exception to this digital transformation. Internationally, gambling in physical venues remains predominantly cash-

based (Gainsbury & Blaszczynski, 2020). To play on an EGM, for example, the gambler typically loads banknotes or coins directly into the EGM for use as gaming credits. Broader societal shifts from cash to cashless payments, risks associated with money laundering, and the potential to use digital technologies as part of gambling harm reduction strategy have prompted increased discussion among policymakers about widespread implementation of cashless payment systems in land-based gambling venues (Gainsbury & Blaszczynski, 2020; NSW Crime Commission, 2022). For jurisdictions adopting a harm reduction approach to gambling policy, two key questions emerge within this discussion. The first question relates to the impacts of transitioning from a cash-based to a cashless payment system on the way people gamble and their risk of experiencing gambling-related harm. The second question relates to the optimal design and implementation of cashless payment systems for supporting effective harm reduction strategy.[4] Greater evidence is needed in these two areas to inform policy decisions about cashless payment systems for land-based gambling environments.

The gambling literature shows that structural characteristics of gambling products can impact the way people gamble and their risk of experiencing harm (Auer & Griffiths, 2023; Griffiths, 1993; Leino et al., 2015; Livingstone, 2017); however, relatively little is known about the relationships between payment methods, gambling behaviour, and gambling harm. Broader evidence from decades of research in consumer psychology and behavioural economics demonstrates that cash and cashless payment methods have differential impacts on spending behaviour—with many studies finding that cashless payments facilitate spending relative to cash (e.g., Prelec & Simester, 2001; Raghubir & Srivastava, 2008; Soman, 2003). Literature from these disciplines also suggests that the behavioural effects of choice environments can vary depending on specific aspects of their design and implementation (Thaler et al., 2013). Given EGM gambling remains largely cash-based (and therefore, anonymous), gambling activity is untracked at the level of the individual consumer, limiting the scope for implementing systematic measures designed to prevent and reduce harm. Account-based (i.e., identity-linked) gambling, which can be implemented through digital payment systems, offers much greater potential for delivering harm reduction measures, such as precommitment (Delfabbro & King, 2021b; A. Thomas, Christensen, et al., 2016). Whether (and under what conditions) the potential benefits of a carefully designed account-based digital payment system can mitigate potential risks associated with cashless payments remains unclear. This thesis presents three studies investigating cashless payment systems for EGMs from a harm reduction perspective. The aims and structure of the thesis are outlined in the following sections.

[4] These research questions naturally lend themselves to research methods such as laboratory and field experiments. However, adopting methods involving face-to-face contact was deemed infeasible for the studies presented in this thesis due to risks and restrictions associated with the COVID-19 pandemic that persisted for a substantial portion of the period of candidature. Desk-based and online research methods were chosen to mitigate these risks.

1.3. Aims of the Thesis

The overarching objective of this thesis is to explore the potential risks and benefits associated with transitioning from a cash-based to a cashless payment system for EGMs from a harm reduction perspective. A mixed methods approach is adopted to triangulate evidence relevant to this overarching objective. In the first study, I present a meta-analytic review that aims to synthesise evidence from the broader literature about the net impact of cashless relative to cash-based payments on spending behaviour in general retail settings. I assess whether this effect has changed over time, evaluate evidence for the main mechanism thought to underlie the effect, and examine the robustness of key conceptual moderators of the effect, including the physical form of the cashless tool (card- vs smartphone-based), the type of funds being used (credit vs debit), and the hedonic value of the product being purchased. Following this review of the broader literature, the focus narrows to payment systems in land-based gambling environments—a context to which relatively little prior research speaks directly. Given the limited prior literature, I adopt a qualitative approach for my second study, which aims to explore the perspectives of regular gamblers regarding the potential risks and benefits associated with cashless gambling payment systems. I explore potential barriers and facilitators to uptake of cashless payment systems, as well as consumers' suggestions regarding harm reduction measures that could be integrated into such systems. Informed by the findings of this qualitative study, my third study involves a discrete choice experiment (DCE) designed to investigate (quantitatively) the preferences of regular gamblers regarding different alternatives of a cashless gambling payment system, which may have varying degrees of harm reduction potential. In this final study, I quantify the relative importance of different attributes of cashless gambling payment systems in driving consumer preferences, assess consumers' willingness to deviate from the existing predominantly cash-based system, and explore heterogeneity in preferences based on individual differences. From a translational perspective, by conducting these three studies, I aim to contribute evidence to inform the development of policy and regulation relating to payment systems that are effective in reducing gambling-related harm.

1.4. Thesis Structure

In Chapter 2, I present my meta-analytic review of broader evidence related to the impact of payment methods on consumer spending behaviour in general retail settings. Following this review of the broader evidence base, the focus narrows to payment systems in the specific context of land-based gambling. In Chapter 3, I provide a narrative review of existing literature reporting findings relevant to understanding the relationships between payment systems, gambling behaviour, and gambling harm. I include a case study of payment systems implemented for EGMs in NSW, Australia, and outline linkages with related yet distinct systems, such as loyalty schemes and precommitment systems. Chapter 4 reports my qualitative analysis of consumer perspectives on the harm reduction potential of cashless payment systems for EGMs. Findings from my discrete choice experiment of consumer preferences for cashless gambling payment systems with integrated harm

reduction measures are covered in Chapter 5. Finally, in Chapter 6, I discuss the findings from all three studies combined, focusing particularly on implications for future research and public policy. Supplemental materials, including study protocols and additional analyses to support findings presented in the main text, are contained in the Appendices.

2. Meta-Analytic Review of the Impact of Payment Methods on Consumer Spending Behaviour

Abstract

Digital transformation of the payments industry in recent decades has revolutionised the way consumers make payments for everyday purchases. An increasingly diverse and complex range of payment methods is replacing cash as the preferred way to pay at the checkout. Outside of the gambling field, prior literature suggests consumers experience a cashless premium: using cashless payments facilitates greater spending than paying in cash. However, as cashless payments become the norm, how might this effect be changing? Using a meta-analytic approach, I evaluate the evidence for the cashless premium, the hypothesised core mechanism (the pain of paying), and key conceptual moderators across 97 studies conducted between 1978 and 2021. Analyses show that the cashless premium is a small but robust effect that, surprisingly, has not changed in size over the time period studied. Findings reveal shortcomings of existing attempts to explain the cashless premium and suggest that the pain of paying may not be the primary mechanism involved. In contrast to theory-driven predictions, I find no evidence that the cashless premium differs significantly across different forms of cashless payment tools (card vs smartphone), types of funds used (credit vs debit), or types of products purchased (hedonic vs utilitarian). I propose an agenda for future research to understand the impact of the evolving payments landscape on consumer spending behaviour.

2.1. Introduction

For millennia, humans have tokenised monetary value in the form of physical currency, such as banknotes and coins. The first known metal coins were minted by the ancient Greeks in the seventh century BC (Elliott, 2020). Paper money was first used in China from AD 960, and was in widespread circulation in Europe from the early 18th century (Velde, 2020). Following the emergence of plastic and digital money in the 20th century, however, the way we interact with money has become increasingly immaterial (Lauer, 2020). Instead of interacting directly with banknotes and coins (material representations of money itself), consumers now interact with cards and smartphones—the tools to access money held in digital stores (Guseva & Rona-Tas, 2017). As a result, the process of making payments has become less physical and more intangible. Payment cards and smartphone payment apps allow the consumer to bypass the steps of sifting through their wallet at the checkout, counting out the banknotes and coins needed to make a purchase and handing the money over to the cashier in exchange for a product. This interactive process has served consumers as a tangible and visually salient cue to the outflow of money. Modern cashless payments reduce the payment process to a swift, contactless action: the consumer can simply tap their smartphone or watch at the point of sale and be on their way, or even just scan an app like Amazon Go as they enter and walk out of the store with their purchases.

Although this shift away from cash towards cashless payments is making our interactions with money less material, money is simultaneously becoming more identifiable (Guseva & Rona-Tas, 2017; Mützel, 2021). In contrast to the anonymity of cash payments, cashless payments leave a trail in the digital ecosystem within which they exist, creating troves of highly granular transaction data on individual consumers' spending patterns and preferences (Lauer, 2020). It is this traceability of digital transactions that is making money more identifiable (Guseva & Rona-Tas, 2017). The digitalisation and datafication of money have facilitated the creation of new tools, such as banking and budgeting smartphone apps, that allow consumers to manage their personal finances and keep track of their spending in real time (C. Y. Zhang & Sussman, 2018). These tools can automatically categorise and summarise digital transactions, giving consumers easier access to more meaningful feedback about their spending. Although the relative convenience and intangibility of cashless payments might act to reduce consumers' awareness of their spending, this reduction might be offset by the enhanced feedback and expense tracking capabilities provided by digital payment technologies (Huebner et al., 2020), such as real-time notifications designed to attract the consumer's attention.

Cashless payments continue to proliferate and are becoming increasingly complex in nature. This raises the question: What is the net impact of the shift towards cashless payments on consumer spending behaviour? Findings across several decades of research provide considerable evidence for a *cashless premium*: consumers have a propensity to spend more when using cashless payments compared to cash (e.g., Feinberg, 1986; Hirschman, 1979; Prelec & Simester, 2001; Raghubir & Srivastava, 2008; Soman, 2003). However, some recent studies have failed to replicate this effect (e.g., Huang et al., 2020; Y. Liu & Dewitte,

2021). This is possibly due to younger generations growing up in a world in which purchases are conducted almost exclusively using cashless payments. In the UK, cash usage dropped from 62% to 15% of all payments between 2006 and 2021—largely due to increased use of electronic payment methods (UK Finance, 2022). The COVID-19 pandemic appears to have reinforced this trend towards a cashless society (Browning, 2022). Potentially as consumers adapt to using cashless payments and as digital payment technologies become more sophisticated in providing timely and personalised feedback, consumers become more aware of their spending, thereby mitigating the cashless premium.

A (re-)evaluation of the cashless premium is important from both theoretical and practical perspectives. From a theoretical perspective, the mental accounting literature remains unclear about whether the effect of credit cards in facilitating spending is primarily driven by the type of funds being used (i.e., borrowed, as opposed to saved—and consequently, a higher degree of temporal separation between consumption and payment; Prelec & Loewenstein, 1998), or the level of "transparency" of the physical form of the payment method (i.e., the outflow of funds being psychologically less salient in comparison to cash; Raghubir & Srivastava, 2008; Soman, 2001, 2003). From a practical perspective, the average strength of the cashless premium remains unclear. For example, Prelec and Simester (2001) found the premium ranged in size from 59% to 113% when comparing credit cards against cash. An understanding of the robustness of the cashless premium is needed to inform policy decisions about the level and type of strategies that may be useful for countering the effect (Soman et al., 2012; Soman & Ahn, 2010)—especially in risky consumption contexts, such as in physical gambling environments where cashless payments are yet to be widely introduced (Gainsbury & Blaszczynski, 2020; Limbrick-Oldfield et al., 2022).

2.1.1. Objectives

To address these issues, I conduct a meta-analysis of all available published and unpublished studies comparing cash and cashless (card- or smartphone-based) payments on measures of spending behaviour in contexts related to day-to-day consumer spending. The meta-analysis firstly aims to evaluate the cashless premium and to assess whether it has changed over time. I also seek to evaluate evidence for the pain of paying, the predominant theoretical explanation of the cashless premium. A final objective is to assess the robustness of key conceptual moderators of the cashless premium, including the physical form of the cashless tool (card- vs smartphone-based), the type of funds being used (credit vs debit), and the hedonic value of the product being purchased. In relation to this thesis, I seek to leverage this existing evidence to understand the potential impacts of transitioning from a cash-based to a cashless payment system on the way people gamble and their risk of experiencing gambling-related harm. I begin by reviewing the previous literature on payment methods and spending behaviour, and the mechanisms thought to underlie this relationship.

2.2. Theory and Conceptual Framework

Payment refers to the transfer of monetary value between parties to an economic transaction (Mützel, 2021). Typically, a buyer makes a payment to a seller in exchange for goods or services at a predetermined value (i.e., the price of the product). A variety of methods are available to the buyer to make the payment, but at the retail point of sale, more than nine in 10 payments are made using either cash, debit cards, credit cards, or digital/mobile wallets (Worldpay, 2021).

Under normative models of consumer behaviour (e.g., Von Neumann & Morgenstern, 1944), humans are assumed to engage in economic transactions as rational actors focused on efficiently allocating their available resources towards the goal of utility maximisation (Thaler, 1980). When considering a specific product at a set price, there is no reason to expect that the likelihood of a consumer purchasing the product, or how much they would be willing to spend on it, would differ based on whether they make the payment using cash or a debit card, provided the money is available and easily accessible. Money is seen to be fungible: at any given point in time, $50 cash in the consumer's wallet is interchangeable with $50 sitting in the bank account linked to their debit card. In both cases, the utility gained from consuming the product should be the same, as should be the reduction in future utility resulting from the cost of the purchase (i.e., the opportunity cost).

However, since the late 1970s, a substantial body of empirical research has shown that the amount a buyer is willing to spend on a product is influenced by the way in which they pay for it. The earliest field studies conducted in this area revealed that consumers who pay using credit cards tended to spend more during a visit to a department store (Hirschman, 1979) and leave larger tips after a meal in a restaurant (Feinberg, 1986; Lynn & Latané, 1984; May, 1978) compared to those paying in cash. These observational findings motivated a seminal study by Prelec and Simester (2001), who provided some of the first experimental evidence for what they termed the *credit card premium*: consumers who pay using a credit card are willing to spend more than those who pay in cash, holding other factors constant. These findings suggested that payment methods have a causal influence on spending behaviour, and that variability in spending is not simply explained by differences between consumers or the contexts within which different payment methods tend to be used.

Recently, a smaller fixed-effects meta-analysis focused on 26 studies testing only the credit card premium estimated the average effect to be moderate in strength (Cohen's d = .50, 95% CI [.41, .58]; Y. Liu & Dewitte, 2021). However, the average size of the premium for other cashless payments remains unclear. Although the credit card premium has remained a major focus in this literature (e.g., Banker et al., 2021; Chatterjee & Rose, 2012; Soman, 2003; M. Thomas et al., 2011), a variety of payment methods have been found to have differential impacts on spending behaviour relative to cash, including cheques (e.g., Monger & Feinberg, 1997; Soman, 2003), gift certificates (e.g., Raghubir & Srivastava, 2008), gift cards (e.g., Helion & Gilovich, 2014), debit cards (e.g., A. Moore & Taylor, 2011; Runnemark et al., 2015), and smartphone payment apps (e.g., Falk et al., 2016; Y. Liu et al., 2021). Related research shows

that the way consumers pay for a product can have a wide range of psychological and behavioural effects, including on their perceptions about the relative costs and benefits of a product (Chatterjee & Rose, 2012), their likelihood of purchasing unhealthy foods (M. Thomas et al., 2011; Van der Horst et al., 2017; Zeballos et al., 2020), and their feelings of connection to and ownership of a product post-transaction (Bechler & Huang, 2021; Kamleitner & Erki, 2013; Shah, Eisenkraft, et al., 2016).

2.2.1. Mental Accounting of Consumer Transactions

Explanations for the psychological and behavioural effects of payment methods come from the field of behavioural economics. In contrast to normative economic theory, *mental accounting* attempts to describe the set of cognitive processes used by consumers to make financial decisions in the real world (Thaler, 1985, 1999; C. Y. Zhang & Sussman, 2018). In this view, consumers manage their money by setting up a ledger in their minds. Like business accounting systems, consumers use this ledger to group funds into different categories (mental accounts; Henderson & Peterson, 1992), commonly based on whether they relate to sources of funds for spending (e.g., current income, current assets, future income; Shefrin & Thaler, 1988) or uses of funds (e.g., expenditure on housing, groceries, transport, entertainment; Heath & Soll, 1996). Consumers commonly define the boundaries of each mental account in relation to a set of choices (and their outcomes), which may be either broad or narrow in scope—a phenomenon known as *choice bracketing* (Read et al., 1999). The breadth of each set of choices typically depends on whether the consumer perceives a set of choices to be temporally related. Broad bracketing involves taking a longer-term, more global view, in which the consumer aggregates many choices and their outcomes for evaluation together. Narrow bracketing, on the other hand, involves evaluating each specific choice and its outcome one at a time (or a few at a time; Kahneman & Lovallo, 1993).

In contrast to business accounting systems, consumers are much more subjective and inconsistent in how they go about managing these mental accounts. Consumers demonstrate flexibility in how they assign funds to different mental accounts, whether they group a set of transactions together or consider them separately, when they choose to open or close a mental account, and how frequently the mental accounts are reconciled or evaluated (Read et al., 1999; Thaler, 1999). Essentially, this flexibility in the way consumers categorise funds means that their propensity to spend varies across different mental accounts. That is, money in one mental account is not treated the same as money in another mental account, violating the normative economic principle of fungibility (Shefrin & Thaler, 1988; Thaler, 1999). This means that consumers do not necessarily have the same propensity to spend the $50 cash in their wallet as the $50 sitting in the bank account linked to their debit card, as these sources of funds for spending may be labelled differently in their minds. Indeed, findings from several empirical studies suggest this is the case (Mercatanti & Li, 2014; A. Moore & Taylor, 2011; Runnemark et al., 2015).

Mental accounting naturally depends on a range of cognitive processes. Memory and attention are suggested to be particularly important for explaining variation in consumers'

ability to track their spending across different payment methods (Heath & Soll, 1996; Raghubir, 2006). Soman (2001) found that undergraduate students had better recall of past expenses when hypothetical payments were made using cheques compared to debit or charge cards. He argued that the process of rehearsing the purchase price by writing down the total amount in words and numbers on the cheque means that the expense is more salient and better encoded in memory compared to the equivalent purchase made by card. Cashless payments, by contrast, do not typically involve such a rehearsal process: the consumer might sign a receipt, enter their PIN, or tap their card or smartphone at the payment terminal. In another study on the links between expense tracking and memory, Srivastava and Raghubir (2002) suggest that the way consumers use memory-based information about past credit card expenses can lead them to either underestimate or overestimate their spending. Decomposing a set of aggregated transactions into individual expenses results in more accurate estimations of past and future expenses (Srivastava & Raghubir, 2002). This provides an example of how consumers' awareness of their spending can be influenced by contextual factors as different payment methods may externally impose broader or narrower choice brackets on consumers (e.g., monthly credit card statements vs small, one-off cash payments), influencing the relative salience of individual transactions (Hadar et al., 2021; H. M. Kim, 2006; Sussman & Alter, 2012).

2.2.2. Psychological Mechanisms Underlying the Cashless Premium

The predominant theoretical explanation for the impact of payment method on spending behaviour is a phenomenon known as the *pain of paying*: consumers experience aversive feelings when parting with their money (Prelec & Loewenstein, 1998; Zellermayer, 1996). Drawing on a burgeoning literature in behavioural economics examining the role of emotions in consumer behaviour, Zellermayer (1996) was the first to investigate the affective experiences of consumers during the act of making a payment. Whereas neoclassical economic models assume that a consumer's choice to make a purchase involves a rational process focused almost entirely on utility maximisation, Zellermayer suggested that the purchase decision is partly influenced by the negative emotional experience associated with making payments. Zellermayer argues that the pain of paying can be differentiated from the reduction in future utility that ultimately results from the choice to consume because the consumer experiences aversive feelings that arise *in the moment* when faced with having to make a payment. These aversive feelings function as an immediate signal to the consumer of the potential negative consequences of making a purchase on their ability to consume in the future. The pain of paying may therefore play an adaptive role in consumer self-regulation: the aversive feelings experienced in the moment prompt the consumer to reconsider whether to make a purchase, potentially acting to prevent impulsive consumption. Studies have since shown that individuals differ in the degree to which the pain of paying is experienced (termed, tightwad-spendthrift tendencies; Rick, 2018; Rick et al., 2008). However, neuroscientific studies have come to mixed conclusions about whether the pain of paying exists more literally as a pain experience (i.e., involving pain processing pathways in the brain), as opposed to more metaphorically as a conceptual description of the relative

salience of the payment experience in the consumer's mind (Banker et al., 2021; Mažar et al., 2017).

In their "double-entry" theory of mental accounting, Prelec and Loewenstein (1998) elaborate on the way that consumer financial decision-making is influenced by the interplay between the pain of paying and the pleasure of consumption. Building on earlier work by Thaler (1985), they propose that factors which draw a consumer's attention to the costs associated with a transaction detract from the pleasure of consumption, whereas factors which draw attention to the benefits of consumption diminish the pain of paying. Prelec and Loewenstein introduce the concept of *coupling*, which emphasises the importance of the relative timing of consumption and payment in moderating a consumer's hedonic response when faced with a transaction (see also, Gourville & Soman, 1998). When paying for an item in cash, the degree of coupling (the association between consumption and payment) is tight because there is a one-to-one match between the payment and consumption—it is clear to the consumer what they are getting in exchange for the payment. In contrast, when paying by credit card, the degree of coupling is relatively weak: the costs relating to each specific consumption event become decoupled from one another in time, as well as being aggregated for payment in a single periodic statement (e.g., a monthly credit card bill). This separation makes the individual cost associated with each specific consumption event less salient to the consumer. As a result, in the moment of making a purchase, the benefits of consumption become more prominent to the consumer, who experiences less of the pain of paying—only to be experienced cumulatively at a later point in time when the credit card balance is due, potentially with added interest and charges.

Whereas Prelec and Loewenstein (1998) focus on the type of funds being used to make a payment, Soman (2003) proposed that the pain of paying is also influenced by the physical form of the payment method used. Building on his earlier findings that the ability to recall past expenses differs across payment methods (Soman, 2001), Soman (2003) suggested that the physical characteristics of a payment method impact the *transparency* (salience) of the payment process. Setting cash payments as the benchmark, cashless payments reduce the tangibility and visual salience of the payment process. The lower the salience of the payment process, the less the consumer experiences the aversive feelings of parting with their money. Consumers using cashless payments therefore experience less of the pain of paying, resulting in a greater propensity to spend compared to paying in cash (Raghubir & Srivastava, 2008; Soman, 2003). In this way, the pain of paying is thought to play a key role in mediating the relationship between payment method and spending behaviour (Park et al., 2021; M. Thomas et al., 2011).

Overall, the available evidence allows me to make the following predictions relating to the cashless premium and the pain of paying, the predominant explanation for the effect:

*H*₁: The estimate of the summary effect will show cashless payment to have a positive association with greater spending behaviour relative to cash payment.

H2: The estimate of the summary effect will show cashless payment to have a negative association with greater pain of paying relative to cash payment.

2.2.3. Moderators of the Cashless Premium

Variance in effects observed in the prior literature suggests that the cashless premium depends on a range of moderating factors. Moderating factors can be arranged into five categories, based on whether they relate to: (i) the cashless payment method used for the transaction; (ii) the consumer engaging in the transaction; (iii) the product being purchased; (iv) characteristics of the primary study conducted; and (v) characteristics of the publication included in the meta-analysis.

Cashless Payment Characteristics. Perhaps the most obvious difference between cashless payment methods is the physical nature of the tool: Is the payment performed using a card or a smartphone? Modern payment cards typically have either a singular payment-related function or a relatively low level of multifunctionality (e.g., proof of identity, rewards schemes; Gafeeva et al., 2018). Smartphones, by contrast, are complex devices with diverse functions, of which payment is one less used (Li et al., 2015). As a result, smartphones are likely to be less distinctly associated with payment in consumers' minds, thereby reducing the salience of the payment process and the pain of paying experienced. Gafeeva and colleagues (2018) provide evidence to support this hypothesis in a field study comparing single and multifunctional card-based payments. They find that when non-payment-related functions are frequently used by consumers, payment methods with greater levels of multifunctionality are associated with poorer recall of transactions. Findings by Boden, Maier, and Wilken (2020) suggest that smartphones are likely to drive greater spending behaviour relative to cards simply due to the convenience of not having to carry around a wallet with cards and cash. On this basis, I hypothesise that:

H3: Whether the cashless payment method is card- or smartphone-based moderates the effect of payment method on spending behaviour, such that the effect of cashless payment methods is stronger for smartphone-based (relative to card-based) payment methods.

A second key difference relates to whether the cashless payment is linked to a source of credit. A credit facility allows the consumer to spend borrowed money, and potentially, to overcome liquidity constraints associated with a debit account (Incekara-Hafalir & Loewenstein, 2009). Prelec and Loewenstein's (1998) double-entry theory of mental accounting suggests that the cashless premium should be stronger for credit cards relative to debit cards due to temporal decoupling between consumption and payment. More broadly, a large body of literature on intertemporal choice shows that consumers are commonly inconsistent in their preferences over time (Urminsky & Zauberman, 2015) and demonstrate a *present bias*, tending to value immediate over future rewards (O'Donoghue & Rabin, 2015; Ruggeri et al., 2022; Soman et al., 2005; Thaler & Shefrin, 1981). This finding has become a central assumption in behavioural economics (Ainslie, 2016). DellaVigna and Malmendier (2004) show that credit card contracts are typically designed on the basis that many

consumers are at least somewhat naive to this bias and underestimate how much they will use the credit card. Combining credit card borrowing data with individual differences in time preferences, Meier and Sprenger (2010) find that present-biased tendencies are associated with higher credit card balances and greater likelihood of having any credit card debt. Examining bank account data of 10,690 US households that use both credit and debit cards, Montgomery, Olivola, and Pretnar (2018) observe that consumers tend to spend more following an increase in credit available than an increase in the balance of their checking account (an everyday transaction account). These findings suggest that the cashless premium is likely to be stronger for credit than debit cards, which do not involve the same intertemporal trade-offs. I therefore expect that:

*H*₄: Whether card-based payment method is debit or credit moderates the effect of payment method on spending behaviour, such that the effect of cashless payment methods is stronger for credit cards (relative to debit cards).

Consumer Characteristics. To explore heterogeneity in the cashless premium across different consumer subgroups, I assess three demographic factors commonly reported in the primary studies (gender, age, and geographical location). Evidence suggests gender differences exist in tightwad-spendthrift tendencies (Rick et al., 2008), personal and household financial decision-making (Wagner & Walstad, 2022), and impulse buying behaviour (Iyer et al., 2020). Tightwad-spendthrift tendencies are known to emerge in early childhood (Smith et al., 2018); however, it remains unclear whether these tendencies are stable across the life course, considering potential changes in income, financial literacy, and experience using different financial products.

Adoption of payment technologies varies across different markets and consumer groups. For instance, use of digital/mobile wallets for point-of-sale transactions is much more common in the Asia-Pacific region (40.2%) than in North America (9.6%; Worldpay, 2021). There is some evidence to suggest that differing levels of adoption can influence perceptions of the payment process. In a series of hypothetical studies across three countries, Boden, Maier, and Wilken (2020) find that the more consumers have used smartphone-based payments, the more they perceive the technology to be convenient. In turn, they show that both adoption and convenience influence consumers' willingness to pay.

I also test for differences in the effect based on different types of respondents in the primary studies (whether the study uses a college student sample, and whether the study recruits using an online panel service). Despite routine use of college student samples in social science research, findings from these studies often fail to generalise to broader non-student populations (Peterson, 2001). The convenience of collecting data via online panel services (e.g., MTurk, Prolific) has resulted in their widespread use by social scientists; however, several authors have questioned the validity of data obtained (Chandler & Paolacci, 2017; Sharpe Wessling et al., 2017).

Product Characteristics. Prelec and Loewenstein's (1998) model of the interactions between the pain of paying and the pleasure of consumption implies that the cashless premium should vary across product types (e.g., purchasing a vacation vs a washer-dryer).

Several authors have investigated differences in the effect based on whether the consumption experience is hedonic or utilitarian in nature (or using related constructs, such as flexible vs inflexible, vice vs virtue, unhealthy vs healthy, high vs low indulgence; Bagchi & Block, 2011; Y. Liu & Dewitte, 2021; Park et al., 2021; Soman, 2003; M. Thomas et al., 2011; Van der Horst et al., 2017). Although products cannot always be neatly classified (Alba & Williams, 2013), hedonic products can be broadly defined as those which primarily provide a pleasurable or affective consumption experience (e.g., a vacation), whereas utilitarian products are those more strongly related to achieving a functional or practical task (e.g., a washer-dryer; Dhar & Wertenbroch, 2000). In general, consumers find it more difficult to justify hedonic purchases (Okada, 2005). Prelec and Loewenstein's model proposes that cashless payments reduce the pain of paying and magnify the benefits of consumption, making these purchases easier to justify and increasing purchase likelihood. Most of the empirical evidence supports this proposition, finding that spending on and consumption of hedonic products is greater when using cashless payments (relative to cash) due to the associated lower pain of paying (H.-H. Liu & Chou, 2020; Park et al., 2021; M. Thomas et al., 2011). On this basis, I predict that:

H_5: Whether the good or service being purchased is hedonic or utilitarian moderates the effect of payment method on spending behaviour, such that the effect of cashless payment methods is stronger for hedonic (relative to utilitarian) products and services.

I explore differences in the cashless premium based on several other product-related factors identified in the prior literature. Mercatanti and Li (2014) identify the need to study whether the effect varies across different product categories (e.g., food vs non-food) to understand whether the effect is partially driven by differences in opportunity to pay with cash versus cashless means. Most of the literature investigates the cashless premium in shopping contexts; however, some studies have focused on spending situations involving an element of prosocial behaviour, such as restaurant tipping (e.g., Lynn & Latané, 1984) and charity donations (e.g., Soetevent, 2011). I assess whether the effect varies when the spending relates to an act of positive social behaviour towards others (Pfattheicher et al., 2022). Finally, given consumers are more likely to choose to pay in cash for smaller value transactions and prefer to use cashless payments for larger value transactions (Coyle et al., 2021; Santana et al., 2021), I investigate differences in the cashless premium across transaction amounts.

Study Characteristics. Liu and Dewitte's (2021) smaller meta-analysis focused on 26 studies testing only the credit card premium found evidence that the effect is fading over time. Using a median split approach, the authors found that studies published after 2004 reported effect sizes that were less than half the size on average compared to those reported in studies published prior to 2004 (Cohen's d = .33 vs d = .76). Given this finding, I assess whether this is the case for cashless payments more broadly. I expect that the cashless premium may also be fading over time due to radical changes in the payment technology landscape and consumer usage patterns since the first studies were conducted several decades ago. In 1970, only 16% of US families had a bank-type credit card (e.g., Mastercard,

Visa; Durkin, 2000). By 2020, credit card ownership had risen to an estimated 83% of US adults (US Federal Reserve, 2021). Digital/mobile wallets are increasingly becoming a key payment instrument—leading service providers like Venmo and Cash App are reported to have userbases numbering in the tens of millions (*What's in Your Digital Wallet?*, 2022). With increased exposure to cashless payment technologies, consumers have likely become more familiar with and aware of differences in the payment process, which might attenuate the cashless premium. Paper-based periodic transaction statements sent in the mail are increasingly a thing of the past. Digital personal finance apps are becoming more widespread, providing consumers with sophisticated tools to manage their money and keep track of their spending in real-time (e.g., Barros Pena et al., 2020; Feltwell et al., 2019). A field experiment by Huebner, Fleisch, and Ilic (2020) provides evidence to suggest that smartphone-based expenditure feedback can help consumers moderate their spending by counteracting the reduced pain of paying typically associated with cashless payments. I therefore expect that:

H$_6$: The year of data collection moderates the effect of payment method on spending behaviour, such that the magnitude of the effect of payment method on spending behaviour is decreasing over time.

To test whether the cashless premium could be artefactual (e.g., due to procedures used to elicit willingness to pay; Plott & Zeiler, 2005), I assess the influence of a range of methodological choices made by authors across the primary studies: whether the effect relates to a purchase in the past, present, or future; whether the study was conducted in the lab, field, or remotely; whether payment method is a within-subjects factor; whether participants report spending outcomes on more than one trial/replicate; whether the study design provides strong (vs weak) evidence for causality regarding the impact of payment method on spending; whether priming is used for the payment method condition; and whether the effect size is derived from a regression coefficient. Finding no differences in the cashless premium across these moderators would increase confidence that the effect is not simply an artefact of study design.

Publication Characteristics. Substantial evidence demonstrates that there are systematic differences in the likelihood of a study's results being made publicly available depending on the statistical significance and magnitude of its findings (Fanelli, 2012). This bias in the published literature, commonly referred to as the "file drawer" problem, represents a threat to the validity of any meta-analysis as ideally, the synthesis should consider all relevant research findings (Rodgers & Pustejovsky, 2021). To control for potential publication bias, I assess whether effect sizes vary based on whether the paper is published in a peer-reviewed journal, and whether the publishing journal has a subject focus on marketing.

2.3. Method

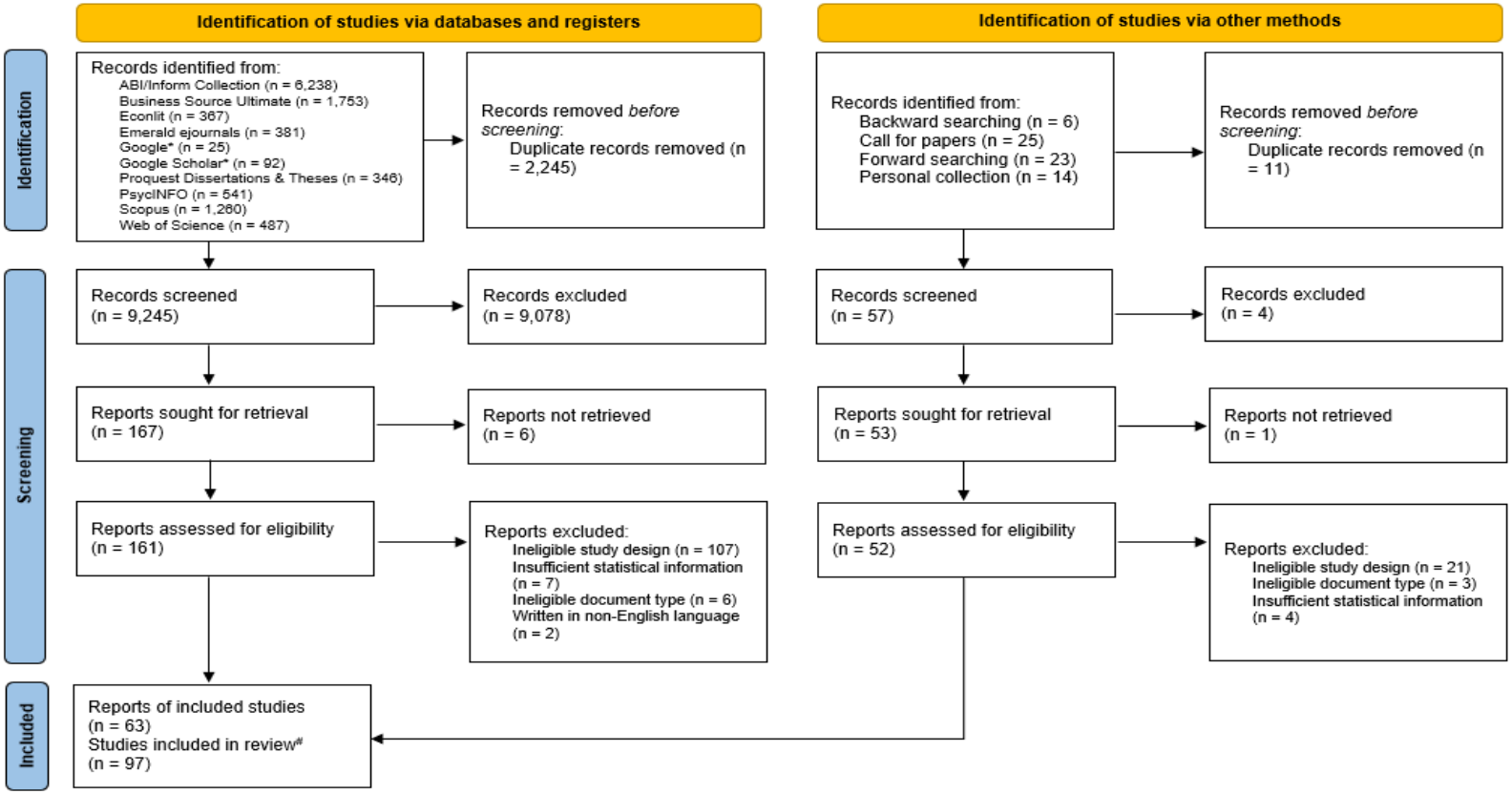
The protocol for this meta-analysis was developed following best practice guidance by Siddaway, Wood, and Hedges (2019). The protocol, including hypotheses and analysis plan, was preregistered on Open Science Framework (https://osf.io/8dsuj/).

2.3.1. Literature Search

To identify relevant literature, I performed a systematic search for both published and unpublished papers available up until January 2021 on the relationship between payment method and spending behaviour across eight major bibliographic databases (ABI/Inform Collection, Business Source Ultimate, Econlit, Emerald ejournals, Proquest Dissertations & Theses Global, PsycINFO, Scopus, Web of Science), as well as Google and Google Scholar (see Appendix A for an example of the search string used). Additional papers were identified by backward and forward searching, issuing calls for papers through listservs operated by relevant scholarly societies (*American Marketing Association*, *Association for Consumer Research*, *Society for Judgment and Decision Making*), and contacting active researchers in the field. Figure 2 displays a flow diagram (Page et al., 2021). The study selection process was managed using Rayyan software for systematic reviews (Ouzzani et al., 2016).

Figure 2

Flow Diagram Summarising Study Identification and Screening



Note. *Records identified from Google and Google Scholar were combined with records identified from databases prior to screening. Two researchers independently conducted the searches of Google and Google Scholar and screened the results for potentially relevant records. The Google search returned 5,520,000 results; however, Google automatically displayed only the 256 results it deemed most relevant. Of these 256 results, 25 records (including duplicates) were identified as relevant and combined with records identified from databases prior to screening. The Google Scholar search returned 14,400 results; however, Google Scholar displayed only the first 1,000 results. Of these 1,000 results, 92 records (including duplicates) were identified as relevant and combined with records identified from databases prior to screening. #Some reports included more than one relevant study.

2.3.2. *Eligibility Criteria*

To be included in the review, studies needed to meet all of the following criteria: (i) be available in the full-text version and written in the English language; (ii) be designed to assess the effect of cashless (card- or smartphone-based) payment methods with cash payment (comparator); (iii) report outcomes relating to spending behaviour (e.g., actual, intended, or perceived spending) or the pain of paying in the context of day-to-day consumer spending; and (iv) have an experimental, quasi-experimental, or observational analytic study design. No restrictions were placed on the earliest publication date.

Studies needed to report sufficient statistical information to allow computation of the standardised difference in means as expressed by Hedges' g. Efforts were made to extract all relevant effect sizes from the included studies as models using the complete set of measurements produce superior estimates compared to those in which each study is represented by a single measurement (e.g., the mean or median effect size; Bijmolt & Pieters, 2001). In cases where the primary studies did not report means and standard deviations, extracted effect sizes were converted using formulae specified by Borenstein et al. (2009) and Lipsey and Wilson (2000; see Appendix B for further details).

Two researchers independently conducted the study screening and eligibility assessments. Cohen's kappa (κ = .33) indicated fair inter-rater agreement during the screening stage.[5] Discrepancies and borderline cases were discussed until a consensus decision was reached.

2.3.3. *Overview of Included Studies*

The literature search yielded a total of 9,245 unique records for screening. Of the 165 full-text papers assessed for eligibility, 97 studies from 63 papers met eligibility criteria (see Appendix C for references).

Ninety-four studies from 62 papers reported outcomes relating to spending behaviour (N = 33,410 participants).[6] Of these papers, 43 were original research articles published between 1978 and 2021 across 28 journals, and 19 were unpublished papers (9 working/conference papers and 10 theses/dissertations). Studies were conducted in Australia (n = 1), Bangladesh (n = 1), Belgium (n = 2), Canada (n = 4), China (n = 3), Czechia (n = 1), Denmark (n = 1), Germany (n = 3), Hong Kong (n = 2), India (n = 3), Indonesia (n = 1), Italy (n = 1), New Zealand (n = 1), the Netherlands (n = 2), the UK (n = 1), and the US (n = 70). Data collection for the earliest study to compare spending outcomes on smartphones and cash took place in 2012 (Falk et al., 2016).

Twenty-one studies from 13 papers reported outcomes relating to the pain of paying (N = 6,394 participants). Of these papers, 7 were original research articles published between 2011 and 2021 across 4 journals, and 6 were unpublished papers (2 working/conference papers and 4 theses/dissertations). Studies were conducted in Belgium (n = 2), Canada (n =

[5] During the screening stage, the researchers took a lenient approach and erred on the side of inclusion if the relevance of the article was unclear.

[6] This figure excludes four studies that analysed large transaction datasets ($N \approx$ 26,421,649 transactions).

2), China (n = 1), Germany (n = 2), India (n = 2), the Netherlands (n = 1), the UK (n = 2), and the US (n = 12).

2.3.4. Data Analysis

Analyses were conducted in R version 4.1.1 (R Core Team, 2021) following the procedures suggested by Harrer and colleagues (2021) using the *metafor* package (Viechtbauer, 2010), which uses restricted maximum likelihood estimation. Values of Hedges' g were interpreted based on the heuristics proposed by Cohen (1988): g = .20 is a small effect size; g = .50 is a medium effect size; g = .80 is a large effect size. Given a total of six hypotheses, critical alpha for each hypothesis test was set at α = .05 / 6 = .0083. A statistical significance level of α = .05 was adopted for all exploratory analyses.

2.3.5. Meta-Analytic Strategy

First, a random-effects meta-analysis was performed to evaluate the cashless premium (H_1). Spending behaviour is typically operationalised using measures of willingness to pay (e.g., Chatterjee & Rose, 2012; Falk et al., 2016; Prelec & Simester, 2001; Runnemark et al., 2015), amount spent (e.g., Bagchi & Block, 2011; Incekara-Hafalir & Loewenstein, 2009; Lee et al., 2019), number of items purchased (e.g., Gafeeva et al., 2018; M. Thomas et al., 2011), and purchase likelihood (e.g., Banker et al., 2021; Shah, 2015). I combined these measures to examine the overall effect size of payment method (cashless vs cash) on spending behaviour, and then compared relative effect size strengths by considering them separately. Mean differences were calculated such that a positive difference score indicates that cashless payment is associated with greater spending behaviour relative to cash payment, i.e., a cashless premium.

Most studies contained multiple measures of the focal effect so I adopted a multi-level modeling approach to account for dependency between effect sizes nested within studies (Moeyaert et al., 2017; Van den Noortgate et al., 2015). Level 1 consists of pooled data (e.g., means and standard deviations) from individual participants within the primary studies. Level 2 pools multiple effect sizes within each primary study (i.e., a cluster). Finally, level 3 pools the aggregated cluster effects to compute an estimate of the overall effect size.

The formal specification of the meta-analytic model used to estimate the cashless premium (without accounting for moderators) can be stated as:

$$\hat{\theta}_{ij} = \mu + \zeta_{(2)ij} + \zeta_{(3)j} + \epsilon_{ij}$$

where $\hat{\theta}_{ij}$ is an estimate of the true effect size θ_{ij}, μ is an estimate of the overall mean population effect, $\zeta_{(2)ij}$ is the within-cluster heterogeneity on level 2 (i.e., heterogeneity due to differences within studies), $\zeta_{(3)j}$ is the between-cluster heterogeneity on level 3 (i.e., heterogeneity due to differences between studies), and ϵ_{ij} represents sampling error.

Primary studies including more than one cashless payment condition involve another source of dependency referred to as "double-counting." Making multiple comparisons with the control (cash) condition results in the participants in that condition being counted more than once (i.e., treated as independent samples). To account for this

source of dependency, I followed Harrer and colleagues' (2021) guidance in dividing the sample size of the control group by the number of cashless payment conditions included in the study. For example, for a study comparing spending outcomes across two types of cashless payments with a cash control condition, the sample size of the control group was divided by 2. Taking this approach allowed comparisons between different types of cashless payments, which would not be possible if I took the alternative solution of synthesising the pooled results from the cashless payment conditions to create a single effect size for comparison.

Using the same approach as described above, a second random-effects meta-analysis was performed to estimate the impact of payment method (cashless vs cash) on the pain of paying (H_2). Studies typically measured the pain of paying by using self-report scales that asked participants about their feelings while spending money (e.g., M. Thomas et al., 2011). Mean differences were calculated such that a negative difference score indicates that cash payment is associated with greater pain of paying relative to cashless payment.

2.3.6. Addressing Publication Bias

Although the literature search employed several strategies to mitigate the risk posed by the "file drawer" problem, statistical methods are also commonly used to assess whether indicators of publication bias are present in the data. These methods are relatively well developed for meta-analyses in which each primary study contributes a single effect size; however, limited attention has been given to assessments of publication bias for multi-level meta-analyses involving multiple statistically dependent effect sizes clustered within each primary study. Even less attention has been given to how to adjust for bias in such cases. To account for the dependencies in our data, Rodgers and Pustejovsky (2021) recommend using the multi-level version of Egger's regression test to detect small-study effects, which refer to the greater likelihood of small studies being affected by publication bias. I perform this test by including the standard error of the estimate (i.e., the precision of the estimate) as a covariate in the model (Fernández-Castilla et al., 2021). I then use three-parameter selection models to explore how the summary estimates change after accounting for potential selective publication on the basis of statistical significance (McShane et al., 2016).[7] Given the dependencies in the data, the selection models are estimated using the aggregate effect size for each study (computed by synthesising the effects within studies).

2.3.7. Quality Assessment

Risk of bias in individual studies was assessed using the Joanna Briggs Institute's critical appraisal tools for randomised controlled trials (Tufanaru et al., 2020), quasi-experimental (non-randomised experimental) studies (Tufanaru et al., 2020), and analytical cross-sectional studies (Moola et al., 2020), as appropriate for the included study's design. Results are reported in Appendix D.

[7] Duval and Tweedie's (2000) trim and fill method is commonly used to calculate adjusted meta-analytic estimates in the presence of small-study effects; however, this method is not ideal when there is a large amount of between-study heterogeneity (Peters et al., 2007). I therefore decided against using this method.

2.3.8. Moderators of the Cashless Premium

Two researchers independently reviewed the included studies and manually coded potential moderators of the cashless premium following the coding scheme outlined in Table 1. Discrepancies and borderline cases were discussed until a consensus decision was reached.

Table 1

Coding Scheme for Moderators in Meta-Regression

Variable	Type	Description and Coding Scheme
Cashless payment characteristics		
Physical form (card vs smartphone)	Categorical	Type of cashless payment (card vs smartphone) being compared to cash. Card-based payments refer to payments performed using a physical card, such as by swiping or tapping the card at a payment terminal. Examples of card-based payments include debit cards, credit cards, charge cards, pre-paid cards, and store gift cards. Smartphone-based payments refer to payments performed using a smartphone device, such as by tapping the smartphone, containing a digital/mobile wallet or payment app, at a payment terminal.
Type of funds (credit vs debit)	Dichotomous	1 = cashless payment is linked to a source of credit (e.g., credit card; smartphone-based digital wallet linked to a credit card)
		0 = cashless payment is not linked to a source of credit (e.g., debit card; smartphone-based digital wallet linked to a bank account)
Consumer characteristics		
Sample type (student vs non-student)	Dichotomous	1 = study sample primarily consists of undergraduate/college students
		0 = study sample does not primarily consist of undergraduate/college students
Recruitment strategy (online panel vs not)	Dichotomous	1 = study sample was primarily recruited using a paid online recruitment service, such as Amazon Mechanical Turk or Prolific
		0 = study sample was not primarily recruited using a paid online recruitment service
Mean age of sample	Continuous	Mean age of the study participants in years
Proportion female	Continuous	Percentage of female participants in the study sample
Continent	Categorical	Continent where data collection took place (Asia, Europe, Oceania, North America)
Product characteristics		
Product category (food vs non-food)	Dichotomous	1 = effect primarily relates to the purchase of food-related products
		0 = effect primarily relates to the purchase of non-food-related products
Product type (hedonic vs utilitarian)	Dichotomous	1 = effect primarily relates to the purchase of hedonic products
		0 = effect primarily relates to the purchase of utilitarian products
		To distinguish between hedonic and utilitarian classifications in cases where this distinction was not made clear in the primary study, Dhar and Wertenbroch's (2000) definition was applied based on the general characteristics of the product(s) being purchased: hedonic products are those "whose consumption is primarily characterised by an affective and sensory experience

Variable	Type	Description and Coding Scheme
		of aesthetic or sensual pleasure, fantasy, and fun," whereas utilitarian products are those "whose consumption is more cognitively driven, instrumental, and goal oriented and accomplishes a functional or practical task" (p. 61).
Spending type (prosocial vs not)	Dichotomous	1 = spending behaviour is prosocial in nature (e.g., tipping, donations)
		0 = spending behaviour is not prosocial in nature
Transaction amount	Continuous	Estimated dollar value of the transaction, adjusted for inflation and converted to USD
Study characteristics		
Year of data collection	Continuous	Year in which data were collected for the study
Timeframe of reference for purchase	Categorical	Whether the effect size relates to a purchase that occurred in the past (e.g., a recalled purchase, even a minute ago), present (the effect is measured in real time, such as an objective measure of amount spent recorded on a receipt), or future (the effect relates to intended or anticipated spending behaviour, as measured by willingness to pay or purchase intention, for example)
Study setting (lab vs field vs remote)	Categorical	Whether the study was conducted as a lab-based, field-based, or remote (e.g., online/mail-based survey) study
Payment method (within vs between subjects)	Dichotomous	1 = payment method is a within-subjects factor in the study (i.e., participants are measured across >1 payment condition)
		0 = payment method is a between-subjects factor in the study
Spending measured on >1 trial/replicate (multiple vs single trial)	Dichotomous	1 = spending outcome variable is measured on >1 trial/replicate. For example, in Study 2 of Thomas, Desai, and Seenivasan (2011), participants respond to 10 replicates of each product type
		0 = spending outcome variable is measured on a single trial
Evidence for causality (strong vs weak evidence)	Dichotomous	1 = study design provides relatively strong evidence for causality regarding the impact of payment method on spending behaviour (e.g., experimental studies using random allocation to the payment method condition)
		0 = study design provides relatively weak evidence for causality (e.g., cross-sectional survey designs)
Priming payment	Dichotomous	1 = study uses priming for payment method conditions
		0 = study does not use priming for payment method conditions
Effect size based on a regression coefficient	Dichotomous	1 = extracted effect size relates to a regression coefficient
		0 = extracted effect size does not relate to a regression coefficient
Publication characteristics		
Peer-reviewed paper	Dichotomous	1 = paper published in a journal that is refereed, according to Ulrich's Web Global Serials Directory
		0 = paper is not published in a refereed journal
Published in a marketing journal	Dichotomous	1 = paper published in a journal with a subject focus on marketing, according to Ulrich's Web Global Serials Directory
		0 = paper is not published in a marketing journal

Missingness is a common problem faced by meta-analysts. Seven moderators had missing values: type of funds (n = 97); mean age of sample (n = 58); proportion female (n = 97); continent (n = 2); food vs non-food (n = 60); hedonic vs utilitarian (n = 44); and transaction amount (n = 63). Of the 431 effect sizes, 178 had no missing values, 168 had 1 missing value, 39 had 2 missing values, 23 had 3 missing values, 9 had 4 missing values, and 14 had 5 missing values. Therefore, if a complete case analysis was performed using listwise deletion, only 41.3% of cases would be included in the meta-regression model, potentially resulting in biased estimates. In cases where moderators could not be coded based on the information reported in the primary study, I adopted Pigott and Polanin's (2020) best practice guidance for dealing with missingness: (i) making an informed inference based on the available data; (ii) contacting the authors for additional information; and failing that, (iii) using multiple imputation to handle missing moderator data. Multiple imputation was performed using the *mice* package (Van Buuren & Groothuis-Oudshoorn, 2011).[8] Following recommendations by White, Royston, and Wood (2011), all moderator variables and effect sizes (but not sampling variances) were entered into the imputation model. Fifty-nine datasets were imputed based on 58.7% of cases being incomplete. This reduces uncertainty about the accuracy of the imputed values. No effect sizes or sampling variances were imputed.

2.3.9. Meta-Regression Model

To assess potential moderators of the cashless premium (H_3 to H_6), a three-level mixed-effects multiple meta-regression was performed. Moderating factors were simultaneously entered into the meta-analytic model to predict the standardised mean difference effect sizes for cashless compared to cash payment on spending behaviour. I fit the model to each of the 59 imputed datasets, and then pooled the results. After adding moderators,[9] the model can be formally specified as follows:

[8] Predictive mean matching was used to impute continuous variables (mean age of sample; proportion female; transaction amount), logistic regression for dichotomous variables (type of funds; food vs non-food; hedonic vs utilitarian), and polytomous regression for categorical variables (continent).

[9] Four moderators included in the preregistration were omitted from the meta-regression model. A moderator indicating whether the product being purchased was physical vs experiential in nature was omitted because the imputation model failed to converge when it was included. A moderator indicating whether the observed effect related to a hypothetical purchase scenario was omitted due to collinearity with the time of purchase moderator (e.g., potentially due to hypothetical purchase scenarios typically relating to future-focused purchase events). A moderator relating to effect size precision (inverse variance) was omitted as the model failed to converge when it was included. Finally, a moderator indicating whether the paper had been published was omitted due to collinearity with the moderator indicating whether the paper had been published in a peer-reviewed journal.

$$\hat{\theta}_{ij} = \theta + \beta_1 physical\ form + \beta_2 type\ of\ funds + \beta_3 sample\ type + \beta_4 recruitment\ strategy + \beta_5 mean\ age\ of\ sample + \beta_6 proportion\ female + \beta_7 continent_{Asia} + \beta_8 continent_{Europe} + \beta_9 continent_{Oceania} + \beta_{10} product\ category + \beta_{11} product\ type + \beta_{12} spending\ type + \beta_{13} transaction\ amount + \beta_{14} year\ of\ data\ collection + \beta_{15} time\ of\ purchase_{past} + \beta_{16} time\ of\ purchase_{future} + \beta_{17} study\ setting_{field} + \beta_{18} study\ setting_{remote} + \beta_{19} payment\ condition_{within\ subjects} + \beta_{20} spending\ outcomes_{multiple\ trials} + \beta_{21} evidence\ for\ causality + \beta_{22} priming + \beta_{23} regression\ coefficient + \beta_{24} paper_{peer-reviewed} + \beta_{25} paper_{marketing} + \zeta_{(2)ij} + \zeta_{(3)j} + \epsilon_{ij}$$

where θ is the intercept and β is the regression weight of the predictor variable.

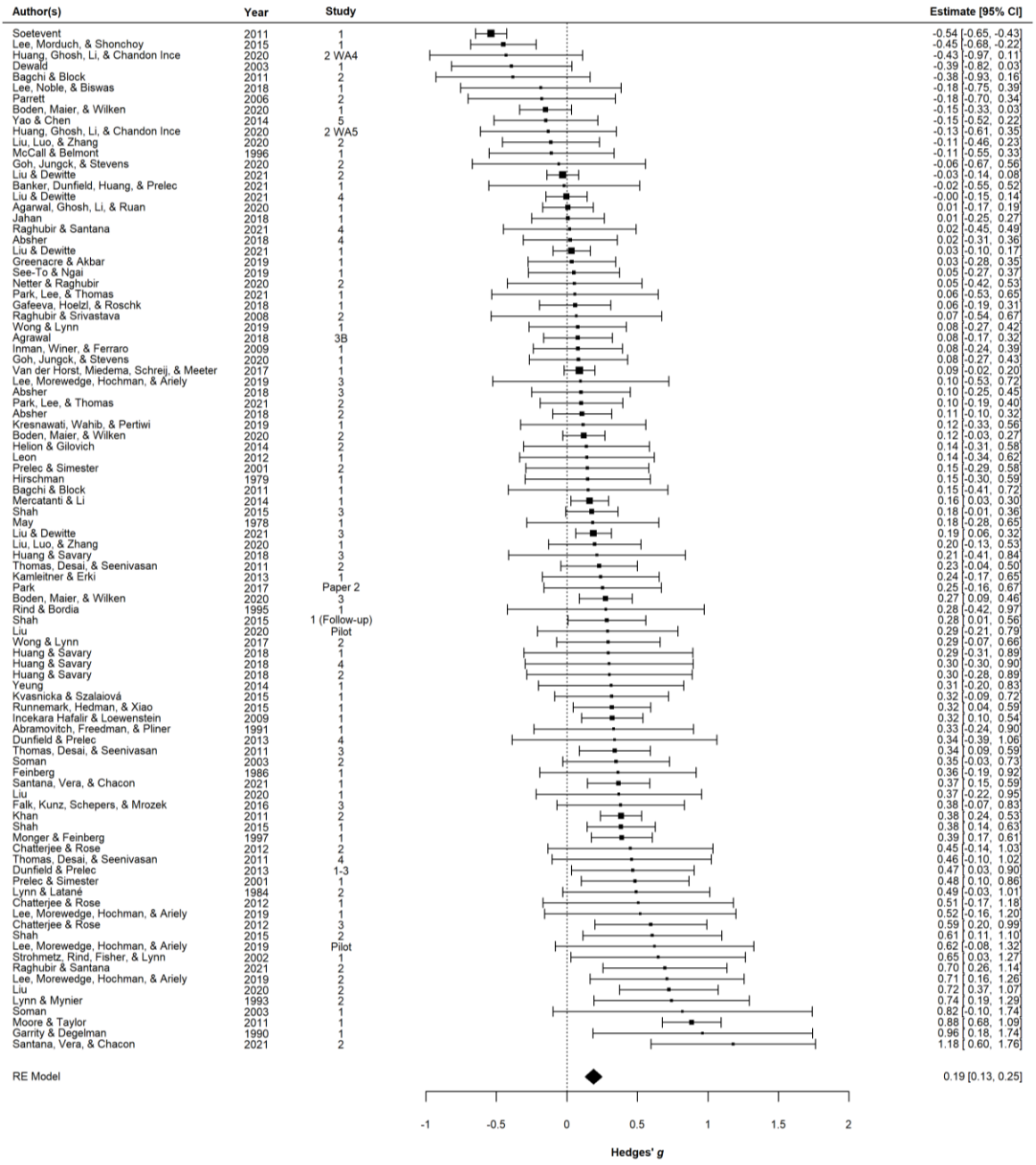
2.4. Results

2.4.1. Payment Methods and Spending Behaviour

Figure 3 contains a forest plot, visually summarising the meta-analysis estimating the effect of cashless (vs cash) payments on spending behaviour. In support of H_1, cashless payment had a significant positive association with greater spending behaviour (g = .19, p < .001, 95% CI [.13, .25]), based on 431 effect sizes from 94 studies. Put simply, this result supports the cashless premium, indicating cashless payments encourage spending behaviour compared to payments made in cash. The 95% prediction interval ranged from g = -.43 to .81, suggesting some future studies can be expected to observe negative effects (IntHout et al., 2016). The estimated variance components were $\tau^2_{\text{Level 3}}$ = .050 and $\tau^2_{\text{Level 2}}$ = .050. This means that similar proportions of heterogeneity are attributable to differences between studies ($I^2_{\text{Level 3}}$ = 49.7%) and differences within studies ($I^2_{\text{Level 2}}$ = 50.3%). Overall, these indicators suggest that there is substantial heterogeneity in the data.

Figure 3

Forest Plot of Studies Included in Meta-Analysis of the Effect of Payment Methods on Spending Behaviour



Note. As many studies included multiple effect sizes, this forest plot displays the aggregate effect size for each study (computed by synthesising the effects within studies), as represented by the square on each row. The size of the square reflects the precision (i.e., inverse standard error) of the estimate, such that larger squares represent more precise estimates. The line extending beyond each side of the square represents the corresponding 95% confidence interval. The diamond at the base of the plot represents the summary estimate predicted by the three-level random-effects meta-analytic model.

Examining Different Measures of Spending Behaviour Separately. When considering different measures of spending behaviour separately, I find similar summary effects for outcomes related to willingness to pay (k = 242; g = .21, p < .001, 95% CI [.13, .29]) and amount spent (k = 91; g = .20, p < .001, 95% CI [.11, .30]). However, the cashless premium was non-significant when spending behaviour was measured based on number of items purchased (k = 32; g = .15, p = .058, 95% CI [-.01, .31]) or purchase likelihood (k = 66; g = .04, p = .670, 95% CI [-.16, .24]). As a robustness check, I ran the model with all effect sizes except those related to purchase likelihood and obtained similar results to the original model (k = 365; g = .21, p < .001, 95% CI [.15, .27]).

Robustness Checks. Several methods were used to check for outliers and influential cases, which may distort the summary estimate if present (Viechtbauer & Cheung, 2010). Values of Cook's distance were below .07 for all observed effects, and below .22 on the cluster level. DFBETAS values ranged from -.26 to .16 for observed effects, and from -.31 to .50 on the cluster level.[10] However, the hat values (i.e., weights) of 15 observed effect sizes were greater than $3\frac{1}{k}$, a commonly used cut-off. Running the model again without these effect sizes, I obtain similar results to the original model (k = 416; g = .20, p < .001, 95% CI [.13, .26]). This result increases confidence that the estimate of the summary effect is not driven by a small number of highly influential cases.

To assess the effect of nesting effect sizes within studies, I compared the three-level model to an equivalent two-level model, which ignores the dependencies between effect sizes in each study. The three-level model demonstrated significantly better fit compared to a two-level model in which the between-study heterogeneity was set to zero, $\chi^2(1) = 136.57$, p < .001. The three-level random-effects model also showed significantly better fit than a two-level fixed-effects model ($\chi^2(1) = 917362.50$, p < .001), suggesting that the assumption that the true effect could systematically vary across studies was justified. Finally, some of the included effect sizes were based on correlations or binary data reported in primary studies (i.e., not mean difference effect sizes). Excluding these effect sizes from the synthesis resulted in a similar estimate of the summary effect (k = 356; g = .20, p < .001, 95% CI [.14, .27]). These results support the suitability of the modelling approach taken.

Publication Bias. The multi-level version of Egger's regression test suggested that small-study effects may be present in the data, as indicated by the coefficient of the precision estimate being statistically significant (β = 1.32, t = 5.39, p < .001, 95% CI [.84, 1.80]). I fit a three-parameter selection model to explore how publication bias might be influencing the summary estimate. Specifying a cut-point of α = .025, I obtain similar results to the original model (k = 94; g = .24, p < .001, 95% CI [.14, .35]). The likelihood ratio test of selection model parameters was non-significant ($\chi^2(1) = 1.81$, p = .18), suggesting that studies reporting statistically significant results were not significantly more likely to be published than those reporting non-significant results, assuming a critical value of p = .05. Performing the same analysis using a less stringent cut-point of α = .05, I again obtain a similar estimate of the

[10] The DFBETAS statistic indicates the change in the estimate of the summary effect when each observation/cluster is excluded from the model in turn (Viechtbauer & Cheung, 2010).

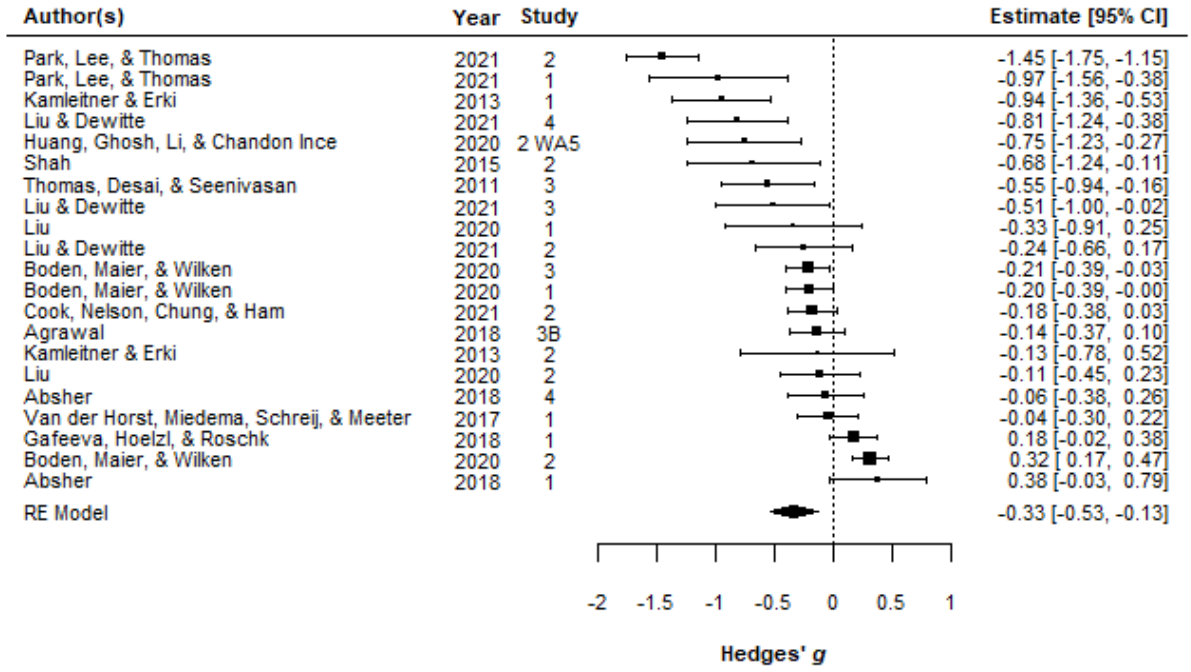
summary effect (g = .22, p < .001, 95% CI [.12, .32]) and do not find significant differences in selection likelihood ($\chi^2(1)$ = .70, p = .40). Taken together, these results suggest there may be some selective reporting in the prior literature, but not to a degree causing substantial bias in the summary estimate.

2.4.2. *Payment Methods and the Pain of Paying*

In support of H_2, cashless payment had a significant negative association with greater pain of paying (g = -.33, p = .002, 95% CI [-.53, -.13]), based on 85 effect sizes from 21 studies (see Figure 4). Put simply, people experience less of the pain of paying when using cashless payment methods. The 95% prediction interval ranged from g = -1.30 to .63, suggesting some future studies can be expected to observe positive effects. The estimated variance components were $\tau^2_{\text{Level 3}}$ = .179 and $\tau^2_{\text{Level 2}}$ = .046. This means that a large portion of heterogeneity is due to differences between studies ($I^2_{\text{Level 3}}$ = 70.9%), while a smaller portion is due to differences within studies ($I^2_{\text{Level 2}}$ = 18.2%).

Figure 4

Forest Plot of Studies Included in Meta-Analysis of the Effect of Payment Methods on the Pain of Paying



Note. As many studies included multiple effect sizes, this forest plot displays the aggregate effect size for each study (computed by synthesising the effects within studies), as represented by the square on each row. The size of the square reflects the precision (i.e., inverse standard error) of the estimate, such that larger squares represent more precise estimates. The line extending beyond each side of the square represents the corresponding 95% confidence interval. The diamond at the base of the plot represents the summary estimate predicted by the random-effects meta-analytic model.

Robustness Checks. Several methods were used to check for outliers and influential cases. Values of Cook's distance were below .16 for all clusters except one (D = .53) and were below .06 for each observed effect. DFBETAS values ranged from -.26 to .11 for observed effects and ranged from -.90 to .41 on the cluster level. Hat values of three observed effect sizes were greater than the conventional cut-off of $3\frac{1}{k}$. Running the model again without these three effect sizes plus another three effect sizes from the study with the larger Cook's distance value, a smaller effect is obtained that is no longer statistically significant at the critical alpha level adopted for confirmatory tests (k = 79; g = -.21, p = .016, 95% CI [-.39, -.04]). This result suggests the estimate of the summary effect is driven by a small number of highly influential cases. After excluding these influential cases, H_2 is not supported when utilising the more stringent significance cut-off of α = .0083, which incorporates an adjustment for multiple comparisons.

Compared to an equivalent two-level model in which the between-study heterogeneity was set to zero, the three-level model demonstrated significantly better fit, $\chi^2(1) = 42.56$, $p < .001$. The three-level random-effects model also showed significantly better fit than a two-level fixed-effects model ($\chi^2(1) = 474.21$, $p < .001$). Excluding effect sizes converted from effect sizes based on correlations or binary data resulted in a smaller yet still statistically significant estimate of the summary effect (k = 78; g = -.24, p = .007, 95% CI [-.42, -.07]). These results support the suitability of the modelling approach taken.

Publication Bias. The multi-level version of Egger's regression test suggested that small-study effects were not present in the data (β = -.55, t = -.63, p = .528, 95% CI [-2.28, -1.18]). A three-parameter selection model with a cut-point of α = .025 produced a similar estimate of the summary effect (k = 21; g = -.29, p = .038, 95% CI [-.56, -.02]), and did not suggest that significant results were more likely to be published than non-significant results ($\chi^2(1) = .33$, p = .57). A similar pattern of results is observed at the less stringent cut-point of α = .05 (g = -.42, $p < .001$, 95% CI [-.62, -.22]; $\chi^2(1) = 1.86$, p = .17). These observations increase confidence that the summary estimate for the pain of paying is not heavily influenced by selective publication.

2.4.3. Moderators of the Cashless Premium

To test for moderators of the impact of payment method on spending behaviour, a mixed-effects multiple meta-regression was performed, based on 431 effect sizes from 94 studies (Table 2). The omnibus test of moderators was significant ($F(25, 405) = 1.798$, p = .012). The estimated variance components were $\tau^2_{\text{Level 3}}$ = .039 and $\tau^2_{\text{Level 2}}$ = .049. All variance inflation factors were below 4.8, indicating problematic levels of multicollinearity were not present.

Table 2

Results of a Three-Level Mixed-Effects Multiple Meta-Regression to Identify Moderators of the Impact of Payment Methods on Spending

Predictors	β	SE(β)	t	df	p
Intercept	.45	.15	3.08	386.49	.002
Cashless payment characteristics					
H_4: Smartphone payment (k = 87; vs card-based)	-.07	.07	-1.10	355.63	.273
H_5: Credit (k = 185; vs debit)	.02	.06	.32	299.21	.751
Consumer characteristics					
Student sample (k = 166; vs non-student)	-.15	.11	-1.36	375.31	.174
Online panel recruitment (k = 116; vs other)	-.17	.15	-1.13	384.46	.257
Mean age of sample (continuous)	-.02	.00	-3.10	268.72	.002
Proportion female (continuous)	-.26	.21	-1.22	237.92	.223
Asia (k = 37; vs North America)	-.19	.09	-2.07	359.01	.039
Europe (k = 119; vs North America)	-.13	.09	-1.40	384.15	.161
Oceania (k = 21; vs North America)	.02	.19	.08	387.84	.934
Product characteristics					
Non-food products (k = 251; vs food)	-.04	.06	-.64	263.23	.525
H_6: Hedonic products (k = 196; vs utilitarian)	-.04	.05	-.88	354.28	.378
Prosocial spending (k = 40; vs non-prosocial)	-.17	.11	-1.54	353.22	.124
Transaction amount (continuous; inflation-adjusted USD)	.00	.00	1.20	265.19	.229
Study characteristics					
H_3: Year of data collection (continuous)	-.01	.00	-1.24	358.07	.217
Past purchase (k = 17; vs present)	-.16	.13	-1.24	391.85	.216
Future purchase (k = 264; vs present)	-.11	.11	-.97	379.59	.334
Field study (k = 127; vs lab)	.09	.12	.79	385.55	.429
Remote study (k = 207; vs lab)	.19	.11	1.70	375.06	.089
Payment condition is within-subjects (k = 26; vs between)	-.01	.14	-.06	390.97	.956
Spending measured on >1 trial/replicate (k = 231; vs single)	.09	.08	1.02	396.06	.306
Strong evidence for causality (k = 331; vs weak)	-.04	.09	-.44	394.88	.657
Priming (k = 88; vs no priming)	.15	.12	1.26	391.39	.208
Regression coefficient (k = 68; vs other)	-.11	.07	-1.70	394.88	.090
Publication characteristics					
Peer-reviewed (k = 280; vs non-peer-reviewed)	-.09	.08	-1.05	384.72	.296
Published in a marketing journal (k = 194; vs other)	-.10	.09	-1.12	391.50	.265

Note. Continuous variables are mean-centred. The number of effect sizes (k) is indicated for the category displayed.

Contrary to H_3, the year of data collection did not have a significant moderating effect on the cashless premium (p = .217). Visual inspection of a scatterplot showed no clear evidence of a relationship (see Appendix E). A consistent result is found when specifying the year of data collection moderator using a median split approach (p = .518). These results suggest that the magnitude of the cashless premium has not changed significantly over time.

Neither the physical form of the cashless payment (smartphone vs card; p = .273) nor the type of funds used (credit vs debit; p = .751) were significant moderators of the cashless premium, meaning H_4 and H_5 were not supported. Studies reporting effects relating to smartphone-based payments generally did not report the type of funds used (e.g., whether the digital wallet was linked to a credit/debit card or bank account). As a robustness check of H_5, I examined the effect of excluding effect sizes that were based on smartphone payments (i.e., only comparisons between cash and card-based payments were included). Running the multiple meta-regression model on the reduced dataset, I still find no significant moderating effect of the type of funds used (k = 344; p = .631).

Contrary to H_6, whether the product being purchased was hedonic or utilitarian in nature did not have a significant moderating effect on the cashless premium (p = .378). As a robustness check, I examined the effect of substituting this moderator with two alternatives found in the literature that overlap conceptually with the hedonic vs utilitarian dichotomy: non-essential vs essential, and impulsive vs non-impulsive products. In both cases, results are consistent: the magnitude of the cashless premium does not significantly differ depending on whether the product(s) being purchased are primarily non-essential vs essential (p = .468), or impulsive vs non-impulsive in nature (p = .574).

As for my exploratory analyses, the mean age of the sample had a significant moderating effect on the cashless premium, such that for every year increase in age, the effect decreases in magnitude by .02 (p = .002). To check for a cohort effect, I added the interaction between the year of data collection and the mean age of the sample to the model. The interaction was non-significant (p = .515), ruling out a cohort effect.

The cashless premium appears to be robust across transaction amounts as no significant differences were observed (p = .229). As a robustness check, I tested the transaction amount moderator specified as a dichotomous variable set at a variety of cut-off points: (i) $2.50, based on Santana and colleagues' (2021) finding that this value is the tipping point at which 50% of transactions are paid in cash; (ii) $25, based on the US Federal Reserve's definition of small-value payments (Coyle et al., 2021); (iii) $100; (iv) mean split ($63.68); and (v) median split ($21.15). In each case, the effect of transaction amount was non-significant (all ps > .188).

Finally, I find some evidence that the cashless premium varies depending on geographic location. In comparison to North America, the magnitude of the cashless premium was significantly lower in studies conducted in Asia (p = .039), but no differences were observed in relation to Europe (p = .161) or Oceania (p = .934).

2.5. Discussion

Recent decades have witnessed significant technological disruption of the payments industry. For consumers, the everyday experience of making payments in physical retail spaces has been revolutionised by the emergence of new digital payment methods and the increasing normality of non-cash payments. Cashless payment technologies are becoming increasingly complex in ways that potentially have both beneficial and detrimental consequences for consumer financial wellbeing. These trends raise questions about the net impact of cashless payments on consumer spending behaviour, and whether this effect is changing over time. I aimed to answer these questions by using a meta-analytic approach to leverage the evidence collected by over 90 studies conducted across more than four decades of consumer research. In addition, I sought to evaluate the evidence relating to the main psychological mechanism thought to underlie the effect (the pain of paying), and to assess the robustness of key conceptual moderators of the cashless premium. In the context of this thesis, this study contributes to understanding the potential impacts of transitioning from cash-based to cashless payment systems on the way people gamble and their risk of experiencing gambling-related harm.

My analysis shows that the cashless premium is a small but robust effect that has not changed in size over the time period during which the primary studies were conducted (1978–2021). Although my main analysis found that people experience less of the pain of paying when using cashless payment methods, this effect became non-significant after excluding a small number of highly influential cases. This result challenges the adequacy of the pain of paying as the predominant theoretical explanation for the cashless premium. The results of the meta-regression also suggest that existing conceptual frameworks are underdeveloped. Despite the cashless premium being robust, factors that existing theories suggest should be key moderators of the effect were not found to be. In contrast to theory-driven expectations, I find no evidence that the cashless premium differs significantly based on the physical form of the cashless tool (card- vs smartphone-based), the type of funds being used (credit vs debit), or the type of product being purchased (hedonic vs utilitarian). In the remainder of this section, I discuss potential explanations for these null effects; however, I note that these explanations should be considered speculative as they rely on asserting the null. Further endeavours are needed to clarify the mechanisms underlying the cashless premium.

I expected to see the cashless premium decreasing in magnitude over time (i.e., as consumers adjust to using cashless payments regularly), but the results of the meta-regression indicate that to date, this is not the case. This finding suggests that even as adoption of and familiarity with cashless payments has increased in recent years, the cashless premium has not changed. Another potential explanation for the lack of change observed is that even though technological developments are making the cashless payment process increasingly "frictionless" (e.g., contactless "tap and go" payments enabled by near-field communication and biometric technologies), this effect might be offset by concurrent improvements in the timeliness and relevance of transaction feedback (e.g., via

smartphone/email notifications; Huebner et al., 2020). However, it remains a possibility that insufficient time has passed since these technological developments for studies to be conducted among younger cohorts who are likely to have had greater exposure to cashless payment technologies.[11] The lack of a cohort effect observed in the dataset alleviates this limitation to some extent.

I do, however, find that sensitivity to the cashless premium changes with age, even after considering the year in which the study was conducted. The effect of cashless payments in encouraging spending behaviour is stronger for younger than older consumers. This novel insight is made possible by the meta-analytic approach of this study. The moderating role of age might reflect differences in income and wealth, payment patterns, and/or money management strategies across the life course. However, I am constrained in my ability to investigate these explanations for the age effect due to limitations in the information reported in primary studies. One potential explanation is that following young adulthood, people's lives tend to become more complex financially, for example, starting a job increases one's financial resources and borrowing power, but starting a family increases the size and frequency of everyday purchases that need to be made. With increasing size and frequency of everyday payments, consumer payment preferences may shift towards cashless over cash, both for convenience and as a money management strategy. As a result, I suspect that as people get older, cash is increasingly perceived as "loose change" or "play money" to spend on relatively small value transactions. This perception may act to attenuate the pain of paying with cash, thereby reducing the cashless premium.

The literature provides some indirect support for this interpretation. Prior to the COVID-19 pandemic, US consumer payments surveys consistently showed share of cash use to have a U-shaped relationship with age, such that the proportion of transactions paid in cash is highest among individuals aged 18 to 24 and those 55 and older (Coyle et al., 2021; L. Kim et al., 2020). The latter group is underrepresented in the current study's dataset, which may explain why a U-shaped relationship with the cashless premium is not observed.[12] Ameriks, Caplin, and Leahy (2004) show that how much attention a consumer pays to their spending is inversely correlated with age. They attribute younger consumers' greater attentiveness to result from the relatively high cost of consumption and low opportunity for borrowing in comparison to middle-aged consumers, who tend to have greater financial resources. Analysing data from nationally representative surveys of US adults, Shefrin and Nicols (2014) found that younger consumers are more likely to be spontaneous than deliberate spenders, relative to older cohorts. Older consumers report greater confidence in

[11] Adult participants in the primary studies are likely to have spent most of their lives in a predominantly cash-based society. For example, assuming participants needed to be at least 18 years of age to take part in the primary study, the youngest possible participant in the most recent primary study (conducted in 2021) would have been born in 2003. Data from the 2008 Survey of Consumer Payment Choice, a nationally representative survey of US consumer payment behaviour, show that cash was still the most widely used payment instrument for retail transactions at that time (Foster et al., 2009).

[12] The youngest mean age of the sample among the primary studies was 8.6 years (from a study sampling children by Abramovitch et al., 1991), whereas the oldest was 54.8 years (Van der Horst et al., 2017). Older cohorts (e.g., 65 years and over) lack representation among the primary studies.

budgeting, are less likely to be surprised by the balance on their credit card statement, and are more likely to use their credit card for everyday purchases as well as emergencies and big ticket purchases (making transaction statements more representative of their overall spending, which should aid expense tracking; Shefrin & Nicols, 2014). Finally, Hernandez, Jonker, and Kosse (2017) found lower income and liquidity-constrained Dutch consumers to prefer cash over debit cards as a budget control tool. Taken together, these findings suggest that the moderating effect of age on the cashless premium may reflect differences in financial resources and behaviours across the life course.

The prior literature suggests that characteristics of the cashless payment should influence the cashless premium. Firstly, I investigated the impact of the physical form of the cashless tool (smartphone- vs card-based) on the cashless premium. Soman (2003) argues that the cashless premium is associated with the relative "transparency" of a payment method (i.e., how salient the payment process is made, which is positively correlated with the pain of paying experienced). The relative complexity and multifunctionality of smartphones, along with the high frequency of using non-payment-related functions (e.g., making calls, sending/receiving text messages), led to the expectation that the cashless premium should be stronger for smartphone- than card-based cashless payments. However, no difference was observed on this basis. This finding might reflect similarities in the payment process for contactless cashless payments—whether using a card or smartphone, contactless payments typically involve "tapping" the instrument at the payment terminal. Moreover, enhanced forms of transaction feedback that might increase spending awareness do not necessarily depend on the modality of the cashless payment (e.g., card-based transactions can still generate feedback delivered via smartphone or email, provided these notifications are activated by the user). This finding suggests that when it comes to making payments, whether the consumer uses a card or smartphone makes a negligible difference in their awareness of their spending.

I also investigated the impact of whether the payment was linked to a source of credit on the cashless premium. Prelec and Loewenstein's (1998) notion of temporal decoupling and the substantial literature on present-biased hyperbolic discounting led to the prediction that the cashless premium would be stronger for cashless payments linked to a source of credit (e.g., credit vs debit cards). The lack of support found for this hypothesis might be explained by several factors. Many consumers use credit cards for convenience rather than out of an intention to borrow money (i.e., by repaying the balance within the interest-free period; Ausubel, 1991; Fulford & Schuh, 2020). Credit and debit cards, whether physical or virtual, are usually almost visually identical (perhaps aside from small text labelling them as either credit or debit), and the payment process is typically the same (e.g., swiping/tapping action). Research by Sharma, Tully, and Cryder (2021) finds that consumers' perceptions of psychological ownership of money differ across debt types. Consumers feel that they own money described as "credit" more than they do money described as a "loan," even when there are no underlying structural differences in the type of debt. Moreover, Sharma and colleagues show that describing borrowed money in a way that increases feelings of psychological ownership (e.g., "credit") results in consumers being

less willing to borrow. Taken together, these findings suggest that the lack of difference observed in the cashless premium might result from many consumers viewing and using credit and debit cards in a similar manner, despite underlying structural differences in the payment instrument.

Prelec and Loewenstein's (1998) model of the interactions between the pain of paying and the pleasure of consumption led to the expectation that the cashless premium would be stronger for hedonic than utilitarian purchases. The model proposes that cashless payments reduce the pain of paying and increase focus on the pleasure of consumption, thereby making hedonic purchases easier to justify than if the payment was being made in cash. However, across three conceptually related classifications (hedonic vs utilitarian, non-essential vs essential, impulsive vs non-impulsive), I consistently do not find evidence to support this proposition. Although key empirical studies found stronger effects for hedonic-related purchases (e.g., Soman, 2003; M. Thomas et al., 2011), the majority of included studies did not directly study this distinction. Liu and Dewitte (2021) manipulated product type in a more sophisticated manner, varying the hedonic value of each product displayed to participants (e.g., willingness to pay for shower gel, varying hedonic vs utilitarian product description). Across three studies, these authors found limited evidence for an interaction effect of payment method and product type on measures of spending behaviour. Liu and Dewitte's approach recognises that products can possess both hedonic and utilitarian attributes. Categorical product-based approaches to classification are also limited because people's motivations for consuming a product can differ (Alba & Williams, 2013). As I could not infer the motivations of participants considering products displayed in the primary studies, I was constrained to using a categorical product-based approach. It is possible that this approach limited my ability to detect an effect. However, the consistency of results across three alternative classifications, and their convergence with recent findings by Liu and Dewitte, increase confidence in the validity of this finding.

Finally, exploratory analyses yielded several noteworthy findings. Importantly, the cashless premium is shown to be robust across a variety of methodological approaches taken across the primary studies. This finding answers questions raised by some scholars about whether the effect might merely be an experimental artefact. I find the cashless premium to be robust across transaction amounts, even though consumers have historically been more likely to use cash for small value transactions—a trend that may be changing following the COVID-19 pandemic (Cubides & O'Brien, 2022). Finally, I find some evidence to suggest that the cashless premium varies geographically as the effect was significantly lower for studies conducted in Asia compared to North America. Asian countries have led the way in adoption of digital payments (Worldpay, 2021), but it is difficult to determine whether intercontinental differences in technology adoption explain this finding given the overrepresentation of primary studies conducted in North America.

2.5.1. Limitations

Interpretation of the findings of this study should be tempered based on some noteworthy limitations. Like any other meta-analysis, my ability to test for specific

moderators is limited by the information reported in primary studies. As much as possible, I sought to gain additional relevant information by contacting the authors of the primary studies. To ensure reliability and to minimise bias in the coding process, two researchers independently coded the studies using a clearly defined coding scheme. Some evidence of small-study effects was detected in the data, meaning I cannot rule out that my estimate of the cashless premium is affected by selective reporting. To mitigate this risk, I encourage authors of future studies to adopt open science practices, such as sharing research data and outputs regardless of the statistical significance of findings. Secondly, although my approach used relatively broad eligibility criteria and included as many relevant effect sizes as possible, the meta-regression may have lacked sufficient statistical power to detect some effects. Thirdly, included effect sizes relating to the pain of paying largely rely on self-report ratings. Self-report ratings may not be an adequate operationalisation of this construct, which may provide an explanation for why the restricted version of the pain of paying meta-analysis rendered a non-significant summary effect. Future studies on the pain of paying should prioritise use of physiological measures (Reshadi & Fitzgerald, 2023). Fourthly, although the pain of paying has been proposed to mediate the relationship between payment method and spending behaviour (M. Thomas et al., 2011), testing of the mediation model was not possible because few studies report outcomes for all three relationships within the model. Fifthly, although the findings suggest the cashless premium is not fading over time and does not differ significantly between card- and smartphone-based payments, evidence relating to smartphones has only begun to emerge in the past 10 years. Cashless payments are becoming increasingly diverse and complex (e.g., facilitating crypto investing, integrations with social media, "buy now, pay later" instalment plans; Acker & Murthy, 2020; Bechler & Huang, 2021), and so it remains a possibility that these effects may change over time. Finally, as the role of the physical mode of payment is of interest, this study focused on point-of-sale transactions in physical retail environments. Online transactions were therefore out of scope, but are an important area for future study given the rapid growth of e-commerce worldwide and the diversity of online payment forms, including virtual currencies (Scheidegger & Raghubir, 2022).

2.5.2. Future Directions

This review of empirical observations made across 43 years of research reveals inadequacies in existing theoretical attempts to explain the cashless premium. Although the pain of paying provides an intuitive explanation for the effect, the findings of this study suggest that Prelec and Loewenstein's (1998) model focused on differences in pain and pleasure does not capture the primary mechanism involved. I observed no differences in the cashless premium based on product type (hedonic vs utilitarian) and found the summary effect of payment method on the pain of paying to be non-significant after excluding a small number of highly influential cases. I also find a lack of support for Prelec and Loewenstein's concept of temporal decoupling as the type of funds used (credit vs debit) did not moderate the cashless premium. Soman's (2003) notion that payment methods vary in levels of transparency is similarly intuitive; however, the finding that the cashless premium does not differ based on the type of cashless tool used suggests this explanation is also insufficient.

The unidimensional nature of this framework is likely unable to account for the increasing complexity of digital payments and their interactions with human behaviour. I am not suggesting that these explanations should be completely ruled out; rather, I echo Banker and colleagues' (2021) argument that explanations for the cashless premium remain largely conjectural, and suggest that multiple mechanisms are likely at work in driving these complex interactions.

Learning-related mechanisms appear to warrant greater attention but are similarly unlikely to provide a singular (complete) explanation. Prelec and Loewenstein's (1998) model suggests that cashless payments might facilitate spending behaviour both through reducing the pain of paying and increasing the pleasure of consumption. However, studies investigating the cashless premium have tended to focus on the pain side, giving less attention to how the pleasure associated with consumption might vary across payment methods. Although relatively few studies have investigated the neural basis for the cashless premium, the available evidence suggests that both aspects may be at work (Banker et al., 2021; Ceravolo et al., 2019; Knutson et al., 2007; Mažar et al., 2017). Using the metaphor proposed by Banker and colleagues (2021, p. 1), cashless payments might not only act to "release the brakes" on spending (i.e., making the consumer less aware of their spending by reducing the pain of paying), but might also "step on the gas" (i.e., motivating greater spending by increasing reward sensitivity). Building on a seminal study by Knutson and colleagues (2007), Banker and colleagues used fMRI to explore patterns of brain activation during a shopping task in which participants purchased products from an individually tailored selection using their own money. When purchases were made using a credit card, participants showed strong activation in the striatum, a region associated with processing of anticipated rewards (Oldham et al., 2018), regardless of the product price. Cash purchases, on the other hand, only activated reward circuitry for lower-priced products, and relatively weakly. Credit card and cash purchase decisions could not be distinguished based on activation of the insula, a region involved in processing of pain (Jensen et al., 2016) and previously linked to the pain of paying (Ceravolo et al., 2019; Knutson et al., 2007). Overall, Banker and colleagues' findings imply that the pain of paying may be better interpreted metaphorically than literally (Chan, 2021; Mažar et al., 2017), and suggest that credit card-related stimuli partly drive spending behaviour by acting as a cue to potential rewards.

The finding that payment methods differentially activate brain reward circuitry lends support to an earlier yet less studied proposition by Feinberg (1986) that the credit card premium develops through a learning mechanism (Banker et al., 2021). In one of the first studies investigating the effect of payment methods on spending, Feinberg proposed that both classical and operant conditioning processes may be at work in driving the effect. In the classical conditioning stage, credit card-related stimuli (conditioned stimuli) become associated with the pleasure of consumption (unconditioned stimulus), which naturally drive spending behaviour (unconditioned response). In the operant conditioning stage, spending behaviour is positively reinforced by the resulting pleasure of consumption. The proposed outcome of these two stages is that credit card-related stimuli come to motivate increased spending behaviour by functioning as a cue to the resulting pleasure of

consumption. Banker and colleagues liken this process to the phenomenon of cue reactivity, a central mechanism in the development and maintenance of addiction (A. K. Rose et al., 2013). In the case of "addictive" behaviours (e.g., gambling, gaming, compulsive shopping), behaviour-related stimuli become associated with the rewarding effects of the activity, resulting in increased cravings to engage in the behaviour (Antons et al., 2020; Starcke et al., 2018). As these behaviours exist on a continuum from normal (healthy) through to dysfunctional levels of engagement, it is plausible that similar mechanisms may underlie excessive yet non-clinically relevant buying behaviour. Findings from several experimental studies that mere exposure to credit and debit card logos is associated with greater willingness to spend provide preliminary evidence to support this possibility (Feinberg, 1986; A. Moore & Taylor, 2011; Raghubir & Srivastava, 2008). Extending work on cue-reactivity and dual process theories of decision-making from the addiction field appears to represent a potentially fruitful avenue to better understand the role of payment methods in impulsive (but non-dysfunctional) buying behaviour (Trotzke et al., 2017).

Studies focusing on differences in salience have implicated Trope and Liberman's (2010) construal level theory of psychological distance as an explanation for the cashless premium (Chatterjee & Rose, 2012; M. Thomas et al., 2011). Construal level theory is a higher-order social psychological framework which posits that people respond to objects differently based on the perceived psychological distance of the object from themselves. Objects that are perceived as being more (less) distant from the self are mentally represented as being more abstract (concrete), and vice versa. The relative abstractness of the perspective adopted is thought to influence behaviour, including the ability to self-regulate (Trope & Liberman, 2010). Relating this theory to the cashless premium, Thomas, Desai, and Seenivasan (2011) argue that cash-based transactions might activate more concrete representations than cashless transactions in consumers' minds, largely due to the relative physicality and visual salience of cash handling during the payment process. More concrete representations potentially elicit greater emotional responses (i.e., the pain of paying; M. Thomas et al., 2011), which would result in a lower propensity to spend when paying in cash. Studies conducted by Chen, Xu, and Shen (2017) and Shah, Maglio, and Wilson (2016) provide some evidence in support of this argument. However, contextual effects of payment methods on mental construal have received relatively minimal empirical attention to date. Cross-disciplinary collaborative efforts would appear useful for developing a more complete theoretical framework that integrates the complex array of psychological and environmental processes underlying the cashless premium.

Finally, although the mechanisms underlying the cashless premium remain unclear, the effect itself is found to be robust across studies. With continued rapid growth in adoption of cashless payments across the globe, the key practical implication of this finding is that strategies are needed to offset the cashless premium and enhance consumers' awareness of their spending. An emergent body of research investigates how feedback messaging and haptic feedback (e.g., smartphone vibration) can be optimised to this end (Hengeveld & Rooijakkers, 2019; Huebner et al., 2020; Manshad & Brannon, 2021). Future studies should build upon this evidence base by assessing the effects of specific design

features of digital payment methods in relation to spending behaviour, and ultimately, evaluating their utility for improving consumer financial wellbeing. Large datasets held by financial institutions and third-party payment providers may provide fertile ground for such studies (e.g., behavioural experiments to assess impacts on cashless spending depending on user activation and engagement with app features providing feedback and expense tracking capabilities; Lukas & Howard, 2022; C. Y. Zhang et al., 2020).

2.5.3. Conclusions

Digital transformation of the payments industry in recent decades has fundamentally changed the options available to consumers for making everyday purchases. Cashless payments are increasingly the norm, and many consumers no longer even carry cash. However, despite this increase in payment options and greater familiarity with cashless alternatives, the cashless premium has not changed (to date). Consumers still have a greater propensity to spend when using cashless payments compared to cash. In contrast to theoretical predictions, this effect does not differ significantly across different cashless payment tools, whether using borrowed or saved funds, or whether purchasing products for pleasure or a functional purpose. Existing explanations of the cashless premium, such as the pain of paying, appear not to sufficiently capture the increasing complexity and diversity of cashless payments and their interactions with human behaviour. Developing a better understanding of the mechanisms involved will be important for designing digital payments systems that enhance consumer financial wellbeing.

3. Narrative Review of the Role of Payment Systems in Land-Based EGM Gambling

3.1. Overview

This chapter provides a narrative review of prior literature reporting findings relevant to understanding the relationships between payment systems, gambling behaviour, and gambling harm. After contextualising this focus within the wider scholarly discourse on consumer impacts of digital payment technologies, I outline the trends towards digitalisation of payments in land-based gambling venues. I review the available evidence about potential behavioural impacts of transitioning from a predominantly cash-based to a cashless payment system for EGMs, as well as potential implications of cashless gambling in relation to harm reduction strategy. Finally, I provide a case study of different payment systems at various stages of planning and implementation in NSW, Australia—the focal jurisdiction within this thesis.

3.2. The Shift Towards Cashless Gambling

Digitalisation of the global economy is transforming the way consumers make payments for everyday goods and services. Between 2018 and 2021, WorldPay (2018, 2022) estimates that global cash usage at the point of sale dropped from 31% to 18%—largely replaced by growth in use of digital/mobile wallets, the share of which increased from 16% to 29%. The COVID-19 pandemic appears to have accelerated the digitalisation of consumer payments (Kosse & Szemere, 2021). Land-based gaming venues are one notable exception to this broader societal trend. In-venue gambling remains predominantly cash-based in many jurisdictions, including the US, UK, and Australia (American Gaming Association, 2020b; Department for Culture, Media & Sport, 2023; Gainsbury & Blaszczynski, 2020). A key reason for hesitancy about cashless gambling among regulators has been the very limited evidence base directly investigating the impacts of cashless payments on gambling behaviour and harm (for reviews, see Hare, 2020; J. Parke et al., 2008). Broader evidence from the consumer behaviour literature reviewed in Chapter 2 has led some to form the hypothesis that gamblers may experience greater difficulty keeping track of their spending and have a greater propensity to overspend when using cashless payments—in part due to the reduced salience of the payment process compared to cash handling (J. Parke et al., 2016). However, cashless payment systems are receiving renewed regulatory attention following findings of money laundering in gaming venues (*Inquiry under Section 143 of the Casino Control Act 1992 (NSW)*, 2021; *Royal Commission into the Casino Operator and Licence*, 2021; NSW Crime Commission, 2022) and increasing recognition of the role of digital technologies in addressing the harms associated with gambling products—themselves, highly technological (Gainsbury & Blaszczynski, 2020; M. T. Liu et al., 2021).

For more than 20 years, the concept of cashless gambling has been discussed as part of approaches to minimising harms associated with EGM gambling in Australia

(Independent Pricing and Regulatory Tribunal NSW, 2003; Nisbet, 2003; Productivity Commission, 1999). Most basically, *cashless gambling* refers to the ability to pay to engage in a gambling activity without using physical currency, such as banknotes or coins (Nisbet, 2003).[13] In practice, cashless gambling payment systems allow gamblers to transfer monetary value into and out of the gambling environment using paper-based tickets, cards, or digital devices, such as smartphones (Ghaharian, Abarbanel, et al., 2023b; Hare, 2020; Nisbet, 2003; J. Parke et al., 2008). For example, a gambler may transfer an amount from their bank account into a cashless gambling account within a digital wallet, from which monetary value can be transferred onto EGMs as gaming credits (Ghaharian, Puranik, et al., 2023).

Forms of cashless gambling are available in all Australian jurisdictions to varying extents (Hare, 2020). However, existing cashless systems operate within a hybrid model, meaning cash is still used within the system. Two variants of cashless gambling are commonly available for gambling on EGMs: "ticket in, ticket out" (TITO) systems,[14] and card-based cashless systems[15] (Hare, 2020; Livingstone, 2017). Existing card-based systems are not mandatory to use, nor are they necessarily registered against the user's identity (e.g., Victorian Commission for Gambling and Liquor Regulation, 2019). Moreover, existing systems still typically involve the use of cash to initiate subsequent cashless transactions, rather than allowing direct transfer of funds between an individual's bank account and their cashless gambling account. For example, gamblers commonly start a gambling session by using banknotes to load credits onto the EGM but collect the value of any remaining credits via a printed TITO ticket at the end of the session.

At the centre of current policy debates are account-based (i.e., identity-linked) forms of cashless gambling, which leverage the digital transaction data linked to an account registered to an individual gambler to track their activity within the gambling environment (Gainsbury, 2011; Gainsbury & Blaszczynski, 2020; Ghaharian, Abarbanel, et al., 2023b). The identified nature of this system is a contrast to the anonymity of cash-based gambling. Account-based cashless gambling already occurs in the online environment where customers transfer funds to and from their wagering account using electronic payment methods (e.g., bank transfer, debit/credit card), and all wagering activity is recorded against their wagering account (Deng et al., 2019; Ghaharian, Puranik, et al., 2023). A range of systems can be added onto an account-based gambling system, including anti-money laundering controls, loyalty programs, and harm reduction measures (also commonly

[13] The terms "cashless gambling" and "cashless gaming" are commonly used interchangeably. In its application to EGMs, cashless gambling refers to the ability to transfer credits to or from gaming machines without using physical currency (e.g., Victorian Commission for Gambling and Liquor Regulation, 2019).

[14] In the TITO system, the user typically begins gambling by using cash to load credits onto the gaming machine. When the user finishes playing on that machine, any remaining credits are collected via a printed ticket ("ticket out" functionality). This ticket can be used to continue gambling on another machine by scanning the printed barcode ("ticket in" functionality), or alternatively, redeemed for cash.

[15] In existing card-based cashless systems, the user typically uses cash to load funds onto a physical card, which is associated with a unique venue-based cashless account. The card can then be used to transfer credits to and from gaming machines. Existing card-based systems may allow for cards to be registered to an individual's identity or used anonymously, and may be linked with venue loyalty programs and/or precommitment systems (e.g., Victorian Commission for Gambling and Liquor Regulation, 2019).

referred to as responsible gambling or consumer protection measures; Delfabbro & King, 2021b; Gainsbury & Blaszczynski, 2020; Livingstone, 2023; A. Thomas, Christensen, et al., 2016). In public discourse, the term "cashless gambling" is sometimes used in reference to this broader set of integrated systems which rely on an individual's cashless gambling account to track their activity (e.g., T. Rose, 2022).

3.3. Digitalisation of Payments from a Consumer Perspective

Outside of the gambling field, scholars across disciplines discuss impacts of the shift towards a cashless society and the growing use of digital financial technologies on consumers. In a phenomenon termed the "new sociability of money" (p. 204), economic sociologists Guseva and Rona-Tas (2017) identify an important paradox about cashless payments: although cashless payments may *feel* impersonal (Singh, 2004), the vast amount of data captured about the consumer's spending patterns and preferences makes digital transactions far more personal than anonymous cash-based transactions. The traceability of digital transactions facilitates organisations using these infrastructures and data to engage in practices that have wide-ranging implications for consumer privacy and financial wellbeing (Barros Pena et al., 2022; Ekpo et al., 2022; V. Ferrari, 2022; Lauer, 2020; Mützel, 2021; Westermeier, 2020). For example, digital payment platforms may impact consumer financial wellbeing (and more specifically, financial freedom of choice; Consumer Financial Protection Bureau, 2015) through the relative friction involved in transferring funds to and from the platform. Platforms may be intentionally designed by organisations to make withdrawal processes difficult for consumers, thereby restricting the consumer's ability to reallocate funds to other consumption opportunities and improving retention rates for the organisation (Ekpo et al., 2022). Platforms typically operate within business models based on data monetisation, aggregating vast amounts of identifiable customer data linked to their transaction records and exchanging these data with other actors in the platform ecosystem (e.g., advertisers, credit ratings agencies) in ways that are largely hidden from the consumer (Christl, 2022; Hörnle et al., 2019; O'Dwyer, 2019). A key trade-off consumers (often unwittingly) make in adopting digital payment systems therefore involves yielding a degree of privacy in exchange for greater perceived convenience and personalisation in the consumption experience, as well as potential loyalty rewards (Ekpo et al., 2022).

As reviewed in Chapter 2, marketing scholars have investigated effects of payment methods on consumer spending since the 1970s (e.g., Feinberg, 1986; Hirschman, 1979). My meta-analytic review of this evidence base shows that cashless payments facilitate spending behaviour, such that consumers are likely to spend more when using cashless payments compared to cash. This effect does not appear to have changed over time, even as cashless payments become the norm. Although the mechanisms underlying the effect are not well understood, psychological explanations centre on a concept termed the *pain of paying*: consumers experience less of the aversive feelings of parting with their money when using cashless payments, resulting in a higher propensity to spend (Prelec & Loewenstein, 1998; M. Thomas et al., 2011; Zellermayer, 1996). A consumer's sensitivity to the pain of paying (and consequently, their awareness of their spending) is thought to be influenced by various

structural characteristics of the payment method (M. Thomas et al., 2011). Two key characteristics relate to the relative salience of the payment process (e.g., cash handling vs swiping/tapping a payment card; Soman, 2001, 2003) and the degree to which consumption and payment are temporally linked (e.g., debit vs credit; Prelec & Loewenstein, 1998).

An emergent body of research aims to mitigate the effect of cashless payments in facilitating (over)spending by designing interventions for integration into digital payment systems. These interventions include providing budgeting tools that allow users to earmark funds for specific expense categories (Lukas & Howard, 2022), haptic vibration feedback during the payment process (Manshad & Brannon, 2021), and personalised feedback messages about spending patterns over time (Huebner et al., 2020). Despite such interventions potentially empowering consumers in the digital age, some scholars caution against blindly accepting the rapid digitalisation of personal finance (see Bedford, 2019 for a similar argument specifically related to the digitalisation of payments for gambling). Barros Pena and colleagues (2022) argue that careful consideration needs to be given to the design of payment systems to avoid them ultimately having adverse impacts for consumers, such as those discussed earlier in relation to reduced privacy and poorer financial wellbeing.

3.4. Digitalisation of Payment Systems in Land-Based Gambling Venues

The next generation of cashless gambling technologies are at various stages of development and implementation internationally. Newer payment systems allow users to access their cashless account using a smartphone app (or a physical card linked to an account). After registering for an account, the user can load funds into their account using a variety of payment methods, such as by bank transfer, debit/credit cards, e-wallets, or cash deposits at the venue. Funding methods available to consumers differ across jurisdictions. For example, credit cards cannot be used for land-based gambling transactions in Australia (Swanton et al., 2019; Sztainert et al., 2020). To use funds in the cashless account for gambling on EGMs, the user can link their smartphone to a gaming machine (a process typically enabled by Bluetooth or near-field communication) and select an amount to transfer onto the machine. At the end of a session, any credits remaining on the machine are transferred back to the account. In addition to facilitating gambling transactions, some systems allow users to spend funds in the cashless account on non-gambling purchases, potentially both in-venue (e.g., food and beverages) and outside the venue (in a similar manner to non-gambling digital wallets). Beyond systems developed primarily for gambling applications, the concept of cashless gambling could theoretically involve the ability to transfer funds directly to and from EGMs using standard bank cards (i.e., without requiring a gambling-specific account; Department for Culture, Media & Sport, 2023).

Payment systems for EGMs vary across jurisdictions internationally. In Norway, where EGMs are operated by a state-owned monopoly, gamblers are required to make deposits into a centralised digital account linked to their verified identity (Horne, 2008; Norsk Tipping, n.d.; Rossow & Hansen, 2016). In this case, the individual's cashless account and its integrated features (e.g., precommitment systems) cover their gambling activity

within the regulated environment relatively comprehensively (Nikkinen, 2019; Rintoul & Thomas, 2017; Rossow & Hansen, 2016). In contrast, in countries with competitive license-based regulatory regimes, such as in Australia, the UK, and the US, the status quo is typically a hybrid system involving a combination of cash and cashless payment methods (American Gaming Association, 2020a; Department for Culture, Media & Sport, 2023; Gambling Commission, 2021a; Hare, 2020). In these cases, cash tends to be the dominant payment method despite the availability of cashless payment options (American Gaming Association, 2020a; Gambling Commission, 2021b; NSW Crime Commission, 2022). Individuals may be able to use the same cashless account across different gambling activities, venues, and modes offered by the same operator, but typically not across different operators. Market research commissioned by the UK Gambling Commission (2021b) suggests that many land-based gamblers continue to prefer using cash despite the availability of cashless payments—partly because using cash helps them to feel "in control of [their] spending."

3.5. Digitalisation of Payment Systems as Part of Gambling Harm Reduction Strategy

Regular gamblers frequently report that restricting access to money is a helpful strategy to prevent unplanned gambling (Currie et al., 2020; Rodda et al., 2019b, 2019a). Land-based gamblers trying to limit their spending often rely on self-management strategies, such as taking only the amount of cash that they are willing to lose to the venue, and not taking debit or credit cards to avoid withdrawing additional cash for gambling (Flores-Pajot et al., 2021; Hing et al., 2017; S. M. Moore et al., 2012; Rodda et al., 2019b, 2019a). However, even with such strategies in place, adhering to self-managed limits is challenging for many gamblers (Currie et al., 2020), especially for those experiencing gambling problems (Currie et al., 2020; Nower & Blaszczynski, 2010; Rodda et al., 2019a). Poor adherence reflects the impaired control that characterises problem and disordered gambling—the inability to stop or reduce one's gambling activity despite trying to do so (American Psychiatric Association, 2022; Blaszczynski & Nower, 2002; O'Connor & Dickerson, 2003; Rodda et al., 2019a; World Health Organization, 2019). A combination of learning-related mechanisms (e.g., increased attention to gambling-related cues) and cognitive distortions (e.g., recalling wins more readily than losses) are theorised to drive continued gambling and loss chasing behaviour (Blaszczynski & Nower, 2002; M. A. Ferrari et al., 2022; Heirene et al., 2022; H. S. Kim et al., 2021; Nigro et al., 2022; Philander & Gainsbury, 2022). A fundamental consequence of excessive gambling is the experience of financial harms, such as having difficulties paying bills and debt problems (Muggleton et al., 2021; Swanton & Gainsbury, 2020b). Financial harms can contribute to harms experienced in a variety of other domains, such as psychological distress and relationship difficulties, and extend beyond the individual gambler to impact their family, friends, and the broader community (Goodwin et al., 2017; Langham et al., 2016; Swanton & Gainsbury, 2020a, 2020b). Interventions to assist gamblers in managing their money for gambling are therefore an important area of investigation for gambling harm reduction (Rodda, 2021).

Little prior research has directly investigated how payment-related characteristics of gambling products impact gambling behaviour and risk of harm. In a scoping review of 23 experiments investigating the effect of monetary manipulations on gambling behaviour, Palmer and colleagues (2022) found no studies comparing cash against card- or smartphone-based payments. These authors found that studies most commonly examined factors unrelated to payment, such as comparing gambling under the presence or absence of monetary rewards (Palmer et al., 2022). Four studies manipulating the salience of monetary value (e.g., whether or not participants held money in a physical form before engaging in a gambling task) were deemed most relevant to understanding the impact of payment method on gambling behaviour (Brandt & Martin, 2015; Limbrick-Oldfield et al., 2022; McGrath, 2005; Palmer et al., 2022; Weatherly et al., 2006). Of these four laboratory-based studies, the experiment that comes closest to testing real-world payment alternatives was conducted by Limbrick-Oldfield and colleagues (2022), who compared cash against a TITO-style voucher among a community sample of 61 Canadian EGM gamblers using real EGMs under laboratory conditions. Participants were randomly allocated to load funds onto EGMs either by inserting CAD $40 value in $5 banknotes or by using a paper voucher (with $40 cash-equivalent value preloaded onto the machine). The loaded value was displayed on the EGM in cash format to participants in the cash group and in credit format to those in the voucher group. Across both session- and trial-level behavioural data from machine play sessions of up to 30 minutes' duration, these authors found minimal support for the hypothesis that the physical mode of payment impacts gambling behaviour—with no differences found between groups in mean bet size, total amount bet during the session, machine balance at the end of the session, or the total amount bet within the first five minutes of play. McGrath (2005) also sought to investigate behavioural impacts of TITO systems, conducting an experiment with 100 Canadian EGM gamblers using real EGMs under laboratory conditions. McGrath made comparisons based on whether participants loaded funds onto EGMs using coins or the experimenter preloaded the funds as credits. McGrath's findings provide some evidence to suggest that the method of payment may impact gambling intensity as exploratory analyses showed participants in the credit condition placed more bets per minute and spent more per minute than those in the coin condition.[16] These effects were not found to differ based on problem gambling risk category. Overall, the findings from relevant experimental studies are mixed and do not yield a clear conclusion about the relationship between the salience of monetary value and gambling behaviour (Palmer et al., 2022; Shah et al., 2014). Limbrick-Oldfield and colleagues emphasise that their null findings might be the result of significant methodological limitations that exist within the laboratory environment, including participants using endowed funds for gambling rather than their own money. Methodological triangulation is therefore important for improving our understanding about the potential impacts of cashless payments in real-world gambling environments.

[16] Additional exploratory analyses of a subgroup of 64 participants who were not exposed to a bonus feature (a potential confound) showed a consistent pattern of results in relation to number of bets per minute and amount spent per minute. However, average session duration was greater for gamblers in the coin condition compared to those in the credit condition.

Few studies have explored consumer perceptions about the relationships between payment-related characteristics of gambling products, gambling behaviour, and risk of harm. Findings by Rodda and colleagues (2018, 2019b) suggest that the tangibility and denominational structure of cash aid some gamblers in regulating their expenditure, such as bringing a specific amount of money to the venue for gambling (Rodda, 2021). Gamblers report leaving credit/debit cards at home to avoid impulsively accessing additional funds for gambling (Knaebe et al., 2019; Rodda et al., 2019b). Running out of cash at the gaming machine creates a natural break in play that is thought to provide gamblers with an opportunity to reconsider whether to continue gambling and protect against loss chasing (McMillen et al., 2004; Nower & Blaszczynski, 2010; Thomas et al., 2013). In the past, this has been a central reason for regulators prohibiting cashless payments, such as debit cards, from being used directly at gaming machines (Department for Culture, Media & Sport, 2023). However, whether such breaks in play provide sufficient time for individuals experiencing gambling problems to "cool off" from the "hot state" of play remains unclear. Individuals experiencing gambling problems report having greater difficulty appreciating the real value of money in online environments, which necessitate digital payments, compared to land-based gambling (Hing et al., 2015). The available evidence suggests that money management strategies used by land-based gamblers commonly derive from the physical nature of cash, which allows them to earmark funds for different purposes (e.g., gambling vs a meal at the venue) and is perceived to help with tracking their spending.

Depending on their design, digital payment systems may involve more or less friction (effort) in payment processes for end-users (Ash et al., 2018), potentially influencing the level of deliberation given to spending-related decisions (Mills, 2020; Newall, 2022; Newall & Rockloff, 2022). Literature on choice architecture suggests that digital payment systems could be intentionally designed to mitigate these effects (Gainsbury et al., 2018; Thaler et al., 2013), such as by applying appropriate defaults to deposit limits (Ní Chonaire et al., 2021). Whether cashless gambling systems help or hinder gamblers in controlling their spending on gambling (and ultimately, reducing their risk of harm) is likely heavily dependent on specific aspects of the system's design and implementation. Moreover, the traceability of digital transactions creates opportunities for harm reduction measures to be integrated into cashless gambling systems in ways which are not possible in anonymous cash-based systems (Gainsbury & Blaszczynski, 2020). First, precommitment systems, which allow gamblers to pre-set limits on the amount of money and/or time that they intend to spend gambling, can be linked with account-based cashless systems (Delfabbro & King, 2021b; Rintoul & Thomas, 2017). Precommitment is meant to prevent unintended gambling, especially during "hot states" when individuals may be tempted to continue gambling (Blaszczynski & Nower, 2002; Brevers et al., 2016; Sharpe & Tarrier, 1993). Limits can be binding (i.e., preventing continued gambling) or non-binding (e.g., only providing a reminder to the gambler about their earlier intentions); however, evidence suggests binding limits are likely more effective for supporting harm reduction (A. Thomas, Christensen, et al., 2016; Wohl et al., 2023). Second, integrated self-exclusion, whereby individuals can ban themselves from accessing gaming machines for a period of time, would overcome existing difficulties in detecting self-excluded individuals and enforcing agreements because self-

excluded individuals could simply be prevented from transferring funds onto gaming machines (Gainsbury, 2014; Kotter et al., 2019; Kraus et al., 2022). Third, account-based gambling activity facilitates the provision of activity statements and personalised messaging interventions, which give gamblers feedback summarising their actual gambling behaviour (Ginley et al., 2017; Thomas et al., 2016). Provided this information is presented in a meaningful and timely manner, feedback interventions may improve gamblers' understanding of their actual gambling behaviour given estimations of net outcomes are commonly inaccurate (Heirene et al., 2022). A lab experiment involving 5,463 UK gamblers found participants receiving activity statements bet lower amounts compared to those receiving no statement (Collerton et al., 2023), providing support for activity statements as a harm reduction tool. A final example is behavioural tracking, which utilises account-based behavioural data to detect individuals showing indicators of risky gambling (Deng et al., 2019; Ghaharian, Abarbanel, et al., 2023b, 2023a; Ghaharian et al., 2022; Haeusler, 2016). These predictions can be used to guide the delivery of tailored interventions as part of a staged approach (Gainsbury, Black, et al., 2020), including proactive supportive interventions led by venue staff (Jonsson et al., 2020; Rintoul et al., 2017).

Data on uptake of existing voluntary cashless gambling systems is scarce. In the UK, two app-based cashless gambling technologies are available for use in some pubs and gaming centres, but initial uptake is reportedly low (Department for Culture, Media & Sport, 2023). Past evaluation studies of account-based gambling technologies have largely focused on precommitment features, and the technologies have not necessarily involved cashless payment functionality (e.g., Focal Research, 2010; Responsible Gambling Council, 2016). Although distinct from using a cashless gambling account, uptake of opt-in precommitment is generally poor across various forms of gambling (Delfabbro & King, 2021b; Heirene et al., 2021; Nisbet et al., 2016; South Australian Centre for Economic Studies, 2019)—in part, likely due to many gamblers not viewing consumer protection tools as being relevant to themselves (Gainsbury et al., 2020; Gainsbury et al., 2017). Whether cashless gambling systems should be made mandatory, largely on the grounds of money laundering and gambling harm prevention, is the subject of debate in several jurisdictions (Bedford, 2019). In countries like Australia and Britain, this debate takes place within the context of increasing emphasis on the importance of systematic population-level approaches to preventing and reducing gambling harm (Regan et al., 2022; Wardle et al., 2019). However, the political and public acceptability of these approaches differs across jurisdictions (Delfabbro & King, 2021b).

3.6. Payment Systems for EGMs in NSW

In the remainder of this chapter, I outline the different payment systems for EGMs that have been proposed and implemented in NSW, Australia, where a hybrid system is currently in operation. NSW provides an interesting case to study as a range of novel cashless gambling technologies are being trialled in this setting (Liquor & Gaming NSW, n.d.), and a potential transition to mandatory cashless gambling is being considered (Gainsbury, 2023; Livingstone, 2023).

Cash remains the primary payment method for EGMs in NSW (NSW Crime Commission, 2022). To load credits onto EGMs using cash, gamblers insert physical currency into coin or note acceptors attached to the gaming machine (Dowling et al., 2005; Livingstone, 2017). Gamblers can load up to $5,000 worth of credit at a time ("load-up" or credit limit; *Australian/New Zealand Gaming Machine National Standard 11.1*, 2022), and all Australian banknote denominations are accepted (Livingstone, 2017). Other Australian jurisdictions restrict the denominations of currency accepted and have lower load-up limits (Livingstone, 2017). South Australia, for example, allows denominations of up to $50 (but not $100) and prescribes a load-up limit of $99.99 (*Australian/New Zealand Gaming Machine National Standard 11.1*, 2022; Government of South Australia, 2023). For comparison, an Australian government inquiry conducted over a decade ago recommended that a load-up limit of $20 be adopted as a measure to prevent high intensity gambling (Productivity Commission, 2010); however, to date, no state or territory has implemented this recommendation (ACT Government, 2022; *Australian/New Zealand Gaming Machine National Standard 11.1*, 2022). Loading larger amounts of money at once (e.g., 1 x $100 vs 5 x $20) means that the gambler is faced with fewer decision points (i.e., running out of credits on the machine), which might otherwise interrupt the gambling session and have some effect in prompting engagement in more deliberative decision-making about whether to continue gambling (Cheema & Soman, 2008).[17] In Australia, EGMs are not permitted to be fitted with banknote dispensers, so depending on the value, credits remaining on EGMs are collected by coins being dispensed from the machine, or via a printed ticket or cashless transfer (*Australian/New Zealand Gaming Machine National Standard 11.1*, 2022). We describe these two variants of cashless gambling below.

The printed ticket relates to the "ticket out" functionality of an anonymous paper-based cashless gambling system known as "ticket in, ticket out" (TITO; *NSW TITO Technical Standard v4.20*, 2010). This ticket is a voucher that can either be used to load the cash-equivalent value onto another gaming machine (e.g., by scanning a barcode printed on the ticket; "ticket in" functionality), or alternatively, redeemed for cash at a redemption terminal or cashier within the venue (*NSW TITO Technical Standard v4.20*, 2010). Cash is still heavily used in venues that have implemented TITO systems as gamblers typically begin a gambling session by inserting cash into the EGM and are then transferred into using the TITO system (when any remaining credits are collected via the printed ticket). Existing TITO systems simply enable the transfer and redemption of cash-equivalent value within the gambling environment, but are not capable of tracking an individual's gambling activity on the EGM (e.g., amounts wagered) or reporting their outcomes across multiple machines or sessions (e.g., total amount of money put into machines; NSW Crime Commission, 2022).

[17] An observational study conducted by Sharpe and colleagues (2005) found that only 12.8% of a sample of 514 EGM gamblers used denominations greater than $20 in value. Use of denominations over $20 was positively associated with greater risk for problem gambling; however, overall, the authors concluded that permitting insertion of denominations over $20 does not appear to impact gambling behaviour. Additional analyses using machine data would be beneficial to validate this finding.

Player cards are the second variant of cashless gambling currently permitted in NSW (Gaming Machines Act 2001 No 127, 2023; Gaming Machines Regulation 2019, 2023). At participating venues, individuals can voluntarily register for a player account (or smartcard equivalent) by providing proof of identity. Player accounts are not directly linked with the individual's bank card or bank account. The player account can be accessed at EGMs using a player card. After inserting the card into an EGM, the user selects the value to be transferred on the EGM touchscreen (e.g., the user may select from a range of pre-defined options or enter a custom amount). At the end of the gaming session, the user collects the card from the machine and can use any remaining value at another EGM, or alternatively, redeem the cash-equivalent value. A maximum of $5,000 can be held in the account at any one time, matching the EGM load-up limit (Gaming Machines Regulation 2019, 2023). Operators are not permitted to offer lines of credit to account holders. In contrast to TITO systems, player cards are capable of tracking an individual's gambling activity on EGMs and reporting outcomes across multiple machines and sessions. Tracking facilitates three notable features of the existing player card system that are specified in gaming machine regulations (Gaming Machines Regulation 2019, 2023). First, player accounts can be linked with loyalty schemes, which provide rewards for spending on EGMs (Gaming Machines Act 2001 No 127, 2023). Second, upon request, account holders can receive a monthly activity statement summarising their total turnover (i.e., amount wagered), winnings, net expenditure (i.e., turnover less winnings), and time spent gambling (Gaming Machines Regulation 2019, 2023). Third, account holders can opt to set a weekly limit on net expenditure by notifying the venue in writing (Gaming Machines Regulation 2019, 2023).[18] All of these features are contingent on the card being used during gambling—commonly referred to as "carded play." Any activity that occurs when the card is not used (i.e., "uncarded play") is untraceable to the individual.

The two variants of cashless gambling described above are already permitted in NSW. However, new variants involving smartphone app-based digital wallets are being trialled in a small number of venues to inform the development of a new regulatory framework for cashless gambling (Liquor & Gaming NSW, n.d.). Several technologies are being trialled, each developed by different gaming technology manufacturers and varying in their specific design features. These technologies are typically white-label products that include a user interface customised and branded for a specific gambling venue (or group of venues). In a manner broadly similar to online wagering apps, digital variants of cashless gambling technologies for land-based applications generally involve the individual downloading a smartphone app, registering for an account with the gambling operator by verifying their identity, and transferring funds into a digital wallet associated with the account by bank transfer or debit card (Liquor & Gaming NSW, n.d.). In some implementations, money transferred into the digital wallet from the external funding source is immediately available for the user to transfer as credits onto an EGM (e.g., by selecting the value to transfer using the operator's app on their smartphone, which connects to the EGM via Bluetooth; IGT, 2023). Other implementations involve an additional step, requiring the

[18] Data relating to the usage of these features do not appear to be publicly available.

user to transfer funds in the digital wallet into a separate gaming wallet, from which funds are transferred onto EGMs (Liquor & Gaming NSW, n.d.). The user can end a gaming session by walking away from the EGM, resulting in the loss of the Bluetooth connection between their smartphone and the gaming machine. Funds can be withdrawn from the digital wallet by using the smartphone app to transfer an amount to a linked bank account.

Beyond the potential integrations with loyalty schemes and precommitment systems already noted, digital variants of cashless gambling technologies can incorporate a range of design features that may be relevant to gambling behaviour and risk of harm, as well as to their utility for consumers more broadly. Geofencing may be used to define the areas in which users can or cannot load funds into the gaming wallet (McEvedy, 2022). For example, users might be required to leave the gaming floor to load additional funds using the smartphone app, mimicking the natural break in play involved in accessing ATMs in cash-based gambling. Payment clearance time is another modifiable factor (McEvedy, 2022), relating to the speed of moving money from the external funding source (e.g., bank account) into the digital wallet. For example, implementing deliberate delays in processing of deposits might function as a friction to reduce impulsive gambling, whereas near instantaneous clearing and settlement might increase this risk. The default flow of funds between different accounts is another design feature with behavioural implications (Gainsbury, 2023). For example, whether large winnings are automatically transferred back to the digital wallet or to a linked bank account might influence the person's propensity to continue gambling based on the relative ease of access to funds. Relatedly, some technologies incorporate a "quarantine" function, allowing users to prevent a portion of funds from being used for gambling for a specified period of time (AGBrief, 2021). Although provision of credit for land-based gambling is prohibited in NSW (Gaming Machines Regulation 2019, 2023), some international jurisdictions permit consumers to fund cashless accounts using credit cards (V. White & Guerreiro, 2021), as well as providing in-app access to lines of credit (e.g., casino markers; Skinner, 2023). More broadly, some omnichannel systems allow funds in the digital wallet to be used for making payments for non-gambling purchases, potentially both in-venue (e.g., food and beverages) and outside the venue for general retail purchases (Liquor & Gaming NSW, n.d.; Sightline Payments, 2023). Investigating the impacts of these various design features on gambling behaviour and risk of harm is an important focus for future research given the current lack of evidence.

3.7. Summary

Policymakers in some jurisdictions are considering widespread implementation of cashless payment systems for land-based EGM gambling, which to date has remained a predominantly cash-based activity. The impacts of such a transition on the way people gamble and their risk of experiencing harm are largely unknown. Literature from outside of the gambling field suggests that the digitalisation of payments has significant implications for consumers, particularly in relation to financial wellbeing and privacy. Most notably, several decades of consumer behaviour research analysed in Chapter 2 show that cashless payments facilitate greater spending relative to cash. Based on the evidence to date, this

effect persists despite increasing normalisation of cashless payments. Within the gambling field, literature on the behavioural impacts of payment methods is sparse and largely inconclusive. There is some evidence that the physical nature of cash aids gamblers in managing their money for gambling. Account-based gambling, which can be facilitated through cashless gambling accounts, holds potential for creating an integrated framework of systems that may be effective for reducing gambling harm, such as through limit-setting. Cashless gambling technologies can take a variety of forms and functions, and may consequently have diverse impacts in relation to gambling behaviour and risk of harm. Given limited prior research has focused on payment systems in gambling environments, qualitative methods provide a useful tool for in-depth exploration of this relationship. In the next chapter, I investigate the perspectives of regular EGM gamblers regarding the harm reduction potential of cashless gambling payment systems.

4. Qualitative Analysis of Consumer Perspectives Regarding the Harm Reduction Potential of Cashless Gambling

Abstract

Land-based gambling venues remain predominantly cash-based despite broader consumer trends towards digital payments. Little prior literature directly investigates the role of payment methods in gambling; however, digital payment systems offer a key intervention point for gambling harm minimisation. This study explores the perspectives of EGM gamblers regarding the concept of cashless gambling—the ability to gamble without using physical currency. Twenty-six Australian regular EGM gamblers (10 females, 16 males; aged 24–76 years) participated in four online focus group discussions. Using content analysis and a pragmatic approach, data were organised thematically in relation to consumer perceptions about the benefits and risks of cashless gambling, factors potentially influencing uptake of cashless gambling, and recommendations about harm reduction features that could be incorporated into the system. Cashless gambling was recognised to present important opportunities for more useful and meaningful harm reduction measures based on the ability to track a user's complete gambling activity. However, participants reported reluctance towards adoption of cashless gambling, tending to perceive such systems as being overly restrictive and invasive, and potentially facilitating (over)spending, depending on design and implementation. Participants commonly perceived systems as offering little value to individuals who do not feel they experience significant harms from gambling. Perceived irrelevance and privacy concerns appear to be major barriers to adoption of a cashless gambling system with strong harm reduction features. Findings provide insights for policymakers considering the optimal design, implementation, and marketing of cashless gambling from a harm reduction perspective.

4.1. Introduction

The range of literature reviewed in earlier chapters suggests that cashless gambling may present both risks and benefits from a harm reduction perspective. Given that much of the available evidence relates somewhat indirectly to cashless gambling, qualitative research methods provide a useful starting point for gaining a deeper understanding of the variety of potential impacts on the way people gamble and their risk of experiencing harm. Consumers possess valuable knowledge from their own lived experience of gambling and its consequences in their lives. Input from individuals with lived experience is increasingly argued as being a critical component in the design and implementation of effective policy (Bombard et al., 2018; Suomi & Dowling, 2020). Understanding consumer perspectives, including potential barriers and motivators for use, is essential for ensuring cashless gambling systems are designed, implemented, and marketed in a manner that maximises their effectiveness for minimising gambling harm.

4.1.1. Objectives

This study aimed to explore consumer perspectives regarding the potential risks and benefits associated with cashless payment systems for EGMs in land-based gambling venues. In addition, we were interested in factors that might influence consumers' uptake of cashless gambling systems, as well as their views about harm reduction functionality that could be incorporated into such a system. In relation to this thesis, these aims contribute to exploration of the potential impacts of transitioning from cash-based to cashless payment systems on the way people gambling and their risk of experiencing gambling-related harm, as well as different approaches to designing and implementing cashless payment systems from a harm reduction perspective. Another objective of this study was to identify the key attributes of cashless gambling systems to inform the design of a subsequent discrete choice experiment (Chapter 5). I explored relevant concepts during semi-structured focus group discussions with regular EGM gamblers and used content analysis to systematically organise the data into the themes presented in this paper.

4.2. Method

The study protocol, including the analysis plan and a reflexivity statement, was preregistered on Open Science Framework (https://osf.io/68hkq/).[19] Ethical approval was obtained from the University of Sydney's Human Research Ethics Committee (project no. 2021/571; Appendix F). Prior to taking part, participants provided informed consent by reading a statement that contained information about the study and returning an online consent form. The study is reported following Tong and colleagues' (2007) 32-item checklist for interviews and focus groups.

[19] Although primarily useful for quantitative research involving hypothesis testing, preregistration can benefit qualitative research by enhancing its credibility and transparency, whilst still allowing for its inherent flexibility and subjectivity (Haven et al., 2020; Haven & van Grootel, 2019).

4.2.1. *Theoretical Framework*

As a mixed-methods researcher, I adopted Morgan's (2007) pragmatic approach to inform my methodological choices. A pragmatic approach has three key implications for the way I designed and conducted the study: (i) reasoning by abduction, allowing flexible movement between inductive (data-driven) and deductive (theory-driven) processes; (ii) adopting an intersubjective mindset, allowing flexible movement between objective and subjective frames of reference; and (iii) considering the degree to which the findings are context-dependent or generalisable through the lens of transferability (i.e., what factors might influence whether the findings are transferable across contexts).

4.2.2. *Participant Selection and Setting*

I adopted a purposive sampling strategy for the study, selecting participants with prior experience using EGMs in land-based gambling venues. To be eligible to take part, participants had to: (i) be at least 18 years of age; (ii) spend money on EGMs at least once a month in land-based clubs; (iii) live in Australia[20]; (iv) be fluent in English; and (v) be comfortable using Zoom video conferencing and have a computer for participating in the online session. Participants were informed that they should not take part in the study if they did not feel comfortable discussing gambling or if they were currently experiencing gambling-related problems.

Moser and Korstjens (2018) suggest that a sample of three to four focus groups, each consisting of six to 12 participants, is appropriate for content analysis. I aimed to recruit up to 32 participants across four focus groups (i.e., 7–8 participants per group) based on budgetary constraints. Five participants were recruited through study advertisements posted on social media and/or invitations sent to mailing lists of previous research study participants who had consented to being contacted about future research opportunities. Twenty-one participants were recruited through a market research agency. A further six individuals were recruited but did not attend their scheduled session. Participants who completed the group discussion and survey were offered an AUD $75 shopping gift card as reimbursement for their time.

A total of 26 Australian adults who reported playing EGMs regularly participated in the study across four focus groups. Participants were mostly male (n = 16; 61.5%) and aged between 24 and 76 years (M = 46.8, SD = 15.3). All participants reported English as their primary language spoken at home. Most participants reported having completed a tertiary qualification (Certificate III or above; n = 20; 76.9%) and were employed either full- or part-time (n = 18; 69.2%). The modal gross personal income category reported was AUD $104,000–$155,999 per year. For reference, the median personal income in Australia for the 2019–20 financial year was $52,338 (Australian Bureau of Statistics, 2022).

[20] The background information provided in the focus group discussions referred to a proposal by the NSW Government; however, due to time constraints, I decided to adopt a broader eligibility criterion requiring participants to live in Australia to expedite the recruitment process.

Table 3 summarises the typical payment and gambling behaviours reported by participants. On average, participants reported spending money on EGMs in land-based gambling venues on 6.4 days during a typical month (*SD* = 6.7). In relation to breadth of gambling involvement, participants reported engagement in an average of 3.2 other (non-EGM) gambling activities during a typical month (*SD* = 2.1). About one in two participants (53.8%) reported having previously used a non-cash payment method, such as a paper-based ticket or card-based system, to load funds onto an EGM in a land-based gambling venue.[21] Nearly all participants (92.3%) reported experiencing one or more gambling problems during the past 12 months (PGSI ≥ 1), and two-fifths (42.3%) were classified as potentially experiencing severe gambling problems (PGSI ≥ 8). Given potential participants were advised not to participate if they were currently experiencing gambling-related problems, these PGSI scores suggest that some participants may not have recognised themselves as being at risk of harm.

Table 3

Typical Payment and Gambling Behaviours Reported (N = 26)

Variable	*M*	*SD*
Frequency of payment method usage for any type of in-person purchase (days per month)		
Cash	7.6	9.3
Cheque	0.0	0.0
Physical debit card	16.6	12.5
Smartphone-based debit card	7.3	10.6
Physical credit card	11.8	12.0
Smartphone-based credit card	5.4	10.1
Previous experience using non-cash payment methods to load funds onto EGMs	*n*	%
Paper-based systems (e.g., "ticket-in, ticket-out" or TITO systems) involving paper-based ticket or voucher with a printed barcode that is scanned to load money onto the gaming machine	12	46.2
Registered card systems (e.g., a membership or loyalty card that is associated with the player's identity and which can be loaded with money and inserted into the gaming machine to play)	7	26.9
Anonymous/casual card-based systems (e.g., a card that is not associated with the player's identity but which can be loaded with money and inserted into the gaming machine to play)	5	19.2

[21] Given TITO systems have been implemented for years in some Australian jurisdictions, it is somewhat surprising that only 53.8% reported having previously used a non-cash payment method to load funds onto an EGM in a land-based gambling venue. However, this figure might be explained due to differing availability across jurisdictions, and different regulations applying to different venue types (Hare, 2020). For example, Victoria only introduced regulations allowing TITO and card-based cashless gambling on EGMs in pubs and clubs in 2019 (Victorian Responsible Gambling Foundation, 2019).

Variable	*M*	*SD*
Monthly participation in other (non-EGM) gambling activities, either land-based and/or online	*n*	%
Instant scratch tickets	12	46.2
Lotto or lottery games	16	61.5
Keno	11	42.3
Bingo	1	3.8
Private betting for real money (e.g., playing cards or mah-jong with friends and family)	3	11.5
Poker	6	23.1
Casino table games (e.g., blackjack, roulette)	8	30.8
Betting on horse or dog races	13	50.0
Betting on sports	12	46.2
Problem Gambling Severity Index[a] (*M* = 8.2; *SD* = 7.6)	*n*	%
Non-problem gambling	1	3.8
Low risk gambling	7	26.9
Moderate risk gambling	6	23.1
Problem gambling	11	42.3

Note. [a]Data relating to the Problem Gambling Severity Index (PGSI) were missing for one participant. Past-year PGSI scores were classified following Ferris and Wynne (2001): non-problem gambling = 0; low-risk gambling = 1–2; moderate-risk gambling = 3–7; problem gambling = 8–27.

4.2.3. Data Collection

Data were collected during focus group discussions, which followed a semi-structured question schedule (see Appendix G). Focus groups were conducted by two researchers between September and November 2021 (see Appendix H for further information about the research team). Sessions were conducted online due to restrictions on face-to-face activity related to the COVID-19 pandemic.[22] After setting out guidelines for the discussion and allowing each person to introduce themselves, participants were provided with some background to the research topic. The background statement was deliberately kept broad because cashless gambling systems can be designed and implemented in a variety of different ways, and the intention was not to assess a specific variant.

Participants were told that the NSW Government was proposing to change the way people pay to play on EGMs, transitioning from a cash-based to a card-based cashless system. Instead of inserting cash directly into a gaming machine, users would load money onto a (physical or virtual) card, which could be used to play on gaming machines.

[22] To my knowledge, no one else was present during the sessions besides the participants and researchers; however, as participants took part remotely, it is possible that others may have been present in the background (i.e., off-screen).

Participants were asked to discuss their perceptions about how a cashless system might change the way they gamble, their reasons for and against wanting to use such a system, their views about whether the system should be voluntary or mandatory to use, and their recommendations regarding features that could be built into the system to help people stay in control of their gambling.[23] Audio recordings of the discussions ranged between 63 and 67 minutes in duration and were professionally transcribed. Transcripts were crosschecked with the audio recordings.

Following the group discussion, participants were asked to complete a brief questionnaire hosted on Qualtrics (see Appendix I). The questionnaire collected data relating to participants' demographic background, typical payment and gambling patterns, past-year experience of gambling problems, and rank-ordered preferences regarding harm reduction features that could potentially be incorporated into a cashless payment system (see Appendix J for these results). Past-year experience of gambling problems was measured using the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001). The PGSI is a commonly used 9-item screening instrument that includes questions about participants' engagement in problematic gambling behaviours (e.g., "How often have you gone back another day to try to win back the money you lost?") and experience of negative consequences from gambling (e.g., "How often has your gambling caused any financial problems for you or your household?"; Tseng et al., 2023). Item responses were collected on a 4-point scale (*never* = 0; *almost always* = 3) and summed to yield a total score, which was classified following Ferris and Wynne (2001): non-problem gambling = 0; low-risk gambling = 1–2; moderate-risk gambling = 3–7; problem gambling = 8–27. Internal consistency was high (Cronbach's α = .93).

4.2.4. Data Analysis

To explore key concepts within the transcribed data, I employed Schreier's (2014) eight-step method for content analysis, which is compatible with the assumptions underlying a pragmatic approach. Two researchers (TS and ST) conducted the analysis following the process detailed in the preregistration. Material deemed irrelevant to the research questions (e.g., instructions to participants at the beginning of the session) was excluded following agreement by both researchers.

To build a coding frame, I initially used the transcripts from the second and third focus group discussions, which were deemed most representative of the four discussions. After defining four main categories (overarching themes), I used a subsumption strategy to generate subcategories (more specific aspects of meaning related to the overarching main category; Schreier, 2014). Each subcategory was given a brief definition, along with indicators (keywords) and one to two example quotations from the data. For cases where

[23] Stimulus materials were used to help focus the discussion on harm reduction features relating to one sub-theme at a time (e.g., features that might help people manage the amount of money spent gambling, manage the amount of time spent gambling, keep track of their gambling, etc.). Stimulus materials were displayed using Zoom's screen-sharing functionality and consisted of a word or phrase summarising the focal sub-theme ("money," "time," "feedback," "access," "identify and support"). Prompts were used to stimulate discussion about a range of existing and proposed harm reduction features (see Appendix G).

subcategories could be perceived as overlapping (which would violate the principle of mutual exclusiveness; Schreier, 2014), I created decision rules to facilitate assignment of units to the most appropriate subcategory. After checking for any subcategories that could be collapsed due to substantial overlap in meaning, the initial coding frame consisted of a total of 31 subcategories. Given the coding frame was thematically based, I segmented the data into thematic units (as opposed to structural units, such as words or sentences).

To trial the initial coding frame, both researchers coded the transcribed data from the third focus group discussion, which was deemed most representative of the different categories in the coding frame. The coding process was conducted using NVivo (QSR International, 2022). Intercoder reliability was fair to good (Cohen's κ = .57), based on Fleiss and colleagues' (2003) heuristics.[24] The validity of the coding frame was indicated by a relatively low frequency of units assigned to residual categories, which were omitted from the main analysis. Following the trial coding phase, I made refinements to the coding frame to clarify the definitions and decision rules for some subcategories to improve the reliability of the main coding process.

In the main analysis phase, both researchers coded all the data using the finalised coding frame (see Appendix K), which consisted of 28 subcategories across four main categories. Intercoder reliability was fair to good (Cohen's κ = .62).

4.3. Results

Table 4 shows the frequency of units coded per subcategory, listed in decreasing order of frequency within each main category.

Table 4

Frequency of Units Coded per Subcategory

Category	Frequency
Perceived benefits	
Provision of harm reduction and consumer protection measures	89
Preventing money laundering	20
Convenience	18
Security	16
Reducing disease transmission	9
Perceived risks and concerns	
Inappropriateness of approach to addressing problem gambling and gambling harm	116
Security and privacy concerns	59

[24] We originally planned to assess the reliability of the coding frame using Krippendorff's alpha (Krippendorff, 2004). However, after inquiring with the software provider, we became aware that it is not possible to calculate this statistic in NVivo, nor is it possible to export the data in a manner allowing its calculation.

Category	Frequency
Overspending—Intangibility of cashless payments	38
Inconvenience	31
Circumvention of the system	27
Overspending—Greater accessibility of funds	26
Inaccessibility	25
Overspending—Other/unspecified	21
Migration to alternate modes or forms of gambling	10
Overspending—Reduced breaks in play	9
Overspending—Linked sources of credit	8
Factors potentially influencing uptake of cashless gambling	
Level of user autonomy and freedom	83
(In)flexibility of consumer protection mechanisms	80
Process of loading funds into the cashless gambling account	45
(In)ability to use non-gambling-specific payment methods	35
(In)consistency across venues	15
Process of withdrawing funds from the cashless gambling account	12
Whether there are fees for using the cashless payment system	6
(Lack of) integration for making in-venue non-gaming transactions	3
Harm reduction and consumer protection measures	
Precommitment	86
Tailored feedback and referrals informed by behavioural tracking	55
Security features	23
Self-exclusion	20

4.3.1. Perceived Benefits of Cashless Gambling

Five subcategories relating to perceived benefits of cashless gambling were identified (see Table 4). Most commonly, participants discussed the potential of cashless gambling systems to incorporate harm reduction features that rely on the ability to track a user's gambling activity, such as tools to help people manage their spending (e.g., precommitment systems). Although views about the appropriateness of this approach were mixed, participants generally recognised that an account-based digital system with integrated harm reduction features could overcome critical deficiencies of existing systems, which are largely decentralised, anonymous, and heavily reliant on manual processes. One participant referred to the fragmented nature of single-venue self-exclusion schemes as a key example:

> *"I see this proposed change as a step in the right direction if it's linked into a Self-Exclusion Scheme. And, obviously, part of that would be limiting the amount of funds that you can put on the card."*

Several participants reported that an account-based digital system with "hard" controls and expenditure tracking tools would facilitate better accountability than an anonymous cash-based system due to the fallibility of "soft" strategies for self-regulating their gambling activity and difficulties that they experienced keeping track of their spending.

> *"I often lose control when I'm gambling. I go in there with the best intentions. However, there's been many times when I've either used ATMs in a venue, or exited the venue, got more money [and] come back. So, this is a way of reducing that problem, or hopefully removing it altogether."*

> *"I've sometimes wondered if I'm ahead overall with your accounts and stuff, like your sports tabs and stuff, you can kind of track it. You can get a statement and stuff. You can't really do that on the pokies … but that card would give you that oversight right? You'd have somewhere to track it."*

Aside from the potential benefit of more sophisticated harm reduction functionality, participants recognised the importance of a cashless account being linked to an individual's verified identity as a mechanism to prevent money laundering. Some participants saw a cashless system as an easy and convenient payment option because they "hardly use cash," and suggested that a cashless system would facilitate "a quicker process to gamble" and "streamline the process." However, as expanded upon in the next section, convenience was commonly seen as a duality because although a cashless system might mean a user only has to "flash [their] card somewhere near [the machine]," the relatively frictionless nature of a cashless payment system could "make it a lot more freer and easier to gamble" and increase the risk of overspending. Participants perceived a cashless payment system as having security benefits over "carrying around large amounts of cash" in or around venues and saw the proposal as part of a "step away from using cash in society, especially because of COVID."

4.3.2. Perceived Risks and Concerns about Cashless Gambling

Eleven subcategories relating to perceived risks and concerns associated with cashless gambling were identified (see Table 4). Participants generated substantially more discussion about potential risks and concerns than potential benefits. Given the broad nature of the background information provided to participants, this difference may have been partly due to uncertainty as some participants expressed wanting to know more about "the reasoning behind [the proposal]" and suggested "it's actually really impossible to say whether it's a good idea or not until we know more about the card."

Participants were most frequently concerned about the appropriateness of using a cashless gambling system as part of a population-level approach to addressing problem gambling and gambling harm. Participants expressed concerns about overregulation and excessive institutional control and monitoring, viewing the proposal as "a control system of the government" and "too big brother." A mandatory universal approach was frequently seen as having adverse impacts on an individual's freedom of choice over how they spend

their money and on the experience of people who gamble recreationally without experiencing significant harms:

> *"I think if all this is about to try and stop problem gambling, then all it's doing is putting more restrictions on the majority of people who aren't problem gamblers."*

However, taken together with the PGSI data, it appears that some participants did not recognise themselves as being at risk of harm. Several participants expressed scepticism that people would use a cashless gambling system or any integrated harm reduction features if they are only voluntary. Concerns about the appropriateness of the approach also stemmed from conflicts of interest that some stakeholder groups, such as the government and gambling industry, may have in wanting to implement cashless gambling:

> *"I'd be a bit sceptical around leaving the monitoring of this up to the institution that's going to benefit from it. I think the clubs, I don't think they mind people gambling in there. Do they?"*

The potential of a cashless payment system to increase the risk of overspending was another major concern. Several factors were identified as potentially contributing to this risk. Participants were often concerned that the intangibility of cashless payments might facilitate spending more than intended because "it doesn't feel like real money" and "you don't physically see like an empty wallet." Several participants talked about the importance of handling physical currency for regulating their spending, as one participant remarked, "I think physically holding the money in your hand actually plays a massive part in the decision-making process and, 'Do I want to keep doing this?'" A reduction in natural breaks in play was seen as another factor that might increase overspending:

> "*I like the fact that I get to have a bit of a break and get away, to go and get more cash if I want to. And then I think about it. Whereas if it's on a card, I'm not thinking about it, I just keep going. So I like the idea of getting away and having a break and just reassessing what I'm doing.*"

Participants were concerned that a cashless gambling system could facilitate overspending by increasing the accessibility of funds for gambling, such as through reduced friction in the payment process (e.g., automatic top-ups) or big wins being easily accessible for immediate re-gambling. One participant asked, "How hard is it to load this card? … does it come directly from your bank account to the cash card, in which case that would be easy but also maybe dangerous." The potential to fund the account from a source of credit was a related concern, as one participant said, "If you were able to attach your credit card to this card, that could be very bad."

Another key concern related to the privacy and security of users' personal information and funds held within a cashless gambling system. Participants raised concerns about how identifiable data might be used by the operators of the system, as well as by third parties with which the data might be shared, such as advertising firms, credit ratings agencies, and social security providers. The anonymity of cash was often preferred for this reason:

"What other data is being collected … where are you visiting … how much are you spending every week? Could that [in] some way be aggregated … and used against you in some way in the future, you know, cash is just completely anonymous."

The risk of a data breach was a worry, as well as whether there would be ways to remediate cases involving lost or stolen cards or compromised accounts.

Several other drawbacks were raised. Despite some participants viewing a cashless payment system as convenient, others disagreed and suggested that they would find the system "[too] much of a hassle" and frustrating to use. Some participants suggested that the system and any integrated harm reduction features might be easily circumvented, particularly if the approach adopted was not mandatory and universal in nature and did not restrict individuals to using a single account. As one participant remarked:

"I'd say it has to be mandatory and all the machines that have to work the same way. You can't have some cashies there and some cards there. If they're serious."

Inaccessibility of the system was another concern, especially for older generations. Finally, some participants suggested that transitioning to a cashless gambling system might facilitate migration to alternate modes or forms of gambling, such as by increasing familiarity with gambling-related apps among land-based gamblers which could result in greater online gambling:

"This is going to create a problem that you're going to get people hooked on apps and gaming apps."

4.3.3. Factors Potentially Influencing Consumer Uptake of Cashless Gambling

Many participants indicated that they would be more or less willing to use a cashless gambling system depending on certain conditions, so we sought to identify a set of factors that potentially influence the perceived utility of cashless gambling. We organised the data in eight subcategories within this main category (see Table 4).

Attitudes towards cashless gambling systems appear to vary depending on the level of user autonomy and freedom inherent in the system. Many participants expressed reluctance towards a mandatory system, citing beliefs that such a system would "[take] away people's rights," such as freedom of choice (e.g., to use cash) and rights to privacy (e.g., not to have their spending on gambling monitored by operators or the government, or identifiable data shared and used by third parties). Conversely, some participants argued strongly for a mandatory system to ensure its effectiveness in reducing gambling harm:

"I firmly believe it should be mandatory [and] connected to … your identity … The gambling industry will kick and fight and try and prevent this from happening. But if the government or the gambling industry are fair dinkum about harm minimisation, this is the only way of achieving that."

Willingness to adopt cashless gambling appears to depend on the relative flexibility of harm reduction features incorporated within the system, such as the ability for users to

set their own limits or to toggle particular settings on or off. As one participant asked, "Who sets that limit and how do you change that limit?" The process of loading funds into the cashless account is important to consumers, including the methods permitted to fund the gambling account (e.g., debit/credit card, bank transfer, cash deposits). One participant stated that his views about the system were "dependent upon how the funds are loaded. That is the actual key. If you have to do it manually, which would be my preference." Similarly, the process involved in withdrawing funds is a consideration, as one participant asked, "[What] would happen if you didn't use all the funds on the thing? Would you get the money back?" Some participants indicated that their willingness to adopt cashless gambling depended on whether they could use an existing non-gambling-specific payment method directly at the gaming machine:

> *"For me it makes more sense either that … it's your cash or your actual bank card rather than, like, a separate card entirely."*

The level of consistency across venues appears to be another important factor, as one participant asked, "[So] has that got to be a specific card that's … that's acceptable across all [venues], for example?" Consistency was seen as critical to the system being convenient, as well as effective from a harm reduction perspective. Some participants were interested in whether the account could be used to make non-gambling transactions (e.g., food and beverages):

> *"Would it be poker machine specific? You know, I think you should be able to use it in the whole club on whatever you want, lunch, that type of thing, not just the pokies."*

Finally, whether consumers are charged transaction fees for using the cashless gambling system was a consideration:

> *"Is there some sort of charge involved with this? Like, is there a small fee per transaction."*

4.3.4. Integration of Harm Reduction and Consumer Protection Measures Within the Cashless Gambling System

Participants made suggestions about harm reduction and consumer protection measures that could be integrated into a cashless gambling system. These suggestions were organised in four subcategories (see Table 4). Some suggestions are not new ideas but organising them here indicates how existing literature covering a variety of interventions could be brought together to inform the design of an integrated system.

Suggestions most frequently related to precommitment features. Participants typically recommended that the cashless gambling system should allow users to set personalised hard daily or weekly limits on deposits and expenditure (i.e., net losses). One participant suggested that once the limit for a period is reached, the account could only be unlocked following approval by a nominated third party:

> *"You have a limit; you've reached that limit, now you have to get a secondary PIN to be unlocking the account."*

Some participants were in favour of a quarantine function to prevent immediate re-gambling of big wins:

> *"I reckon [if it was] an app, there'd probably be some sort of blocker where if you did win $1,000, you could lock it away and you wouldn't be able to access it for 48 hours or something like that."*

This function was likened to existing regulations that require prizes over a specific amount to be paid out via cheque or electronic funds transfer instead of cash. However, others questioned the effectiveness of a quarantine function, suggesting that some users might simply reload the equivalent amount that had been quarantined into their account:

> *"What's the point of having the money in a safety zone, if I can just deposit more?"*

In relation to precommitment of time, some participants reported that soft time limits (e.g., periodic alerts) would be helpful "to break that trance." Hard time limits, mandatory breaks in play, and enforced waiting periods (e.g., before deposited funds are available for gambling) were commonly perceived as "very frustrating." One participant suggested that hard time limits might backfire by prompting more intensive gambling:

> *"People could think, right, I've got five minutes to go. I'm going to spend more."*

Cognitive biases, such as the gambler's fallacy and hot hand fallacy, were often evident in reasons given for disliking limits on time:

> *"There are times where it would be very frustrating if there was a time limit because sometimes you sort of get this feeling that it's the right time to really play the machine. And if you have to stop or pause or somebody else comes along and plays the machine and you've invested this money in it, that could be really annoying too."*

> *"I can be there one hour or five hours. I've been at the casino for 12 hours at a time. If I'm winning and I'm on a streak, I don't care about time. I'll go without food for 20 hours if I'm winning. So to me, [the] time concept is irrelevant. I wouldn't use it."*

Participants discussed their perspectives regarding the use of cashless account data to provide tailored feedback to gamblers and the application of behavioural tracking algorithms to inform the delivery of targeted interventions. Participants commonly recommended that the system should provide regular and meaningful feedback about the amount of time and money spent gambling through easily accessible activity statements and just-in-time messaging interventions (e.g., on-screen alerts or push notifications during gambling sessions):

> *"You get a statement every week or every month saying, 'This is what you spent. This is how much. These are your sessions. Here's what you won. Here's what you lost.'"*

Graphical representations were recommended to help gamblers understand their net outcomes over time:

"How much you're actually winning or losing over time, that would be quite interesting to see. They could provide graphs."

Expenditure feedback was suggested to be more impactful if net losses were translated into tangible expressions of alternative consumption opportunities (e.g., a holiday, rent payments).

Several participants indicated that they were supportive of interventions involving provision of information (e.g., activity statements) on the basis of the gambler having personal agency in deciding how to respond to the information presented:

"You can see how much you've spent for that day and how much you won. … I don't mind that. Something you can use and walk away, whether you decide to or not, it's your choice being the adult."

In contrast, the concept of targeted interventions (e.g., individuals showing indicators of high-risk gambling activity being approached by venue staff members) was commonly viewed as "invasive," "patronising," and "embarrassing." Some participants were sceptical that an individual's gambling risk level could be accurately classified using account data alone, as one participant remarked, "I don't believe they could identify risky behaviour anyway. … If someone kept putting money into a machine, that's not to say that they've got an addiction, or that they've overspent what they've got available." However, another participant suggested that analysing account data could improve existing protocols by providing additional information to guide supportive interactions between venue staff and patrons.

"The people that already do man the gambling area, you know, they'[re] supposed to have done a RCG which is a responsible conduct [of] gambling course. So the only way they have [of] identifying this in the past, I guess, is if they see the person sitting there for eight hours in front of the machine. So this is a more targeted way, a more informed way of them perhaps finding problem gamblers."

Finally, participants recommended that the cashless gambling system should have strong security features to protect their account from being compromised and be integrated with a centralised self-exclusion register effective across venues.

4.4. Discussion

This qualitative study aimed to explore regular EGM gamblers' views about potential risks and benefits associated with cashless gambling on EGMs in land-based venues. We were also interested in factors that might influence their uptake of cashless gambling systems, as well as their views about harm reduction functionality that could be incorporated into such systems. This contribution highlights the value and importance of including the voices of individuals with lived experience in discussions about policies by which they are likely to be affected. Overall, my analysis of focus group discussions with 26 Australian EGM gamblers suggests that despite cashless gambling presenting important

opportunities from a harm reduction perspective, many gamblers do not view potential harm reduction features as being relevant for themselves (despite evidence that some were at serious risk based on PGSI scores) and are likely to feel reluctant towards using cashless gambling systems, at least initially.

The concerns most frequently raised by participants related to potential impacts of the system on their personal choice and privacy. Consistent with previous literature (Gainsbury, Angus, et al., 2020; Gainsbury et al., 2017), participants commonly viewed harm reduction features as not being relevant to themselves, but as intended for people experiencing gambling problems—even though most participants' PGSI scores suggested that they had experienced at least some level of gambling problems in the past 12 months. Discussion of mandatory and inflexible aspects of the system, as well as potential monitoring and intervention based on user activity patterns, was often embedded within narratives relating to excessive government interference with personal choice to engage in gambling. This emphasis on gambling being primarily a matter of individual responsibility has been observed in previous Australian qualitative research involving regular gamblers (Marko et al., 2022). Evaluations of the "My-Play" card-based cashless gambling system that was trialled in Nova Scotia, Canada, between 2005 and 2014 similarly identified perceived irrelevance and privacy concerns as major barriers to adoption of the system (Focal Research, 2010; Responsible Gambling Council, 2016). Some of these barriers to adoption may be less relevant should a mandatory universal system be implemented, as consumers would be required to enrol in the system to gamble on EGMs.

The potential of a cashless gambling system to facilitate (over)spending was another major concern. Consistent with literature from both within and beyond the gambling field, participants suggested that (over)spending could be facilitated through reduced tangibility in the payment process (Lapuz & Griffiths, 2010; Soman, 2003), greater accessibility of funds for gambling (Rodda, 2021; Rodda et al., 2019b), reduced breaks in play on gaming machines (McMillen et al., 2004), and the potential to fund a cashless account using credit (Swanton & Gainsbury, 2020b). "Frictionless" payments may have convenience benefits by minimising as much as possible the steps involved in making a purchase, but may increase the risk of overspending by reducing deliberative decision-making and the pain of paying experienced (Schomburgk & Hoffmann, 2022; M. Thomas et al., 2011). In the context of online gambling, a behavioural risk audit of 10 operator platforms conducted by the Behavioural Insights Team (2022) found that setting up a deposit limit took customers in Britain an average of three more steps than placing a bet. This review also found evidence of convoluted withdrawal and account closure processes (examples of "sludge" practices; Newall & Rockloff, 2022), and default deposit amounts that were greater than the minimum required (Behavioural Insights Team, 2022). These findings provide examples of the way in which cashless gambling could ultimately increase the potential for consumers to experience gambling-related harm if the harm reduction value of the system is not maximised and realised. However, it seems possible that any effect of cashless payments in facilitating spending can be mitigated through integration of strong harm reduction features and the careful design of the system's choice architecture in a manner that prioritises consumer

welfare. For example, geofencing technology, payment clearance times, and the default flow of funds between different accounts may provide levers to create greater friction and reduce the potential for overspending (see section 3.6).

Taking the findings from this study together with the prior literature, it appears that the net impacts of a cashless gambling system on gambling behaviour and harm may be largely dependent on how such a system is designed and implemented. Critical factors include whether the system is mandatory (vs voluntary) for consumers to use (i.e., a completely cashless vs hybrid system), whether each user is registered against only one account linked to their verified identity (vs multiple anonymous/unverified accounts), and whether the system is consistent and networked across venues (vs separate systems across venues). These factors underlie the ability to trace and link a user's complete EGM gambling activity (within the regulated environment in a specific jurisdiction), which is a fundamental requirement for effective precommitment systems (Rintoul & Thomas, 2017) and for providing accurate and meaningful feedback to consumers (A. Thomas, Rintoul, et al., 2016). Results suggest that consumers accurately understand that non-binding precommitment systems have limited harm reduction utility (Wohl et al., 2023).

Several important questions arise for further investigation by researchers and for thoughtful consideration by policymakers. Even if a completely cashless system (i.e., mandatory universal) is implemented across a jurisdiction, policy decisions still need to be made about the flexibility of harm reduction features to be incorporated into the system. Whether precommitment features are voluntary or mandatory is a key consideration (Meerkerk, 2022, summarises various approaches across 22 European countries). Opt-in limits are unlikely to be effective due to very low uptake rates (Delfabbro & King, 2021b), whereas opt-out defaults (requiring consumers to set limits or otherwise opt-out from them) have been found to increase limit-setting substantially (Heirene et al., 2021). Further policy decisions are required about how such limits are set. Mandatory but self-imposed limits may be rendered ineffective if consumers set limits so high that they are unlikely to ever be reached (South Australian Centre for Economic Studies, 2019; A. Thomas, Christensen, et al., 2016). Default limits (which can be changed) may help anchor players to lower amounts (Ní Chonaire et al., 2021). The potential of mandatory breaks in play to backfire by prompting more intensive gambling requires further investigation. Affordability assessments are another potential solution to ensure appropriate spending limits are set (Nower & Glynn, 2022). In Tasmania, default maximum limits of $5,000 per year have been proposed—with affordability checks required for individuals requesting to increase their limit beyond this cap (Tasmanian Liquor & Gaming Commission, 2022). In the UK, Noyes and Shepherd (2020) have proposed a model in which gamblers with net deposits over £100 per month across operators would be subject to an enhanced affordability check. More recently, the UK Government has proposed requirements for operators to conduct affordability checks when a customer's spend passes set thresholds—with financial vulnerability checks proposed at net loss thresholds of £125 per month or £500 per year, and enhanced spending checks proposed at net loss thresholds of £1,000 per 24-hour period or £2,000 within 90 days (as potential indicators of binge gambling; Department for Culture, Media & Sport, 2023).

This study provides in-depth insight into factors that are likely to influence the acceptability of cashless gambling by regular EGM gamblers. Overall, participants in this study tended to perceive cashless gambling as part of a paternalistic system offering minimal value to the consumers who gamble without experiencing significant harms. These findings suggest that the communication strategy and framing of messaging need to be carefully designed to enhance uptake and engagement with the harm reduction features of a cashless gambling system. Messaging needs to shift the perception that harm reduction tools are solely intended for people experiencing gambling problems, but rather are designed with preventative intention and are beneficial for use by gamblers across the spectrum of risk (Gainsbury, Angus, et al., 2020; Gainsbury et al., 2017). Reframing from a restriction-focused perspective to one focused on benefits to the individual will likely be key to driving adoption. Framing harm reduction around reducing the risk of overspending may be one approach to investigate given this was a key concern. The ability to access meaningful and accurate feedback in real time appears to be an important benefit to emphasise. Prior literature suggests that integration of loyalty programs within cashless gambling systems presents another potential avenue to drive uptake and engagement (A. Thomas, Christensen, et al., 2016), such as by providing customers with non-gambling-related rewards (e.g., food or hotel offers) for using harm reduction features (Hollingshead & Wohl, 2022). However, whether (or under what conditions) loyalty programs are compatible with harm reduction remains unclear (Delfabbro & King, 2021a; Wohl, 2018). Addressing consumer concerns about the privacy and confidentiality of personal information will be critical for reducing reluctance towards cashless gambling systems (Rintoul & Thomas, 2017). Consumers have major concerns about how identifiable data could be used by operators or governments and shared with third parties in ways that are not made clear to them, such as for behavioural profiling and targeted marketing practices (Christl, 2022; Hörnle et al., 2019). Findings by Christl (2022) suggest these concerns are justified in the case of operators. Robust regulatory mechanisms are needed to prevent misuse of such data, both to enhance consumer confidence in the system and to prevent the system from contributing to gambling harm in more obscure ways. Finally, training for venue staff will be necessary to ensure that effective use of harm reduction features is normalised as part of the customer experience, especially during onboarding processes (South Australian Centre for Economic Studies, 2019).

4.4.1. Limitations

This exploratory study provides qualitative evidence regarding consumer perceptions about the relationships between cashless gambling, gambling behaviour, and gambling harm. This study focused on applications of cashless gambling to EGMs, but future studies could consider applications to other forms of land-based gambling activities, such as casino table games. This study was not designed to evaluate the impact of a specific cashless gambling system on measures of gambling behaviour or harm. Consumers possess valuable knowledge about their lived experience of gambling and its consequences in their lives, and learning from their experiences is critical to informing effective policy. However, qualitative studies investigating consumers' subjective experiences are unable to speak to

the actual effectiveness of various design options suggested for reducing gambling harm. Replications relating to specific implementations of cashless gambling could incorporate product demonstrations or user experience components to gain greater insight about particular aspects of the system. Focus group discussions were conducted in the context of the COVID-19 pandemic and related government restrictions, such as stay-at-home orders and mandatory venue check-in procedures that were in force across large parts of Australia at various times. Participants' experiences of and attitudes towards these restrictions likely influenced the views expressed during discussions (Kleitman et al., 2021), and may have contributed to the dominance of themes relating to personal freedom and autonomy.

4.4.2. Conclusions

Regular EGM gamblers appear to be reluctant towards the concept of cashless gambling, tending to perceive such systems as being overly restrictive and having little value for themselves. If cashless gambling is implemented without adequate harm reduction functionality (e.g., precommitment), it seems possible that the system could increase the potential for harm by facilitating overspending, such as through reduced friction in deposit processes and easier access to account funding sources. It is therefore imperative to ensure that the harm reduction potential of cashless gambling is realised. Voluntary and fragmented implementations would severely compromise the harm reduction potential of the system because not all gambling activity would be contained within the system. Moreover, uptake of the system is likely to be low if consumers remain unpersuaded about its benefits. In the next chapter, we investigate this possibility further by quantitatively analysing regular EGM gamblers' preferences towards different variants of a cashless gambling system. In sum, a mandatory system with carefully designed choice architecture (e.g., opt-out precommitment with appropriate default limits) may be optimal for maximising the harm reduction value of cashless gambling whilst preserving freedom of choice.

5. Discrete Choice Experiment Assessing Consumer Preferences for Cashless Gambling Systems with Integrated Harm Reduction Measures

Abstract

EGMs are strongly associated with gambling-related harm. Account-based cashless payment systems offer strategic opportunities over anonymous cash-based systems for implementing gambling harm reduction measures. This study aimed to assess the preferences of Australian EGM gamblers towards cashless gambling systems. Participants completed an online survey incorporating a discrete choice experiment (DCE) between February and March, 2023. The DCE was designed to quantify the relative importance of different characteristics of hypothetical cashless gambling systems (physical form of the cashless payment; consistency across venues; choice in whether to set a spending limit; choice in setting the spending limit amount; loyalty scheme integration), and to assess consumers' willingness to deviate from the existing predominantly cash-based system. Data were analysed using error components panel models. Responses from 363 Australian adults (M_{age} = 40.2 years; 30.9% female) who regularly use EGMs were analysed. Gamblers most preferred a smartphone-based cashless gambling system that operates across multiple venues in their area, involves mandatory self-imposed spending limits, and is linked with a loyalty scheme that provides rewards for both money spent and engagement with harm reduction features of the system. Preferences for mandatory spending limits were stronger among gamblers at higher risk of harm. However, our model predicts that at least 42.5%–62.9% of gamblers would not use a cashless gambling system if the option to use cash remains available. Uptake of cashless gambling systems depends on the system's features and is likely to be low for voluntary systems. A mandatory system will maximise potential effectiveness for reducing gambling harm.

5.1. Introduction

Meta-analytic evidence from international gambling prevalence studies shows that EGMs are the form of land-based gambling most strongly associated with gambling-related harm (Allami et al., 2021). Gambling-related harms commonly include negative impacts on people's finances, mental and physical health, and social relationships, and extend beyond the gambler to affect their family, friends, and the broader community (Langham et al., 2016). In contrast to online gambling (Deng et al., 2019), a person's EGM activity in land-based gambling venues remains largely untraceable because payments are primarily made anonymously in cash (NSW Crime Commission, 2022). The lack of an identity-linked account-based system limits the potential for providing important harm reduction measures, such as precommitment, self-exclusion, and real-time feedback on gambling activity (Regan et al., 2022). Cashless gambling systems, which facilitate tracking through use of non-cash payment methods (e.g., identity-linked cards, digital wallets), provide strategic opportunities for implementing harm reduction measures as part of a public health approach (Gainsbury & Blaszczynski, 2020; Goyder et al., 2020). However, the effectiveness of cashless gambling in reducing gambling harm likely depends on how the system is designed and implemented. In particular, it is critical to ensure such systems do not increase risk of harm, such as by reducing gamblers' awareness of their spending and increasing the accessibility of funds for gambling (Gainsbury & Blaszczynski, 2020). This study aimed to provide quantitative evidence from an Australian context to inform the development of policy that maximises the harm reduction potential of cashless gambling.

5.1.1. Characteristics of Cashless Gambling Systems

Cashless gambling systems can be either mandatory or voluntary for people to use. Norway, which operates a state gambling monopoly, is one of few jurisdictions where using a personal gambling card is mandatory (Nikkinen, 2019; Rossow & Hansen, 2016). The card is registered to a person's national identification number and funded using electronic payment methods. The mandatory nature of the system means that transaction data captured cover the entirety of a person's gambling activity (across forms and modes) within the regulated environment (Nikkinen, 2019). Voluntary cashless gambling systems, which are in place in various forms across Australia, amount to a hybrid model in which people can pay using both cash and cashless methods (Hare, 2020; NSW Crime Commission, 2022). Voluntary systems related to gambling harm reduction may be implemented in a fragmented and decentralised manner such that gamblers are unable to use the same account across all venues in their area. For example, the incomplete nature of voluntary precommitment systems seriously limits their harm reduction utility (A. Thomas, Christensen, et al., 2016). The ineffectiveness of many self-exclusion schemes provides a prime example as a lack of universality renders such systems easily circumvented (Kraus et al., 2022). Uptake of voluntary precommitment systems is typically very low (South Australian Centre for Economic Studies, 2019; A. Thomas, Christensen, et al., 2016). Major barriers to uptake include the perceived irrelevance of harm reduction measures, as well as concerns relating to privacy, freedom of choice, and the potential of cashless payments to

facilitate (over)spending (see Chapter 4; Delfabbro & King, 2021b; A. Thomas, Christensen, et al., 2016). Outside of the gambling field, meta-analytic evidence shows cashless payments facilitate spending relative to cash usage—with card and smartphone usage showing a similar cashless spending increase (see Chapter 2). Smartphone-based payment systems, however, likely hold greater potential for adding on sophisticated harm reduction functionality than card-based systems.

Precommitment, which involves pre-setting limits on gambling expenditure (e.g., per day/week/month), has the potential to be a highly effective harm reduction measure (Regan et al., 2022). Precommitment systems can be implemented through links with account-based cashless gambling systems (Delfabbro & King, 2021b). Setting an expenditure limit can be voluntary or mandatory, even if the cashless gambling system is mandatory to use. In Finland, setting a loss limit is optional despite gamblers being required to verify their identity (e.g., using a player card) to access EGMs at the country's two land-based casinos (Veikkaus, 2021). In Norway, a mandatory monthly loss limit is applied to all gamblers (Delfabbro & King, 2021b). Evidence suggests mandatory precommitment systems are more likely to be effective than voluntary systems (Delfabbro & King, 2021b; A. Thomas, Christensen, et al., 2016). Whether limits are self-imposed or external is another important factor (A. Thomas, Christensen, et al., 2016). Gamblers may be able to select the amount at which limits are set themselves. Although self-imposed limits offer greater flexibility to accommodate different financial situations, a noteworthy drawback is that some people may set limits so high that they have minimal potential to be effective (Behavioural Insights Team, 2021; South Australian Centre for Economic Studies, 2019; A. Thomas, Christensen, et al., 2016). For example, an evaluation of a voluntary precommitment system implemented in Victoria, Australia reported that the modal value for daily loss limits set in the system was $1,000,000 (South Australian Centre for Economic Studies, 2019). Some governments therefore cap self-imposed limits within an absolute maximum, as in Norway (Langeland et al., 2022). Affordability checks are another method by which personalised limits could be set. Under one working model proposed in the UK, gamblers with net deposits over £100 per month across operators would be subject to an enhanced affordability check (Noyes & Shepherd, 2020). In Tasmania, default maximum limits of $100 per day, $500 per month, and $5,000 per year have been proposed—with an affordability check required to increase limits above these defaults (Tasmanian Liquor & Gaming Commission, 2022). Some empirical evidence supports the use of income-based loss limits, which could be externally imposed based on the outcome of an affordability check (Langeland et al., 2022); however, this strategy remains underexplored.

Loyalty programs, used by gambling operators to incentivise continued patronage, are commonly linked with cashless gambling systems (Delfabbro & King, 2021b, 2021a; A. Thomas, Christensen, et al., 2016). Contrasting the objectives of precommitment systems and loyalty programs demonstrates how cashless gambling systems can be used to serve multiple, potentially conflicting interests (Bedford, 2019). The coupling of loyalty and precommitment systems may be a useful strategy for increasing uptake of voluntary precommitment systems (A. Thomas, Christensen, et al., 2016), such as by requiring loyalty

program members to set limits or otherwise opt-out of precommitment, as has been proposed in Victoria, Australia (South Australian Centre for Economic Studies, 2019). Some researchers have hypothesised that loyalty programs could be useful for normalising and increasing engagement with harm reduction measures more broadly, such as by giving non-gambling-related rewards (e.g., food or entertainment offers) to individuals who set limits and access gambling activity statements regularly (Wohl, 2018). Despite loyalty programs being a common component of cashless gambling systems, their compatibility with effective harm reduction strategy remains unclear. Correlational analysis of data from Australian prevalence surveys conducted between 2011 and 2020 found that the likelihood of having a loyalty card increases with problem gambling severity (Delfabbro & King, 2021a).

5.1.2. Objectives

Motivated by ongoing policy debates about cashless gambling as a player tracking solution, I conducted a discrete choice experiment (DCE) to investigate the preferences of regular EGM gamblers regarding cashless gambling systems in Australian land-based gambling venues. DCEs are widely used in health economics to investigate consumers' stated preferences for different hypothetical policy alternatives (Ryan, 2004). This method is particularly useful when the alternatives of interest vary along multiple dimensions (attributes; Hensher, Rose, & Greene, 2015). When choosing between different policy alternatives, respondents are assumed to make trade-offs between competing attributes of the policies based on what they perceive as offering the greatest utility (i.e., benefit). By modelling responses to a series of choice tasks, one can achieve various goals, including determining the relative importance of different attributes and forecasting demand for different alternatives of a policy (Bliemer & Rose, forthcoming).

DCEs have only been applied a few times in gambling studies, including to study interdependencies between various addictive behaviours and time/risk preferences (Ida & Goto, 2009), the relative importance of different features of the gambling environment for EGM gamblers (Rockloff et al., 2017a, 2017b), the influence of regulatory and social cues on choice of gambling websites (Teichert et al., 2021), and the role of mental health conditions in preferences for different online gambling offers (Cameron & Ride, 2023). In this study, I use the DCE method to quantify the relative importance of different attributes of cashless gambling systems in driving consumer preferences, to assess consumers' willingness to deviate from the existing predominantly cash-based system, and to explore heterogeneity in preferences based on individual differences. Given the limited evidence on the desirable attributes of a cashless gambling system (Blank et al., 2021), conducting a DCE in the early stages of policy development is useful for identifying approaches that are likely to have greater acceptability and for prioritising strategies for more in-depth evaluation. In relation to this thesis, this study contributes to understanding the optimal design and implementation of cashless payment systems for supporting effective harm reduction strategy.

Based on a pilot study (see Appendix L), I hypothesised that regular EGM gamblers would prefer cashless gambling systems that are card-based (H_1); consistent across all

venues in their area (H_2); give them the option to set a spending limit (H_3); allow them to set the amount of the spending limit themselves (H_4); and linked to a loyalty scheme that provides points for spending money using the cashless account and for using player safety features (e.g., spending limits, activity statements; H_5). These pilot study findings were largely congruent with the earlier qualitative analysis reported in Chapter 4. Greater consistency across venues was perceived by gamblers as being more convenient, as well as facilitating more effective harm reduction measures (e.g., more accurate feedback about their total gambling activity). Preferences for optional and self-imposed limits were consistent with gamblers' stated concerns about cashless gambling systems being excessively restrictive. The preference for a card-based system might reflect the relatively high mean age of the pilot sample (47.3 years) as adoption of smartphone-based payment technologies is strongest among younger cohorts in Australia (Australian Banking Association, 2023). Finally, Hollingshead and Wohl (2022) previously found that US casino loyalty program members reported being more willing to use player safety features if they were rewarded for doing so, suggesting that this is an attractive feature for gamblers.

5.2. Method

The study protocol, including hypotheses and analysis plan, was preregistered on Open Science Framework (https://osf.io/twda2/). Ethical approval was received from the University of Sydney's Human Research Ethics Committee (protocol no. 2022/779; Appendix M).

5.2.1. Study Sample

The study's target population consisted of Australian adults who use EGMs regularly in land-based gambling venues, such as pubs/hotels, clubs, and casinos. Data were collected between February 14 and March 6, 2023. Participants were recruited through a market research agency and provided informed consent by responding to an online survey prior to taking part in the study. A total of 363 participants were included in the sample for analysis. Eligibility criteria required participants to: (i) be at least 18 years of age; (ii) spend money on EGMs at least once a fortnight at in-person gambling venues; (iii) live in Australia; (iv) speak, read, and write English fluently, as the study was run in English; (v) have a computer (e.g., desktop, laptop) to use for completing the survey; and (vi) have not participated in earlier studies in the project (i.e., survey pre-testing or pilot studies). Potential participants were informed that they should not take part if they did not feel comfortable with the gambling-related content of the study. Participants who completed the survey were offered 150 points by the recruitment agency as reimbursement for their time. Members of the agency's panel can accumulate points and redeem them for shopping gift vouchers.

5.2.2. Experimental Design

The scenario and set of attributes for the choice experiment were developed based on findings from focus group discussions with 26 Australian EGM gamblers (see Chapter 4), as

well as the prior literature and consultations with relevant subject matter experts. Efforts were made to prioritise the most relevant attributes for inclusion given the more attributes included, the greater the burden on respondents, and the larger the error variance (Bliemer & Rose, forthcoming). After pre-testing a draft of the survey through cognitive interviews with five participants from the target population, the survey was piloted with 73 participants before conducting the main study (see Appendix L). Table 5 contains the attributes and levels used in the DCE.

Table 5

Attributes and Levels

Attributes	Attributes as presented to respondents	Levels as presented to respondents
Physical form of cashless payment	You access funds in the cashless account using a …	Plastic card* Smartphone app
Consistency across venues	Your cashless account can be used at …	One venue only* Small group of venues in your area All venues in your area
Choice in whether to set a spending limit	Setting a spending limit is …	Optional* Mandatory
Choice in setting the spending limit amount	Spending limits are …	Set by you* Set based on an affordability check made by an independent body (similar to a credit check)
Loyalty scheme integration	Users of the cashless payment system receive …	No loyalty points—the cashless account is not linked to a loyalty program* Loyalty points for spending money using the cashless account. Loyalty points can be redeemed for non-gambling purchases only (e.g., food and beverages) Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements). Loyalty points can be redeemed for non-gambling purchases only (e.g., food and beverages)

Note. Levels marked with an asterisk (*) are the reference level for that attribute.

Participating in the study involved completing an online survey with three sections (see Appendix N). The first section, hosted on Qualtrics, included questions relating to past-month retail payment behaviours (relative use of cash and cashless payments), frequency of using EGMs, number and type(s) of venues visited, typical amount of money put into EGMs per visit, number of venue memberships, and previous experience using cashless methods to load funds onto EGMs. Participants then read about the hypothetical scenario and were shown an example of a choice task (Figure 5). Four attention check items were used to measure comprehension of the scenario.

Figure 5

Hypothetical Scenario and Example of a DCE Choice Task

We are going to show you a number of hypothetical profiles of cashless payment systems that you could potentially use to play on electronic gaming machines (more commonly known as "pokies," or poker machines) at in-person gambling venues, such as pubs/hotels, clubs, and casinos.

Currently, people typically use cash to play on poker machines, such as by inserting banknotes or coins directly into the machine.

One new payment option involves introducing a cashless payment system. Below we outline some key features of the cashless payment system.

- Register for a cashless account. You could sign up for a personal cashless gambling account, which would involve providing proof of your identity. Venue staff would show you how to use the cashless payment system and its features.
- Use a card or digital wallet instead of cash. The cashless gambling account would allow you to transfer funds to and from gaming machines using a player card or a digital wallet on a smartphone instead of needing to carry cash to gamble.
- Deposits and withdrawals. You could deposit funds into the cashless gambling account by debit card, cash deposit, or bank transfer, and withdraw funds in cash or by bank transfer. Funds could not be deposited using a credit card. There would be no transaction fees for making deposits.
- Track your gambling spend with activity statements. You could easily access an activity statement summarising your spending, wins, and losses on the cashless gambling account.
- Strong security features. The cashless payment system would have strong security features to protect your personal information, and to make sure that the funds in your account could only be used by you.
- Strong privacy features. Your privacy would be strongly protected. Identifiable information from the system would only be shared as required by law, such as in cases of suspected money laundering.
- Linked with self-exclusion registers. The cashless payment system would be linked with self-exclusion registers, which allow people to voluntarily ban themselves from accessing gaming machines.

If you were going to play on electronic gaming machines at an in-person gambling venue (e.g., a pub/hotel, club, or casino) and had to choose between the two cashless payment systems shown below, which would you prefer?

	Option A	**Option B**
You access funds in the cashless account using a …	Smartphone app	Plastic card
Spending limits are …	Set by you	Set based on an affordability check made by an independent body (similar to a credit check)
Users of the cashless payment system receive …	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements). Loyalty points can be redeemed for non-gambling purchases only (e.g., food and beverages).	No loyalty points—the cashless account is not linked to a loyalty program
Your cashless account can be used at …	One venue only	All venues in your area
Setting a spending limit is …	Optional	Mandatory
	Select	**Select**

Now suppose you can choose to use cash instead of the cashless payment system to play on electronic gaming machines.

Would you prefer to use the cashless system you chose above (Option A or B), or to use cash?

I would still prefer the cashless payment system I chose above	**I would prefer to use cash**

The second section of the survey contained the DCE, hosted on Sawtooth Software (2023). Ngene was used to generate an experimental design matrix consisting of 24 choice tasks (see Appendix O; J. M. Rose et al., 2021). I adopted a Bayesian *D*-efficient strategy, setting normally distributed Bayesian priors using parameter estimates and standard errors obtained from the pilot study. Bayesian *D*-error (M = .59, SD = .05) was computed with 1,600 Sobol draws (Bliemer et al., 2008). To minimise respondent burden, the design was split into two blocks such that each respondent was presented with 12 choice tasks. Each choice task had a dual-response format, requiring participants to provide two responses: (i) to choose their preferred option between two unlabelled (generic) alternatives of a cashless gambling system (Choice 1: Option A vs Option B; "forced" choice); and (ii) to indicate whether they would really choose to use the selected cashless system over using cash (Choice 2: the selected cashless option in Choice 1 vs opt-out; "unforced" choice; Brazell et al., 2006). The

inclusion of the opt-out alternative reduces hypothetical bias by making the choice scenario more realistic for respondents. Selecting the opt-out alternative in all completed choice tasks was classified as outright refusal to adopt cashless gambling (regardless of the system's characteristics). I randomised the order of choice tasks between respondents to account for learning and fatigue effects, and the order of attributes between respondents to account for order effects.

The third section of the survey, hosted on Qualtrics, included questions relating to sociodemographic characteristics (gender, age, primary language spoken at home, highest completed educational qualification, employment status, annual personal gross income bracket, postcode), past-month engagement in non-EGM gambling activities (land-based and/or online), and past-year problem gambling severity, measured using the PGSI (as described in Chapter 4; Ferris & Wynne, 2001). Internal consistency for the PGSI responses was high (Cronbach's α = .92).

5.2.3. Statistical Analysis

Data cleaning and descriptive analyses were performed using R (R Core Team, 2021). Choice modelling was conducted using NLOGIT 6 (Econometric Software, 2016). Attribute levels were dummy coded. If a respondent did not complete the full set of 12 choice tasks, their complete responses were included and their incomplete responses excluded. For the confirmatory analysis, I firstly estimated a main-effects only error components panel model (a type of mixed logit model) with all attributes and the alternative-specific constant (for the opt-out alternative) specified as normally distributed random parameters, and using 1,000 Halton draws and the BHHH algorithm.[25] I adopted this approach for several reasons: (i) random parameters induce correlation across alternatives, relaxing assumptions about the independence of irrelevant alternatives; (ii) the error components model allows the error variance of the opt-out alternative to differ from that of the set of other alternatives; (iii) the panel specification accounts for correlation among multiple observations per respondent; and (iv) the error components model is suitable for analyses combining multiple datasets (forced and unforced observations; Hensher et al., 2008; Revelt & Train, 1998). Model fit was assessed using rho-squared and the Akaike Information Criterion (AIC). The threshold for statistical significance was set at α = .05.

To explore observed preference heterogeneity, individual-level variables were included in the model by adding them as main effects to the utility function (see Appendix P). If data related to the individual-level variables were missing, the response was excluded from the model. Pairwise correlations between individual-level variables were all ≤ ±.72, suggesting multicollinearity was not problematic.

To predict the uptake of various scenarios of a voluntary cashless gambling system, I applied the simulation function of NLOGIT to parameter estimates from the model including individual level variables but restricted the sample to include unforced choice

[25] The Berndt–Hall–Hall–Hausman (BHHH) algorithm is a maximum likelihood approach to variance estimation.

observations only (see Appendix Q). The simulation function allows me to examine "what if" scenarios by using the model to predict the choice probabilities for the participant sample based on a restricted set of alternatives (Hensher, Rose, & Greene, 2015).[26]

5.3. Results

Invitations were sent to 67,266 members of the recruitment agency's panel, of which 2,896 panellists clicked on the link to complete an initial screening questionnaire on the agency's platform. A total of 1,865 panellists were screened out because their responses indicated that they did not meet the study eligibility criteria. Of the 392 responses to the consent survey, 375 participants started the survey (after excluding 10 duplicate responses). Twelve responses were excluded because participants did not complete any choice tasks. A total of 363 participants were included in the sample for analysis. Only three participants (0.8%) failed all attention checks. Most commonly, participants incorrectly reported that credit cards could be used to deposit funds into the cashless account (45.5%), which was inconsistent with the scenario. The proportion of incorrect responses for the other three items ranged between 14.9%–27.0%.

Table 6 reports characteristics of the study sample. Participants were aged between 19 and 79 years (M = 40.2, SD = 12.7). Four in five participants (78.9%) reported using EGMs at least weekly in the past month—with two in three participants (65.5%) using EGMs across different types of venues (casinos, clubs, pubs/hotels). PGSI scores (M = 6.2, SD = 5.4) indicated that most participants (87.3%) were engaging in at least low-risk gambling (PGSI ≥ 1), and 30.3% of participants were at risk for problem gambling (PGSI ≥ 8).

One in five participants (21.2%) were classified as refusing to adopt cashless gambling outright (if such a system was optional to use). Univariate analyses showed outright refusal to be associated with greater age, female gender, lower educational attainment, not being employed full- or part-time, living in a less advantaged area, not using smartphone payment apps, using EGMs less frequently, visiting fewer venues to use EGMs, not being a casino-based EGM user, not being a club-based EGM user, holding fewer venue memberships, not having used identity-linked card-based cashless gambling systems in the past, not gambling online, and reporting a lower PGSI score (all ps < .05; Table 6).

[26] The model is used to simulate choice probabilities for these analyses, as opposed to using descriptive opt-out data, because each respondent completes a different set of choice tasks (see Appendix O).

Table 6

Characteristics and Outright Refusal to Adopt Cashless Gambling Among Study Participants

	All participants (*N* = 363)	Outright refusal to adopt cashless gambling		
		Yes (*n* = 77)	No (*n* = 286)	*p*
Sociodemographic variables[a]				
Age (years)	35.0 (31.0–48.5)	53.0 (43.0–63.0)	34.0 (30.0–40.0)	< .001
Gender				<.001
Male	243 (66.9%)	36 (14.8%)	207 (85.2%)	
Female	112 (30.9%)	37 (33.0%)	75 (67.0%)	
Primary language spoken at home				.771[b]
English	337 (92.8%)	69 (20.5%)	268 (79.5%)	
Non-English	18 (5.0%)	4 (22.2%)	14 (77.8%)	
Highest level of education completed				<.001
Non-school qualification[c]	319 (87.9%)	54 (16.9%)	265 (83.1%)	
High school or below	36 (9.9%)	19 (47.2%)	17 (52.8%)	
Employment status				<.001
Employed, working full- or part-time	307 (84.6%)	48 (15.6%)	259 (84.4%)	
Other (e.g., retired, carer, unemployed, student)	48 (13.2%)	25 (52.1%)	23 (47.9%)	
Annual personal income (AUD, before tax)[d]	97,500 (71,500–130,000)	84,500 (42,250–130,000)	97,500 (71,500–130,000)	.145
Neighbourhood advantage/disadvantage[e]				
IRSAD decile[f]	9.0 (6.0–9.0)	8.0 (5.0–9.0)	9.0 (6.0–9.0)	.007
Geographical remoteness[e]				1.00
Major cities of Australia	327 (90.1%)	68 (20.8%)	259 (79.2%)	
Regional or remote Australia	26 (7.2%)	5 (19.2%)	21 (80.8%)	
Variables related to payment behaviour for in-person retail settings				
Cashless payment adoption (past 30 days)				.280
Almost always using cashless payments	89 (24.5%)	22 (24.7%)	67 (75.3%)	
A mix of cash and cashless payments	243 (66.9%)	46 (18.9%)	197 (81.1%)	
Almost always using cash	31 (8.5%)	9 (29.0%)	22 (71.0%)	
Smartphone payment adoption (past 30 days)				<.001
Used smartphone payment app	260 (71.6%)	31 (11.9%)	229 (88.1%)	
Did not use smartphone payment app	103 (28.4%)	46 (44.7%)	57 (55.3%)	

	All participants (N = 363)	Outright refusal to adopt cashless gambling		
		Yes (n = 77)	No (n = 286)	p
Variables related to gambling behaviour				
Number of days using EGMs at in-person gambling venues (past 30 days)	4.3 (4.3–17.1)	4.3 (2.0–4.3)	17.1 (4.3–17.1)	<.001
Number of different in-person gambling venues visited to use EGMs (past 30 days)	2.5 (2.5–4.5)	2.5 (1.0–2.5)	2.5 (2.5–4.5)	<.001
Casino-based EGM gambling (past 30 days)				<.001
Used EGMs at casinos	198 (54.5%)	20 (10.1%)	178 (89.9%)	
Did not use EGMs at casinos	165 (45.5%)	57 (34.5%)	108 (65.5%)	
Club-based EGM gambling (past 30 days)				.021
Used EGMs at clubs	262 (72.2%)	47 (17.9%)	215 (82.1%)	
Did not use EGMs at clubs	101 (27.8%)	30 (29.7%)	71 (70.3%)	
Pub-based EGM gambling (past 30 days)				.727
Used EGMs at pubs/hotels	251 (69.1%)	55 (21.9%)	196 (78.1%)	
Did not use EGMs at pubs/hotels	112 (30.9%)	22 (19.6%)	90 (80.4%)	
Typical amount of money put into EGMs on each visit to a venue (AUD, past 30 days)	75.5 (35.5–75.5)	75.5 (35.5–75.5)	75.5 (35.5–75.5)	.283
Number of memberships at different in-person gambling venues	2.5 (2.5–4.5)	2.5 (1.0–2.5)	2.5 (2.5–4.5)	<.001
Prior experience using identity-linked card-based cashless gambling systems				<.001
Yes	208 (57.3%)	26 (12.5%)	182 (87.5%)	
No	155 (42.7%)	51 (32.9%)	104 (67.1%)	
Gambling breadth (past 30 days)[a,g]	5.0 (3.0–8.0)	3.0 (2.0–5.0)	6.0 (3.0–8.0)	<.001
Online gambling status (past 30 days)[a]				<.001
Spent money gambling online	236 (65.0%)	29 (12.3%)	207 (87.7%)	
Did not spend money gambling online	119 (32.8%)	44 (37.0%)	75 (63.0%)	
Problem gambling severity (past 12 months)[a,h]				<.001
Non-problem gambling	38 (10.5%)	16 (42.1%)	22 (57.9%)	
Low-risk gambling	49 (13.5%)	19 (38.8%)	30 (61.2%)	
Moderate-risk gambling	158 (43.5%)	20 (12.7%)	138 (87.3%)	
Problem gambling	110 (30.3%)	18 (16.4%)	92 (83.6%)	

	All participants (N = 363)	Outright refusal to adopt cashless gambling		
		Yes (n = 77)	No (n = 286)	p
Variables related to data quality				
Survey completion time (mins)	9.4 (6.8–14.2)	11.2 (6.9–15.9)	9.3 (6.8–13.7)	.168
Correct responses to attention checks (score out of 4)	3.0 (3.0–4.0)	3.0 (3.0–4.0)	3.0 (2.0–3.0)	< .001

Note. IQR = interquartile range; IRSAD = Index of Relative Socio-economic Advantage and Disadvantage. Data are median (IQR) for continuous variables and n (%) for categorical variables. Percentages represent the distribution of variable categories among all participants or the split between outright refusal and no outright refusal to adopt cashless gambling for participants in each variable category. p values come from Mann-Whitney U tests for continuous variables and χ^2 tests for categorical variables. [a]Data were missing for eight participants due to incomplete responses. [b]p value comes from Fisher's exact test due to one cell having an expected value below five. [c]Non-school qualifications are based on classifications from the Australian Bureau of Statistics, and include the following qualifications: Certificate I–IV, Diploma, Advanced Diploma, Bachelor Degree, Graduate Diploma, Graduate Certificate, Postgraduate Degree. [d]Seventeen participants reported not knowing their income bracket or preferred not to report it. [e]Data were missing for an additional two participants who reported postcodes that could not be matched to data for coding IRSAD deciles and geographical remoteness. [f]Higher scores relate to greater advantage. [g]The count of gambling activities in which the respondent reported participating in the past 30 days, including EGMs. Maximum possible score is 10. [h]Past-year PGSI scores were classified following Ferris and Wynne (2001): non-problem gambling = 0; low-risk gambling = 1–2; moderate-risk gambling = 3–7; problem gambling = 8–27.

5.3.1. Preferences for Cashless Gambling Systems

Table 7 displays the results of the choice models. To interpret preference data, the absolute magnitude of the coefficient indicates the relative strength of the attribute level on choice. Positive coefficients indicate preferred attributes, whereas coefficients with a negative sign relate to attributes that are not preferred. A statistically significant standard deviation parameter indicates heterogeneity in preferences for that attribute. The relative importance of each attribute is calculated by expressing the range of coefficients for that attribute as a proportion of the sum of the ranges for all attributes.

The confirmatory analysis is based on Model 1 (attributes only; Table 7). The most important attribute was the level of consistency across venues (37.0%), followed by loyalty scheme integration (27.6%), choice in whether to set a spending limit (15.1%), choice in setting the spending limit amount (12.3%), and the physical form of the cashless payment (8.0%). The most preferred cashless gambling system was one that is smartphone-based (not supporting H_1), consistent across all venues (supporting H_2), has mandatory spending limits (not supporting H_3), allows users to set the amount of the spending limit themselves (supporting H_4), and is linked to a loyalty scheme that provides points for spending money and using player safety features (supporting H_5). The least preferred cashless gambling system was a card-based system that can only be used at one venue, involves optional spending limits set based on an affordability check, and is not linked to a loyalty scheme.

Table 7

Error Components Panel Models of Preferences for Cashless Gambling Systems

Variables	Model 1 (attributes only)[a]				Model 2 (including individual-level variables)[b]			
	Coefficient (SE)	*p*	Standard deviation (SE)	*p*	Coefficient (SE)	*p*	Standard deviation (SE)	*p*
Attributes[c]								
Physical form of cashless payment								
Plastic card	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…
Smartphone	.19 (.07)	.003	1.30 (.05)	<.001	.13 (.06)	.046	1.36 (.05)	<.001
Consistency across venues								
One venue only	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…
Small group of venues	.85 (.06)	<.001	.85 (.07)	<.001	.97 (.06)	<.001	.77 (.07)	<.001
All venues	.89 (.06)	<.001	.80 (.06)	<.001	.93 (.06)	<.001	.77 (.06)	<.001
Choice in whether to set a spending limit								
Optional	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…
Mandatory	.36 (.06)	<.001	.90 (.05)	<.001	.34 (.06)	<.001	1.00 (.05)	<.001
Choice in setting the spending limit amount								
Self-imposed	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…
Affordability check	-.30 (.07)	<.001	1.50 (.06)	<.001	-.22 (.07)	.002	1.58 (.06)	<.001
Loyalty scheme integration								
None	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…
Loyalty points for spending money only	.06 (.06)	.296	.79 (.06)	<.001	.06 (.07)	.375	.85 (.06)	<.001
Loyalty points for spending money and using player safety features	.67 (.06)	<.001	.95 (.06)	<.001	.68 (.06)	<.001	.90 (.07)	<.001
Opt-out[d]	1.10 (.13)	<.001	2.89 (.13)	<.001	2.63 (.92)	.004	2.69 (.14)	<.001
Error component[e]	…	…	-.25 (.15)	.092	…	…	-.14 (.16)	.375

Variables	Model 1 (attributes only)[a]				Model 2 (including individual-level variables)[b]			
	Coefficient (SE)	*p*	Standard deviation (SE)	*p*	Coefficient (SE)	*p*	Standard deviation (SE)	*p*
Sociodemographic variables[f]								
Age (years)[g]					-.08 (.01)	<.001	…	…
Gender								
Female					0 (ref)	…	…	…
Male					.88 (.29)	.002	…	…
Primary language spoken at home								
Non-English					0 (ref)	…	…	…
English					-.20 (.46)	.662	…	…
Non-school qualification status								
Have not completed a non-school qualification					0 (ref)	…	…	…
Completed a non-school qualification					-.45 (.50)	.373	…	…
Employment status								
Not employed full- or part-time					0 (ref)	…	…	…
Employed full- or part-time					.22 (.43)	.611	…	…
Annual personal income (before tax)								
Equal to or below median (≤ $97,500)					0 (ref)	…	…	…
Above median (> $97,500)					-.60 (.29)	.037	…	…
Neighbourhood advantage/disadvantage								
IRSAD decile[g]					.08 (.05)	.122	…	…
Geographical remoteness								
Major cities of Australia					0 (ref)	…	…	…
Regional or remote Australia					-.42 (.53)	.433	…	…

Variables	Model 1 (attributes only)[a]				Model 2 (including individual-level variables)[b]			
	Coefficient (SE)	*p*	Standard deviation (SE)	*p*	Coefficient (SE)	*p*	Standard deviation (SE)	*p*
Variables related to payment behaviour for in-person retail settings[f]								
Cashless payment adoption (past 30 days)								
Using a mix of cash and cashless payments, or almost always using cash					0 (ref)	…	…	…
Almost always using cashless payments					1.89 (.34)	<.001	…	…
Smartphone payment adoption (past 30 days)								
Did not use smartphone payment app					0 (ref)	…	…	…
Used smartphone payment app					1.19 (.32)	<.001	…	…
Variables related to gambling behaviour[f]								
Number of days using EGMs at in-person gambling venues (past 30 days)[g]					.04 (.03)	.150	…	…
Number of different in-person gambling venues visited to use EGMs (past 30 days)[g]					-.08 (.13)	.539	…	…
Casino-based EGM gambling (past 30 days)								
Did not use EGMs at casinos					0 (ref)	…	…	…
Used EGMs at casinos					.21 (.35)	.541	…	…
Club-based EGM gambling (past 30 days)								
Did not use EGMs at clubs					0 (ref)	…	…	…
Used EGMs at clubs					-1.12 (.31)	<.001	…	…
Pub-based EGM gambling (past 30 days)								
Did not use EGMs at pubs/hotels					0 (ref)	…	…	…
Used EGMs at pubs/hotels					.14 (.28)	.628	…	…
Typical amount of money put into EGMs on each visit to a venue (AUD, past 30 days)[g]					-.002 (.004)	.699	…	…
Number of memberships at different in-person gambling venues[g]					.23 (.09)	.007	…	…

Variables	Model 1 (attributes only)[a]				Model 2 (including individual-level variables)[b]			
	Coefficient (SE)	*p*	Standard deviation (SE)	*p*	Coefficient (SE)	*p*	Standard deviation (SE)	*p*
Prior experience using identity-linked card-based cashless gambling systems								
No					0 (ref)	…	…	…
Yes					.74 (.31)	.018	…	…
Gambling breadth (past 30 days)[g,h]					.05 (.09)	.551	…	…
Online gambling status (past 30 days)								
Did not spend money gambling online					0 (ref)	…	…	…
Spent money gambling online					-.21 (.30)	.484	…	…
PGSI score (past 12 months)[g]					.006 (.021)	.770	…	…
Observations	8602				8062			
K	17				38			
Log likelihood function	-5636.96				-5234.39			
Rho-squared[i]	.24				.29			
AIC	11307.92				10544.78			
AIC/N	1.315				1.308			

Note. AIC = Akaike Information Criterion; IRSAD = Index of Relative Socio-economic Advantage and Disadvantage; *K* = number of parameters in the model; PGSI = Problem Gambling Severity Index; SE = standard error. [a]Panel data from 363 respondents. [b]Panel data from 336 respondents (cases with missing data related to the individual-level variables were excluded from the model). Individual-level variables were added as main effects to the utility functions of alternatives related to cashless gambling systems (i.e., not the opt-out alternative). [c]All attributes and the alternative-specific constant for the opt-out alternative were specified as normally distributed random parameters. [d]The opt-out alternative refers to the scenario in which the participant responded to the unforced choice component of the choice task by indicating that they would prefer to use cash over the cashless system selected in the forced choice component. [e]Alternatives related to cashless gambling systems were grouped in the error component (i.e., separated from the opt-out alternative). [f]Individual-level variables were specified as non-random parameters. [g]Continuous variables are mean-centred. [h]The count of gambling activities in which the respondent reported participating in the past 30 days, including EGMs. Possible scores range between 1–10. [i]Rho-squared calculated with respect to a multinomial logit base model including attributes only.

5.3.2. Preference Heterogeneity

Subgroup analyses of the attributes-only model were performed to explore differences in preferred profiles by PGSI category (see Appendix R). Table 8 displays profiles of the cashless gambling system most preferred by each subgroup.

Standard deviation parameters were statistically significant for all attributes in Model 1, suggesting the presence of unobserved (latent) heterogeneity in preferences. To explore the observed component of preference heterogeneity, I added variables related to individual characteristics in Model 2 (Table 7). The pattern of results relating to attribute preferences remained the same as in Model 1, except that the most preferred attribute level relating to consistency across venues was the ability to use the system at a small group of venues in the local area. Model 2 indicates that choosing a cashless gambling system over opting out (i.e., preferring to use cash) was associated with being younger, male, having an annual personal income below or equal to AUD $97,500, greater adoption of cashless payments, greater use of smartphone payment apps, not being a club-based EGM user, holding more venue memberships, and having used identity-linked card-based cashless gambling systems in the past. PGSI score was not associated with opt-out decisions (p = .770).

Table 8

Most Preferred Cashless Gambling System by PGSI Category

Attributes	Non-problem gambling (n = 38)	Low-risk gambling (n = 49)	Moderate-risk gambling (n = 158)	Problem gambling (n = 110)
Physical form of cashless payment	No preference on average, but significant heterogeneity	Plastic card	Smartphone	No preference on average, but significant heterogeneity
Consistency across venues	All venues	All venues	Small group of venues	Small group of venues
Choice in whether to set a spending limit	No preference on average, but significant heterogeneity	No preference on average, but significant heterogeneity	Mandatory	Mandatory
Choice in setting the spending limit amount	No preference on average, but significant heterogeneity	Self-imposed	No preference on average, but significant heterogeneity	No preference on average, but significant heterogeneity
Loyalty scheme integration	Loyalty points for spending money and using player safety features	Loyalty points for spending money only	Loyalty points for spending money and using player safety features	Loyalty points for spending money and using player safety features

Note. "No preference on average, but significant heterogeneity" means that none of the attribute levels had mean parameter estimates that were significantly different from zero but did have statistically significant standard deviation parameters. Past-year PGSI scores were classified following Ferris and Wynne (2001): non-problem gambling = 0; low-risk gambling = 1–2; moderate-risk gambling = 3–7; problem gambling = 8–27.

5.3.3. Predicted Uptake of Voluntary Cashless Gambling Systems

Among the unforced choice observations, the proportion of opt-out responses was 41.5%. This result indicates that for more than two in five choice tasks, respondents preferred using cash over the cashless systems described in the forced choice component of the choice task.

Predicted uptake rates for various configurations of a voluntary cashless gambling system are presented in Table 9. Simulations predicted an uptake of 57.5% for the scenario with the most preferred attribute mix, whereas the least preferred attribute mix had an estimated uptake of 37.1%. These simulations show that even when a voluntary cashless gambling system with the most preferred combination of attributes is available, more than two in five people (42.5%) are likely to opt-out (i.e., still prefer using cash).

Table 9

Predicted Uptake of Voluntary Cashless Gambling Scenarios

	Current scenario (most closely related to existing voluntary systems in Australia)	Most preferred scenario	Least preferred scenario	Scenario with stronger harm reduction measures
Predicted uptake	38.2%	57.5%	37.1%	50.4%
Physical form of cashless payment	Plastic card	Smartphone	Plastic card	Smartphone
Consistency across venues	One venue only	All venues	One venue only	All venues
Choice in whether to set a spending limit	Optional	Mandatory	Optional	Mandatory
Choice in setting the spending limit amount	Self-imposed	Self-imposed	Affordability check	Affordability check
Loyalty scheme integration	Loyalty points for spending money	Loyalty points for spending money and using player safety features	None	None

Note. Simulations were applied such that the set of alternatives was restricted to the scenario of interest (e.g., "most preferred scenario") and the opt-out alternative. "Predicted uptake" indicates the estimated proportion of the population that would adopt a cashless gambling system under a scenario with the corresponding characteristics—with the remainder predicted to continue using cash. "Current scenario" represents a cashless gambling system configured with attribute levels most closely related to existing voluntary card-based cashless systems in Australia. The most and least preferred scenarios are based on the results of the confirmatory analysis. "Scenario with stronger harm reduction measures" represents a cashless gambling system configured with attribute levels that could theoretically be expected to maximise the harm reduction value of the system.

5.4. Discussion

This study investigated the preferences of 363 Australian EGM gamblers for account-based cashless payment systems with integrated harm reduction measures for land-based gambling environments. Whether such systems are effective for reducing gambling-related harm likely depends heavily on specific aspects of their design and implementation. Understanding consumer preferences is important for effective public health policymaking (Ryan, 2004), but very few studies have applied preference elicitation methods for optimising gambling harm reduction policies. Findings from this DCE suggest that, on average, regular EGM gamblers would most prefer a smartphone-based cashless gambling system that operates across multiple venues in their area, involves mandatory self-imposed spending limits, and is linked with a loyalty scheme that provides rewards for both money spent and engagement with harm reduction features of the system. Heterogeneity in preferences was partly explained by adoption of cashless and mobile payments in broader retail settings, as well as prior experience using existing card-based gambling systems, suggesting that the attractiveness of cashless gambling may increase over time alongside broader societal trends towards the digitalisation of consumer payments. PGSI scores were not associated with decisions to opt-out of using a cashless gambling system. However, modelling suggests that at present a minimum of 42.5%–62.9% of regular EGM gamblers would not use a cashless gambling system if the option to use cash remains available. Overall, this finding provides strong evidence to support arguments that a cashless gambling system must be mandatory to facilitate effective harm reduction measures.

Precommitment systems are potentially a highly effective harm reduction measure (Regan et al., 2022), and a natural add-on to account-based cashless gambling systems. To maximise their effectiveness, precommitment systems should be universal so that all gambling activity counts towards set limits (A. Thomas, Christensen, et al., 2016). In this study, consistency across venues was the most important factor driving choice of cashless gambling systems. Eighty-five percent of participants reported using EGMs at two or more venues in the past month. Consistency is likely attractive for user convenience, but also underlies the ability to implement universal precommitment, enforce self-exclusion agreements, and provide accurate feedback covering cross-operator gambling activity (Kraus et al., 2022; A. Thomas, Christensen, et al., 2016). The preferred smartphone-based solution could facilitate integration of currently fragmented systems within a comprehensive digital framework. Responsibility for creating a universal solution lies with government. Contrary to expectations, participants were more likely to choose cashless gambling systems featuring mandatory (vs optional) spending limits. Subgroup analyses indicate this preference is stronger among gamblers at higher risk of harm. Differences in the distribution of participants across PGSI categories may have driven inconsistent results between the pilot and main studies. Fifty-nine per cent of participants in the pilot study reported scores relating to moderate-risk or problem gambling, whereas 73.8% of participants in the main study reported scores relating to these PGSI categories. It is surprising but plausible that gamblers at higher risk see the benefits of mandatory spending limits, given that voluntary

limits are easily circumvented. This unexpected finding highlights the value of preference elicitation studies for validating assumptions and suggests that regular EGM gamblers recognise that voluntary and non-binding limits have little value for preventing impulsive gambling (Wohl et al., 2023). Prior literature shows that a major barrier to gamblers using strategies to limit their gambling is not believing that the strategy will work (Hing et al., 2011), which may partly explain the very low uptake of existing voluntary precommitment systems (Delfabbro & King, 2021b; A. Thomas, Christensen, et al., 2016). As for how limits are set, participants were averse to limits being set based on affordability checks, as expected—likely due to concerns about privacy and freedom of choice, as discussed in Chapter 4. However, whether limits are self-imposed or external does not appear to be a major factor in driving choice given this attribute was found to be the second least important in this study. Elaborating on UK-based affordability proposals (Franklin, 2021; Noyes & Shepherd, 2020), one approach to integrated precommitment could involve opt-out self-imposed limits up to a population-wide threshold set based on low-risk gambling guidelines (Hodgins et al., 2022), above which limit setting would be mandatory and set within a maximum amount based on enhanced affordability checks.

Loyalty programs are another common add-on to cashless gambling systems (Delfabbro & King, 2021b; A. Thomas, Christensen, et al., 2016), and were the second most important factor driving choice in this experiment. Regular EGM gamblers most preferred systems that allowed them to accrue loyalty points for both spending money and using harm reduction features. Findings suggest loyalty integrations may have some value for increasing uptake of and engagement with voluntary cashless gambling systems. For example, adding a loyalty scheme that provides points for both spending money and using harm reduction features to the scenario with stronger harm reduction measures shown in Table 9 is predicted to increase uptake from 50.4% to 56.5%. Despite linkages of existing cashless gambling systems with loyalty programs, evidence suggests loyalty program use is associated with greater risk of harm, even after accounting for frequency of EGM use (Delfabbro & King, 2021a). Even if loyalty programs incorporate reward mechanisms designed to increase engagement with harm reduction measures, whether such benefits outweigh the risks associated with mechanisms encouraging continued gambling requires further investigation (Wohl, 2018). At a minimum, linkages between loyalty programs and systems designed to facilitate limit setting appear to send conflicting messages to consumers (A. Thomas, Christensen, et al., 2016). Such strategies are likely less necessary for a mandatory cashless gambling system with strong harm reduction measures, such as mandatory precommitment—a design that is supported by the results of this study.

5.4.1. Limitations

Several limitations should temper interpretation of these results. Although DCEs are a robust method for modelling preferences towards policy alternatives when real-world data are not available, all stated preference surveys are subject to hypothetical bias. The inclusion of an opt-out alternative in the experimental design was partly intended as a strategy to mitigate hypothetical bias by making the choice context more realistic for respondents (Haghani et al., 2021). Despite this inherent bias, meta-analytic evidence suggests DCEs can

approximate real-world health-related choices reasonably accurately (Quaife et al., 2018). Considering the well-documented intention-action gap and potential barriers to real-world uptake (e.g., perceived inconvenience of account registration processes; Schwarzer, 2008), the results are more likely to overestimate uptake of voluntary cashless gambling systems. Moreover, uptake estimates do not account for the fact that for a voluntary system to work, people must not only register for an account but continue to use it over time. Evaluations of voluntary precommitment systems suggest that motivating continued engagement is likely to be challenging (Delfabbro & King, 2021b). These considerations add weight to the conclusion that a cashless gambling system must be mandatory to facilitate effective harm reduction measures. To reduce respondent burden, the design was restricted to five key attributes identified by the qualitative analysis reported in Chapter 4; however, there may be other attributes worth including in future studies (e.g., varying limit-setting requirements based on thresholds). Pre-testing and piloting the survey increased confidence that the scenario covered the most important aspects and could be easily understood by respondents, and that the choice task was not too difficult. This study had a relatively low response rate (36.4%).[27] Selection bias cannot be ruled out as it is not known how the characteristics of respondents vary from non-respondents. Replication studies would be beneficial given the inconsistent results observed between the pilot and main studies, particularly in relation to the physical form of the cashless payment and choice in whether to set a spending limit. Finally, evaluating the harm reduction effectiveness and cost-effectiveness of different policy alternatives was outside the scope of this study.

5.4.2. Conclusions

In summary, this study used a DCE to model the preferences of Australian EGM gamblers regarding variants of a hypothetical cashless gambling system in comparison with using cash—the status quo in most Australian land-based gambling venues. More than two to three in five regular EGM gamblers would likely not opt-in to a voluntary cashless gambling system if the option to use cash remains available. Findings support the implementation of a mandatory cashless gambling system that is consistent across venues (i.e., universal) and involves mandatory precommitment with flexibility for personalised limits. This study directly informs current policy debates in Australia regarding a potential transition to mandatory cashless gambling on EGMs, as well as ongoing field trials of cashless gambling technologies.

[27] Response rate calculated by dividing the number of respondents who started the survey (n = 375) by the number of individuals who were identified as potentially meeting study eligibility criteria in the recruitment agency's initial screening questionnaire (n = 1,031).

6. General Discussion

The way people make payments for day-to-day purchases is changing. Internationally, consumers are increasingly using cashless payments over cash at the retail point of sale (WorldPay, 2022). A notable exception to this broad societal trend is land-based gambling venues, where cashless payments are yet to be widely introduced (Gainsbury & Blaszczynski, 2020). This thesis was motivated by two research questions related to exploring the harm reduction potential of cashless payment systems in the context of land-based gambling. The first question related to the impacts of shifting from a cash-based to a cashless payment system on gambling behaviour and risk of experiencing gambling-related harm. The second question related to the optimal design and implementation of cashless payment systems for supporting effective harm reduction strategy. Across the three studies presented in this thesis, a mixed-methods approach was adopted in an effort to triangulate evidence that advances our understanding of the answers to these questions. In this final chapter, I summarise my main findings, consider the limitations of the studies conducted, and discuss their implications for future research and public policy.

6.1. Summary of Main Findings

6.1.1. Meta-Analysis

Consumer researchers have been studying the impacts of payment methods on spending behaviour in broader retail settings since the 1970s (e.g., Feinberg, 1986; Hirschman, 1979). Reviewing this evidence base is a logical starting point to guide investigations into the impacts of shifting from cash-based to cashless payment systems on spending behaviour in the specific context of gambling.

In Chapter 2, I adopted a meta-analytic approach to leverage the evidence available from all relevant published and unpublished studies with the primary objectives of evaluating the net impact of cashless payments on spending behaviour relative to cash and assessing whether this effect has changed over time. Analysis of 431 effect sizes from 94 studies conducted between 1978 and 2021 supported the cashless premium, showing that cashless payments have a small but significant effect in encouraging spending behaviour compared to using cash. Some statistical evidence of selective reporting in the literature was found, but this appeared not to be to a degree that would cause substantial bias in the summary estimate of the cashless premium. Unexpectedly, I did not find evidence to suggest that the cashless premium has changed in size during the period of time studied. It remains possible that insufficient time has passed to detect such a change (if it exists). For example, studies comparing spending outcomes between smartphone-based cashless payments and cash have only been conducted since 2012 (Falk et al., 2016). Based on the evidence to date, results suggest that cashless payments have a net effect of stimulating spending behaviour relative to using cash, and that this effect persists despite the increasing normalisation of cashless payments in general retail settings.

The second objective of this study was to evaluate evidence for the pain of paying, the main theoretical explanation for the cashless premium provided in the literature. The main analysis of 85 effect sizes from 21 studies conducted between 2011 and 2021 supported the hypothesis that people experience less of the pain of paying when using cashless payment methods compared to cash. However, statistical tests suggested that the summary effect might be distorted by a small number of highly influential cases within the sample. After excluding these cases from the analysis, the pain of paying effect became statistically non-significant. I did not find evidence indicative of publication bias among the sample of effect sizes relating to the pain of paying. Taken together with other recent findings in the literature (Banker et al., 2021), these results suggest that the pain of paying may not provide an adequate explanation for the differential impacts of alternative payment methods on spending behaviour. A review of the literature suggests that greater attention should be paid to the role that learning-related mechanisms may play in driving spending behaviour, such as by conditioning stimuli related to cashless payments as cues to potential rewards (Banker et al., 2021; Feinberg, 1986).

The final objective of this study was to assess the evidence for key conceptual moderators of the cashless premium. Contrary to predictions made following a review of the literature, a meta-regression of 431 effect sizes from 94 studies showed no evidence that the magnitude of the cashless premium differs depending on the physical form of the cashless tool (card- vs smartphone-based), the type of funds being used (credit vs debit), or the type of product being purchased (hedonic vs utilitarian). In other words, the effect of cashless payments in facilitating spending does not appear to differ based on whether the buyer is using a card or smartphone to make the payment, using a credit or debit account to fund the purchase, or making the purchase primarily for pleasure or practical purposes. Exploratory analyses showed the cashless premium to be moderated by age, such that the effect of cashless payments in facilitating spending is stronger for younger than older consumers. This effect held after accounting for the year of data collection, suggesting that the result did not reflect a cohort effect. The effect of age in moderating the cashless premium might relate to differences in income and wealth, payment patterns, and/or budget management strategies across the life course, but I was unable to investigate these alternative explanations further given limitations in the information reported in the primary studies.

6.1.2. Narrative Review

Following the meta-analytic review of the broader literature, the focus narrowed in Chapter 3 to review literature relevant to the role of payment systems in land-based EGM gambling. Despite the concept of cashless gambling having been discussed among policymakers for over two decades (e.g., Productivity Commission, 1999), I found relatively little academic research directly investigating the relationships between payment methods, gambling behaviour, and gambling harm. Evidence from the few relevant experimental studies is largely inconclusive about the behavioural effects of using cashless payments instead of cash to transfer monetary value to and from EGMs, independent of any added mechanisms designed to mitigate excessive gambling (Limbrick-Oldfield et al., 2022; McGrath, 2005; Palmer et al., 2022). Studies using self-report methods suggest that gamblers

have the perception that the tangibility of cash helps them to track and control their spending on gambling (Hing et al., 2015). The denominational structure of cash facilitates limit-setting strategies used by some gamblers, such as taking only a pre-planned amount of money to a venue for gambling (Rodda et al., 2019b). Self-management strategies such as these are frequently reported by EGM gamblers trying to limit their spending on gambling (Rodda et al., 2019a, 2019b). However, adhering to self-managed limits is a common challenge for gamblers (Currie et al., 2020; Rodda et al., 2019a). The anonymous nature of cash-based systems does little to facilitate the setting of limits that are binding (A. Thomas, Christensen, et al., 2016). Account-based gambling, which can be implemented through digital payment systems, represents a technological solution to providing a suite of potentially more effective harm reduction measures, including binding precommitment systems (Gainsbury & Blaszczynski, 2020). Considering the various possible forms and functions of cashless gambling systems, this chapter underscored the need for further research to identify the optimal attributes of such systems for supporting effective gambling harm reduction.

6.1.3. Qualitative Analysis

To deepen understanding about the harm reduction potential of cashless gambling, I sought the perspectives of 26 regular EGM gamblers in four focus group discussions (Chapter 4). Using qualitative content analysis and a pragmatic approach, my first objective for this study was to explore their perspectives regarding the potential risks and benefits associated with cashless payment systems for EGMs in land-based gambling venues. Among the perceived benefits identified by my analysis, the most common related to the provision of more sophisticated and comprehensive harm reduction features, such as "hard" controls and expenditure tracking tools. The potential of a cashless system to provide better accountability was particularly important for gamblers who had experienced difficulties adhering to self-managed limit-setting strategies in cash-based gambling environments. Other perceived benefits related to the utility of identity-linked accounts for addressing money laundering through gambling venues, greater convenience in payment processes, improved security by not having to carry cash in or near venues, and reduced disease transmission through cash handling.

Compared to perceived benefits, potential risks and concerns associated with cashless gambling received substantially more attention from participants. The concern most frequently raised related to the appropriateness of using cashless gambling systems as a vehicle to implement population-wide strategies to address problem gambling and gambling harm. Participants often perceived potential harm reduction measures as being irrelevant to themselves, expressing concerns about excessive interference with their personal choice to gamble and scepticism that such a system could effectively address problem gambling. Another common concern was that cashless gambling systems might facilitate overspending compared to cash-based systems. Participants suggested that this could occur through the relative intangibility of cashless payments, easier access to funds for gambling, fewer breaks in play, and the ability to fund cashless gambling accounts using

credit cards (if permitted).[28] Privacy and security risks were another major concern, particularly in relation to monetisation of users' personal data. Participants also expressed perceptions that a cashless gambling system might be inconvenient to use, easily circumvented if not mandatory (potentially rendering ineffective harm reduction measures), inaccessible for some subpopulations (e.g., older generations), and could facilitate migration to online gambling among individuals who predominantly gamble in land-based settings.

The second objective for my qualitative study was to identify factors that might influence consumer uptake of cashless gambling. Two major factors identified by the analysis related to gamblers' freedom of choice about whether to use the system (i.e., mandatory vs voluntary registration), as well as the level of flexibility of harm reduction measures incorporated into the system, such as the (in)ability to set personalised limits and to toggle particular settings on or off. Other factors identified included the relative ease of making deposits and withdrawals, the (in)ability to transfer funds directly to and from EGMs using standard bank-issued cashless payments (e.g., debit cards), the level of consistency of the system across venues, the (in)ability to use the account for in-venue non-gambling transactions (e.g., food and beverages), and whether transaction fees apply.

The final objective for this study was to explore the views of regular EGM gamblers about harm reduction and consumer protection measures that could be incorporated into cashless gambling systems. Many of the proposed measures have been covered previously in the literature, but the current analysis provides an indication of their acceptability in novel applications related to cashless EGM gambling. Most suggestions related to integration of precommitment features. Participants were primarily interested in having the ability to set binding expenditure limits and to access real-time information summarising their gambling activity. Although targeted interventions for higher risk gambling were commonly perceived as invasive, it was suggested that the use of behavioural tracking could enhance existing protocols by providing an additional source of information to guide venue staff in their interactions with relevant patrons. Other measures proposed by participants related to account security features and the integration of a centralised self-exclusion system that is effective across venues.

6.1.4. Discrete Choice Analysis

Informed by the findings from the qualitative analysis, I conducted a DCE to investigate (quantitatively) the preferences of 363 regular EGM gamblers regarding cashless gambling systems in Australian land-based gambling venues. This study contributes to understanding the optimal design and implementation of cashless payment systems for supporting gambling harm reduction strategy. The survey experiment involved participants making repeated choices between alternatives of a hypothetical cashless payment system, as well as indicating if they would prefer to continue using cash instead of using the cashless payment systems shown to them. The cashless payment systems varied on a range of

[28] The use of credit cards is prohibited for land-based gambling in Australia (Parliamentary Joint Committee on Corporations and Financial Services, 2021), but is permitted in some jurisdictions internationally (e.g., American Gaming Association, 2022).

features that might impact their harm reduction potential, such as whether the system requires users to set an expenditure limit for gambling. The scenario also outlined several features that applied to all cashless alternatives and are relevant to a system's harm reduction potential, including identity verification requirements upon account registration, prohibition of using credit cards as a source of funds, the ability to easily access gambling activity summary statements, and integration with self-exclusion registers.

The first objective for this study was to quantify the relative importance of different attributes of cashless gambling systems in driving consumer preferences. The most important attribute for regular EGM gamblers was the level of consistency of the cashless gambling system across venues, followed by its integration with loyalty schemes, whether users have a choice about setting a spending limit, whether the amount of a spending limit is self-imposed or external, and lastly, the physical form of the cashless payment. Regular EGM gamblers most prefer a smartphone-based cashless gambling system that can be used across multiple venues in their area, involves mandatory spending limits but with flexibility to set the amount of the limit themselves, and is linked with a loyalty scheme that provides rewards for both money spent and engagement with harm reduction features of the system, such as activity statements.

Another objective of this study was to explore how preferences might differ based on individual differences. Individuals with prior experience using cashless payments, both in gambling-related and general retail settings, were more likely to favour using a cashless gambling system over cash. PGSI scores were not associated with decisions to opt-out of using a cashless gambling system. In relation to system attributes, subgroup analyses suggested that preferences for mandatory spending limits were stronger among individuals reporting higher PGSI scores. I assessed consumers' willingness to deviate from the existing predominantly cash-based system to take up cashless gambling. Simulations predicted that 57.5% of regular EGM gamblers would take up the most preferred cashless gambling system, whereas an estimated 37.1% would be willing to take up the least preferred system.[29] These findings suggest that even in the case of the most preferred system, at least two in five regular EGM gamblers would not use a cashless gambling system if the option to use cash remains available.

6.2. Limitations

The studies presented in this thesis are subject to several limitations, which affect the confidence with which the research questions posed in Chapter 1 can be answered. Firstly, the meta-analytic estimates are based on evidence from non-gambling contexts. In the absence of any eligible gambling-related studies, I sought to make use of the most relevant evidence available. The generalisability of these findings to the context of land-based gambling is somewhat unclear. However, my qualitative analysis in Chapter 4 provides evidence congruent with the broader literature. I found that gamblers have concerns about

[29] The least preferred cashless gambling system was a card-based system that can only be used at one venue, involves optional spending limits based on an affordability check, and is not linked to a loyalty scheme.

the potential of cashless payments to facilitate overspending and have the perception that using physical currency aids self-regulation of gambling expenditure. Secondly, the findings from my qualitative and discrete choice analyses reflect perceptions and preferences about hypothetical cashless gambling systems, and do not represent real-world behaviour. Adopting online research methods was partly motivated by risks and restrictions associated with the COVID-19 pandemic, which rendered face-to-face research activities infeasible for a substantial period of time. The studies presented in this thesis do not provide a quantitative evaluation of the effects of a specific cashless gambling system on measures of gambling behaviour and harm, nor do they evaluate the cost-effectiveness of alternative solutions. However, this thesis contributes evidence that is useful for informing the design of future evaluation studies. Suggestions for such studies are provided in the next section. Thirdly, two noteworthy contextual factors occurring around the time of data collection may have influenced participants' responses in the qualitative and discrete choice studies, particularly in their attitudes towards externally imposed restrictions. The first relates to restrictions associated with the COVID-19 pandemic, including stay-at-home orders, which affected many Australians for substantial periods of time (Campbell & Vines, 2021; Storen & Corrigan, 2020). The second relates to considerable attention given to cashless gambling in the mainstream media, particularly in the lead up to the NSW State Election held in March 2023 (e.g., Shams & Tatham, 2023). Given election commitments made by the two major parties diverged significantly in relation to cashless gambling, participants' responses to the DCE may have been influenced by their political beliefs, which were not measured in the study (Marks, 2023).

6.3. Implications

Taken together with the prior literature, my findings lead to the following three general propositions about cashless gambling from a harm reduction perspective. The harm reduction potential of cashless gambling is a function of the extent to which the system: (i) imposes frictions on deposits into the cashless gambling account and reduces frictions on withdrawals from the account; (ii) captures a complete picture of a person's gambling activity; and (iii) imposes limits on money and time spent gambling that are appropriate to the individual's circumstances and binding for the period during which the limit applies. I elaborate on each of these propositions below, followed by a discussion of more specific implications for future research and public policy.

The first proposition relates to the relative ease of making gambling-related transactions in a cashless payment system, independent of any added precommitment functions (which may not necessarily be a feature of a cashless gambling system). In this context, frictions are likely to be aspects of the transaction process that increase the cognitive burden and/or the tediousness and frustration involved in completing a transaction (termed "obscurant" and "hedonic" frictions, respectively, by Mills, 2020). My meta-analytic review showed that payments tending to involve fewer frictions (e.g., swiping/tapping a card) encourage spending behaviour compared to payments involving greater frictions (e.g., cash handling). Both my qualitative analysis and prior literature suggest that gamblers

experience frictions such as the physical cash handling process and breaks in play as helpful mechanisms for regulating their gambling activity (Hing et al., 2015; McMillen et al., 2004; Nower & Blaszczynski, 2010). Extending these findings to the context of cashless gambling, I propose that systems designed with relatively frictionless deposit processes and effortful withdrawal processes are more likely to contribute to gambling harm, such as by facilitating more intensive and persistent gambling. In comparison, systems that impose greater frictions on deposits and fewer frictions on withdrawals are more likely to be effective for reducing gambling harm. Potential frictions on deposit processes include requiring users to enter deposit amounts using a free-text box (as opposed to pre-defined options, which might have anchoring effects; Behavioural Insights Team, 2021), imposing load-up limits[30] to increase the number of decision points in the consumption process (Cheema & Soman, 2008), requiring gamblers to physically move off the gaming floor before processing new deposits (e.g., using geofencing to impose not only a temporal but also a physical break in play), and imposing waiting periods by slowing down payment clearance times (Gainsbury & Blaszczynski, 2020; Newall, 2023). Excessive frictions in withdrawal processes, such as minimum withdrawal amounts and lengthy processing times, are common on online gambling platforms, and disincentivise reallocation of funds to non-gambling consumption opportunities (Behavioural Insights Team, 2022; Citizens Advice, 2021; Ekpo et al., 2022; Newall, 2023). Reverse withdrawals, which are banned in some jurisdictions but permitted in others, allow gamblers to cancel pending withdrawal requests and have funds immediately redeposited into their gambling account (Newall & Rockloff, 2022).[31] Reverse withdrawals effectively function to reduce friction on deposits, and are treated as an indicator of harm in analyses of operator data (Haeusler, 2016; McAuliffe et al., 2022). Prior qualitative literature suggests that lengthy withdrawal processing times can encourage gamblers to go back on earlier deliberate decisions to withdraw money and facilitate impulsive gambling (A. Parke & Parke, 2019). Cashless gambling systems that allow relatively easy and immediate withdrawals to external bank accounts are likely to have greater harm reduction potential.

The second proposition states that the harm reduction potential of cashless gambling is a function of the extent to which the system captures a complete picture of a person's gambling activity. This aspect of the system is similar to the "single customer view" solution being trialled in the UK for online gambling (Department for Culture, Media & Sport, 2023). Under this proposition, systems capturing a greater (lesser) extent of the individual's complete gambling activity have greater (lesser) harm reduction potential. Three critical factors influence the completeness of the data captured: (i) whether the system is mandatory (vs voluntary) to use (i.e., completely cashless vs hybrid); (ii) the extent to which the system is consistent and networked across venues in the jurisdiction; and (iii) whether users are restricted to holding only one identity-verified account across venues (vs multiple anonymous/unverified accounts). Findings from my qualitative and discrete choice analyses

[30] Load-up limits refer to the amount of money that can be loaded as credits onto an EGM at any one time (see Chapter 3). Load-up limits are different from deposit limits.

[31] In Australia, the online gambling regulator has recommended amendment of the *Interactive Gambling Act 2001* to prohibit reverse withdrawals (Australian Communications and Media Authority, 2021).

suggest uptake of a voluntary cashless gambling system is likely to be relatively low, which would undermine the harm reduction potential of the system. Consistency across venues is valued by users from a convenience perspective but is also important for capturing a greater degree of their gambling activity across multiple operators. In my discrete choice analysis, more than four in five participants reported using EGMs at multiple venues in the past month. Completeness of coverage has clear implications for any added precommitment and self-exclusion functions, which are less likely to be effective if they can be easily circumvented (Kraus et al., 2022; A. Thomas, Christensen, et al., 2016). Moreover, the completeness of data captured affects the accuracy of feedback provided to users about their gambling activity (A. Thomas, Rintoul, et al., 2016). Given most gamblers underestimate their losses (Heirene et al., 2022), provision of accurate and objective feedback summarising an individual's gambling activity may improve their awareness about the actual outcomes of their gambling (Gainsbury, Angus, et al., 2020). Finally, completeness impacts the accuracy of gambling risk predictions made using algorithmic approaches (Chagas & Gomes, 2017; Delfabbro et al., 2012). Accurate behavioural profiling is potentially a useful source of information to inform the delivery of interventions that are appropriately targeted to an individual's level of risk (Challet-Bouju et al., 2020; Deng et al., 2019).

Finally, the third proposition states that the harm reduction potential of cashless gambling is a function of the extent to which the system imposes limits on money and time spent gambling that are appropriate to the individual's circumstances and binding for the period during which the limit applies. The extent to which limits are imposed (e.g., opt-in vs opt-out vs mandatory) impacts their harm reduction potential through their level of utilisation. Prior literature shows that uptake of opt-in precommitment systems is low (Delfabbro & King, 2021b; Heirene et al., 2021; A. Thomas, Christensen, et al., 2016). Findings from the qualitative analysis are consistent with previous studies showing that many gamblers view these measures as irrelevant to themselves (Gainsbury, Angus, et al., 2020; Gainsbury et al., 2017). The preference for mandatory limits observed in the discrete choice analysis is potentially explained by regular gamblers, especially those at higher risk, perceiving voluntary and non-binding limits as having relatively little utility as a safeguard against excessive gambling. Evidence supporting the accuracy of this perception is provided by research using operator data by Wohl and colleagues (2023), who show that non-binding limits are relatively ineffective at limiting continued gambling relative to binding limits. Limits that can be easily revoked or exceeded potentially send the wrong message to gamblers about the importance of adhering to appropriate limits to reduce risk of harm. The appropriateness of limits set matters not only in relation to an individual's financial means at any point in time, but in relation to factors relevant to the experience of gambling-related harm more broadly, such as the gambler's commitments to a partner and any dependent children (Hing, Nuske, Breen, et al., 2022). Gamblers prefer having flexibility to set their own limits, but a risk of this approach is that some gamblers set unrealistically high limits that are inappropriate to their circumstances (Behavioural Insights Team, 2021; A. Thomas, Christensen, et al., 2016). Potential mitigation strategies include requiring personalised limits to be set within a cap (i.e., an absolute maximum), or conducting enhanced affordability

checks at specific expenditure thresholds (e.g., based on low-risk gambling guidelines; Department for Culture, Media & Sport, 2023; Hodgins et al., 2022; Langeland et al., 2022).

6.3.1. Future Research

Further studies are needed to test the general propositions outlined above, as well as to evaluate the impacts of specific cashless gambling systems on gambling behaviour and risk of harm. Identifying optimal methods to moderate gambling intensity by imposing frictions on deposits into cashless gambling accounts should be a priority for future research. This priority includes investigating the impact of load-up limits and different methods of selecting amounts to transfer onto EGMs (e.g., selecting predefined values vs entering custom amounts), effects related to the default flow of monetary value within the system (e.g., winnings over a certain value being automatically quarantined or transferred directly to a linked bank account), the influence of temporal and physical breaks in play (e.g., Hopfgartner et al., 2023), and the content, format, and timing of personalised messages for enhancing gamblers' awareness of their net outcomes over time. Greater understanding about the role of loyalty schemes in gambling behaviour, including different reward structures and features, is another key area where evidence is needed to inform decisions about the appropriateness of linking such schemes with cashless gambling systems from a harm reduction perspective.

Triangulation of evidence using a variety of methodologies is important given each methodology has inherent limitations, some of which may be critical to generalising findings to the context of real-world gambling (Gainsbury & Blaszczynski, 2011). Qualitative studies that allow participants to experience a specific cashless gambling technology are needed to gain a deeper understanding about gamblers' interactions with the technology and to identify design features perceived to be beneficial or problematic. For example, flexibility of a digital system is important to gamblers as different individuals might manage their gambling using different strategies. However, although presenting users with many different customisable options (e.g., types of limits) might intuitively seem useful, this approach might in fact be counterproductive by increasing the difficulty involved in making decisions and encouraging acceptance of (potentially suboptimal) default options (Botti & Iyengar, 2006). For this reason, careful consideration should be given to how people from different subpopulations may use the system and its integrated tools (e.g., older people, vulnerable cohorts). Analyses of behavioural data are needed to identify common patterns of cashless gambling account use by different subgroups of gamblers, such as the size, frequency, and timing of deposits and withdrawals and utilisation of harm reduction features (e.g., changing limit amounts, toggling optional restrictions on/off; Ghaharian, Abarbanel, et al., 2023b, 2023a; Heirene et al., 2021). For example, gamblers in existing cash-based systems might deliberately take only a specific amount of money that they are willing to lose during one session (Rodda et al., 2019b). However, it is unknown whether gamblers using a cashless system might plan to deposit larger amounts less frequently (e.g., for convenience), and if so, how such money management strategies might impact subsequent gambling behaviour. Understanding these patterns is important for informing the design of systems that aid gamblers in managing their money and controlling their spending within

the digital environment. This shift will likely require gamblers to use different money management strategies to those that they might be used to employing in cash-based gambling environments.

Laboratory experiments have value for isolating the effects of specific design features on gambling behaviour in a controlled environment allowing random assignment to different conditions, such as for comparing different methods of transferring money onto EGMs. For example, Palmer and colleagues' (2022) review identifies a need for experimental studies comparing cash vs card- or smartphone-based payments. However, even when well designed (e.g., sampling experienced gamblers using real EGMs; Limbrick-Oldfield et al., 2022), findings from laboratory settings may not provide valid representations of real-world gambling contexts. For example, participants may behave differently when gambling with an endowment compared to their own hard-earned money (Thaler & Johnson, 1990). The inherent variability in outcomes of machine play (e.g., chance-related elements) and subsequent effects on the gambler's subjective experience present additional challenges for researchers attempting to isolate the effects of specific EGM design features (Limbrick-Oldfield et al., 2022; McGrath, 2005). Limbrick-Oldfield and colleagues suggest that studies employing EGM simulators may be beneficial for attempting to control some of this variability by standardising outcome sequences across participants.

Field studies overcome some of the inherent limitations of the laboratory experiments as the effects of introducing a cashless gambling system can be observed in ecologically valid settings. However, a key trade-off is a much lower degree of control over potential confounds. This reduces the confidence with which any effects observed on measures of gambling behaviour or harm can be specifically attributed to the introduction of the cashless gambling system. Moreover, field studies have less utility for disentangling the unique effects of specific components of a cashless gambling system (e.g., different types/amounts of limits). Findings from field studies are likely to be heavily influenced by selection bias (e.g., due to voluntary participation and non-random assignment) and inaccurate estimates of participants' gambling behaviour (e.g., due to lack of control over participants gambling at unobserved machines/venues). For within-subjects designs seeking to evaluate changes in gambling behaviour following implementation of a cashless gambling system, the anonymous nature of existing cash-based systems makes it difficult to establish reliable individual-level baseline estimates for the period prior to implementation. Ecological momentary assessment methods with integrated geolocation functions may provide one solution, such as by collecting brief self-report survey data in real-time via smartphones when participants enter and/or leave gambling venues (Bertz et al., 2018). Venue-level analyses may provide some evidence regarding impacts at an aggregate level, such as the effects of introducing a cashless gambling system on operator revenue (i.e., aggregate user losses) relative to matched control venues (Stevens & Livingstone, 2019).

6.3.2. Public Policy

Given the significant methodological constraints that exist, it is possible that even with further well-designed studies, the evidence base may remain inconclusive. A lack of

clear evidence should not delay policy action, especially when the risk of harm is high—as is the case with EGM gambling (Allami et al., 2021; Browne et al., 2023). In such cases, policymakers should adopt a precautionary approach (UNESCO & World Commission on the Ethics of Scientific Knowledge and Technology, 2005), taking action that prioritises consumer welfare and rigorously evaluating the outcomes of that action, including unintended adverse impacts, to inform future iterations.

Focusing on the context of our research, I recommend that Australian gambling regulators require cashless gambling systems to be designed and implemented following the three propositions outlined above. First, the system should be designed such that it is easier for users to withdraw funds from their cashless gambling account than to make deposits into it (Gainsbury, 2023). Second, the system should be mandatory to use, restrict each user to holding a single identity-verified account, and be networked across all EGM gambling venues in a jurisdiction (pubs, clubs, and/or casinos). Relevant to this point is the integration of the cashless gambling system with a jurisdiction-wide self-exclusion scheme, which should be implemented such that individuals with active self-exclusion agreements are prevented from accessing EGMs. Universality across a jurisdiction is also relevant to the system's utility from an anti-money laundering perspective (NSW Crime Commission, 2022). Third, the cashless gambling system should be linked with a mandatory precommitment system with maximum loss limits that are binding for the period during which the limit applies. I recommend that the precommitment system gives gamblers flexibility to set their own personalised limits but incorporates safeguards that aim to ensure the effectiveness and appropriateness of those limits with respect to the individual's circumstances. There may be multiple ways to achieve this, but a two-tiered approach may be a useful strategy (Franklin, 2021; Noyes & Shepherd, 2020). The first tier could involve opt-out self-imposed limits up to a population-wide threshold (e.g., a cap set based on Australian low-risk EGM gambling guidelines; Dowling et al., 2022). Above that threshold, the second tier could involve mandatory personalised limits set within a cap based on enhanced affordability checks. Finally, a precautionary approach suggests that to maximise a cashless gambling system's harm reduction potential, the system should ideally not be linked with loyalty schemes. Given their potential to encourage continued gambling, loyalty schemes appear to offer little added value from a harm reduction perspective if the above approach is taken (i.e., a mandatory cashless gambling system with strong harm reduction features, including mandatory precommitment). Strong consumer privacy and security mechanisms are necessary features of any cashless gambling system. From a consumer engagement perspective, messaging should emphasise system tools that allow users to better manage and keep track of their spending on gambling rather than restrictions that might be imposed. Behavioural risk audits provide a useful strategy for analysing the choice architecture of specific cashless gambling technologies, and for assessing commonalities and differences across systems from a harm reduction perspective (Behavioural Insights Team, 2022).

6.4. Conclusions

Digital technologies are transforming the way people gamble. This trend towards digitalisation has not yet greatly affected payment systems in land-based gambling venues, where cash use remains the status quo. The possibility of a widespread shift towards cashless gambling raises important questions relating to the potential impacts on gambling behaviour and harm, and the optimal design and implementation of such systems to reduce the risk of harm. Using a mixed-methods approach, this thesis sought to explore the potential risks and benefits associated with transitioning from a cash-based to a cashless payment system from a harm reduction perspective. The specific focus was applications of cashless payment systems to EGM gambling in Australia, where EGMs are estimated to cause more than half of gambling problems experienced among the population (Browne et al., 2023).

In sum, this work suggests that the impacts of cashless gambling on gambling behaviour and harm are likely to be heavily dependent on specific features of the system's design and implementation. Cashless gambling systems should be designed to mitigate the risk that cashless payment processes facilitate (over)spending, such as by applying greater frictions on deposits relative to withdrawals from the cashless gambling account. Account-based gambling, implemented through cashless payment systems, presents important opportunities over anonymous cash-based systems for implementing systematic measures to reduce gambling harm. To maximise the system's harm reduction potential, it is concluded that the system should require all gamblers to pre-set binding limits on their gambling, and cover all EGM gambling venues within a jurisdiction.

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List of Appendices

Appendix A: Example Literature Search Strategy

The following search protocol was used to identify records in Scopus on January 18, 2021:

TITLE-ABS-KEY ((cash OR cashless OR "charge card" OR "credit card" OR "debit card" OR "digital payment" OR "digital transaction" OR "digital wallet" OR "electronic payment" OR "electronic transaction" OR e?wallet OR "mobile payment" OR "mobile wallet" OR "payment form" OR "payment instrument" OR "pay later" OR "payment mechanism" OR "payment medium" OR "payment method" OR "payment mode" OR "payment process" OR "payment technolog*" OR "payment type") AND (("behavio?ral economics" OR "buy* behavio?r" OR "buy* choice" OR "buy* decision" OR "buy* habit" OR construal OR "consumer behavio?r" OR "consumer choice" OR "consumer judg?ment" OR "consumer psychology" OR "consumer spend*" OR "consumption behavio?r" OR "consumption choice" OR "consumption decision" OR "consumption habit" OR "economic psychology" OR "expenditure behavio?r" OR "expenditure choice" OR "expenditure decision" OR "expenditure habit" OR "financial decision" OR "mental account*" OR over?spend* OR "pain of pay*" OR "payment behavio?r" OR "payment choice" OR "payment decision" OR "payment habit" OR "payment transparency" OR "psychological distance" OR "purchas* behavio?r" OR "purchas* choice" OR "purchas* decision" OR "purchas* habit" OR "shopping behavio?r" OR "shopping choice" OR "shopping decision" OR "shopping habit" OR "spend* behavio?r" OR "spend* choice" OR "spend* decision" OR "spend* habit" OR "willingness to pay") OR (gambl*)))

Appendix B: Formulae for Effect Size Calculations

Table B1

Formulae for Effect Size Calculations

Calculation	Formula	Reference
Compute *t*-value from *p*-value	$t = IDF(p, df)$ using the TINV function in Excel	Lipsey and Wilson (2000), Table B10, page 199, formula 6
Compute *r*-family effect size from *t*-statistic	$r = \frac{t}{\sqrt{t^2 + df}}$	Lipsey and Wilson (2000), Table B11, page 201, formula 9
Compute variance of *r*	$V_r = \frac{(1 - r^2)^2}{n - 1}$	Borenstein et al. (2009), page 41, formula 6.1
Convert *r* to Cohen's *d*	$d = \frac{2r}{\sqrt{1 - r^2}}$	Borenstein et al. (2009), page 48, formula 7.5
Convert variance of *r* to variance of Cohen's *d*	$V_d = \frac{4V_r}{(1 - r^2)^3}$	Borenstein et al. (2009), page 48, formula 7.6
Compute odds ratio from cell frequencies of a 2x2 contingency table	$OR = \frac{ad}{bc}$	Lipsey and Wilson (2000), Table B12, page 202, formula 1
Compute odds ratio from group proportions	$OR = \frac{p_1(1 - p_2)}{p_2(1 - p_1)}$	Lipsey and Wilson (2000), Table B12, page 202, formula 2
Compute log odds ratio	$logOR = \ln(OR)$	Borenstein et al. (2009), page 36, formula 5.9
Compute variance of log odds ratio	$V_{logOR} = \frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}$	Borenstein et al. (2009), page 36, formula 5.10
Convert log odds ratio to Cohen's *d*	$d = logOR \times \frac{\sqrt{3}}{\pi}$	Borenstein et al. (2009), page 47, formula 7.1
Convert variance of log odds ratio to variance of Cohen's *d*	$V_d = V_{logOR} \times \frac{3}{\pi^2}$	Borenstein et al. (2009), page 47, formula 7.2
Compute Cohen's *d* from means, standard deviations, and group sample sizes	$d = \frac{\bar{X}_1 - \bar{X}_2}{S_{within}}$	Borenstein et al. (2009), page 26, formula 4.18
Compute within-groups standard deviation	$S_{within} = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}}$	Borenstein et al. (2009), page 26, formula 4.19
Compute Cohen's *d* from independent *t*-test (when group sample sizes are available)	$d = t\sqrt{\frac{n_1 + n_2}{n_1 n_2}}$	Lipsey and Wilson (2000), Table B10, page 198, formula 2
Compute Cohen's *d* from independent *t*-test (using total sample size)	$d = \frac{2t}{\sqrt{N}}$	Lipsey and Wilson (2000), Table B10, page 198, formula 3
Compute Cohen's *d* from F-ratio (when group sample sizes are available)	$\lvert d \rvert = \sqrt{\frac{F(n_1 + n_2)}{n_1 n_2}}$	Lipsey and Wilson (2000), Table B10, page 199, formula 4

Calculation	Formula	Reference
Compute Cohen's *d* from F-ratio (using total sample size)	$\lvert d\rvert = 2\sqrt{\frac{F}{N}}$	Lipsey and Wilson (2000), Table B10, page 199, formula 5
Compute Cohen's *d* from chi-square	$\lvert d\rvert = 2\sqrt{\frac{\chi^2}{N-\chi^2}}$	Lipsey and Wilson (2000), Table B10, page 200, formula 23
Compute variance of Cohen's *d*	$V_d = \frac{n_1+n_2}{n_1 n_2} + \frac{d^2}{2(n_1+n_2)}$	Borenstein et al. (2009), page 27, formula 4.20
Correction factor for converting Cohen's *d* to Hedges' *g*	$J = 1 - \frac{3}{4df-1}$	Borenstein et al. (2009), page 27, formula 4.22
Convert Cohen's *d* to Hedges' *g*	$g = J \times d$	Borenstein et al. (2009), page 27, formula 4.23
Compute variance of Hedges' *g*	$V_g = J^2 \times V_d$	Borenstein et al. (2009), page 27, formula 4.24

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Appendix D: Quality Assessment of Studies Included in Meta-Analysis

Table D1

Quality Assessment of Randomised Controlled Trials

Author(s)	Year	Study	Was true randomisation used for assignment of participants to treatment groups?	Was allocation to treatment groups concealed?	Were treatment groups similar at the baseline?	Were participants blind to treatment assignment?	Were those delivering treatment blind to treatment assignment?	Were outcomes assessors blind to treatment assignment?	Were treatment groups treated identically other than the intervention of interest?	Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	Were participants analysed in the groups to which they were randomised?	Were outcomes measured in the same way for treatment groups?	Were outcomes measured in a reliable way?	Was appropriate statistical analysis used?	Was the trial design appropriate, and any deviations from the standard RCT design accounted for in the conduct and analysis?
Abramovitch, Freedman, & Pliner	1991	1	Yes	Unclear	Unclear	Unclear	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Absher	2018	1	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Absher	2018	2	Unclear	Yes	Unclear	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NA
Absher	2018	3	Unclear	Yes	Unclear	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NA
Absher	2018	4	Unclear	Yes	Unclear	Yes	Yes	Yes	No	Unclear	Yes	Yes	Yes	Yes	NA
Agrawal	2018	3B	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Bagchi & Block	2011	2	Yes	Yes	Unclear	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Banker, Dunfield, Huang, & Prelec	2021	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Boden, Maier, & Wilken	2020	1	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Boden, Maier, & Wilken	2020	3	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA

Author(s)	Year	Study	Was true randomisation used for assignment of participants to treatment groups?	Was allocation to treatment groups concealed?	Were treatment groups similar at the baseline?	Were participants blind to treatment assignment?	Were those delivering treatment blind to treatment assignment?	Were outcomes assessors blind to treatment assignment?	Were treatment groups treated identically other than the intervention of interest?	Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	Were participants analysed in the groups to which they were randomised?	Were outcomes measured in the same way for treatment groups?	Were outcomes measured in a reliable way?	Was appropriate statistical analysis used?	Was the trial design appropriate, and any deviations from the standard RCT design accounted for in the conduct and analysis?
Chatterjee & Rose	2012	1	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Chatterjee & Rose	2012	2	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	NA
Chatterjee & Rose	2012	3	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	NA
Dunfield & Prelec	2013	1-3	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NA
Dunfield & Prelec	2013	4	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NA
Falk, Kunz, Schepers, & Mrozek	2016	3	Yes	Unclear	Unclear	Unclear	Unclear	No	No	Unclear	Yes	Yes	Yes	Yes	NA
Goh, Jungck, & Stevens	2020	2	Yes	Yes	Unclear	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NA
Helion & Gilovich	2014	2	Yes	Yes	Unclear	Unclear	No	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	NA
Huang & Savary	2018	1	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Huang & Savary	2018	2	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Huang & Savary	2018	3	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Huang & Savary	2018	4	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Huang, Ghosh, Li, & Chandon Ince	2020	2 WA4	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Huang, Ghosh, Li, & Chandon Ince	2020	2 WA5	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Incekara Hafalir & Loewenstein	2009	1	Yes	Unclear	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes	NA

Author(s)	Year	Study	Was true randomisation used for assignment of participants to treatment groups?	Was allocation to treatment groups concealed?	Were treatment groups similar at the baseline?	Were participants blind to treatment assignment?	Were those delivering treatment blind to treatment assignment?	Were outcomes assessors blind to treatment assignment?	Were treatment groups treated identically other than the intervention of interest?	Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	Were participants analysed in the groups to which they were randomised?	Were outcomes measured in the same way for treatment groups?	Were outcomes measured in a reliable way?	Was appropriate statistical analysis used?	Was the trial design appropriate, and any deviations from the standard RCT design accounted for in the conduct and analysis?
Kamleitner & Erki	2013	2	Unclear	Unclear	Unclear	Unclear	Unclear	Unclear	No	Unclear	Yes	Yes	Unclear	Yes	NA
Kresnawati, Wahib, & Pertiwi	2019	1	Yes	Unclear	Unclear	Unclear	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	NA
Leon	2012	1	Yes	Yes	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Liu	2020	1	Yes	Unclear	Unclear	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	NA
Liu	2020	2	Yes	Unclear	Unclear	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	NA
Liu & Dewitte	2021	1	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Liu & Dewitte	2021	2	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Liu & Dewitte	2021	3	Yes	Yes	Unclear	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Liu & Dewitte	2021	4	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Liu, Luo, & Zhang	2020	1	Yes	Unclear	Unclear	Unclear	Unclear	No	No	Yes	Yes	Yes	Yes	Yes	NA
Liu, Luo, & Zhang	2020	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Monger & Feinberg	1997	1	Yes	Unclear	Unclear	Unclear	Unclear	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	NA
Moore & Taylor	2011	1	Yes	Unclear	Unclear	Unclear	Unclear	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	NA
Netter & Raghubir	2020	2	Unclear	Yes	Unclear	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NA
Park	2017	Paper 2	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Park, Lee, & Thomas	2021	1	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA

Author(s)	Year	Study	Was true randomisation used for assignment of participants to treatment groups?	Was allocation to treatment groups concealed?	Were treatment groups similar at the baseline?	Were participants blind to treatment assignment?	Were those delivering treatment blind to treatment assignment?	Were outcomes assessors blind to treatment assignment?	Were treatment groups treated identically other than the intervention of interest?	Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	Were participants analysed in the groups to which they were randomised?	Were outcomes measured in the same way for treatment groups?	Were outcomes measured in a reliable way?	Was appropriate statistical analysis used?	Was the trial design appropriate, and any deviations from the standard RCT design accounted for in the conduct and analysis?
Park, Lee, & Thomas	2021	2	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Prelec & Simester	2001	1	Yes	Yes	Unclear	Yes	Unclear	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	NA
Prelec & Simester	2001	2	Yes	Yes	Unclear	Yes	Unclear	Yes	No	Unclear	Yes	Yes	Yes	Yes	NA
Raghubir & Santana	2021	2	Yes	Yes	Unclear	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Raghubir & Santana	2021	4	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Raghubir & Srivastava	2008	2	Yes	Yes	Unclear	Unclear	Unclear	Yes	No	Unclear	Yes	Yes	Yes	Yes	NA
Runnemark, Hedman, & Xiao	2015	1	Unclear	Unclear	Unclear	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Soman	2003	1	Yes	Unclear	Unclear	Unclear	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	NA
Thomas, Desai, & Seenivasan	2011	2	Unclear	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Thomas, Desai, & Seenivasan	2011	3	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Thomas, Desai, & Seenivasan	2011	4	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA
Van der Horst, Miedema, Schreij, & Meeter	2017	1	Yes	Unclear	Unclear	Yes	Yes	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	NA
Wong & Lynn	2017	2	Yes	Yes	Unclear	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	NA
Wong & Lynn	2019	1	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	NA

Author(s)	Year	Study	Was true randomisation used for assignment of participants to treatment groups?	Was allocation to treatment groups concealed?	Were treatment groups similar at the baseline?	Were participants blind to treatment assignment?	Were those delivering treatment blind to treatment assignment?	Were outcomes assessors blind to treatment assignment?	Were treatment groups treated identically other than the intervention of interest?	Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	Were participants analysed in the groups to which they were randomised?	Were outcomes measured in the same way for treatment groups?	Were outcomes measured in a reliable way?	Was appropriate statistical analysis used?	Was the trial design appropriate, and any deviations from the standard RCT design accounted for in the conduct and analysis?
Yao & Chen	2014	5	Yes	Unclear	Unclear	Unclear	Unclear	Unclear	No	Yes	Yes	Yes	Yes	Yes	NA

Table D2

Quality Assessment of Quasi-Experimental Studies (Non-Randomised Experimental Studies)

Author(s)	Year	Study	Is it clear in the study what is the cause and what is the effect (i.e., there is no confusion about which variable comes first)?	Were the participants included in any comparisons similar?	Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Was there a control group?	Were there multiple measurements of the outcome both pre and post the intervention/exposure?	Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	Were the outcomes of participants included in any comparisons measured in the same way?	Were outcomes measured in a reliable way?	Was appropriate statistical analysis used?
Agarwal, Ghosh, Li, & Ruan	2020	1	Yes	Unclear	No	No	Yes	NA	Yes	Yes	Yes
Boden, Maier, & Wilken	2020	2	Yes	Unclear	Yes	No	No	Yes	Yes	Yes	Yes
Gafeeva, Hoelzl, & Roschk	2018	1	Yes	Unclear	No	No	No	Yes	Yes	Yes	Yes
Goh, Jungck, & Stevens	2020	1	Yes	Unclear	No	No	No	Unclear	Yes	Yes	Yes
Greenacre & Akbar	2019	1	Yes	Yes	No	Yes	Yes	NA	Yes	Yes	Yes
Lee, Morduch, & Shonchoy	2015	1	Yes	Unclear	Yes	No	Yes	Unclear	Yes	Yes	Yes
Liu	2020	Pilot	Yes	Unclear	Yes	No	No	Unclear	Yes	Yes	Yes
Santana, Vera, & Chacon	2021	2	Yes	Unclear	Yes	No	Yes	NA	Yes	Yes	Yes
Shah	2015	1	Yes	Unclear	No	No	No	Unclear	Yes	Yes	Yes
Shah	2015	1 (Follow-up)	Yes	Unclear	No	No	No	Unclear	Yes	Yes	Yes
Shah	2015	2	Yes	Unclear	No	No	No	Unclear	Yes	Yes	Yes
Shah	2015	3	Yes	Unclear	No	No	No	Yes	Yes	Yes	Yes
Soetevent	2011	1	Yes	Unclear	Yes	Yes	No	Yes	Yes	Yes	Yes
Soman	2003	2	Yes	Unclear	No	No	Yes	Yes	Yes	Yes	Yes
Yeung	2014	1	Yes	Unclear	No	No	No	Yes	No	Unclear	Yes

Table D3

Quality Assessment for Analytical Cross-Sectional Studies

Author(s)	Year	Study	Were the criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?
Bagchi & Block	2011	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cook, Nelson, Chung, & Ham	2021	2	Yes	Yes	Unclear	Yes	Yes	No	Unclear	Yes
Dewald	2003	1	Yes	Yes	Yes	Yes	Yes	No	Unclear	Yes
Feinberg	1986	1	Unclear	Unclear	Yes	Yes	Yes	No	Yes	Yes
Garrity & Degelman	1990	1	Unclear	Unclear	Yes	Yes	No	No	Unclear	Yes
Hirschman	1979	1	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	Yes
Inman, Winer, & Ferraro	2009	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jahan	2018	1	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Kamleitner & Erki	2013	1	Yes	No	Yes	Yes	No	No	Unclear	Yes
Khan	2011	2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kvasnička & Szalaiová	2015	1	Unclear	Yes	Yes	Yes	Yes	No	Yes	Yes
Lee, Morewedge, Hochman, & Ariely	2019	Pilot	Unclear	Yes	Yes	Yes	No	No	Yes	Yes
Lee, Morewedge, Hochman, & Ariely	2019	1	Unclear	Yes	Yes	Yes	No	No	Yes	Yes
Lee, Morewedge, Hochman, & Ariely	2019	2	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Lee, Morewedge, Hochman, & Ariely	2019	3	Unclear	Yes	Yes	Yes	No	No	Yes	Yes
Lee, Noble, & Biswas	2018	1	Yes	Yes	Yes	Yes	No	No	Yes	Yes
Lynn & Latané	1984	2	Unclear	No	Yes	Yes	Yes	Yes	Yes	Yes
Lynn & Mynier	1993	2	Yes	Yes	Yes	Yes	No	No	Yes	Yes

Author(s)	Year	Study	Were the criteria for inclusion in the sample clearly defined?	Were the study subjects and the setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies to deal with confounding factors stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?
May	1978	1	Unclear	Yes	Yes	Yes	Yes	No	Yes	Yes
McCall & Belmont	1996	1	Unclear	Yes	Yes	Yes	Yes	No	Yes	Yes
Mercatanti & Li	2014	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Parrett	2006	2	Unclear	Unclear	Yes	Yes	Yes	No	Yes	Yes
Rind & Bordia	1995	1	Unclear	No	Yes	Yes	Yes	No	Yes	Yes
Santana, Vera, & Chacon	2021	1	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
See-To & Ngai	2019	1	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Strohmetz, Rind, Fisher, & Lynn	2002	1	Unclear	No	Yes	Yes	No	No	Yes	Yes

Appendix E: Scatterplots of Cashless Premium Effect Size by Year of Data Collection and Mean Age of Study Sample

Figure E1

Scatterplot of Cashless Premium Effect Size by Year of Data Collection

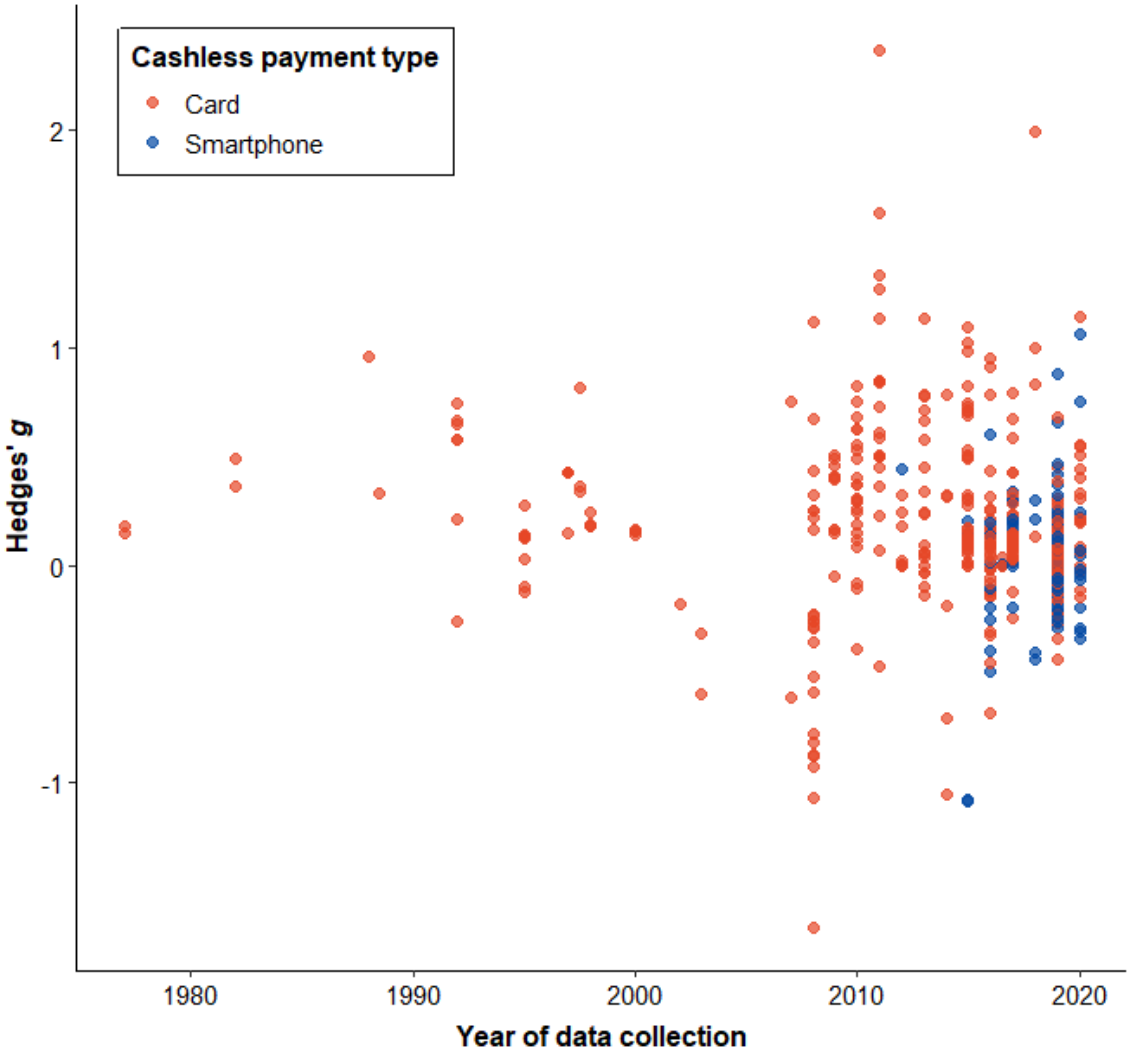
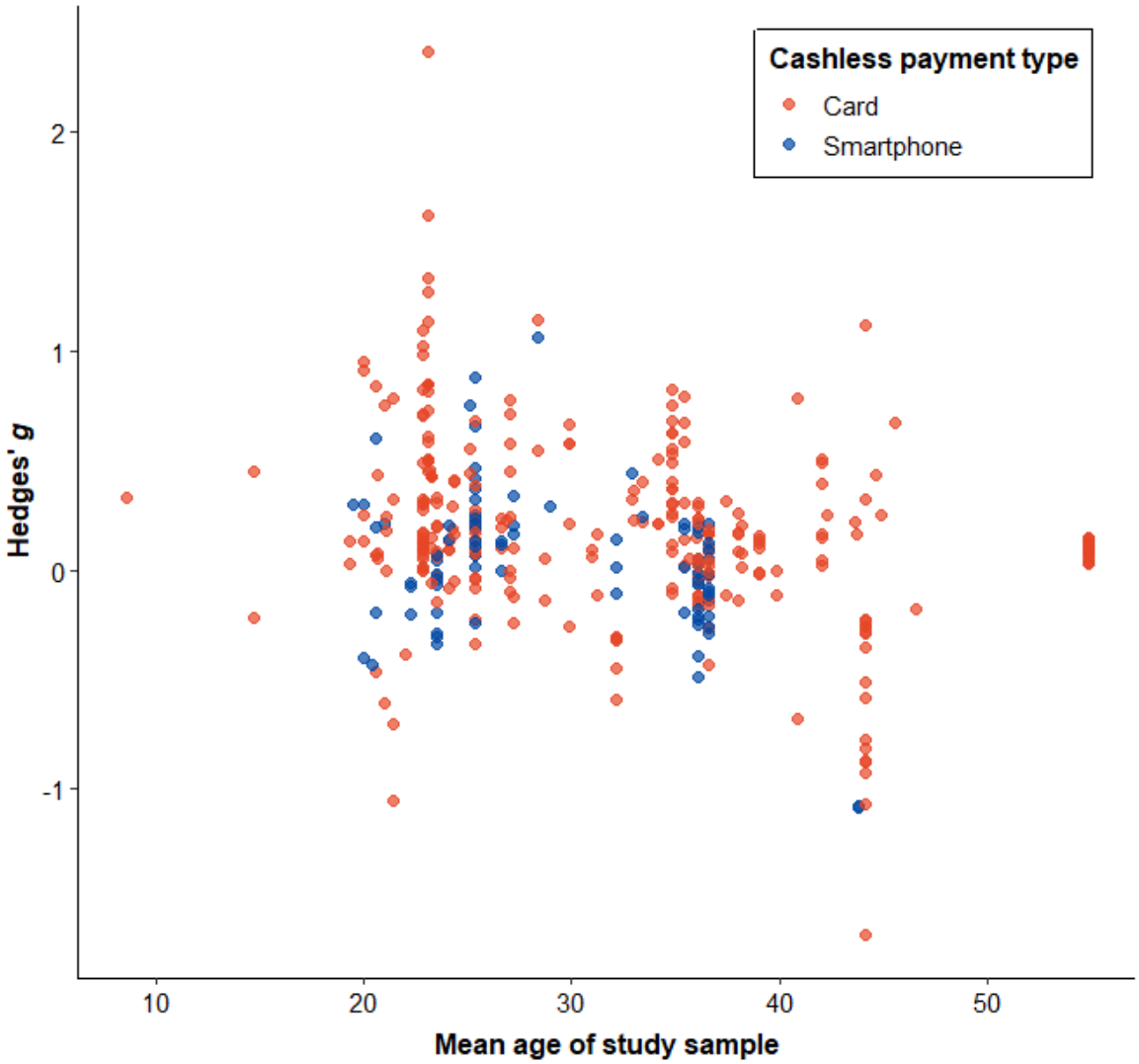


Figure E2

Scatterplot of Cashless Premium Effect Size by Mean Age of Study Sample



Appendix F: Letters of Ethical Approval for Project No. 2021/571

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE

Tuesday, 31 August 2021

Dr Sally Gainsbury
Psychology; Faculty of Science
Email: sally.gainsbury@sydney.edu.au

Dear Sally,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

I am pleased to inform you that after consideration of your response, your project has been approved.

Details of the approval are as follows:

Project No.:	**2021/571**
Project Title:	**Research study on payment methods for electronic gaming machines**
Authorised Personnel:	**Gainsbury Sally; Collard Sharon; Garbarino Ellen; Swanton Thomas; Tsang Stephanie;**
Approval Period:	**31/08/2021 to 31/08/2025**
First Annual Report Due:	**31/08/2022**

Documents Approved:

Date Uploaded	Version Number	Document Name
23/08/2021	Version 2	Participant Information Statement_Version 2_Clean
23/08/2021	Version 2	Discussion guide_Version 2_Clean
23/08/2021	Version 2	Email reminder_Version 2_Clean
23/08/2021	Version 2	Email invitation_Version 2_Clean
23/08/2021	Version 2	Post-session information_Version 2_Clean
16/07/2021	Version 1	Advertisement 1_Version 1
16/07/2021	Version 1	Attendance instructions_Version 1
16/07/2021	Version 1	Debrief statement_Version 1
16/07/2021	Version 1	Questionnaire_Version 1
16/07/2021	Version 1	Advertisement 2_Version 1
16/07/2021	Version 1	Stimulus material_Version 1

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.
- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
  - Serious or unexpected adverse events (which should be reported within 72 hours).
  - Unforeseen events that might affect continued ethical acceptability of the project.

Research Integrity & Ethics Administration
Research Portfolio
Level 3, F23 Administration Building
The University of Sydney
NSW 2006 Australia

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ABN 15 211 513 464
CRICOS 00026A

- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely,

Associate Professor Carolyn Maccann
Chair
Psychology Review Committee (Low Risk)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's Australian Code for the Responsible Conduct of Research (2018)

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE

Monday, 11 October 2021

Dr Sally Gainsbury
Psychology; Faculty of Science
Email: sally.gainsbury@sydney.edu.au

Dear Sally,

Your request to modify this project, which was submitted on 24/09/2021, has been considered.

This project has been approved to proceed with the proposed amendments.

Protocol Number: **2021/571**
Protocol Title: **Research study on payment methods for electronic gaming machines**

Documents Approved:

Date Uploaded	Version Number	Document Name
24/09/2021	Version 3	Participant Information Statement_Version 3_Clean

Please contact the ethics office should you require further information.

Sincerely,

Associate Professor Carolyn Maccann
Chair
Psychology Review Committee (Low Risk)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's Australian Code for the Responsible Conduct of Research (2018)

Appendix G: Focus Group Discussion Guide and Question Schedule

Red-coloured text is for researcher reference only

Outline for focus group introduction

- Welcome: Focus group facilitators introduce themselves and outline their roles to participants
- The facilitators will check participants' microphones and webcams are working correctly, and provide some tips on "Zoom etiquette" (e.g., muting microphone when not speaking; being mindful of background noise; positioning camera so it is stable and focused at eye level; asking participants to display their first name). The assistant facilitator will provide support to participants experiencing technical difficulties.
- Purpose:
    - Today we are interested to hear your thoughts about using different types of payment methods to pay to play on electronic gaming machines (also known as "pokies", or poker machines). I will explain a bit more of the background in a moment but the NSW Government is proposing to introduce legislation that would let people pay to play on electronic gaming machines using cashless payment methods (like a card or app on your smartphone) instead of inserting cash into the gaming machine. We are interested in hearing your thoughts about how this might change the way you gamble, any concerns you have about how this could contribute to people experiencing harm related to gambling, as well as any ways you think a cashless payment system could be set up to help people stay in control of their gambling.
    - You were selected to take part in this focus group because you indicated that you meet the eligibility criteria for this study, which include spending money on electronic gaming machines ("pokies", poker/slot machines) at least once a month (in a typical month) in a land-based club, such as an RSL or bowling club.
    - Your input, along with input from other focus groups we are conducting, is critical for our research. After we finish running the focus groups, we will write up a report to summarise the findings from the study. We expect the findings from this research will help to guide policy and practice about how payment systems can be designed to help protect people from experiencing harm related to gambling.
- Guidelines for the focus group: Before we begin, I want to mention a few points that will help our conversation to run smoothly.
    - We have until about [insert time based on 75-minute discussion] for our discussion. After that, there is a short survey that takes about 10 to 15 minutes to complete. We will make sure the session wraps up by [insert session end time based on 1.5-hour session duration].

- We will be recording today's session because we don't want to miss any of your comments. People say really helpful things in these discussions and we can't write fast enough to get them all down.
- It will help if only one person talks at a time. If several people are talking at the same time, the recording will be difficult to hear and we'll miss your comments.
- If you have a mobile phone, please put it on silent mode. If you need to take an urgent call, please make sure your microphone is muted and then re-join us as quickly as you can.
- Each of us have our first names displayed to help us remember each other's names. We'll be on a first-name basis today but we won't use any of your names in our reports. Anything you say will be anonymous in the reports so none of the answers you give can be personally linked to you.
- My role is to guide the discussion. I've got a number of questions that I want to ask, but my job is really to listen to what you have to say. This session will be more interesting for all of us if we treat it like a conversation. There are no wrong answers, only differing points of view. You don't need to agree with others, but we do ask that you listen respectfully as others share their views. Please feel free to share your point of view even if it differs from what others have said. If someone says something, feel free to follow up on it or share a different perspective. You don't need to address all your comments to me.
- We want to hear everyone's point of view, so if we haven't heard from someone for a while, it is possible I might call on you to share your thoughts.
- There are quite a few questions to get through so it is possible I may need to interrupt the discussion at some points so we can hear the group's thoughts on all the questions. I apologise ahead of time if I need to do this.
- Does anyone have any questions before we begin our discussion? After answering any questions, we will start recording the Zoom meeting.

I am starting the recording of our discussion now.

Participant introductions

Let's begin by going around the room and meeting everyone here. Tell us your first name and what you had for breakfast this morning.

Background

The NSW Government is proposing to change the way people pay to play on electronic gaming machines (more commonly known as "pokies", or poker machines). Currently a person typically loads funds onto a gaming machine by inserting banknotes or coins directly into the gaming machine. One of the new payment options proposed involves introducing a cashless gambling card.

Instead of inserting cash directly into the gaming machine, you could load money onto the card. Money loaded onto the card could be used to play on gaming machines. In addition to

the physical (plastic) card, you could access the card via an app on your smartphone and tap the smartphone at the gaming machine to load funds onto the machine.

Discussion questions

- What are your initial reactions to this idea?
- How do you think this could change the way you gamble?
- What do you think are the potential benefits of switching to a system where you load money onto a card and then pay at the gaming machine using a card or smartphone, as opposed to in cash? (Potential prompt questions are listed below).
    - Can you think of reasons why you might want to use a cashless payment system for gambling?
    - Can you think of ways in which a cashless payment system might make it easier for you to stay in control of your gambling?
- What concerns do you have about switching to a system where you load money onto a card and then pay at the gaming machine using a card or app, as opposed to in cash? (Potential prompt questions are listed below).
    - Can you think of reasons why you might not want to use a cashless payment system for gambling?
    - Can you think of ways in which a cashless payment system might make it harder for you to stay in control of your gambling?
- If the switch to a cashless payment system did go ahead, what do you think about whether it should be voluntary or mandatory to use?
- Earlier we spoke about concerns relating to the cashless payment system. What could be done to address some of those concerns?
- What safeguards do you recommend should be built into cashless payment systems to help people stay in control of their gambling?
    - It has been suggested that a range of different tools and features could be integrated with the cashless payment system to help people stay in control of their gambling and protect people from experiencing harm. (The researchers will use Zoom's screen-sharing functionality to show participants stimulus material related to the theme of the sub-question).
        - What are your ideas for tools or features that could help people to manage the amount of money spent gambling? (Facilitator shows "Money" stimulus card to participants. Potential prompt questions are listed below).
            - Being able to set limits on the amount of money you spend gambling (for example, per day, week, or month)?
            - Having a quarantine function within the payment system, for example, so that any money won is transferred into a quarantine account for a certain period of time so that the money cannot be immediately re-gambled?
        - What are your ideas for tools or features that could help people to manage the amount of time spent gambling? (Facilitator shows

"Time" stimulus card to participants. Potential prompt questions are listed below).

- Being able to set limits on the amount of time you spend gambling (for example, per day, week, or month)?
- Being able to suspend a gambling session (for example, having a 'time-out' function that allows you to pause the gambling session for a period of time)?
- Having a mandatory break in play after having gambled for a certain amount of time?
- Having a time delay between loading money onto the card and being able to spend the funds at the gaming machine (for example, to mimic the natural break in play that occurs when getting up from the machine to get more cash out to continue gambling)?

- What are your ideas for tools or features that could help people keep track of their gambling by providing more feedback? (Facilitator shows "Feedback" stimulus card to participants. Potential prompt questions are listed below).
  - Being able to see an activity statement (for example, via a payment app) that summarises your gambling activity in real time?
  - Receiving messages from time to time that update you on your gambling activity (for example, the amount of time or money spent during a session)?
- What are your ideas for tools or features that could help people control their access to gambling? (Facilitator shows "Access" stimulus card to participants. Potential prompt questions are listed below).
  - Linking the cashless payment system to self-exclusion schemes, which allow people to ban themselves from the gaming area of a venue?
  - Requiring people to provide proof of identity, such as by showing their driver's licence, to obtain a cashless gambling card?
- What are your ideas about how the system could be used to proactively identify and offer support to people who might be experiencing problems controlling their gambling? (Facilitator shows "Identify & support" stimulus card to participants. Potential prompt questions are listed below).
  - Linking the cashless payment system to risk monitoring systems (for example, the customer and venue could be notified if risky patterns of gambling are detected, and an intervention could be initiated according to the level of risk, such as the customer receiving a message on the screen of the

gaming machine or venue staff making contact with the customer)?

- If you had one minute to give advice to the people designing the cashless payment system, what would you say?

Conclusion of group discussion component

- Assistant facilitator asks any important follow-up or clarification questions
- Assistant facilitator briefly summarises key points from discussion and asks participants for feedback (e.g., "Does that reflect the conversation you heard, or is there anything you would change?")
- Lead facilitator: Thank you very much everyone for taking part in the discussion. We will stop recording the meeting now [Facilitator stops the recording]. Before we wrap up the session, we would like to ask you to complete a short survey. The survey contains questions about your gambling, your use of different payment methods, as well as some demographic questions. It should take about 10 to 15 minutes to complete. We will share the link to the survey in the chat box now. Please click on the link to access the survey. Please keep your microphone on mute so that it is quiet while people do the survey. When you are finished, you can raise your virtual hand so that I know you are done, and then we will wrap up the session.

Verbal debrief (after survey component): A copy of the post-session information sheet will be shared in the Zoom chat box for participants to download if they wish.

- Thank you very much for participating in this study. The aim of this study is to explore people's perspectives about the potential risks and benefits of cashless payment methods for electronic gaming machines in land-based gambling venues, such as clubs.
- Your responses will help us to make recommendations for policies and practices that seek to reduce gambling harm and enhance the wellbeing of Australians.
- We would like to remind you that anything discussed during the study should be kept confidential and not discussed with other people outside of the study.
- If any of the content in this study has triggered distress or you need help for problems related to gambling, we encourage you to contact your GP or one of the support services listed in the debrief statement, such as Lifeline or Gambling Help.
- Having completed this study, you are eligible to receive a $75 Westfield shopping gift card to reimburse you for your time. We will email these out to you in the next 2 weeks using the contact details you supplied when you completed the consent form to take part in this study.
- The session has now come to an end. Thank you again for your participation and interest in our research.

Appendix H: Qualitative Research Team Statement

At the time of conducting the study, I was a second-year PhD student. The person who assisted with facilitating the focus group discussions and analysing the data was completing a Graduate Diploma in Psychology. I had some previous experience assisting with a focus groups study, and received guidance from supervisors more experienced in qualitative research. I included a statement reflecting on my positionality in the study's preregistration.

None of the researchers had a relationship with participants prior to study commencement. Participants recruited through mailing lists may have previously taken part in research studies investigating the use of consumer protection tools on online wagering websites and relationships between gambling, debt, and mental health problems. Participants were told in the Participant Information Statement that the study was about different payment methods (e.g., cash, cards) for electronic gaming machines, and that the study was funded by a PhD scholarship awarded to the first author through the NSW Government's Gambling Research Capacity Grants program, funded by the NSW Responsible Gambling Fund.

Appendix I: Questionnaire for Qualitative Study

QUESTIONNAIRE

Red-coloured text: For researcher reference only. Participants will not see this text.

Research study on payment methods for electronic gaming machines

Thank you for taking part in the focus group. Before we finish the session, please complete this brief survey.

We are not collecting your name or contact details in this survey so your response is anonymous. This means that none of your answers are personally linked to you.

SEQ1 **To begin, please select the focus group session you attended today from the drop-down list.**

- [Day, date, and time of focus group #1 to be entered once scheduled]
- [Day, date, and time of focus group #2 to be entered once scheduled]
- [Day, date, and time of focus group #3 to be entered once scheduled]
- [Day, date, and time of focus group #4 to be entered once scheduled]

SECTION A: DEMOGRAPHIC INFORMATION

Next, we are going to ask you some demographic questions. Please select the answer that best applies to you.

DMQ1 **What is your gender?**

- Female
- Male
- Other

DMQ2 **What is your age?** Please enter numbers only.

_____

DMQ3 **What is the primary language spoken at your home?**

- English
- Arabic
- Cantonese
- Italian
- Mandarin
- Vietnamese
- Other – please specify.....

DMQ4 **What is the highest level of education you have completed?**

- High school, Year 10 or below
- Certificate I or II
- High school, Year 11 or 12
- Certificate III or IV
- Diploma or Advanced Diploma
- Bachelor Degree
- Graduate Diploma or Graduate Certificate
- Postgraduate Degree

DMQ5 **What is your current employment status?**

- Employed, working full-time
- Employed, working part-time
- Unemployed
- Home duties / full-time carer
- Retired
- Student

The following question asks about your **total annual income from all sources**, including wages and salaries, pensions and allowances (e.g., Centrelink payments), profit or loss from unincorporated business/farm or rental properties, and any other income, such as from superannuation, child support, or dividends from shares. **Do not deduct tax**, superannuation contributions, amounts salary sacrificed, or any other automatic deductions.

This question relates to your **personal income**, not your household income. If you are not sure, please make your best estimate.

DMQ6 **What is your total annual personal income before tax?** If you are not sure, please make your best estimate.

- $1–$7,799 per year ($1–$149 per week)
- $7,800–$15,599 per year ($150–$299 per week)
- $15,600–$20,799 per year ($300–$399 per week)
- $20,800–$25,999 per year ($400–$499 per week)
- $26,000–$33,799 per year ($500–$649 per week)
- $33,800–$41,599 per year ($650–$799 per week)
- $41,600–$51,999 per year ($800–$999 per week)
- $52,000–$64,999 per year ($1,000–$1,249 per week)
- $65,000–$77,999 per year ($1,250–$1,499 per week)
- $78,000–$90,999 per year ($1,500–$1,749 per week)
- $91,000–$103,999 per year ($1,750–$1,999 per week)
- $104,000–$155,999 per year ($2,000–$2,999 per week)
- $156,000 or more per year ($3,000 or more per week)
- Nil income
- I don't know
- I prefer not to say

SECTION B: GENERAL USE OF PAYMENT METHODS

Order of questions will be randomised (other than where a specific order makes sense).

The next questions ask you about how you usually pay for things.

For these questions, think about payments you make in-person for any type of good or service (i.e., not only for gambling). In-person refers to paying for something at the physical point-of-sale (e.g., in a shop), as opposed to paying for something online (e.g., ordering something on the computer).

Thinking about a typical month in the last 12 months, how often did you pay for something using …

PBQ1a **Cash**

Not at all	1–3 times per month	Once a week	2–6 times per week	Daily
0	**1**	**2**	**3**	**4**

PBQ1b **Cheque**

Not at all	1–3 times per month	Once a week	2–6 times per week	Daily
0	**1**	**2**	**3**	**4**

PBQ1c **A physical/plastic debit card (not including on your smartphone or another payment-enabled mobile device)**

Not at all	1–3 times per month	Once a week	2–6 times per week	Daily
0	**1**	**2**	**3**	**4**

PBQ1d **A debit card on your smartphone or another payment-enabled mobile device (not including using a physical/plastic card)**

Not at all	1–3 times per month	Once a week	2–6 times per week	Daily
0	**1**	**2**	**3**	**4**

PBQ1e **A physical/plastic credit card (not including on your smartphone or another payment-enabled mobile device)**

Not at all	1–3 times per month	Once a week	2–6 times per week	Daily
0	**1**	**2**	**3**	**4**

PBQ1f **A credit card on your smartphone or another payment-enabled mobile device (not including using a physical/plastic card)**

Not at all	1–3 times per month	Once a week	2–6 times per week	Daily
0	**1**	**2**	**3**	**4**

SECTION C: GAMBLING PARTICIPATION

Order of questions will be randomised (other than where a specific order makes sense).

The next questions ask you about any gambling activities you took part in during a typical month in the last 12 months.

Gambling includes any activity where you bet money on an unknown outcome (e.g., a game or sporting event) for the chance to win money.

Thinking about a typical month in the last 12 months …

GPQ1 **How often did you spend any money on electronic gaming machines ('pokies', poker/slot machines) in a land-based gambling venue, such as a pub, club, or casino?**

1–3 times per month	Once a week	2–6 times per week	Daily
1	**2**	**3**	**4**

GPQ2 **Did you spend any money on any of the following activities, either in a land-based gambling venue (e.g., pub, club, casino) and/or online (on a computer, mobile/smart phone, iPad)?** (Select all that apply)

- Instant scratch tickets ("scratchies")
- Lotto or lottery games, like Powerball or Oz Lotto
- Keno
- Bingo
- Private betting for real money (e.g., playing cards or mah-jong with friends and family)
- Poker
- Casino table games (e.g., blackjack, roulette)
- Betting on horse or dog races
- Betting on sports
- None of the above

SECTION D: USE OF PAYMENT METHODS FOR GAMBLING

Order of questions will be randomised (other than where a specific order makes sense).

The next question asks you specifically about your gambling on electronic gaming machines ('pokies', poker/slot machines) in LAND-BASED gambling venues, such as pubs, clubs, and casinos.

GPQ1 **Which of the following payment methods have you ever used to load funds onto an electronic gaming machine?** (Select all that apply)

- Cash (banknotes and/or coins)
- A paper-based ticket or voucher (e.g., "ticket-in, ticket-out" or TITO systems involve paper-based tickets with a printed barcode that is scanned to load money onto the gaming machine)
- A plastic card registered in your name (e.g., a membership or loyalty card that is associated with your identity. The card can be loaded with money and inserted into the gaming machine to play).
- An anonymous/casual plastic card (e.g., a card that is not associated with your identity. The card can be loaded with money and inserted into the gaming machine to play).

SECTION E: HARM MINIMISATION FEATURES

Order of questions will be randomised (other than where a specific order makes sense).

Now, thinking back to the focus group discussion, we talked about a range of different tools and features that could be integrated with a cashless payment system to help people stay in control of their gambling.

HMQ1 **Please rank the following items in order of importance to you, with 1 being the most important and 10 being least important.**

- Linking the cashless payment system to self-exclusion schemes, which allow people to ban themselves from the gaming area of a venue
- Requiring people to provide proof of identity (e.g., driver's licence) to obtain a cashless gambling card
- Being able to set limits on the amount of time and money you spend gambling (e.g., per day, week, month)
- Being able to suspend a gambling session (e.g., a 'time-out' function that pauses the gambling session for a period of time)
- Having a time delay between loading money onto the card and being able to spend the funds at the gaming machine (e.g., to mimic the natural break in play that occurs when someone needs to get up from the machine to get more cash out to continue gambling)
- Having a quarantine function within the cashless payment system (e.g., so that any money won is transferred into a quarantine account for a certain period of time so that the money cannot be immediately re-gambled)
- Being able to see an activity statement (e.g., via a payment app) that summarises your gambling activity in real time
- Receiving messages from time to time that update you on your gambling activity (e.g., the amount of time or money spent during a session)
- Linking the cashless payment system to risk monitoring systems (e.g., the customer and venue could be notified if risky patterns of gambling are detected, and an intervention could be initiated according to the level of risk, such as the customer receiving a message on the screen of the gaming machine or venue staff making contact with the customer)
- Having a mandatory break in play after having gambled for a certain amount of time

SECTION F: PROBLEM GAMBLING SEVERITY

Order of questions will be randomised (other than where a specific order makes sense).

The final set of questions asks you about your gambling during the past 12 months. For each question, please indicate how often the statement applied to you.

PGQ1a **How often have you bet more than you could really afford to lose?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGQ1b **How often have you needed to gamble with larger amounts of money to get the same feeling of excitement?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGQ1c **How often have you gone back another day to try to win back the money you lost?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGQ1d **How often have you borrowed money or sold anything to get money to gamble?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGQ1e **How often have you felt that you might have a problem with gambling?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGQ1f **How often have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGQ1g **How often have you felt guilty about the way you gamble, or what happens when you gamble?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGQ1h **How often has your gambling caused you any health problems, including stress or anxiety?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGQ1i **How often has your gambling caused any financial problems for you or your household?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

SECTION G: DEBRIEF

Thank you for taking part in this study!

Thank you very much for participating in this study. The aim of this study is to explore people's perspectives about the potential risks and benefits of cashless payment methods for electronic gaming machines in land-based gambling venues, such as clubs.

Your responses will help us to make recommendations for policies and practices that seek to reduce gambling harm and enhance the wellbeing of Australians.

If you would like to know more about the study, please feel free to contact Associate Professor Sally Gainsbury (sally.gainsbury@sydney.edu.au) at the University of Sydney.

If any content in this study has triggered distress or you need help for problems related to gambling, please contact your GP or the support services listed below:

- Lifeline: 13 11 14 (available 24/7) or https://www.lifeline.org.au/
- Gambling Help: 1800 858 858 (available 24/7) or https://www.gamblinghelponline.org.au/

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the University:

Human Ethics Manager

human.ethics@sydney.edu.au

+61 2 8627 8176

Please click "Continue" below to submit the survey.

Continue

Appendix J: Focus Group Participant Preferences Regarding Harm Reduction Features That Could be Incorporated Into a Cashless System

Table J1

Participants' Rank-Ordered Preferences Regarding Harm Reduction Features That Could be Incorporated Into a Cashless Gambling System (N = 25)

Harm reduction feature	Mean ranking (out of 10)
Being able to see an activity statement (e.g., via a payment app) that summarises your gambling activity in real time	3.5
Linking the cashless payment system to self-exclusion schemes, which allow people to ban themselves from the gaming area of a venue	4.2
Requiring people to provide proof of identity (e.g., driver's licence) to obtain a cashless gambling card	4.2
Being able to set limits on the amount of time and money you spend gambling (e.g., per day, week, month)	4.2
Having a quarantine function within the cashless payment system (e.g., so that any money won is transferred into a quarantine account for a certain period of time so that the money cannot be immediately re-gambled)	5.9
Receiving messages from time to time that update you on your gambling activity (e.g., the amount of time or money spent during a session)	5.9
Being able to suspend a gambling session (e.g., a 'time-out' function that pauses the gambling session for a period of time)	6.2
Linking the cashless payment system to risk monitoring systems (e.g., the customer and venue could be notified if risky patterns of gambling are detected, and an intervention could be initiated according to the level of risk, such as the customer receiving a message on the screen of the gaming machine or venue staff making contact with the customer)	6.8
Having a mandatory break in play after having gambled for a certain amount of time	6.8
Having a time delay between loading money onto the card and being able to spend the funds at the gaming machine (e.g., to mimic the natural break in play that occurs when someone needs to get up from the machine to get more cash out to continue gambling)	7.3

Note. Participants were asked to rank items in order of importance to themselves, with 1 being the most important and 10 being least important. Data from one participant was missing due to an incomplete survey response.

Appendix K: Coding Frame for Qualitative Study

Table K1

Main Categories

Main category	No.	Definition
Perceived benefits	1	This category relates to participants' beliefs and perceptions about the general reasons why implementing a cashless payment system for electronic gaming machines could be beneficial. For example, some participants suggested that a cashless payment system could have benefits in relation to security, preventing money laundering, and facilitating more effective limit setting and better tracking of net outcomes.
Perceived risks and concerns	2	This category relates to participants' beliefs and perceptions about the general reasons why implementing a cashless payment system for electronic gaming machines could be detrimental or not of interest. For example, some participants expressed concerns about data security and privacy issues, as well as about ways in which a cashless payment system might facilitate overspending through reduced friction in the payment process.
Moderating factors	3	A cashless payment system could be implemented in a variety of ways, so this category relates to factors that would moderate the perceived utility of or intention to use a cashless payment system for electronic gaming machines (and any incorporated consumer protection mechanisms). For example, some participants indicated they would be more or less willing to use a cashless payment system under certain conditions, or that a cashless payment system would be more or less useful under certain conditions.
Consumer protection mechanisms	4	This category relates to participants' suggestions and recommendations about consumer protection mechanisms that could be incorporated into a cashless payment system for electronic gaming machines. For example, participants shared ideas and opinions about ways in which the system could be designed to minimise gambling-related harm, such as through integration of self-exclusion schemes, precommitment tools, and provision of feedback through activity statements and personalised messaging.

Table K2

Coding Frame

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
Perceived benefits	Provision of consumer protection mechanisms	1.1	This category applies if the participant expresses that a cashless payment system could be beneficial for allowing tools or features to be provided that may help an individual to control or limit their gambling, such as precommitment tools (e.g., ability to set limits on money and/or time spent gambling), self-exclusion, and behavioural feedback (e.g., activity statements, messaging).	Units should only be coded in this category if they are expressed as a benefit of a cashless payment system, or are expressed in the context of discussion about benefits. Units relating to limit-setting are also relevant to category 4.1, but units coded in that category may not necessarily relate to benefits.	limit, block, feedback	*"I reckon an app, there'd probably be some sort of blocker where if you did win $1,000, you could lock it away and you wouldn't be able to access it for 48 hours or something like that. So it's probably even potentially safer than cash."* *"Actually, that's a good benefit I didn't think of is that you could look at the probability and how much you're actually winning or losing over time, that would be quite interesting to see. They could provide graphs and things."*
Perceived benefits	Preventing money laundering	1.2	This category applies if the participant expresses that a cashless payment system could be beneficial for preventing money laundering.		laundering	*"And also the money laundering stuff because it's going to have an identity to the card that they're loading the cash on. So it could definitely reduce all the money laundering and how the cash is coming from different stuff."*
Perceived benefits	Reducing disease transmission	1.3	This category applies if the participant expresses that a cashless payment system could be beneficial for reducing disease transmission, such as during the COVID-19		COVID, COVID-19, cash handling	*"So I don't think it's just the COVID stuff but also there are many other things."*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
			pandemic (e.g., by improved hygiene through contactless payments instead of cash handling).			
Perceived benefits	Security	1.4	This category applies if the participant expresses that a cashless payment system could be beneficial for the consumer's security. For example, some participants expressed that a cashless payment system linked to an individual's identity could be beneficial for the security of their funds if the card was lost or misplaced. Some participants expressed that a cashless payment system could be beneficial in relation to reducing the need to carry cash, as they had concerns about their personal safety when carrying large amounts of cash.		security, safety, lose	*"So there will be people like me who will lose the card and just get it back into your bank account. So I'd see that as a benefit."* *"If you had a win of say 1,500, 2,000, you've probably got to be, this is a man talking, you got to be careful walking out of the venue, making sure you're not sort of, you know, no one's watched you win. So I suppose it's a safety sort of mechanism as well."*
Perceived benefits	Convenience	1.5	This category applies if the participant expresses that a cashless payment system could be convenient for them to use.		convenience, quick, easy	*"I guess it would be a quicker process to gamble because you wouldn't be taking that time to go away and have to get more money"* *"I think it's a benefit, but it's a negative as well, is that it is convenient."*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
Perceived risks and concerns	Overspending —Greater accessibility of funds	2.1	This category applies if the participant expresses a concern that a cashless payment system may increase the risk of spending more money than intended due to greater accessibility of funds. For example, some participants expressed this as a concern due to reduced friction in the payment process (e.g., automatic topping-up of the gambling account from a linked source of funds), or due to winnings potentially being more easily accessible for immediate re-gambling.		load, accessible, winnings	*"Also, you know, how hard is it to load this card? Can it be done, you know, like, does it come directly from your bank account to the cash card, in which case that would be easy but also maybe dangerous because, you know,"* *"But if the funds or your winnings are going back onto the app and they're accessible, then you're able to dip straight back into those winnings again, which I don't think is a great thing."*
Perceived risks and concerns	Overspending —Intangibility of cashless payments	2.2	This category applies if the participant expresses a concern that a cashless payment system may increase the risk of spending more money than intended due to cashless payments being less tangible than payments made in cash. For example, some participants expressed that handling physical currency and seeing it deplete from a wallet plays an important role in their awareness of their spending. This category includes units expressing concerns that tracking one's spending is more		physical, real, number	*"If you're not careful with it, it can just be, you end up in a big hole because you don't physically see like an empty wallet."* *"I think physically holding the money in your hand actually plays a massive part in the decision making process and, "Do I want to keep doing this?", essentially."*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
			difficult with cashless payments compared to cash. For example, some participants expressed that monitoring one's spending is easier when using cash compared to cashless payments.			
Perceived risks and concerns	Overspending—Linked sources of credit	2.3	This category applies if the participant expresses a concern that a cashless payment system may increase the risk of spending more money than intended if the system allowed the account to be funded from a source of credit (e.g., credit card).		credit	*"If you were able to attach your credit card to this card, that could be very bad for a lot of people because you've got to pay it all back with interest"*
Perceived risks and concerns	Overspending—Reduced breaks in play	2.4	This category applies if the participant expresses a concern that a cashless payment system may increase the risk of spending more money than intended due to having fewer natural breaks in play. For example, running out of cash can provide a natural break in play as the individual has to get up from the machine to take out more cash (e.g., from an automated teller machine), which may provide an		break, get more, ATM	*"And I like the fact that I get to have a bit of a break and get away, to go and get more cash if I want to. And then I think about it. Whereas if it's on a card, I'm not thinking about it, I just keep going. So I like the idea of getting away and having a break and just reassessing what I'm doing."* *"Also, you're not having that break to go away, and every time you do collect more money at an ATM, you're thinking, "Oh, I've spent this much.*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
			opportunity to reconsider whether to continue gambling.			*I've spent this much," and that's quite good, I think."*
Perceived risks and concerns	Overspending —Other/ unspecified	2.5	This category applies if the participant expresses a concern that a cashless payment system may increase the risk of spending more money than intended without further elaboration or for a different reason to those covered by categories 2.1 to 2.4.	Units that refer to spending being made "easier" or "more convenient" without further elaboration should be coded in this category.	easier, convenient, spend more	*"My initial thoughts is that I might be tempted to spend more than I would want to."* *"It's just making it a lot easier for people, generally a lot easier for people to spend more money, which I don't think is necessarily a good thing."*
Perceived risks and concerns	Security and privacy concerns	2.6	This category applies if the participant expresses concerns relating to the security and privacy of personal information kept within a cashless payment system. For example, some participants were concerned about how their personal information might be used (e.g., sharing of data with advertising firms, credit ratings firms, social security providers). Concerns about the security of an individual's funds within a cashless payment system are also included in this category. For example, some participants	Units coded in this category should specifically relate to security and privacy concerns, including the storage, handling, sharing, usage, and security of an individual's personal information and/or funds within a cashless payment system. Units that relate to broader concerns about over-regulation and government control, and adverse impacts on freedom of choice and the experience of gambling as a recreational	privacy, lose, hack, breach, skim, advertising, marketing	*"If you lose the card and someone picks it up, is it free money for them?"* *"I definitely agree with XX that you are opening yourself up to a whole heap of marketing or targeted marketing specifically."*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
			were concerned that their account could be hacked.	activity should be coded in category 2.8.		
Perceived risks and concerns	Inconvenience	2.7	This category applies if the participant expresses concerns that a cashless payment system would be inconvenient to use. For example, some participants were concerned that it would be inconvenient to set up an account in a cashless payment system.		inconvenient, hassle	*"Too much of a hassle transferring money to a card"* *"It's like another thing that you have to have; another thing that you have to carry with you; another thing that you kind of have to worry about and set up and, I don't know, for me it makes more sense either that you're—it's your cash or your actual bank card rather than, like, a separate card entirely."*
Perceived risks and concerns	Inappropriateness of approach to addressing problem gambling and gambling harm	2.8	This category applies if the participant expresses concerns about the use of cashless payment systems as part of a public health (population-level) approach to addressing problem gambling and gambling harm. For example, some participants expressed concerns relating to over-regulation and excessive government control, and how this approach may adversely impact on an individual's freedom of choice over how they spend their money and on the experience of gambling as a recreational activity	Units that specifically relate to security and privacy concerns, including the storage, handling, sharing, usage, and security of an individual's personal information within a cashless payment system should be coded in category 2.6.	thrill, social, fun, government, track, monitor, watch, big brother, problem gambling, addiction	*"It's just a control system of the government. I mean gambling is an issue for a lot of people, but you know, it's also not for others. And it's like, I don't know. They just shouldn't tell you what to do with something that's meant to be a fun thing."* *"Can I say, I think this whole concept and discussion is going about it the wrong way. I think if all this is about to try and stop problem gambling, then all it's doing is putting more restrictions on the majority of people who aren't problem gamblers. That there are*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
			(e.g., making the gambling experience less exciting or enjoyable). Some participants expressed concerns about the effectiveness of such a system for people experiencing severe gambling problems, and suggested it is more important to focus on provision of individual-level interventions, such as counselling. Some participants expressed concerns about potential conflicts of interest that different stakeholder groups may have in relation to a cashless payment system, and how this may impact the effectiveness of such a system in relation to addressing gambling harm.			*problem gamblers, there are problem drinkers, as you can have an addiction with anything in society. And the answer is really much more about education and funding in counselling and avenues that people can get help rather than restricting how much alcohol you can buy, how much money you can put on a gambling card or anything like that. So, I don't know why we are really talking about all these things today to try and stop problem gambling. I don't think it's going to work."*
Perceived risks and concerns	Migration to alternate modes or forms of gambling	2.9	This category applies if the participant expresses concerns that a cashless payment system could result in migration to other modes or forms of gambling (e.g., by increasing familiarity with gambling apps for individuals who have not previously used them). Some participants went on to suggest that this migration could		online gambling, gateway	*"This is going to create a problem that you're going to get people hooked on apps and gaming apps."*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
			result in an increase in gambling-related harm.			
Perceived risks and concerns	Circumvention of the system	2.10	This category applies if the participant expresses the concern that a cashless payment system or any incorporated consumer protection mechanisms could be circumvented, potentially rendering it ineffective in achieving its objectives.	Units that relate to methods or techniques that an individual might employ to circumvent the system should be coded in this category. Units that relate to broader comments about the potential effectiveness of such a system for addressing problem gambling should be coded in category 2.8.	find a way, number of cards, double dip	*"And then the fact can someone else use it if like you give it to your mate, give them the pin number, whatever?"* *"Some people, no matter what you do, they're going to get around it. Because, they just find some way to do it. Having a limit is fine. But then again, if it's voluntary, you have the card, you get so much there. And if you can do use cash, you're going to double dip."*
Perceived risks and concerns	Inaccessibility	2.11	This category applies if the participant expresses a concern about the accessibility of the system. For example, some participants were concerned that a cashless payment system may not be easily accessible for older generations due to lower levels of cashless payment adoption generally.		phone, older, generation, pensioners	*"But for the older generation I think they'd find it—some people don't even have a iPhone, you know, and that to be able to download things and put money on and off. So I think for the older generation it'd be very hard to adapt to."* *"And also, you know, you've got a flat battery, you can't transfer money because your phone's dead."*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
Moderating factors	Level of user autonomy and freedom	3.1	This category applies if the participant expresses that they would be more or less willing to use a cashless payment system depending on the level of user autonomy and freedom inherent in the system. For example, some participants expressed reluctance or hesitancy towards a mandatory system, citing beliefs that such a system would infringe upon their civil liberties, such as their freedom of choice (e.g., to use cash) and right to privacy (e.g., not to have their spending on gambling monitored by the government, or personal information shared with third parties).	Units relating to an individual's freedom to use or customise specific settings within the system (e.g., the ability to set personalised monetary limits) should be coded in category 3.2.	voluntary, mandatory, choice, force, replace, government, monitor, privacy, anonymous	*"I don't know if they propose to get rid of cash altogether but, you know, I'm not sure that that should be the case."* *"I probably wouldn't use the app unless there was some sort of privacy regulation or act that the government agrees to that this information can't be used by other companies."*
Moderating factors	(In)flexibility of consumer protection mechanisms	3.2	This category applies if the participant expresses that they may be more or less willing to use a cashless payment system depending on the (in)flexibility of consumer protection mechanisms incorporated into the system (e.g., the ability to set one's own deposit limit; toggle on/off particular functions).	Units coded in this category should relate to settings within the system. Units relating to individual's freedom in using the system itself should be coded in category 3.1.	set, customisation, personalised, restriction, optional, self-imposed	*"And who sets that limit and how do you change that limit? So I think one question just leads to more questions."* *"Well, it would depend on whether you're controlling that or not. So if I'm controlling that quarantine function, then funny that word's very popular these days. If I was controlling it, then that would be fine, but I wouldn't be happy if someone else was controlling*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
						that because I may want to play for longer."
Moderating factors	(In)consistency across venues	3.3	This category applies if the participant expresses that they may be more or less willing to use a cashless payment system depending on whether the system was consistent across venues (e.g., the same card being accepted across venues).		venue-specific, accept	*"So has that got to be a specific card that's—that's acceptable across all RSLs, for example?"*
Moderating factors	(Lack of) integration for making in-venue non-gaming transactions	3.4	This category applies if the participant expresses that they may be more or less willing to use a cashless payment system depending on whether the card could also be used to make non-gaming transactions (e.g., food and beverages) in the gambling venue.		meal, food, drink	*"So you could go in there and probably play the pokies, yet pay for a meal with it, and different raffle tickets with the card as well. Or would it be poker machine-specific? You know, I think you should be able to use it in the whole club on whatever you want, lunch, that type of thing, not just the pokies."*
Moderating factors	(In)ability to use non-gambling-specific payment methods	3.5	This category applies if the participant expresses that they may be more or less willing to use a cashless payment system depending on whether they could use an existing non-gambling-specific payment method directly at the gaming machine (e.g., using a bank-issued debit card directly at	Units coded in this category should focus on the ability to use a non-gambling-specific payment method directly at the gaming machine. For units relating to funding a gambling-specific card, see category 3.6.	debit card, credit card	*"First, I thought you meant that you could use your debit card or whatever straight in. Thank God it's not that."* *"Yeah, so, okay, so given that opening I would say let's assume that people did it on a debit card, because credit card, like*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
			the gaming machine, as opposed to topping up a gambling-specific card).			*XX's already mentioned; gateway to hell."*
Moderating factors	Process of loading funds into the cashless gambling account	3.6	This category applies if the participant expresses that they may be more or less willing to use a cashless payment system depending on the process of loading funds into the gambling account, including the methods permitted to fund the gambling account (e.g., debit/credit card, bank transfer, kiosk). This category includes units relating to the process of loading funds into the gambling account depending on whether the cashless payment system is card- or smartphone-based.	Units coded in this category should focus on the process involved in funding a gambling-specific account. For units relating to the ability to use a non-gambling-specific payment method directly at the gaming machine, see category 3.5.	top up, load, link, transfer	*"Or is it going to be—default to your nominated debit card or credit card? So if it's got to be another thing that you've got to top up—so unless it's almost supposed to be putting in a barrier before people going in."* *"I think it kind of depends on this app, because if it's [an] app where you kind of transfer money, it's like a Sportsbet account where you transfer money into it, it's a bit of a resistance to actually just use all your money."*
Moderating factors	Process of withdrawing funds from the cashless gambling account	3.7	This category applies if the participant expresses that they may be more or less willing to use a cashless payment system depending on the process of withdrawing funds from the cashless gambling account (e.g., how difficult it is to withdraw	Units coded in this category should focus on withdrawing funds (cashing out) from the cashless payment system. For units relating to settings governing how funds are transferred within the system, see category 3.2.	withdraw, take out	*"Well, if you have the big winnings put on your card, are you able to access that to take it out or does it have to stay on the card too?"*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
			funds; how much time it takes for the withdrawal to process).			
Moderating factors	Whether there are fees for using the cashless payment system	3.8	This category applies if the participant expresses that they may be more or less willing to use a cashless payment system depending on whether additional transaction fees and charges would be applied.		fee, charge	*"Is there some sort of charge involved with this? Like, is there a small fee per transaction or per press or—because that hasn't really been discussed, because that also wouldn't unfair because it's free to use cash; right?"*
Consumer protection mechanisms	Precommitment	4.1	This category applies if the participant makes suggestions or recommendations about a consumer protection mechanism relating to precommitment, such as the ability to set limits on the amount of money or time spent gambling. Units relating to other functions that may limit the accessibility of funds during a gambling session (e.g., quarantine or cooling off functions, which may limit the accessibility of winnings for a period of time) are included in this category.		limit, load, quarantine, cooling off, delay, win	*"So just self-imposed limits that individuals can put on for themselves."* *"I reckon an app, there'd probably be some sort of blocker where if you did win $1,000, you could lock it away and you wouldn't be able to access it for 48 hours or something like that."*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
Consumer protection mechanisms	Self-exclusion	4.2	This category applies if the participant makes suggestions or recommendations about a consumer protection mechanism relating to self-exclusion, such as the ability to apply a block on an account that prevents an individual from accessing gaming machines for an extended period of time (e.g., months).	Units coded in this category should relate to functions that prevent an individual from accessing gaming machines for an extended period of time (e.g., months). Units relating to precommitment functions that limit an individual's access to funds or to a gaming machine for a shorter period of time (e.g., minutes) during a gambling session should be coded in category 4.1.	block, ban, stop	*"I guess you could do a temporary one. If you want to give yourself a break, you could say, "Okay, I can't." If I could control it myself and say, "Okay, I don't want to go to the club again for six months," I think that would be quite a good tool to be able to do that myself."* *"Yes, similar to, like, what credit card companies have. So I know that CBA had a thing a while ago called lock, block, limit. So if you have a problem gambler and then they have, I don't know, a sponsor or an advocate they would also need to have to approve the card to be unlocked. So it's just not, "Okay, yeah, you have a limit; you've reached that limit, now you have to get a secondary PIN to be unlocking the account". So you could do it that way."*
Consumer protection mechanisms	Tailored feedback and referrals informed by behavioural tracking	4.3	This category applies if the participant makes suggestions or recommendations about the application of behavioural tracking or risk monitoring to data captured within the cashless payment system in order to inform the delivery of targeted consumer protection mechanisms, such as the delivery of tailored feedback (e.g., activity		identify, pattern, track, notification, warning, confirmation, statistics, information,	*"The only thing you could have is when you're putting your card in it could have onscreen confirmation. So it could have something like, you know, "Do you—are you aware you're putting in $100 into the machine?" And even with a warning saying, you know, "Do you know $100 is the equivalent of, you know, five meals or whatever or, you know, two tanks of petrol" or something.*

Main category	Subcategory	No.	Definition	Decision rules	Indicators	Example quotations
			statements, messaging) or referrals to support services.		statement, support, flag	*So it actually makes it relative so people actually understand the value of what it is they're putting in."* *"Maybe they can base it off your like last week. So say, week one, you put in 50 bucks and then the second week, it'll send a notification being like, "You are gambling 100% more this week." And then maybe some information about how to get help. That'd be a good idea, but I don't know how effective that would actually be. And again, like XX said, if you could just be out having a holiday and you're spending a bit more."*
Consumer protection mechanisms	Security features	4.4	This category applies if the participant makes suggestions or recommendations about a consumer protection mechanism relating to security, such as personal identification numbers, biometric authentication, and multifactor authentication.		PIN, face recognition, lose	*"Or if it was a card, it would have maybe a pin number. But also if it was an app, you could have face recognition on your phone."*

Appendix L: DCE Pre-Testing and Pilot Study

Pre-testing

Cognitive interviews were used to pre-test a draft version of the survey to ensure that the content could be readily comprehended by members of the target population. Cognitive interviews are designed to investigate the thought processes and incremental decisions that shape human behaviour, and are commonly used as a tool for pre-testing survey instruments (Collins, 2003). During the interview, participants were asked to share their screen with the researcher using Zoom screen-sharing functionality and to "think aloud" as they completed the survey. Probing questions were used to elicit feedback about particular aspects of the survey, such as whether the survey questions were easy to understand and were expressed using familiar concepts and terminology. Ethical approval for the interviews was obtained from the University of Sydney's Human Research Ethics Committee (protocol no. 2022/779).

A sample of five participants (40% female), ranging in age from 24 to 59 years (M = 45), took part in the interviews. Interviews were conducted by the lead author between November 22 to 29, 2022. On average, participants took 32 minutes to complete and provide feedback on the survey. Participants were recruited through a market research agency and provided informed consent by responding to an online survey prior to taking part in the study. Eligibility criteria required participants to: (i) be at least 18 years of age; (ii) spend money on electronic gaming machines at least once a fortnight at in-person gambling venues; (iii) live in Australia; (iv) speak, read, and write English fluently; and (v) be comfortable using Zoom video conferencing and have a computer with a strong Internet connection and a functioning webcam and microphone for participating in the online session. Participants were advised that they should not take part in the study if they did not feel comfortable discussing the subject of gambling. Participants were offered an AUD $50 eGift voucher as reimbursement for their time.

Participants reported that the survey was generally clear and straightforward to complete, and did not appear to find the choice task too difficult. Following feedback from participants, minor revisions were made to the survey, including formatting changes, re-wording of some survey questions, and provision of additional information to aid comprehension of the experimental scenario and survey questions.

Pilot study

Following pre-testing, a pilot study was conducted to gain additional feedback on the survey, and to estimate a preliminary choice model prior to conducting the main study. Specifically, the pilot study allowed me to estimate the parameter distributions (i.e., estimates of the parameter values and their standard errors) needed to generate a Bayesian efficient design for the main study (Bliemer et al., 2008). Ethical approval for the pilot study was obtained from the University of Sydney's Human Research Ethics Committee (protocol no. 2022/779).

To pilot a choice experiment, it is typical to recruit approximately 10% of the total sample size (Bliemer & Rose, forthcoming). The project budget allowed for recruitment of approximately 500 participants across both the pilot and main studies, so I planned to recruit approximately 50 participants for the pilot study. The pilot study was conducted between December 19 to 21, 2022. Participants were recruited through the same market research agency used for the cognitive interviews, and provided informed consent by responding to an online survey prior to taking part in the study. Eligibility criteria required participants to: (i) be at least 18 years of age; (ii) spend money on electronic gaming machines at least once a fortnight at in-person gambling venues; (iii) live in Australia; (iv) speak, read, and write English fluently; (v) have a computer (e.g., desktop, laptop) to use for completing the survey; and (vi) have not participated in earlier studies in the project. Participants were advised that they should not take part in the study if they did not feel comfortable discussing the subject of gambling. Participants who completed the survey were offered 150 points by the market research agency as reimbursement for their time. Members of the agency's panel can accumulate points and redeem them for eGift vouchers.

A total of 75 participants responded to the pilot study.[32] Two responses were excluded because participants did not complete any choice tasks. The sample for analysis therefore consisted of 73 responses. Median response time was 9.0 minutes. On average, participants provided correct responses to 3.2 out of four attention checks related to information provided in the experimental material (SD = 0.9). No participant failed all of the attention checks. Most commonly, participants incorrectly reported that credit cards could be used to deposit funds into the cashless account (43.8%), which was inconsistent with the scenario. The proportion of incorrect responses for the other three items ranged between 12.3%–16.4%. On average, participants rated the difficulty of the choice task as 2.0 (SD = 1.1) on a 5-point Likert-type scale (*very easy* = 1; *very difficult* = 5), indicating that the choice experiment was not too difficult.

Table L1 reports the sociodemographic characteristics of the sample. Participants were aged between 23 and 79 years (M = 47.3, SD = 13.3). Most participants primarily spoke English at home (89.0%), had completed a non-school qualification (87.5%), and were employed on either a full- or part-time basis (82.2%). The median personal income bracket was AUD $65,000–$77,999 per year ($1,250–$1,499 per week).

[32] The discrepancy between our target (N = 50) and actual (N = 75) sample sizes for the pilot study occurred due to a misunderstanding with the recruitment agency about how the sample size quota was being applied in the online survey setup.

Table L1

Sociodemographic Characteristics of Pilot Study Participants (N = 73)

Variable	*n*	%
Gender		
Male	42	57.5
Female	29	39.7
Other	1	1.4
Primary language spoken at home		
English	65	89.0
Mandarin	4	5.5
Cantonese	2	2.7
Vietnamese	1	1.4
Highest level of education completed		
High school, Year 9 or below	1	1.4
Certificate I or II	5	6.8
High school, Year 10 or above	7	9.6
Certificate III or IV	12	16.4
Diploma or Advanced Diploma	15	20.5
Bachelor Degree	25	34.2
Graduate Diploma or Graduate Certificate	3	4.1
Postgraduate Degree	4	5.5
Employment status		
Employed, working full-time	44	60.3
Employed, working part-time	16	21.9
Retired	7	9.6
Home duties / full-time carer	5	6.8
Annual personal income (before tax)		
$156,000 or more per year ($3,000 or more per week)	5	6.8
$104,000–$155,999 per year ($2,000–$2,999 per week)	15	20.5
$91,000–$103,999 per year ($1,750–$1,999 per week)	8	11.0
$78,000–$90,999 per year ($1,500–$1,749 per week)	5	6.8
$65,000–$77,999 per year ($1,250–$1,499 per week)	6	8.2
$52,000–$64,999 per year ($1,000–$1,249 per week)	9	12.3
$33,800–$41,599 per year ($650–$799 per week)	7	9.6
$26,000–$33,799 per year ($500–$649 per week)	3	4.1
$20,800–$25,999 per year ($400–$499 per week)	6	8.2
$15,600–$20,799 per year ($300–$399 per week)	6	8.2

Variable	*n*	%
I prefer not to say	2	2.7
Geographic location by state		
New South Wales	34	46.6
Victoria	19	26.0
Queensland	11	15.1
South Australia	4	5.5
Western Australia	3	4.1
Tasmania	1	1.4

Note. Data for all variables in this table were missing for one participant due to an incomplete response.

Participants responded to a set of questions about their typical payment behaviours in land-based (i.e., in-person) retail settings during the past 30 days (i.e., non-gambling-specific payment behaviours). Using a mix of cash and cashless payments was most common (45.2%), followed by almost always using cashless payments (35.6%). One in five (19.2%) reported almost always using cash. Nearly three in five participants (57.5%) reported having used a smartphone payment app to make a payment. Almost all participants (97.2%) reported typically carrying at least some cash with them (e.g., in a wallet/purse)—with the median amount being between AUD $21–$50.

Table L2 summarises typical gambling behaviours reported by participants. Three in four participants (76.7%) reported using EGMs at least weekly in the past 30 days. The median amount of money typically put into EGMs during each visit was between AUD $21–$50. Many participants gambled at more than one venue (67.1%), but usually at venues of the same type (i.e., casinos or clubs or pubs/hotels only; 60.2%). Most participants (80.7%) were members of at least one venue. Seven in 10 participants (69.9%) had previous experience using a non-cash payment method to load funds onto EGMs. In addition to using EGMs, nearly all participants (94.5%) indicated that they participated in other gambling activities, of which about half (47.8%) reported gambling online. Past-year Problem Gambling Severity Index (PGSI) scores indicated that most participants (72.6%) were engaging in at least low-risk gambling (PGSI ≥ 1)—with two in five participants (38.4%) classified as engaging in problem gambling (PGSI ≥ 8).

Table L2

Gambling Behaviours Reported by Pilot Study Participants (N = 73)

Variable	*n*	%
Frequency of using EGMs at in-person gambling venues (past 30 days)		
1–3 times in the last 30 days	17	23.3
Once a week	41	56.2
2–6 times per week	13	17.8
Daily	2	2.7
Number of different in-person gambling venues visited to use EGMs (past 30 days)		
1 venue only	24	32.9
2–3 venues	39	53.4
4–5 venues	8	11.0
6 or more venues	2	2.7
Type of in-person gambling venues visited to use EGMs (past 30 days)[a]		
Casinos	25	34.2
Clubs	42	57.5
Pubs/hotels	44	60.3
Typical amount of money put into EGMs on each visit to a venue (past 30 days)		
$5 or less	3	4.1
$6–$10	4	5.5
$11–$20	16	21.9
$21–$50	17	23.3
$51–$100	19	26.0
More than $100	14	19.2
Number of memberships at different in-person gambling venues		
None	14	19.2
1 venue only	22	30.1
2–3 venues	29	39.7
4–5 venues	5	6.8
6 or more venues	3	4.1
Previous experience using non-cash payment methods to load funds onto EGMs		
Paper-based systems (e.g., "ticket-in, ticket-out" or TITO systems) involving paper-based tickets or vouchers with a printed barcode that is scanned to load money onto the EGM	38	52.1
Registered card systems (e.g., a membership or loyalty card that is associated with the player's identity and which can be loaded with money and inserted into the EGM to play)	21	28.8
Anonymous card systems (e.g., a card that is not associated with the player's identity but which can be loaded with money and inserted into the EGM to play)	10	13.7

Variable	*n*	%
Participation in gambling activities apart from EGMs (past 30 days)[b]		
Lotto or lottery games	39	53.4
Betting on sports	37	50.7
Betting on horse or dog races	36	49.3
Instant scratch tickets	32	43.8
Poker	21	28.8
Keno	16	21.9
Casino table games	15	20.5
Bingo	14	19.2
Private betting for real money	11	15.1
Problem Gambling Severity Index[b,c] (*M* = 6.6; *SD* = 7.0)		
Non-problem gambling	19	26.0
Low-risk gambling	10	13.7
Moderate-risk gambling	15	20.5
Problem gambling	28	38.4

Note. [a]Multiple responses were possible. Participants were not asked which was the primary type of venue visited. [b]Data relating to these variables were missing for one participant due to an incomplete response. [c]Past-year Problem Gambling Severity Index scores were classified following Ferris and Wynne (2001): non-problem gambling = 0; low-risk gambling = 1-2; moderate-risk gambling = 3-7; problem gambling = 8-27.

The elements of the choice experiment, including the scenario, dual-response format, number of alternatives per choice task, attributes and attribute levels, number of choice tasks presented to respondents, and use of blocking, followed the preregistered protocol (https://osf.io/gsj2v/) and were the same as in the main study. The initial experimental design matrix for the pilot study was generated using Ngene (ChoiceMetrics, 2012). I adopted a *D*-efficient design strategy with non-informative (zero) priors, assuming a multinomial logit model as the base model. The design was located using the modified Federov algorithm (Cook & Nachtrheim, 1980). *D*-error was estimated at .16.

Table L3 presents the results of a main-effects only multinomial logit model based on the combined dataset of forced and unforced choice observations, and where choice is the dependent variable. The relative importance of each attribute was calculated by expressing the range of parameter estimates for each attribute as a proportion of the sum of the ranges for all attributes. The most important attribute was loyalty program integration (33.7%), followed by choice in whether to set a spending limit (19.9%), the physical form of cashless payment (16.9%), the level of consistency across venues (16.1%), and lastly by choice in setting the spending limit amount (13.4%). The most preferred attribute mix was a card-based system that can be used across all venues, has optional self-imposed spending limits, and is linked to a loyalty program that rewards users for spending and use of harm reduction tools. The least preferred attribute mix was a smartphone app-based system that

can only be used at a small number of venues, has mandatory spending limits set based on an affordability check, and is not linked to a loyalty program.

Table L3

Multinomial Logit Model of Preferences for Cashless Gambling Systems

Attributes	Estimate	*SE*	*p*	95% CI	
				LL	*UL*
Physical form of cashless payment					
Smartphone app	-.299	.068	<.001	-.433	-.165
Consistency across venues					
Small group of venues	-.053	.253	.833	-.549	.442
All venues	.231	.066	<.001	.102	.361
Choice in whether to set a spending limit					
Mandatory	-.351	.066	<.001	-.480	-.222
Choice in setting the spending limit amount					
Externally imposed based on an affordability check	-.237	.065	<.001	-.365	-.109
Loyalty program integration					
Linked to a loyalty program that provides points for spending	.226	.140	.105	-.048	.500
Linked to a loyalty program that provides points for spending and use of harm reduction tools	.595	.067	<.001	.464	.726
Opt-out	1.187	.102	<.001	.987	1.387
Observations	1750				
Log likelihood function	-1341.5				
AIC	2699.1				
AIC/N	1.542				

Note. SE = standard error; CI = confidence interval; *LL* = lower limit; *UL* = upper limit; AIC = Akaike Information Criterion. Attributes were dummy-coded. The reference category relates to a cashless gambling system that is card-based, can be used at one venue only, involves voluntary, self-imposed spending limits, and is not linked to a loyalty program. Opt-out refers to the scenario where participants preferred to use cash instead of the cashless alternative selected in the forced choice component of the dual-response choice task.

Among the unforced choice observations, the proportion of opt-out responses was 61.4%. This result indicates that in the majority of cases, respondents preferred using cash over the cashless systems described in the forced choice component of the choice task.

I used the parameter estimates and standard errors from the pilot study to generate a Bayesian efficient experimental design for the main study. No changes were made to the choice experiment after conducting the pilot study.

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Appendix M: Letters of Ethical Approval for Project No. 2022/779

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE

Friday, 11 November 2022

Dr Sally Gainsbury
Psychology; Faculty of Science
Email: sally.gainsbury@sydney.edu.au

Dear Sally,

The University of Sydney Human Research Ethics Committee (HREC) has considered your application.

I am pleased to inform you that after consideration of your response, your project has been approved.

Details of the approval are as follows:

Project No.:	**2022/779**
Project Title:	**Research study on payment methods for electronic gaming machines**
Authorised Personnel:	**Gainsbury Sally; Collard Sharon; Garbarino Ellen; Swanton Thomas;**
Approval Period:	**11/11/2022 to 11/11/2026**
First Annual Report Due:	**11/11/2023**

Documents Approved:

Date Uploaded	Version Number	Document Name
10/11/2022	Version 1	Email invitation for interviews_Version 1
10/11/2022	Version 1	Attendance confirmation for interviews_Version 1
10/11/2022	Version 1	Email invitation for pilot and main survey studies_Version 1
10/11/2022	Version 1	Social media advertisement for interviews_Version 1
04/11/2022		CRNRSTONE_Example email invitation for online surveys
04/11/2022		CRNRSTONE_Example email invitation for interviews
04/11/2022	Version 2	PIS_Interviews_V2_Clean
04/11/2022	Version 2	PIS_Pilot and main studies_V2_Clean
04/11/2022	Version 1	Protocol_Version 1
04/11/2022	Version 1	Interview guide_Version 1
10/10/2022	Version 1	Pre-test interview attendance instructions_Version 1
10/10/2022	Version 1	Experimental variables_Version 1
10/10/2022	Version 1	Post-experiment questionnaire_Interviews and main study_V1
10/10/2022	Version 1	Post-experiment questionnaire_Pilot study_V1
10/10/2022	Version 1	Pre-experiment questionnaire_Version 1
10/10/2022	Version 1	Sample experimental task_Version 1
10/10/2022	Version 1	Sawtooth Software Privacy Policy

Condition/s of Approval

- Research must be conducted according to the approved proposal.
- An annual progress report must be submitted to the Ethics Office on or before the anniversary of approval and on completion of the project.

Research Integrity & Ethics Administration
Research Portfolio
Level 3, F23 Administration Building
The University of Sydney
NSW 2006 Australia

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ABN 15 211 513 464
CRICOS 00026A

THE UNIVERSITY OF SYDNEY

- You must report as soon as practicable anything that might warrant review of ethical approval of the project including:
  - Serious or unexpected adverse events (which should be reported within 72 hours).
  - Unforeseen events that might affect continued ethical acceptability of the project.
- Any changes to the proposal must be approved prior to their implementation (except where an amendment is undertaken to eliminate *immediate* risk to participants).
- Personnel working on this project must be sufficiently qualified by education, training and experience for their role, or adequately supervised. Changes to personnel must be reported and approved.
- Personnel must disclose any actual or potential conflicts of interest, including any financial or other interest or affiliation, as relevant to this project.
- Data and primary materials must be retained and stored in accordance with the relevant legislation and University guidelines.
- Ethics approval is dependent upon ongoing compliance of the research with the *National Statement on Ethical Conduct in Human Research*, the *Australian Code for the Responsible Conduct of Research*, applicable legal requirements, and with University policies, procedures and governance requirements.
- The Ethics Office may conduct audits on approved projects.
- The Chief Investigator has ultimate responsibility for the conduct of the research and is responsible for ensuring all others involved will conduct the research in accordance with the above.

This letter constitutes ethical approval only.

Please contact the Ethics Office should you require further information or clarification.

Sincerely,

Associate Professor Carolyn Maccann
Chair
Psychology Review Committee (Low Risk)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's Australian Code for the Responsible Conduct of Research (2018)

THE UNIVERSITY OF SYDNEY

Research Integrity & Ethics Administration
HUMAN RESEARCH ETHICS COMMITTEE

Friday, 9 December 2022

Dr Sally Gainsbury
Psychology; Faculty of Science
Email: sally.gainsbury@sydney.edu.au

Dear Sally,

Your request to modify this project, which was submitted on 30/11/2022, has been considered.

This project has been approved to proceed with the proposed amendments.

Protocol Number: **2022/779**
Protocol Title: **Research study on payment methods for electronic gaming machines**

Annual Report Due: **11/11/2023**

Documents Approved:

Date Uploaded	Version Number	Document Name
30/11/2022	Version 2	Protocol_Version 2_Clean

Please contact the ethics office should you require further information.

Sincerely,

Associate Professor Carolyn Maccann
Chair
Psychology Review Committee (Low Risk)

The University of Sydney of Sydney HRECs are constituted and operate in accordance with the National Health and Medical Research Council's (NHMRC) National Statement on Ethical Conduct in Human Research (2018) and the NHMRC's Australian Code for the Responsible Conduct of Research (2018)

Appendix N: DCE Protocol

PROTOCOL

PRE-EXPERIMENT QUESTIONNAIRE

Red-coloured text: For researcher reference only. Participants will not see this text.

Research study on payment methods for electronic gaming machines

Thank you for agreeing to take part in this study.

SECTION 1A: GENERAL PAYMENT BEHAVIOUR

First, we would like to ask you some questions about how you usually pay for things when you are at the shops (i.e., at in-person stores, not online shopping).

We are interested in how often you pay using cash compared to cashless payments. Examples of cashless payments include debit/credit cards and smartphone payment apps (e.g., Tap & Pay, Apple Pay, Google Pay, Samsung Pay).

Thinking about the last 30 days …

PAYTYPE **How did you usually pay for things at the shops?**

- Almost always using cash
- A mix of cash and cashless payments
- Almost always using cashless payments

EWALLET **Did you use a smartphone payment app to make any payments at the shops?**

- No
- Yes

AMOCASH **How much cash did you usually carry with you (e.g., in a wallet/purse)?**

- None
- $1–$5
- $6–$10
- $11–$20
- $21–$50
- $51–$100
- More than $100

SECTION 1B: EGM PARTICIPATION

Next, we would like to ask you some questions about your gambling on electronic gaming machines ('pokies', poker/slot machines) at in-person gambling venues, such as pubs/hotels, clubs, and casinos, during the last 30 days.

Thinking about the last 30 days …

EGMFREQ **How often did you spend any money on electronic gaming machines in an in-person gambling venue, such as a pub/hotel, club, or casino?**

1–3 times in the last 30 days	Once a week	2–6 times per week	Daily

VENNUM **At how many different in-person gambling venues (e.g., pubs/hotels, clubs, casinos) did you spend money on electronic gaming machines?**

- 1 venue only
- 2–3 venues
- 4–5 venues
- 6 or more venues

VENTYPE **<u>At what types of venues</u> did you spend money on electronic gaming machines?** (Select all that apply)

- Casinos
- Clubs
- Pubs/hotels

EGMSPEND **<u>How much money did you typically put into electronic gaming machines</u> each time you went to a venue?**

- $5 or less
- $6–$10
- $11–$20
- $21–$50
- $51–$100
- More than $100

SECTION 1C: VENUE MEMBERSHIP

The next question asks you about whether you are a member at any in-person gambling venues, such as pubs/hotels, clubs, and casinos.

MEMNUM **<u>At how many different in-person gambling venues</u> (e.g., pubs/hotels, clubs, casinos) are you a member?**

- None
- 1 venue only
- 2–3 venues
- 4–5 venues
- 6 or more venues

SECTION 1D: EGM PAYMENT METHODS

The next question asks you about different ways to pay to play on electronic gaming machines ('pokies', poker/slot machines) at in-person gambling venues, such as pubs/hotels, clubs, and casinos.

EGMPAY **Which of the following payment methods have you ever used to load funds onto an electronic gaming machine?** (Select all that apply)

- Cash (banknotes and/or coins)
- A paper-based ticket or voucher (e.g., "ticket-in, ticket-out" or TITO systems involve paper-based tickets with a printed barcode that is scanned to load money onto the gaming machine)
- A plastic card registered in your name (e.g., a membership or loyalty card that is associated with your identity. The card can be loaded with money and inserted into the gaming machine to play).
- An anonymous/casual plastic card (e.g., a card that is not associated with your identity. The card can be loaded with money and inserted into the gaming machine to play).

SECTION 1E: INSTRUCTIONS FOR CHOICE TASK – PART #1

Order of questions will be randomised (other than where a specific order makes sense).

In the next part of the survey, we are going to show you a number of hypothetical profiles of cashless payment systems that you could potentially use to play on electronic gaming machines (more commonly known as 'pokies', or poker machines) at in-person gambling venues, such as pubs/hotels, clubs, and casinos.

Currently, people typically use cash to play on poker machines, such as by inserting banknotes or coins directly into the machine.

One new payment option involves introducing a cashless payment system. Below we outline some key features of the cashless payment system.

- To register for a cashless account: You could sign up for a personal cashless gambling account, which would involve providing proof of your identity. Venue staff would show you how to use the cashless payment system and its features.

- Use a card or digital wallet instead of cash: The cashless gambling account would allow you to transfer funds to and from gaming machines using a player card or a digital wallet on a smartphone instead of needing to carry cash to gamble.

- Deposits and withdrawals: You could deposit funds into the cashless gambling account by debit card, cash deposit, or bank transfer, and withdraw funds in cash or by bank transfer. Funds could not be deposited using a credit card. There would be no transaction fees for making deposits.

- Track your gambling spend with activity statements: You could easily access an activity statement summarising your spending, wins, and losses on the cashless gambling account.

- Strong security features: The cashless payment system would have strong security features to protect your personal information, and to make sure that the funds in your account could only be used by you.

- Strong privacy features: Your privacy would be strongly protected. Identifiable information from the system would only be shared as required by law, such as in cases of suspected money laundering.

- Linked with self-exclusion registers: The cashless payment system would be linked with self-exclusion registers, which allow people to voluntarily ban themselves from accessing gaming machines.

Based on the information above, please select the correct answer to each of the following four questions. Your responses will help us to make sure that you have understood the scenario. If you are unsure of the answer to a question, please re-read the information above.

ATTN1 **You can deposit funds into the cashless account using a credit card.**

- False
- True

ATTN2 **You can access an activity statement summarising your spending, wins, and losses.**

- False
- True

ATTN3 **The cashless payment system has strong security and privacy features.**

- False
- True

ATTN4 **Your cashless account is unique and associated with your verified identity.**

- False
- True

SECTION 1F: INSTRUCTIONS FOR CHOICE TASK – PART #2

We are going to show you a number of hypothetical profiles of cashless payment systems that you could potentially use to play on electronic gaming machines (more commonly known as 'pokies', or poker machines) at in-person gambling venues, such as pubs/hotels, clubs, and casinos.

We will show you the profiles of two potential systems at a time.

Each time we show you the different profiles, we want you to choose the profile of the system that you would most likely use in real life.

You will be shown 12 scenarios which ask you to choose among the two potential systems on offer.

Before we start, we will look at an example.

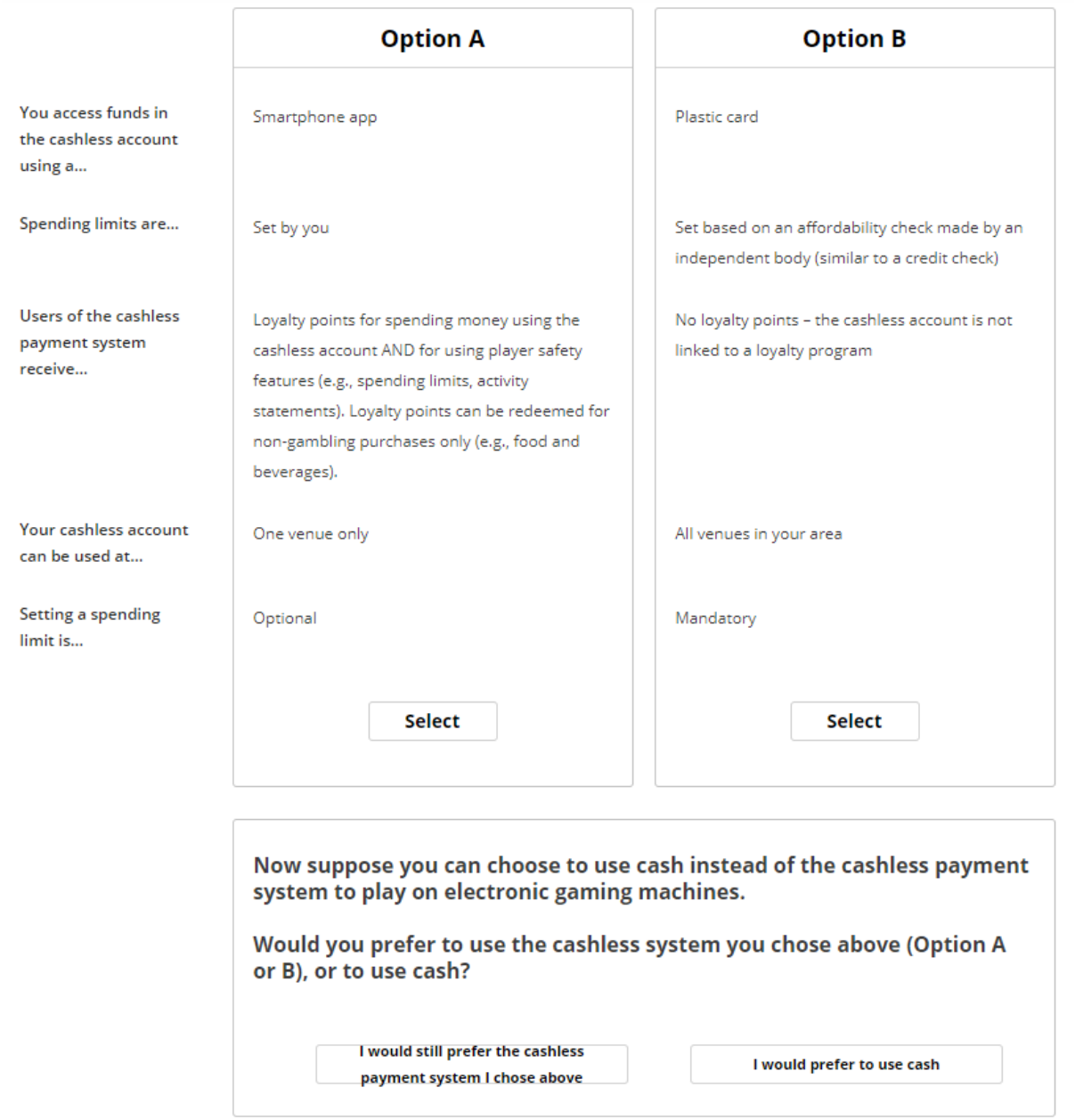
SECTION 1G: EXAMPLE CHOICE TASK

You will first be asked to choose between using two potential cashless payment systems (options A and B).

We will then ask you whether you would prefer to use the cashless payment system you chose in your first response (Option A or B), or to stick with using cash.

In making the choice, we want you to consider the following scenario:

If you were going to play on electronic gaming machines at an in-person gambling venue (e.g., a pub/hotel, club, or casino) and had to choose between the two cashless payment systems shown below, which would you prefer?



You will be shown 12 scenarios similar to the one above. Each scenario will show the profiles of different potential cashless payment systems.

We want you to select which cashless payment system you would choose in each scenario based only on the profiles shown in that scenario.

That is, we want you to think only about the two cashless payment systems shown in the scenario and not about other potential systems that might have been shown in scenarios that you have seen previously.

Please make sure that you understand the task before proceeding. Once you go to the next screen, you will not be able to go back. If you wish to re-read the instructions, please do so now.

The participant will be re-directed from Qualtrics to Sawtooth Software to complete the experimental task.

EXPERIMENTAL TASK

The experimental task will be hosted by Sawtooth Software. Participants will be presented with a series of 12 choice tasks. A sample choice task is displayed below.

When choosing between different alternatives (e.g., Option A or B), choice experiments assume that participants make trade-offs between competing features based on what they perceive to offer the greatest utility (i.e., benefit).

In each of the 12 choice tasks, participants are firstly asked to choose their preferred option between two potential cashless payment systems (options A and B). They are then asked to respond to a follow-up question about whether they would prefer to use the cashless payment system chosen in their first response (Option A or B) or to stick with using cash (if they did not have to use the cashless payment system).

If you were going to play on electronic gaming machines at an in-person gambling venue (e.g., a pub/hotel, club, or casino) and had to choose between the two cashless payment systems shown below, which would you prefer?

(1 of 12)

	Option A	Option B
You access funds in the cashless account using a...	Smartphone app	Plastic card
Spending limits are...	Set by you	Set based on an affordability check made by an independent body (similar to a credit check)
Users of the cashless payment system receive...	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements). Loyalty points can be redeemed for non-gambling purchases only (e.g., food and beverages).	No loyalty points – the cashless account is not linked to a loyalty program
Your cashless account can be used at...	One venue only	All venues in your area
Setting a spending limit is...	Optional	Mandatory
	Select	Select

Now suppose you can choose to use cash instead of the cashless payment system to play on electronic gaming machines.

Would you prefer to use the cashless system you chose above (Option A or B), or to use cash?

I would still prefer the cashless payment system I chose above

I would prefer to use cash

Back Next

0% 100%

Each choice task will be presented in the same format as the sample shown above, but the combinations of features (attribute levels) of the two alternatives being compared (options A and B) will differ. To account for presentation order effects, the order of attributes will be randomised across respondents (but kept consistent for each individual respondent).

Table N1 below contains the full set of features (attribute levels) that may be displayed to participants in the choice tasks. The choice tasks shown to participants are drawn from a matrix of combinations generated using Ngene, a specialised software program for generating designs for choice experiments.

Table N1

Attributes and Levels

Attributes	Attribute levels
You access funds in the cashless account using a…	Plastic card
	Smartphone app
Your cashless account can be used at…	One venue only
	Small group of venues in your area
	All venues in your area
Setting a spending limit is…	Optional
	Mandatory
Spending limits are…	Set by you
	Set based on an affordability check made by an independent body (similar to a credit check)
Users of the cashless payment system receive…	No loyalty points—the cashless account is not linked to a loyalty program
	Loyalty points for spending money using the cashless account. Loyalty points can be redeemed for non-gambling purchases only (e.g., food and beverages).
	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements). Loyalty points can be redeemed for non-gambling purchases only (e.g., food and beverages).

POST-EXPERIMENT QUESTIONNAIRE

After completing the experimental task, the participant will be redirected from Sawtooth Software back to Qualtrics to complete the post-experiment questionnaire.

Research study on payment methods for electronic gaming machines

Before we finish, we would like to ask some questions.

SECTION 3A: FEEDBACK ON EXPERIMENTAL TASK

The following question will be displayed in the pilot study only (i.e., not in the interview or main studies).

First, thinking about the task you just completed …

EXP1 **How difficult did you find the task?**

Very difficult	Somewhat difficult	Neither easy nor difficult	Somewhat easy	Very easy

---

SECTION 3B: DEMOGRAPHIC INFORMATION

Next, we are going to ask you some demographic questions. Please select the answer that best applies to you.

GENDER **What is your gender?**

- Female
- Male
- Other

AGE **What is your age?** Please enter numbers only.

_____

PRIMLANG **What is the primary language you speak at home?**

- English
- Arabic
- Cantonese
- Greek
- Italian
- Mandarin
- Vietnamese
- Other (please specify) ……

EDUCAT **What is the level of the highest qualification you have completed?**

- High school, Year 9 or below
- Certificate I or II
- High school, Year 10 or above
- Certificate III or IV
- Diploma or Advanced Diploma
- Bachelor Degree
- Graduate Diploma or Graduate Certificate
- Postgraduate Degree

EMPLOY **What is your current employment status?**

- Employed, working full-time
- Employed, working part-time
- Unemployed
- Home duties / full-time carer
- Retired
- Student

The following question asks about your **total income from all sources**, including wages and salaries, pensions and allowances (e.g., Centrelink payments), profit or loss from unincorporated business/farm or rental properties, and any other income, such as from superannuation, child support, or dividends from shares. **Do not deduct tax**, superannuation contributions, amounts salary sacrificed, or any other automatic deductions.

This question relates to your **personal income**, not your household income. If you are not sure, please make your best estimate.

INCOME **What is the total of all income you usually receive (before tax)?** If you are not sure, please make your best estimate.

- $1–$7,799 per year ($1–$149 per week)
- $7,800–$15,599 per year ($150–$299 per week)
- $15,600–$20,799 per year ($300–$399 per week)
- $20,800–$25,999 per year ($400–$499 per week)
- $26,000–$33,799 per year ($500–$649 per week)
- $33,800–$41,599 per year ($650–$799 per week)
- $41,600–$51,999 per year ($800–$999 per week)
- $52,000–$64,999 per year ($1,000–$1,249 per week)
- $65,000–$77,999 per year ($1,250–$1,499 per week)
- $78,000–$90,999 per year ($1,500–$1,749 per week)
- $91,000–$103,999 per year ($1,750–$1,999 per week)
- $104,000–$155,999 per year ($2,000–$2,999 per week)
- $156,000 or more per year ($3,000 or more per week)
- Nil income
- I don't know
- I prefer not to say

POSTCODE **What is your postcode?** Please enter numbers only.

_____

SECTION 3C: GAMBLING PARTICIPATION

Order of questions will be randomised (other than where a specific order makes sense).

Next, we would like to ask you about any gambling activities you took part in during the last 30 days (apart from playing electronic gaming machines).

Gambling includes any activity where you bet money on an unknown outcome (e.g., a game or sporting event) for the chance to win money.

Thinking about the last 30 days …

GAMTYPE **Did you spend any money on any of the following activities, either in an in-person gambling venue (e.g., pub/hotel, club, casino) and/or online (e.g., on a computer, mobile/smart phone, iPad)?** (Select all that apply)

- Instant scratch tickets ("scratchies")
- Lotto or lottery games, like Powerball or Oz Lotto
- Keno
- Bingo
- Private betting for real money (e.g., playing cards or mah-jong with friends and family)
- Poker
- Casino table games (e.g., blackjack, roulette)
- Betting on horse or dog races
- Betting on sports
- None of the above

The following question will only be displayed if the participant does not select 'None of the above' at GAMTYPE.

Next, we would like to ask you about <u>any gambling activities you took part in ONLINE</u> during the last 30 days. This includes any gambling activities listed in the previous question that are available online.

Thinking about the last 30 days …

ONLINE **Did you spend any money gambling online (e.g., on a computer, mobile/smart phone, iPad)?**

- No
- Yes

SECTION 3D: Problem Gambling Severity

Order of questions will be randomised (other than where a specific order makes sense).

The final set of questions asks you about your gambling during the <u>past 12 months</u>. For each question, please indicate how often the statement applied to you.

PGSI1 **How often have you bet more than you could really afford to lose?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGSI2 **How often have you needed to gamble with larger amounts of money to get the same feeling of excitement?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGSI3 **How often have you gone back another day to try to win back the money you lost?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGSI4 **How often have you borrowed money or sold anything to get money to gamble?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGSI5 **How often have you felt that you might have a problem with gambling?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGSI6 **How often have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGSI7 **How often have you felt guilty about the way you gamble, or what happens when you gamble?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGSI8 **How often has your gambling caused you any health problems, including stress or anxiety?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

PGSI9 **How often has your gambling caused any financial problems for you or your household?**

Never	Sometimes	Most of the time	Almost always
0	**1**	**2**	**3**

SECTION 3E: FEEDBACK

The following question will be displayed in the pilot study only (i.e., not in the interview or main studies).

Before we finish, we would like to ask if you have any feedback about this survey.

If there were any aspects you found difficult to understand or if you have any suggestions about how to improve the survey, please share your comments with us in the box below.

_____
_____
_____

SECTION 3F: END OF SURVEY MESSAGE

Thank you for taking part in this study!

Thank you very much for participating in this study. The aim of this study is to investigate people's preferences about cashless payment systems for electronic gaming machines at in-person gambling venues, such as pubs/hotels, clubs, and casinos.

Your responses will help us to make recommendations for policies and practices that seek to reduce gambling harm and enhance the wellbeing of Australians.

If you would like to know more about the study, please feel free to contact Professor Sally Gainsbury (sally.gainsbury@sydney.edu.au) at the University of Sydney.

If any content in this study has triggered distress or you need help for problems related to gambling, please contact your GP or the support services listed below:

- Lifeline: 13 11 14 (available 24/7) or https://www.lifeline.org.au/
- Gambling Help: 1800 858 858 (available 24/7) or https://www.gamblinghelponline.org.au/

If you are concerned about the way this study is being conducted or you wish to make a complaint to someone independent from the study, please contact the University:

Human Ethics Manager
human.ethics@sydney.edu.au
+61 2 8627 8176

Please click "Continue" below to submit the survey.

Continue

Appendix O: DCE Design Matrix

Table O1

Experimental Design Matrix

Version	Task	Concept	Form	Consistency	Limits	Amount	Loyalty
1	1	1	Plastic card	All venues in your area	Mandatory	Set by you	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
1	1	2	Smartphone app	One venue only	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account
1	2	1	Smartphone app	Small group of venues in your area	Mandatory	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
1	2	2	Plastic card	All venues in your area	Optional	Set by you	Loyalty points for spending money using the cashless account
1	3	1	Plastic card	All venues in your area	Mandatory	Set by you	No loyalty points—the cashless account is not linked to a loyalty program
1	3	2	Smartphone app	Small group of venues in your area	Optional	Set by you	Loyalty points for spending money using the cashless account
1	4	1	Smartphone app	All venues in your area	Mandatory	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account
1	4	2	Plastic card	One venue only	Optional	Set by you	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
1	5	1	Plastic card	Small group of venues in your area	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	No loyalty points—the cashless account is not linked to a loyalty program
1	5	2	Plastic card	One venue only	Mandatory	Set by you	Loyalty points for spending money using the cashless account

Version	Task	Concept	Form	Consistency	Limits	Amount	Loyalty
1	6	1	Smartphone app	One venue only	Mandatory	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
1	6	2	Plastic card	Small group of venues in your area	Optional	Set by you	Loyalty points for spending money using the cashless account
1	7	1	Plastic card	Small group of venues in your area	Optional	Set by you	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
1	7	2	Smartphone app	All venues in your area	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	No loyalty points—the cashless account is not linked to a loyalty program
1	8	1	Smartphone app	Small group of venues in your area	Mandatory	Set by you	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
1	8	2	Plastic card	All venues in your area	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account
1	9	1	Smartphone app	Small group of venues in your area	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account
1	9	2	Plastic card	All venues in your area	Mandatory	Set by you	No loyalty points—the cashless account is not linked to a loyalty program
1	10	1	Plastic card	Small group of venues in your area	Mandatory	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account
1	10	2	Smartphone app	One venue only	Optional	Set by you	No loyalty points—the cashless account is not linked to a loyalty program
1	11	1	Smartphone app	All venues in your area	Optional	Set by you	No loyalty points—the cashless account is not linked to a loyalty program
1	11	2	Plastic card	One venue only	Mandatory	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account AND for using player safety

Version	Task	Concept	Form	Consistency	Limits	Amount	Loyalty
							features (e.g., spending limits, activity statements)
1	12	1	Smartphone app	All venues in your area	Optional	Set by you	Loyalty points for spending money using the cashless account
1	12	2	Plastic card	One venue only	Mandatory	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
2	1	1	Smartphone app	Small group of venues in your area	Mandatory	Set by you	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
2	1	2	Plastic card	All venues in your area	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	No loyalty points—the cashless account is not linked to a loyalty program
2	2	1	Smartphone app	All venues in your area	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
2	2	2	Plastic card	One venue only	Mandatory	Set by you	Loyalty points for spending money using the cashless account
2	3	1	Plastic card	Small group of venues in your area	Optional	Set by you	No loyalty points—the cashless account is not linked to a loyalty program
2	3	2	Smartphone app	One venue only	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account
2	4	1	Plastic card	All venues in your area	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
2	4	2	Plastic card	One venue only	Mandatory	Set by you	No loyalty points—the cashless account is not linked to a loyalty program
2	5	1	Smartphone app	Small group of venues in your area	Mandatory	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account AND for using player safety

Version	Task	Concept	Form	Consistency	Limits	Amount	Loyalty
							features (e.g., spending limits, activity statements)
2	5	2	Plastic card	One venue only	Optional	Set by you	Loyalty points for spending money using the cashless account
2	6	1	Plastic card	All venues in your area	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	No loyalty points—the cashless account is not linked to a loyalty program
2	6	2	Smartphone app	One venue only	Optional	Set by you	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
2	7	1	Plastic card	Small group of venues in your area	Mandatory	Set based on an affordability check made by an independent body (similar to a credit check)	No loyalty points—the cashless account is not linked to a loyalty program
2	7	2	Smartphone app	All venues in your area	Optional	Set by you	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
2	8	1	Plastic card	All venues in your area	Mandatory	Set by you	Loyalty points for spending money using the cashless account
2	8	2	Smartphone app	One venue only	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	No loyalty points—the cashless account is not linked to a loyalty program
2	9	1	Smartphone app	One venue only	Optional	Set by you	No loyalty points—the cashless account is not linked to a loyalty program
2	9	2	Plastic card	All venues in your area	Mandatory	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
2	10	1	Plastic card	One venue only	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
2	10	2	Smartphone app	All venues in your area	Mandatory	Set by you	Loyalty points for spending money using the cashless account

Version	Task	Concept	Form	Consistency	Limits	Amount	Loyalty
2	11	1	Smartphone app	All venues in your area	Mandatory	Set by you	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)
2	11	2	Plastic card	Small group of venues in your area	Optional	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account
2	12	1	Smartphone app	All venues in your area	Mandatory	Set based on an affordability check made by an independent body (similar to a credit check)	Loyalty points for spending money using the cashless account
2	12	2	Plastic card	Small group of venues in your area	Optional	Set by you	Loyalty points for spending money using the cashless account AND for using player safety features (e.g., spending limits, activity statements)

Appendix P: Coding Scheme for DCE Sociodemographic Variables

Table P1

Coding Scheme for Sociodemographic Variables

Variable	Measure	Coding scheme for analysis
Cashless payment adoption status (CASHLESS)	SECTION 1A: GENERAL PAYMENT BEHAVIOUR – PAYTYPE Thinking about the last 30 days … How did you usually pay for things at the shops? • Almost always using cash • A mix of cash and cashless payments • Almost always using cashless payments	1 = *Almost always using cashless payments*; 0 = other
Smartphone payment adoption status (MOBILE)	SECTION 1A: GENERAL PAYMENT BEHAVIOUR – EWALLET Thinking about the last 30 days … Did you use a smartphone payment app to make any payments at the shops? • No • Yes	1 = *Yes*; 0 = *No*
Frequency of using EGMs at in-person gambling venues (EGMDAYS)	SECTION 1B: EGM PARTICIPATION – EGMFREQ Next, we would like to ask you some questions about your gambling on electronic gaming machines ("pokies", poker/slot machines) at in-person gambling venues, such as pubs/hotels, clubs, and casinos, during the last 30 days. Thinking about the last 30 days … How often did you spend any money on electronic gaming machines in an in-person gambling venue, such as a pub/hotel, club, or casino? • 1–3 times in the last 30 days • Once a week • 2–6 times per week • Daily	Recoded as continuous (days per month) as follows: *1–3 times in the last 30 days* = 2 (the average of "1–3 times"); *Once a week* = 4.29 (calculated as 30-day month divided by 7); *2–6 times per week* = 17.14 (calculated as a 30-day month divided by 7, multiplied by 4 [the average of "2–6 times per week"]); *Daily* = 30. Mean-centred.
Number of different in-person gambling venues visited to use EGMs (VENCOUNT)	SECTION 1B: EGM PARTICIPATION – VENNUM Thinking about the last 30 days … At how many different in-person gambling venues (e.g., pubs/hotels, clubs, casinos) did you spend money on electronic gaming machines?	Recoded as continuous as follows: *1 venue only* = 1; *2–3 venues* = 2.5; *4–5 venues* = 4.5; *6 or more venues* = 6.5. Mean-centred.

Variable	Measure	Coding scheme for analysis
	• 1 venue only • 2–3 venues • 4–5 venues • 6 or more venues	
Casino-based EGM gambling status (CASINO)	SECTION 1B: EGM PARTICIPATION – VENTYPE Thinking about the last 30 days … At what types of venues did you spend money on electronic gaming machines? (Select all that apply) • Casinos • Clubs • Pubs/hotels	1 = *Casinos*; 0 = other
Club-based EGM gambling status (CLUB)	SECTION 1B: EGM PARTICIPATION – VENTYPE Thinking about the last 30 days … At what types of venues did you spend money on electronic gaming machines? (Select all that apply) • Casinos • Clubs • Pubs/hotels	1 = *Clubs*; 0 = other
Pub-based EGM gambling status (PUB)	SECTION 1B: EGM PARTICIPATION – VENTYPE Thinking about the last 30 days … At what types of venues did you spend money on electronic gaming machines? (Select all that apply) • Casinos • Clubs • Pubs/hotels	1 = *Pubs/hotels*; 0 = other

Variable	Measure	Coding scheme for analysis
Typical amount of money put into EGMs on each visit to a venue (EGMDLRS)	SECTION 1B: EGM PARTICIPATION – EGMSPEND Thinking about the last 30 days … How much money did you typically put into electronic gaming machines each time you went to a venue? • $5 or less • $6–$10 • $11–$20 • $21–$50 • $51–$100 • More than $100	Recoded as continuous as follows: *$5 or less* = 2.5; *$6–$10* = 8; *$11–$20* = 15.5; *$21–$50* = 35.5; *$51–$100* = 75.5; *More than $100* = 101. Mean-centred.
Number of memberships at different in-person gambling venues (MEMCOUNT)	SECTION 1C: VENUE MEMBERSHIP – MEMNUM The next question asks you about whether you are a member at any in-person gambling venues, such as pubs/hotels, clubs, and casinos. At how many different in-person gambling venues (e.g., pubs/hotels, clubs, casinos) are you a member? • None • 1 venue only • 2–3 venues • 4–5 venues • 6 or more venues	Recoded as continuous as follows: *None* = 0; *1 venue only* = 1; *2–3 venues* = 2.5; *4–5 venues* = 4.5; *6 or more venues* = 6.5. Mean-centred.

Variable	Measure	Coding scheme for analysis
Prior registered card-based cashless experience status (CARDUSER)	SECTION 1D: EGM PAYMENT METHODS – EGMPAY The next question asks you about different ways to pay to play on electronic gaming machines ('pokies', poker/slot machines) at in-person gambling venues, such as pubs/hotels, clubs, and casinos. Which of the following payment methods have you ever used to load funds onto an electronic gaming machine? (Select all that apply) • Cash (banknotes and/or coins) • A paper-based ticket or voucher (e.g., "ticket-in, ticket-out" or TITO systems involve paper-based tickets with a printed barcode that is scanned to load money onto the gaming machine) • A plastic card registered in your name (e.g., a membership or loyalty card that is associated with your identity. The card can be loaded with money and inserted into the gaming machine to play). • An anonymous/casual plastic card (e.g., a card that is not associated with your identity. The card can be loaded with money and inserted into the gaming machine to play).	1 = *A plastic card registered in your name*; 0 = other
Gender (GEND)	SECTION 3B: DEMOGRAPHIC INFORMATION – GENDER What is your gender? • Female • Male • Other	0 = *Female*; 1 = *Male*
Age (AGE)	SECTION 3B: DEMOGRAPHIC INFORMATION – AGE What is your age? Please enter numbers only.	Age in years. Mean-centred.
Primary language spoken at home (ENGLISH)	SECTION 3B: DEMOGRAPHIC INFORMATION – PRIMLANG What is the primary language you speak at home? • English • Arabic • Cantonese • Greek • Italian • Mandarin • Vietnamese • Other (please specify) ……	1 = *English*; 0 = other

Variable	Measure	Coding scheme for analysis
Non-school qualification status (NONSCHL)	SECTION 3B: DEMOGRAPHIC INFORMATION – EDUCAT What is the level of the highest qualification you have completed? • High school, Year 9 or below • Certificate I or II • High school, Year 10 or above • Certificate III or IV • Diploma or Advanced Diploma • Bachelor Degree • Graduate Diploma or Graduate Certificate • Postgraduate Degree	1 = non-school qualification completed (*Certificate I or II*; *Certificate III or IV*; *Diploma or Advanced Diploma*; *Bachelor Degree*; *Graduate Diploma or Graduate Certificate*; *Postgraduate Degree*) (Australian Bureau of Statistics, 2021); 0 = other (*High school, Year 9 or below*; *High school, Year 10 or above*)
Employment status (EMPLOYED)	SECTION 3B: DEMOGRAPHIC INFORMATION – EMPLOY What is your current employment status? • Employed, working full-time • Employed, working part-time • Unemployed • Home duties / full-time carer • Retired • Student	1 = employed (*Employed, working full-time*; *Employed, working part-time*); 0 = other

Variable	Measure	Coding scheme for analysis
Annual personal income (before tax) (INCDLRS)	SECTION 3B: DEMOGRAPHIC INFORMATION – INCOME The following question asks about your total income from all sources, including wages and salaries, pensions and allowances (e.g., Centrelink payments), profit or loss from unincorporated business/farm or rental properties, and any other income, such as from superannuation, child support, or dividends from shares. Do not deduct tax, superannuation contributions, amounts salary sacrificed, or any other automatic deductions. This question relates to your personal income, not your household income. If you are not sure, please make your best estimate. What is the total of all income you usually receive (before tax)? If you are not sure, please make your best estimate. • $1–$7,799 per year ($1–$149 per week) • $7,800–$15,599 per year ($150–$299 per week) • $15,600–$20,799 per year ($300–$399 per week) • $20,800–$25,999 per year ($400–$499 per week) • $26,000–$33,799 per year ($500–$649 per week) • $33,800–$41,599 per year ($650–$799 per week) • $41,600–$51,999 per year ($800–$999 per week) • $52,000–$64,999 per year ($1,000–$1,249 per week) • $65,000–$77,999 per year ($1,250–$1,499 per week) • $78,000–$90,999 per year ($1,500–$1,749 per week) • $91,000–$103,999 per year ($1,750–$1,999 per week) • $104,000–$155,999 per year ($2,000–$2,999 per week) • $156,000 or more per year ($3,000 or more per week) • Nil income • I don't know • I prefer not to say	Median split after recoding responses as continuous using the average of the lower and upper annual amounts per income bracket. 1 = above median (AUD $97,500); 0 = equal to or below median
Neighbourhood advantage/disadvantage (IRSAD)	SECTION 3B: DEMOGRAPHIC INFORMATION – POSTCODE What is your postcode? Please enter numbers only.	Decile on the Index of Relative Socio-economic Advantage and Disadvantage (IRSAD) from the Australian Bureau of Statistics' Socio-economic Indexes for Areas (SEIFA) 2016 (2018b). Coded based on the respondent's postcode. The most disadvantaged 10% of areas has a decile number of 1; the most advantaged 10% of areas has a decile number of 10. Mean-centred.

Variable	Measure	Coding scheme for analysis
Geographical remoteness (REMOTE)	SECTION 3B: DEMOGRAPHIC INFORMATION – POSTCODE What is your postcode? Please enter numbers only.	1 = regional/remote Australia (*Inner regional Australia*; *Outer regional Australia*; *Remote Australia*; *Very remote Australia*); 0 = major cities of Australia. Coded based on the respondent's postcode using the Australian Statistical Geography Standard's Remoteness Structure (Australian Bureau of Statistics, 2018a).
Gambling breadth (number of gambling activities) (BREADTH)	SECTION 3C: GAMBLING PARTICIPATION – GAMTYPE Next, we would like to ask you about any gambling activities you took part in during the last 30 days (apart from playing electronic gaming machines). Gambling includes any activity where you bet money on an unknown outcome (e.g., a game or sporting event) for the chance to win money. Thinking about the last 30 days … Did you spend any money on any of the following activities, either in an in-person gambling venue (e.g., pub/hotel, club, casino) and/or online (e.g., on a computer, mobile/smart phone, iPad)? (Select all that apply) • Instant scratch tickets ("scratchies") • Lotto or lottery games, like Powerball or Oz Lotto • Keno • Bingo • Private betting for real money (e.g., playing cards or mah-jong with friends and family) • Poker • Casino table games (e.g., blackjack, roulette) • Betting on horse or dog races • Betting on sports • None of the above	Count of gambling activities in which the respondent reported participating in the past 30 days, including EGMs. Minimum possible score is 1 given EGM gambling was a study eligibility criterion (i.e., if respondent selects "None of the above", gambling breadth = 1). Maximum possible score is 10. Mean-centred.

Variable	Measure	Coding scheme for analysis
Online gambling status (ONLGAMB)	SECTION 3C: GAMBLING PARTICIPATION – ONLINE Next, we would like to ask you about any gambling activities you took part in ONLINE during the last 30 days. This includes any gambling activities listed in the previous question that are available online. Thinking about the last 30 days … Did you spend any money gambling online (e.g., on a computer, mobile/smart phone, iPad)? • No • Yes	1 = *Yes*; 0 = *No*/missing (survey question was not displayed to respondents who selected "None of the above" at GAMTYPE)
Problem gambling severity (PGSI)	Past-year Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001)	Nine items scored on a 4-point scale (*never* = 0; *almost always* = 3) are summed to yield a total PGSI score, which can be classified as follows: non-problem gambling = 0; low-risk gambling = 1-2; moderate-risk gambling = 3-7; problem gambling = 8-27. Mean-centred.

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Appendix Q: Error Components Panel Model Including Unforced Choice Observations Only

Table Q1

Error Components Panel Model Including Unforced Choice Observations Only

Variables	Model including individual-level variables[a]			
	Coefficient (SE)	*p*	Standard deviation (SE)	*p*
Attributes[b]				
Physical form of cashless payment				
Plastic card	0 (ref)	…	0 (ref)	…
Smartphone	.22 (.07)	.001	.64 (.07)	<.001
Consistency across venues				
One venue only	0 (ref)	…	0 (ref)	…
Small group of venues	.77[#] (.07)	<.001	…	…
All venues	.74[#] (.06)	<.001	…	…
Choice in whether to set a spending limit				
Optional	0 (ref)	…	0 (ref)	…
Mandatory	.24 (.06)	<.001	.47 (.07)	<.001
Choice in setting the spending limit amount				
Self-imposed	0 (ref)	…	0 (ref)	…
Affordability check	-.07 (.07)	.308	.76 (.07)	<.001
Loyalty scheme integration				
None	0 (ref)	…	0 (ref)	…
Loyalty points for spending money only	.05[#] (.07)	.466	…	…

Variables	Model including individual-level variables[a]			
	Coefficient (SE)	*p*	Standard deviation (SE)	*p*
Loyalty points for spending money and using player safety features	.56[#] (.07)	<.001	…	…
Opt-out[c]	3.12 (1.05)	.003	…	…
Error component[d]	…	…	-2.38 (.15)	<.001
Sociodemographic variables[e]				
Age (years)[f]	-.08 (.02)	<.001	…	…
Gender				
Female	0 (ref)	…	…	…
Male	.53 (.34)	.117	…	…
Primary language spoken at home				
Non-English	0 (ref)	…	…	…
English	-.96 (.64)	.135	…	…
Non-school qualification status				
Have not completed a non-school qualification	0 (ref)	…	…	…
Completed a non-school qualification	.20 (.60)	.745	…	…
Employment status				
Not employed full- or part-time	0 (ref)	…	…	…
Employed full- or part-time	1.06 (.51)	.037	…	…
Annual personal income (before tax)				
Equal to or below median (≤ $97,500)	0 (ref)	…	…	…
Above median (> $97,500)	-.40 (.38)	.295	…	…
Neighbourhood advantage/disadvantage				
IRSAD decile[f]	.09 (.07)	.194	…	…

Variables	Model including individual-level variables[a]			
	Coefficient (SE)	*p*	Standard deviation (SE)	*p*
Geographical remoteness				
Major cities of Australia	0 (ref)	…	…	…
Regional or remote Australia	.25 (.84)	.764	…	…
Variables related to payment behaviour for in-person retail settings[e]				
Cashless payment adoption (past 30 days)				
Using a mix of cash and cashless payments, or almost always using cash	0 (ref)	…	…	…
Almost always using cashless payments	1.73 (.39)	<.001	…	…
Smartphone payment adoption (past 30 days)				
Did not use smartphone payment app	0 (ref)	…	…	…
Used smartphone payment app	1.04 (.41)	.011	…	…
Variables related to gambling behaviour[e]				
Number of days using EGMs at in-person gambling venues (past 30 days)[f]	-.001 (.03)	.983	…	…
Number of different in-person gambling venues visited to use EGMs (past 30 days)[f]	.06 (.21)	.772	…	…
Casino-based EGM gambling (past 30 days)				
Did not use EGMs at casinos	0 (ref)	…	…	…
Used EGMs at casinos	.50 (.46)	.282	…	…
Club-based EGM gambling (past 30 days)				
Did not use EGMs at clubs	0 (ref)	…	…	…
Used EGMs at clubs	-.60 (.40)	.130	…	…
Pub-based EGM gambling (past 30 days)				
Did not use EGMs at pubs/hotels	0 (ref)	…	…	…
Used EGMs at pubs/hotels	-.21 (.40)	.605	…	…

Variables	Model including individual-level variables[a]			
	Coefficient (SE)	*p*	Standard deviation (SE)	*p*
Typical amount of money put into EGMs on each visit to a venue (AUD, past 30 days)[f]	-.005 (.005)	.374	…	…
Number of memberships at different in-person gambling venues[f]	.20 (.12)	.091	…	…
Prior experience using identity-linked card-based cashless gambling systems				
No	0 (ref)	…	…	…
Yes	.45 (.40)	.257	…	…
Gambling breadth (past 30 days)[f,g]	-.04 (.12)	.710	…	…
Online gambling status (past 30 days)				
Did not spend money gambling online	0 (ref)	…	…	…
Spent money gambling online	.48 (.41)	.244	…	…
PGSI score (past 12 months)[f]	-.002 (.03)	.942	…	…
Observations	4031			
K	33			
Log likelihood function	-3193.56			
AIC	6453.1			
AIC/N	1.601			

Note. AIC = Akaike Information Criterion; IRSAD = Index of Relative Socio-economic Advantage and Disadvantage; *K* = number of parameters in the model; PGSI = Problem Gambling Severity Index. [a]Panel data from 336 respondents (cases with missing data related to the individual-level variables were excluded from the model). Individual-level variables were added as main effects to the utility functions of alternatives related to cashless gambling systems (i.e., not the opt-out alternative). [b]All attributes and the alternative-specific constant for the opt-out alternative were specified as normally-distributed random parameters aside from those marked with a hash (#), which were specified as non-random parameters. [c]The opt-out alternative refers to the scenario in which the participant responded to the unforced choice component of the choice task by indicating that they would prefer to use cash over the cashless system selected in the forced choice component. [d]Alternatives related to cashless gambling systems were grouped in the error component (i.e., separated from the opt-out alternative). [e]Individual-level variables were specified as non-random parameters. [f]Continuous variables are mean-centred. [g]The count of gambling activities in which the respondent reported participating in the past 30 days, including EGMs. Possible scores range between 1–10.

Appendix R: Error Components Panel Models by PGSI Category

Table R1

Error Components Panel Models by PGSI Category

Attributes[a]	**Non-problem gambling** (n = 38)				**Low-risk gambling** (n = 49)				**Moderate-risk gambling** (n = 158)				**Problem gambling** (n = 110)			
	Coeff. (SE)	*p*	SD (SE)	*p*	Coeff. (SE)	*p*	SD (SE)	*p*	Coeff. (SE)	*p*	SD (SE)	*p*	Coeff. (SE)	*p*	SD (SE)	*p*
Physical form of cashless payment																
Plastic card	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…
Smartphone	-.81 (.56)	.149	2.55 (.41)	<.001	-.64 (.30)	.033	2.70 (.27)	<.001	.33 (.08)	<.001	.74 (.06)	<.001	.20 (.11)	.058	1.05 (.07)	<.001
Consistency across venues																
One venue only	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…
Small group of venues	.50[#] (.20)	.012	…	…	.54[#] (.15)	<.001	…	…	1.28 (.10)	<.001	.67 (.11)	<.001	.69 (.12)	<.001	.89 (.11)	<.001
All venues	.79[#] (.15)	<.001	…	…	.78 (.20)	<.001	.79 (.24)	.001	1.00 (.08)	<.001	.63 (.10)	<.001	.64 (.10)	<.001	.88 (.10)	<.001
Choice in whether to set a spending limit																
Optional	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…
Mandatory	-.17 (.33)	.611	.96 (.21)	<.001	.18 (.23)	.437	1.46 (.23)	<.001	.46 (.09)	<.001	.97 (.09)	<.001	.36 (.10)	<.001	.69 (.10)	<.001

Attributes[a]	Non-problem gambling (n = 38)				Low-risk gambling (n = 49)				Moderate-risk gambling (n = 158)				Problem gambling (n = 110)			
	Coeff. (SE)	*p*	SD (SE)	*p*	Coeff. (SE)	*p*	SD (SE)	*p*	Coeff. (SE)	*p*	SD (SE)	*p*	Coeff. (SE)	*p*	SD (SE)	*p*
Choice in setting the spending limit amount																
Self-imposed	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…
Affordability check	-.58 (.39)	.131	1.51 (.27)	<.001	-1.04 (.22)	<.001	2.70 (.33)	<.001	.11 (.10)	.261	1.30 (.07)	<.001	-.21 (.14)	.124	1.44 (.11)	<.001
Loyalty scheme integration																
None	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…	0 (ref)	…
Loyalty points for spending money only	.76[#] (.14)	<.001	…	…	.81 (.27)	.003	1.40 (.28)	<.001	-.06 (.09)	.528	.66 (.08)	<.001	-.18 (.10)	.066	.70 (.12)	<.001
Loyalty points for spending money and using player safety features	1.27[#] (.16)	<.001	…	…	.12 (.36)	.737	1.71 (.28)	<.001	.79 (.09)	<.001	.83 (.07)	<.001	.32 (.09)	<.001	.63 (.11)	<.001
Opt-out[b]	1.88 (.91)	.039	3.30 (1.42)	.020	1.83 (.57)	.001	1.36 (.61)	.026	1.07 (.22)	<.001	2.06 (.18)	<.001	1.58 (.24)	<.001	.95 (.33)	.004
Error component[c]	…	…	-6.78 (1.92)	<.001	…	…	6.22 (1.31)	<.001	…	…	-.34 (.31)	.273	…	…	-2.16 (.22)	<.001
Observations	912				1176				3792				2638			
K	13				16				17				17			
Log likelihood function	-428				-574				-2595				-1844			
AIC	881				1170				5223				3723			
AIC/N	.966				1.003				1.377				1.411			

Note. AIC = Akaike Information Criterion; Coeff. = Coefficient; *K* = number of parameters in the model; PGSI = Problem Gambling Severity Index; SD = standard deviation; SE = standard error. [a]All attributes and the alternative-specific constant for the opt-out alternative were specified as normally-distributed random parameters aside from those

marked with a hash (#), which were specified as non-random parameters. [b]The opt-out alternative refers to the scenario in which the participant responded to the unforced choice component of the choice task by indicating that they would prefer to use cash over the cashless system selected in the forced choice component. [c]Alternatives related to cashless gambling systems were grouped in the error component (i.e., separated from the opt-out alternative).