HEDGE YOUR BETS: DESIGN, IMPLEMENTATION, AND EVALUATION OF AN ONLINE GAMBLING HARM REDUCTION PROGRAM FOR OFFENDER POPULATIONS

JAMI ALBRIGHT-TOLMAN
Bachelor of Arts, Thompson Rivers University, 2002
Master of Arts, University of Lethbridge, 2019

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Dr. Robert Williams Thesis Supervisor	Professor	PhD
Dr. Robert Wood Thesis Committee Member University of Alberta Edmonton, Alberta	Dean, Faculty of Arts	PhD
Dr. Tom Perks Thesis Committee Member	Associate Professor	PhD
Dr. Amanda Roberts External Examiner University of Lincoln Lincoln, England	Professor	PhD
Dr. James Sanders Chair, Thesis Examination Committee	Associate Professor	PhD

DEDICATION

To my family, whose love and support has been integral to my success in this endeavour. To my colleagues in corrections, who go to work everyday facing personal risk and repeated trauma to do their very important part in protecting public safety, despite the lack of resources and minimal support they constantly face. And finally, to all the clients I have worked with over the years in corrections: I really do believe every one of you has the potential to change, to overcome your past trauma and become the person you want to be. With resources, support, and hard work, anything is possible. Remember, being brave doesn't mean you aren't afraid, it means you do what needs to be done despite your fear.

ABSTRACT

Gambling is a common recreational activity that may cause harm to the gambler, their family and friends, and society. Though gambling only causes harm to a small proportion of the general population, it impacts offender populations (consisting of criminal offenders) at much higher rates. Due to unique demographic and subculture factors, offenders are both highly susceptible to gambling harm and less affected by programs designed to address that harm. In this dissertation, I present the development and evaluation of an online gambling harm reduction program for offenders, their family, and those who or live or work with offenders. The program, called *Hedge Your Bets*, teaches participants about gambling through four online modules that required a demonstration of mastery before proceeding to the next module: (1) gambling knowledge, (2) gambling fallacies, (3) gambling-related mathematical skills, and (4) gambling problems, with each module being delivered one week apart. A total of 84 adults were initially recruited into the study, with 27 of these having criminal convictions and 57 having either worked with offenders or being a close friend or family member. A total of 58 individuals completed the post-program assessment one week after the final module and 53 completed the follow-up survey three weeks after that. Longitudinally, the four modules were effective at creating gambling-related knowledge and skills that were associated with more negative attitudes toward gambling over time as well as decreased gambling behavior, with this latter effect being more pronounced for the offender group. Thus, *Hedge Your Bets* appears to be a promising program for reducing gambling-related harm in offender populations, though future research should be conducted with larger sample sizes of offenders.

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Researcher Positionality

At the outset of this dissertation, I think it is important to acknowledge my own position in relation to the subject matter of my research. I have significant experience working in the Canadian corrections industry. During my nearly two-decade career, I worked as a uniformed correctional officer (or "prison guard"), an institutional parole officer, a community parole officer, and occasionally as a parole officer supervisor. Thus, I worked both inside prisons and in the community. Further, all my experience has been operational, meaning I worked directly with offenders. This experience means that I have a great deal of knowledge about the correctional system and offenders. This research includes my operational knowledge and observations of offenders, the offender subculture, and the corrections system. Throughout this dissertation, I have stated where I have included my operational knowledge and/or observations.

Introduction

In Canada, gambling is a recreational activity that takes many forms. Most Canadians accept that legal gambling is a legitimate recreational activity and the majority gamble at least occasionally (Williams et al., 2020). However, for a small proportion of the population, gambling becomes problematic and leads to significant harms to personal health, interpersonal relationships, and community wellness (Livingstone, 2020). Globally, between 0.1% and 5.8% of the population have problems with gambling depending on the particular time period and jurisdiction (Calado & Griffiths, 2015; Gabellini et al., 2023; Williams et al., 2012). People who experience problems with gambling are called commonly called "problem gamblers"; however, throughout this dissertation, I will use the term "people with gambling problems" unless I am referring to those who meet the criteria for a problem gambling designation (according to a screening tool or diagnostic process), in which case I will use the term "problem gamblers." Problem gambling causes harm to the gambler, their family and friends, and society (McIntosh & O'Neill, 2017). However, gamblers can experience gambling harm without being categorized as a problem gambler (Langham et al., 2016). As most gambling researchers agree on Langham and colleague's (2016) conceptual framework of gambling harm (Browne et al., 2018; Latvala et al., 2021; Williams et al., 2017), I use the their definition of gambling harm in this study: "Any initial or exacerbated adverse consequence due to an engagement with gambling that leads to a decrement to the health or wellbeing of an individual, family unit, community or population" (p. 4).

Significance of Problem Gambling and Gambling Harm among Offender Populations

The prevalence of gambling problems and gambling-related harm is much higher in offender populations,[1] with estimates ranging from 5.9% to 73% around the globe (Banks et al., 2019). In the literature, a commonly accepted prevalence rate for gambling problems among offender populations is between 25% and 33% (Turner et al., 2013a; Williams et al., 2005). As will be discussed, offenders have

[1] Offender populations is the term I use throughout this dissertation to include those who are serving, or have served, a criminal sentence. I use this term because it is inclusive of those in prison (more commonly known as "inmates") and those serving their sentences in the community. I chose not to use the term "forensic populations" because, in the correctional system, this term is commonly used when referring to the inmate population (not including offenders serving community sentences).

many more risk factors for gambling problems, and their gambling problems also motivate additional criminal behaviour (Turner et al., 2013a). Despite this strong association with gambling problems, the corrections industry has done very little to address this issue (Adolphe et al., 2018; Riley & Oakes, 2015; Turner et al., 2017).

Most people who become criminal offenders face multiple disadvantages that lead to negative life outcomes. Experiences of poverty, neglect, abuse, poor mental health, and discrimination (e.g., racism, sexism, etc.) are risk factors for criminal activity (Public Safety Canada, 2015). People who survive this type of trauma and experience negative life outcomes have often developed maladaptive coping mechanisms that may include problematic gambling behavior. These coping mechanisms allow them to escape their reality and avoid their negative emotions (Blaszczynski & Nower, 2002) and further increase their likelihood of engaging in criminal behavior (Public Safety Canada, 2015).

The disadvantages outlined above are also risk factors for developing gambling problems (Dowling et al., 2017; Roberts et al., 2017) or substance addictions (LeTendre & Reed, 2017). In fact, antisocial behaviors like substance abuse, problem gambling, and criminal activity can be viewed as maladaptive coping mechanisms used by traumatized people as survival strategies. Though these maladaptive coping mechanisms also cause harm to the person using them, that harm is uncertain and distant; something that might occur at some point in the future. In contrast, the relief brought about by these negative maladaptive coping mechanisms is an immediate and thus a strong reinforcer (Blaszczynski & Nower, 2002). The more powerful and frequent the reinforcer, the more likely the behavior is to continue (Blaszczynski & Nower, 2002). Therefore, most offenders use these maladaptive coping mechanisms despite the long-term harm they cause. Altogether, then, offenders are at high risk for developing problem gambling and gambling harm.

When it comes to gambling, harm can take many forms including emotional/ psychological, physical health, social, interpersonal/relationship, financial, and legal. Offenders experience difficulty in all of these domains at greater levels than the general population even if they do not gamble (Kouyoumdjian et al., 2016). For example, offender populations experience emotional problems and comorbid psychiatric disorders at rates significantly higher than those in the general population (Kouyoumdjian et al., 2016; Preston et al., 2012). Financial harm is also commonplace among offender populations as many

offenders come from low-income backgrounds and experience insufficient employment or unemployment (Engelen et al., 2016). Additionally, the familial and interpersonal relationships of offenders are often disrupted by their incarceration, and rebuilding these relationships is challenging (DeHart et al., 2018). For non-offender populations, this litany of harms can be caused by problem gambling. For offender populations, most of these harms are already occurring, whether the offender is a gambler or not. For offenders who are gamblers, these harms are intensified. This intensified experience of harm is not, however, the only reason that problem gambling is significant for offender populations.

Problem gambling is also a criminogenic[2] factor associated with criminal behavior (Riley & Oakes, 2015; Turner et al., 2009; Turner et al., 2013a). Turner et al. (2009) surveyed male federal offenders in Canada (*n* = 254) and conducted follow-up in-depth interviews with 106 of these participants. They found that more than 65% of severe problem gamblers (n = 23) attributed their criminal behavior to their gambling. In moderate problem gamblers (n = 30), the proportion dropped to 20%. Participants interviewed by Turner and colleagues (2009) made the following statements about the relationship between their criminal behavior and their gambling (p. 163):

- "Gambling led to debt, my debt led to crime… and around it goes."
- "Robbery was committed to pay off a loan that was taken out to pay off an earlier gambling debt."
- "Took up muscling for bookie in order to pay off gambling debts. Involvement in criminal lifestyle led to more gambling, specifically when collecting would offer debtor opportunity to bet double or nothing."
- "I was bringing in $5,000/wk and had to spend it somewhere."
- "Card games held privately therefore illegal. Criminal peers enjoyed gambling therefore I gambled as well."
- "Crime provided more time and disposable income to gamble with and paid bills. Had more money to gamble with."
- "Used proceeds to gamble with and committed property crimes to pay off gambling debts."

[2] Criminogenic factors are dynamic risk that contribute directly to criminal behavior (Public Safety Canada, n.d.).

These statements demonstrate that the relationship between problem gambling and criminal behavior is complex. In some cases, it appears that gambling led to criminal behavior. In others, the relationship appears to be bi-directional, with each activity leading to the other. And in still other cases, gambling is simply part of the overall criminal lifestyle; a component of the offender subculture (Turner et al., 2009). A subculture is a set of norms and informal behavior expectations within a subgroup of the broader population (Mitchell et al., 2017).

There is a complex relationship between gambling and crime, wherein engaging in gambling may, depending on the nature and severity, contribute to criminal recidivism. Recidivism is a criminal offender's likelihood of relapsing into criminal behavior (Correctional Service of Canada, 2019a). Low rates of recidivism are considered an indicator that rehabilitation works (Correctional Service of Canada, 2019a). The opposite also holds true; as recidivism rates increase, the success of rehabilitation efforts is called into question. For these reasons, reducing recidivism is one of the foremost concerns of the correctional system in Canada.[3] Recidivism is reduced by addressing the risk factors that contributed to each offender becoming involved in criminal activity (Correctional Service of Canada, 2019a). These risk factors are addressed through treatment programs (which typically address mental health or addictions) or correctional programming (which addresses criminogenic factors) to reduce their impact on the offender's behavior and thereby reduce the offender's risk for recidivism (Correctional Service of Canada, 2019b). We know that moderate to severe problem gambling is a risk factor that contributes to recidivism (Turner et al., 2009; Turner et al., 2013a). We know that offenders' experiences of gambling-related harms are intensified by the numerous comorbid harms they experience (Blaszczynski & Nower, 2002). We know that the more harm offenders suffer, the more maladaptive coping mechanisms they will use in efforts to find relief (Preston et al., 2012). For all these reasons, problem gambling and gambling harm should be treated as contributing factors to criminal recidivism in cases where gambling is, in fact, a contributing factor.

[3] The correctional system in Canada is a system that operates at both the federal and provincial levels and is responsible for incarcerating, rehabilitating, and supervising criminal offenders.

Despite the obvious need, very little has been done to address either problem gambling or gambling harm within the Canadian corrections system (Banks et al., 2019; Turner et al., 2017). The few programs that have been offered have been generalized problem gambling prevention programs that neither consider nor address the unique factors common to offender populations. More specifically, gambling is typically an integral part of both low- and working-class cultures as well as the offender subculture (Beauregard et al., 2013; Binde & Romild, 2020). Hence, it may be difficult or impossible for offenders to quit gambling altogether. For these reasons, it likely makes more sense to provide education around *gambling harm reduction* rather than elimination or prevention of gambling. Next, I will review the literature relevant to this project.

Chapter 1: Literature Review

The current studies involved the design, implementation, and evaluation of *Hedge Your Bets*, a free, multi-session, online gambling harm reduction program tailored to meet the needs of the offender population. In the literature review below, I will explore the importance of harm reduction approaches in general and more specifically for offender populations, as well as the theoretical frameworks that informed the design and evaluation of the *Hedge Your Bets* program.

Harm Reduction

The goal of harm reduction is to minimize the negative effects of a behavior rather than eliminate the behavior (Hawk et al., 2017). Harm reduction has been successfully applied to behaviors such as addiction (Hawk et al., 2017), tobacco smoking/e-cigarette substitutions (Ritter & Cameron, 2006), alcohol consumption (Anderson et al., 2009), and sex work (Jana et al., 2006). Harm reduction programs are cost-effective, feasible, and successful at reducing negative outcomes (Hawk et al., 2017). Further, harm reduction is often successful where abstinence-based programs are not (Hawk et al., 2017). In situations where abstinence is unlikely, it is worthwhile in terms of both the financial and human costs to reduce harm. Researchers provide some guidance in reducing gambling harm, specifically.

Gambling Harm Reduction

Gambling harm reduction is a dual approach that focuses on both individual factors and regulatory measures. At the individual level, gambling harm reduction focuses on individual choice and quality of life (rather than gambling prevalence or abstinence) as its outcome (Simon et al., 2020). At the regulatory level, gambling harm reduction is a responsibility shared by gambling providers and governments (Simon et al., 2020). Simon et al. (2020) note that gambling harm must be accurately defined and measured before it can be reduced. Finally, harm reduction programs in gambling should be assessed for efficacy by measuring realistic outcome indicators (Christensen et al., 2020). There are three distinct approaches to reducing gambling harm that evolved as gambling availability increased.

First, early initiatives to protect consumers from gambling harm were directed at gambling operators by requiring them to provide gambling activities in a responsible manner (Christensen, 2020; Livingstone, 2019; Williams et al., 2012). Practices such as banning automatic teller machines in casinos, limiting the number of electronic gambling machines (EGMs), providing responsible gambling information

centers[4] (RGICs), and regulating gambling availability and access have been used with varying degrees of success in several jurisdictions worldwide (Blaszczynski et al., 2011; Christensen, 2022; Marionneau et al., 2022; Williams et al., 2012). Second, the onus was often placed on the individual gambler who was expected to limit themselves (Christensen, 2020). Placing the onus on the gambler is epitomized in the common Canadian slogan: "know your limit, play within it" (BC Ministry of Public Safety and Solicitor General, 2011). Third, in response to the advent and increase in popularity of EGMs, which are one of the most harmful forms of gambling (Williams et al., 2012), there is, recognition that both the gambling operator and the gambler must work to reduce gambling harm (Christensen, 2020). Widespread policies and gambling regulations provide one avenue for reducing gambling harm, while individual educational interventions provide another (Williams et al., 2012). Many of these interventions take an abstinence approach.

For example, people can decide to enact casino self-exclusion. Self-exclusion is when individual gamblers enroll themselves in a program that prohibits their access to casino(s) (Christensen, 2020; Nowatzki & Williams, 2002). However, this does not stop them from gambling in other locations or formats (Christenson, 2020; Hakansson & Widdinghoff, 2020). Self-exclusion is underutilized by those with gambling problems (Motka et al., 2018), unreliably enforced by venues (Ladouceur et al., 2007), and only provides cessation of gambling at that particular venue (although cross-jurisdictional self-exclusion is common in Canada). This may be useful for some people, but for many people with gambling problems, abstinence is ineffective. Thus, gambling programs should include methods for reducing gambling behavior or changing the nature of gambling behavior to minimize harm for those who will not choose, or be able, to maintain abstinence. In addition to abstinence based self-exclusion, there are gambler-initiated harm reduction approaches.

Namely, another individual gambling harm reduction measure is pre-commitment, described by Christensen (2020) as the individual gambler setting a monetary, time, or frequency limit to their gambling

[4] Responsible gambling information centers (RGICs) are essentially information desks located inside casinos, where patrons can request information about how gambling works (e.g., chances of winning, how random numbers are generated, etc.), the risks of gambling, and problem gambling resources. (Christensen, 2020).

before they begin gambling. By setting these limits in advance, the limits are unlikely to be impacted by the increased stimulation in the brain's reward pathway that occurs during gambling play (Reuter et al., 2005). Unfortunately, however, the issues with pre-commitment are that those who struggle with gambling are more likely to (a) set higher limits and (b) exceed their limits (Christensen, 2020; Delfabbro & King, 2021). Thus, existing approaches either rely on abstinence or the individual gambler's ability to change their behavior, with often poor success rates.

Overall, the reviewed research indicates that harm reduction programs have been successful in other areas and that participants are more likely to maintain harm reduction efforts when compared to abstinence. The application of harm reduction approaches in relation to problem gambling has been haphazard, often relying on individuals to monitor their own behavior. Further, existing literature and interventions on harm reduction in gambling do not address the factors unique to an offender population.

Gambling Harm Reduction among Offender Populations

In addition to the benefits of harm reduction noted above, it is important to focus on harm reduction rather than abstinence for offender populations because they have demographic and subculture factors that make harm reduction a more realistic option. These factors significantly limit the efficacy of standard problem gambling prevention programs. First, I will outline the unique demographic factors of offender populations.

Demographic Factors Common to Criminal Offenders. Demographic factors common to the offender population have a role in limiting the efficacy of standard problem gambling prevention programs for this population. Offender populations are disproportionately composed of Indigenous offenders and male offenders between the ages of 20 and 39 (Statistics Canada, 2020). Male offenders in Canada suffer mental health disorders two to three times higher than men in the general public (Kouyoumdjian et al., 2016) and addiction at rates between three and five times the rate of the general public (Canadian Centre for Addictions, 2019; Kouyoumdjian et al., 2016; Statistics Canada, 2014). Most inmates also have a low socioeconomic status (SES), which includes low education, low employment rates, low income, and inadequate or no housing (Kouyoumdjian et al., 2016; Mitchell et al., 2017). Further, childhood trauma is common to most inmates, with half reporting a history of physical, sexual, or emotional abuse (Kouyoumdjian, et al., 2016).

The above summary of demographic characteristics of the offender population overlaps significantly with risk factors for criminal activity (Public Safety Canada, 2015). For example, substance abuse, poverty, homelessness, presence of neighborhood crime, witnessing violence as children, unemployment/underemployment, mental or physical illness, and more are listed as criminogenic factors by Public Safety Canada (2015). Furthermore, Dowling et al. (2017) found similar early risk factors for problem gambling, including frequency of alcohol use, cannabis use, illegal drug use, antisocial behavior, depression, being male, and violent behavior. Offenders who are gambling problems are likely affected by most of the demographic risk factors listed above, which increase their risk of both criminal offending and gambling problems. These demographic factors combine to interfere with the efficacy of treatment and prevention programs in general, and gambling programs in particular.

For example, education is likely an important demographic factor. Namely, to make rational and consequential decisions (i.e., making decisions based on the potential outcomes of that decision), one must be able to weigh the costs against the potential benefits of each possible action. When talking about gambling, this means weighing the costs of participating in the games (i.e., the wagers) against the likelihood of winning. In short, this requires an understanding of probability and random chance (Turner et al., 2008). The association between lower problem gambling scores and greater knowledge of randomness supports the idea that learning about probability may positively influence gambling behavior; if not through abstinence, then by allowing gamblers to make smart wagers (Turner et al., 2008). More education leads to better critical thinking and consequential decision-making skills (Williams & Connolly, 2006). For example, post-secondary students and graduates who understand probability are less likely to believe gambling fallacies, which are associated with problematic gambling and therefore gambling harm (Turner et al., 2008; Williams & Connolly, 2006). Thus, it is reasonable to conclude that low education levels may mitigate the efficacy of gambling programs among offender populations. Education is not the only relevant demographic factor, however.

Comorbidities, or the presence of a mental or substance use disorder in combination with problematic gambling, also impact the efficacy of problem gambling prevention programs among offender populations. Blaszczynski and Nower (2002) identified three pathways to problem gambling: the behaviorally conditioned pathway, the emotionally vulnerable pathway, and the antisocial impulsivist

pathway. Aside from the behaviorally conditioned pathway, where problem gambling occurs strictly because of classical[5] and operant conditioning,[6] both remaining pathways include higher rates of comorbid disorders (e.g., depression, anxiety) and substance abuse. Additionally, those with gambling problems who fell into either the emotionally vulnerable or antisocial impulsivist groups were more difficult to treat and less likely to maintain recovery. People who have gambling problems and have comorbid disorders are likely to experience several gambling problems with more severe consequences, such as job loss or suicide attempts (Ladd & Petry, 2003; Lorrains et al., 2011). Relatedly, the presence of comorbid disorders also reduces the likelihood of the gambler accessing and complying with treatment and reduces the effectiveness of treatment (Lorains et al., 2011). Additionally, comorbid mental health disorders (such as depression) increase vulnerability to relapse into gambling behavior (Smith et al., 2015). Further, the pathways model calls for different treatment types based on the presence or absence, and type, of comorbidity (Blaszczynski & Nower, 2002; Lorains et al. 2011). Thus, it seems likely that, just as comorbidities interfere with treatment and recovery, they will interfere with the efficacy of prevention programs. However, harm reduction programs that take the potential comorbidities into account may be able to provide relief from the intersectional harms that come from both these comorbidities and problem gambling. Alongside demographic factors, subculture factors also influence offender gambling behavior and the efficacy of problem gambling prevention programs for this population.

Subculture Factors Common to Criminal Offenders. In low SES and working-class cultures, where most offenders are born and raised, the code of the street is prevalent (Anderson, 1999; Binde & Romild, 2020; Casey, 2020). The code of the street is a subculture that guides the lives of people living in low SES and working-class neighborhoods (Anderson, 1999). Similarly, the convict code is a set of informal behavior expectations that guide the lives of criminal offenders, whether they are serving their

[5] Classical conditioning occurs when a neutral stimulus is paired with potent physiological stimulus to condition an automatic response. The classic example is Pavlov's dogs, where Ivan Pavlov conditions dogs to salivate at the sound of a bell by repeatedly pairing the sound of the bell with the presence of food. Initially, the smell of food caused the salivation, but after repeated pairings with the bell, the dogs salivated every time they heard the bell (Bartol & Bartol, 2016).

[6] Operant conditioning is a form of learning that occurs through use of positive and negative reinforcement (Bartol & Bartol, 2016).

sentence in prison or the community (Ricciardelli, 2014). There is significant overlap between the two codes, with both having similar unspoken rules and expectations (Anderson, 1999; Mitchell et al., 2017; Ricciardelli, 2014). Both are hyper-masculine codes that value respect and status above all else (Mitchell et al., 2017). Both incorporate pride in being separate from the dominant culture (Anderson, 1999; Mitchell et al., 2017). These subcultures are countercultures[7] that encourage posturing and impression management, as one must always appear tough, aggressive, and superior toward something of value to the counterculture. In such a context, respect is gained and status is enhanced through being tough and physically powerful, showing no fear, using aggression and violence, and opposing authority (Mitchell et al., 2017; Ricciardelli, 2014). In both the code of the street and the convict code, gambling presents a relatively low-risk method of opposing authority that carries the possibility of great financial reward. For people with a low SES and limited options, this possibility of financial reward is compelling and may contribute to the prevalence of gambling behavior.

There are four main theories behind the prevalence of gambling in low SES and working-class neighborhoods. First, the something-for-nothing theory states that people with low-paying jobs are less likely to take extra shifts because their work is boring or dangerous. As such, gambling is one of their few remaining options to increase their wealth (Binde & Romild, 2020; Nyman et al., 2008). Second, the self-perceived low mobility theory states that those who perceive themselves as having low social mobility believe that winning the lottery is their only chance for wealth attainment (Beckert & Lutter, 2013; Binde & Romild, 2020). Further, the concept of anomie[8] plays a significant role in this theory. For people experiencing anomie and self-perceived low mobility, gambling in one form or another appears to be the only option to attain societal ideals (Binde & Romild, 2020). Third, alienation theory applies to those who have limited to no autonomy in their work lives; those with jobs that are highly structured, limited, and/or

[7] A counterculture is a subculture that opposes the dominant culture by "rejecting its most important values and norms and endorsing their opposites" (Scott, 2014, p. 131).

[8] Anomie is defined as a situation where a "psychological state of disorder and meaninglessness" results from people recognizing a disconnect between societal ideals and their position in life (Scott, 2014, p. 23). Anomie encompasses feelings of purposelessness, normlessness, and a perceived breakdown of values and standards (Scott, 2014).

repetitive. According to alienation theory, these people engage in skill-based gambling to demonstrate their abilities in a way they cannot do in their working lives (Banwell et al., 2006; Binde & Romild, 2020). Fourth, being exposed to gambling at, or in connection to, work encourages the activity (Binde & Romild, 2020; Revheim & Buvik, 2008). If gambling is a part of the organizational culture or subculture, the desire to fit in will further promote gambling behavior (Binde & Romild, 2020; Revheim & Buvik, 2008). Taken together, these theories indicate that gambling is used by people who have a low SES in efforts to increase wealth and status, combat feelings of anomie and alienation, increase their sense of belonging, and pass the time. Gambling fulfills these same needs for offender populations operating within the confines of the offender subculture.

To fully understand why gambling is entrenched in the offender subculture, it is important to also understand the prison environment of relative deprivation.[9] First, just like gambling in low SES neighborhoods, gambling in prison allows offenders to combat both alienation and anomie. Both feelings are strong in prison where personal autonomy is virtually non-existent, time is structured, and the identity of "inmate" is alienated from the societal goals touted by the dominant Canadian culture. Second, inmates have no access to cash, so they gamble for items of value (e.g., canteen items[10]) rather than money (Beauregard et al., 2013; Turner et al., 2013a). Third, inmates are often bored. Though their time is structured by institutional routines, those same routines include downtime intended for introspection and self-improvement through positive leisure activities (Beauregard et al., 2013). Boredom combined with the drive to engage in counterculture activities leads to rule-breaking, and gambling provides a way to break the rules with minimal risk of punishment[11] (Beauregard et al., 2013). Fourth, gambling can be a cover for

[9] Relative deprivation is feeling deprived of rights, freedoms, or material goods in comparison to others. Prison is an environment of relative deprivation for inmates, who are deprived of rights, freedoms, and material goods relative to the Canadian population.

[10] All correctional facilities operate canteens where inmates can buy snack food and hygiene items, neither of which are provided by the facility. Inmates have institutional jobs, and the pay for those jobs gets deposited into an inmate account. They can spend money from this account at the canteen. This is done with ledgers, as cash is an unauthorized item in Canadian correctional facilities.

[11] Correctional officers have great discretion in enforcing rules. They see gambling as a petty offence that keeps the inmate population calm, thereby decreasing the likelihood of violence or unrest. Therefore, they often choose to ignore inmate gambling. For a full analysis of this phenomenon, see Beauregard et al., 2013.

establishing and maintaining alliances, both in prison and on the street. Card games, which are one of the popular gambling formats in prison, allow inmates to associate and have regular conversations with little risk of being overheard. Alliances are maintained, deals are struck, and favors are exchanged during card games (Mitchell et al., 2017). In summary, gambling in prison is motivated by the drive to reduce relative deprivation and is used to combat anomie and alienation, relieve boredom, increase social interaction, and potentially increase status and wealth. Another factor that is vital to understanding the offender subculture is the offender hierarchy.

The offender subculture (both in prison and on the street) is governed by a strict hierarchy that is established firstly by offence type, with sex offenders at the bottom of the hierarchy, and secondly by character, with "rats" or "snitches"[12] also at the bottom of the hierarchy (Ricciardelli, 2014). An offender's position on the hierarchy dictates much about the relative ease or difficulty of their sentence. Gambling while incarcerated can enhance an offender's status (and subsequent position on the hierarchy) because, by doing so, the offender is actively opposing the prison authority (Mitchell et al., 2017; Turner et al., 2013a). Simply put, gambling is seen as a counterculture activity that comes with many benefits and limited risks. Therefore, offenders may be unwilling to stop gambling altogether.

Since gambling is an entrenched part of both the code of the street and the convict code, any offender gambling program that focuses on abstinence is unlikely to be effective. It is important to understand that both the code of the street and the convict code are significant parts of many offenders' identity and sense of self. Offenders are *proud* of being tough, strong, and anti-authoritarian. Offenders are *proud* of their counterculture. For these reasons, a problem gambling prevention program that focuses on abstinence (like many do) is unlikely to be successful in an offender environment (Pickering et al., 2017; Turner et al., 2017). Instead, a gambling harm reduction program may be more engaging and palatable to offenders, as it will provide them with skills to reduce their risk of gambling harm without forcing them to give up a leisure activity they value. Additionally, a program tailored to the needs of

[12] "Rats" and "snitches" are terms used within the offender subculture to pejoratively describe someone who gives information to the authorities (i.e., correctional or police officers).

offenders will be useful, given the lack of any such program to date. These factors may increase offender motivation to take part in such a program. Along with understanding the significance of problem gambling and gambling harm reduction for offender populations, it is important to review the theoretical frameworks that apply to gambling harm reduction interventions.

Theoretical Frameworks Applicable to a Gambling Harm Reduction Program

Several theoretical frameworks apply to gambling harm reduction interventions. These frameworks reflect ongoing research into best practices and informed the design *Hedge Your Bets*. The three frameworks most relevant to my program design, implementation, and evaluation are gambling and problem gambling etiology theories, educational theories, and behavior change theories. First, I discuss the main theoretical framework of gambling and problem gambling etiology.

The Biopsychosocial Model: A Gambling Etiology Theory

To address gambling harm, we must understand why people gamble in the first place, as well as why gambling becomes problematic in some cases but not others. The biopsychosocial model is the central framework in the etiology of addiction, including gambling disorder (Williams et al., 2012). This approach incorporates biological factors, psychological factors, and social factors in an etiological model of addiction that is complex and interactive (Williams et al., 2012, 2023). Some of these factors are indirect, meaning they may increase the likelihood of developing an addiction but are not causal. Others are direct, meaning they have a more explicit influence and may play a causal role in addiction. Whether indirect or direct, biological, psychological, and social factors are all relevant to the etiology of problem gambling. However, problem gambling is not homogenous in its etiology; diverse biopsychosocial factors can combine in different ways and still result in problem gambling (Sharman et al., 2019). Next, I will consider the biological, social, and psychological components that make up the biopsychosocial model.

First, indirect biological risk or protective factors include genetic inheritance that predisposes a person to, or protects them from, developing a gambling problem. The heritability of problem gambling is estimated to be 40% to 50% (Davis et al., 2019; Lobo & Kennedy, 2009; Slutske et al., 2010; Xuan et al., 2017). This genetic inheritance is a vulnerability to several different conditions, which helps explain the comorbidity of problem gambling with other disorders (such as substance abuse, antisocial personality disorder, and mood disorders). Neurobiologically, this inheritance includes a generally lower reward

sensitivity (Oberg et al., 2011; Wardell et al., 2015; Williams et al., 2012) which may explain the common association between problem gambling and attention deficit hyperactivity disorder (ADHD), increased stimulation-seeking, and risky behavior (Breyer et al., 2009; Theule et al., 2019). Additionally, this neurobiological makeup leads to an overpowering desire for instant rewards rather than delayed rewards (Madden et al., 2009; Oberg et al., 2011; Williams et al., 2012), which likely explains the common association between problem gambling and increased impulsivity.

Second, Williams et al. (2012) discussed several indirect environmental (mainly social) risk factors that further contribute to the development of a gambling problem. These include childhood trauma (e.g., abuse, neglect), having primary and secondary agents of socialization (parents, peers, media) who model gambling behavior, having a low SES, social acceptance of gambling, gambling opportunities that are readily accessible, increasing/ongoing stress, poor or no support systems, and unsafe commercial gambling opportunities (Dowling et al., 2017; Lane et al., 2016; Mazar et al., 2018).

The third category of risk factors identified by Williams et al. (2012) is direct risk factors that have a more immediate influence on the development of gambling problems. These direct risk factors constitute the psychological component of the biopsychosocial model and include cognitive errors or lack of understanding or knowledge about gambling (Goodie & Fortune, 2013). These gambling fallacies include not understanding random chance, not being aware that the gambler has a very small chance of winning in the short term and no chance of coming out ahead in the long term, and that no strategies or systems can overcome random chance and negative probabilities (Goodie & Fortune, 2013; Leonard et al., 2015; Williams et al., 2021). Another direct risk factor is the fulfillment of a psychological need. That is, if gambling provides stimulation, escape from reality, or status, it is more likely to progress to problematic levels (Blaszcaynski & Nower, 2002). A final direct risk factor is the size and frequency of wins early in one's gambling experiences (Williams et al., 2021). In addition to biological, psychological, and social risk factors, classical and operant conditioning also play a role in problem gambling.

As one continues to gamble, and especially if their gambling behavior includes any of the aforementioned direct risk factors, classical and operant conditioning do their part to reinforce gambling behavior (Blaszczynski & Nower, 2002, Williams et al., 2012). Soon enough, the person becomes preoccupied with gambling, engaging in riskier behavior, such as playing more often, for longer durations,

spending more money, and chasing losses.[13] Preoccupation and risky gambling behavior comprise two of the most significant direct risk factors. The biopsychosocial model of problem gambling demonstrates the complexity and interdependence of indirect and direct risk factors that can lead to the development of gambling problems. The biopsychosocial model is most evident in longitudinal research into problem gambling (Williams et al., 2023).

Several longitudinal studies have been conducted worldwide, and the result clearly outline the biopsychosocial etiology of problem gambling (Williams et al., 2015). The Leisure, Lifestyle, Lifecycle Project (LLLP) involved 1, 808 participants in Alberta, Canada and ran from 2006 to 2014 (El-Guebaly et al., 2015; Mutti-Packer et al., 2017). The Quite Longitudinal Study (QLS) involved 4,121 participants in the Quinte region of Ontario, Canada and ran from 2006 to 2011 (Williams et al., 2015). The Alberta Gambling Research Institute (AGRI) National Project (ANP) began in 2018; thus far, articles are available on the initial baseline survey (August 16, 2018 to October 10 2018) with 10,199 Canadians (Williams et al., 2023). While there are several smaller-scale local or regional studies, the finding of the these three major studies (the LLLP, the QLS, and the ANP) provide an excellent overview of the results of longitudinal research into problem gambling.

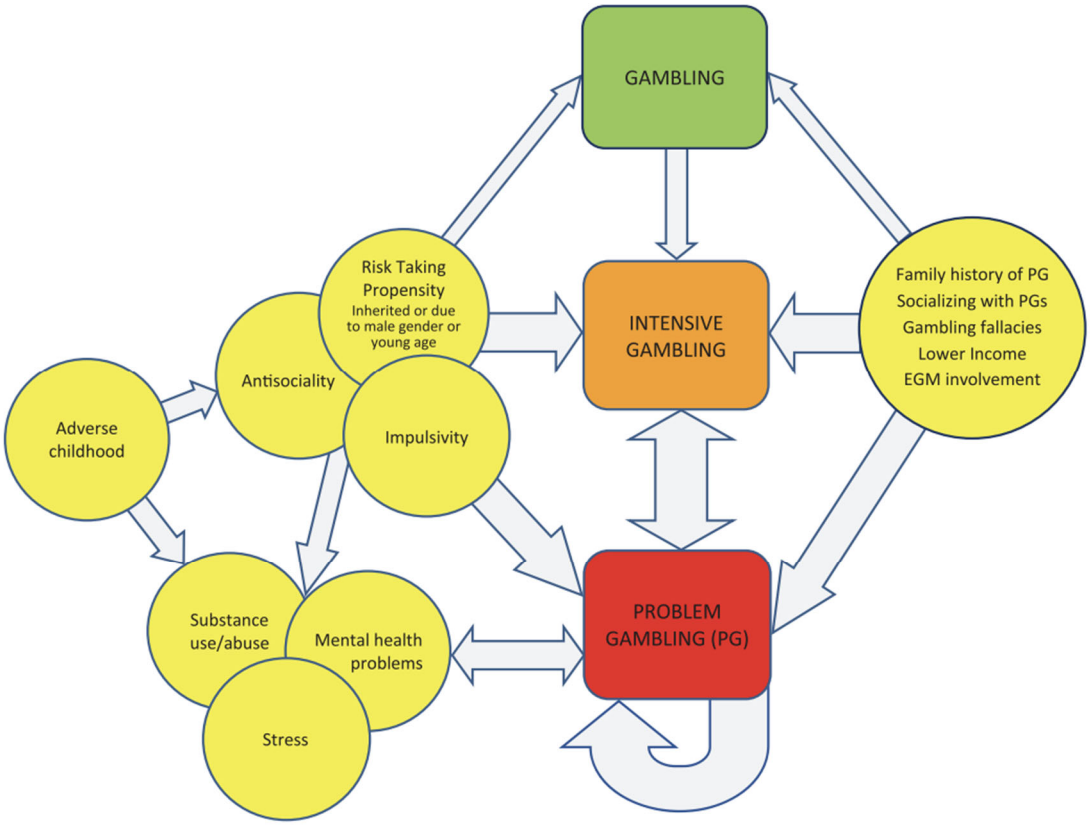
Longitudinal research has identified several predictors for problem gambling. Risk factors from diverse domains were found to be significant predictors for problem gambling, which supports the biopsychosocial etiological model (Williams et al., 2023; Williams et al., 2015). Gambling-related factors were found to be most significant both concurrently and prospectively, followed by impulsivity and low household income (Williams et al., 2023; Williams et al., 2015). Gambling fallacies and social environment were also identified as concurrent and prospective predictors (William et al., 2023; Williams et al., 2015). Prospective predictors included younger age, frequency of tobacco/nicotine use, and illegal online gambling, as well as the following demographic variables: male gender, South Asian ethnicity, and Middle Eastern ethnicity (Williams et al. 2023). Another important finding from longitudinal research involves the

[13] Chasing losses refers to continued gambling in the face of persistent loss, in an effort to win back money already lost.

relative stability of each of the five gambling categories: non-gamblers, recreational gamblers, at-risk gamblers, problem gamblers, and pathological gamblers (Williams et al., 2015). Results of the QLS indicated that non-gamblers, recreational gamblers, and pathological gamblers tended to have very stable gambling behaviors while at-risk gamblers and problem gamblers did not (Williams et al., 2015). At-risk and problem gamblers tended to move into and out of the neighboring categories throughout the five years of the study. The dynamic nature of the predictors for problem gambling likely explain the fluidity of the at-risk and problem gambler categories. Figure 1 (from Williams et al., 2023) provides a visual representation of the biopsychosocial model.

Figure 1

Etiological Model of Problem Gambling (from Williams et al., 2023).



This literature review has highlighted the importance of harm reduction, educational theories, behavior change theories, and the biopsychosocial model in terms of creating an effective program to reduce gambling harm among offender populations. Next, I will review the development of the *Hedge Your Bets* program, taking each of these factors into account.

Chapter 2: *Hedge Your Bets* Program Design

I created the *Hedge Your Bets* Program based on the second edition of the *Stacked Deck* Program (Williams & Wood, 2022), which is a 5-session in-person PowerPoint problem gambling prevention program designed for high school students (grades 9 to 12). In addition to being empirically effective in reducing gambling-related harm (Williams & Wood, 2022), Stacked *Deck* has an orientation that makes it particularly well suited for adaptation to an offender population. Recognizing that gambling is a normative behaviour in the general population *Stacked Deck* (Williams & Wood, 2022) focuses on harm reduction rather than abstinence. It does this by emphasizing the need to be a 'smart gambler' by correctly assessing the odds and evaluating what could be won in light of what is being staked and the odds of winning. This general orientation is then applied not only to gambling, but to life decisions more generally.

Content Changes

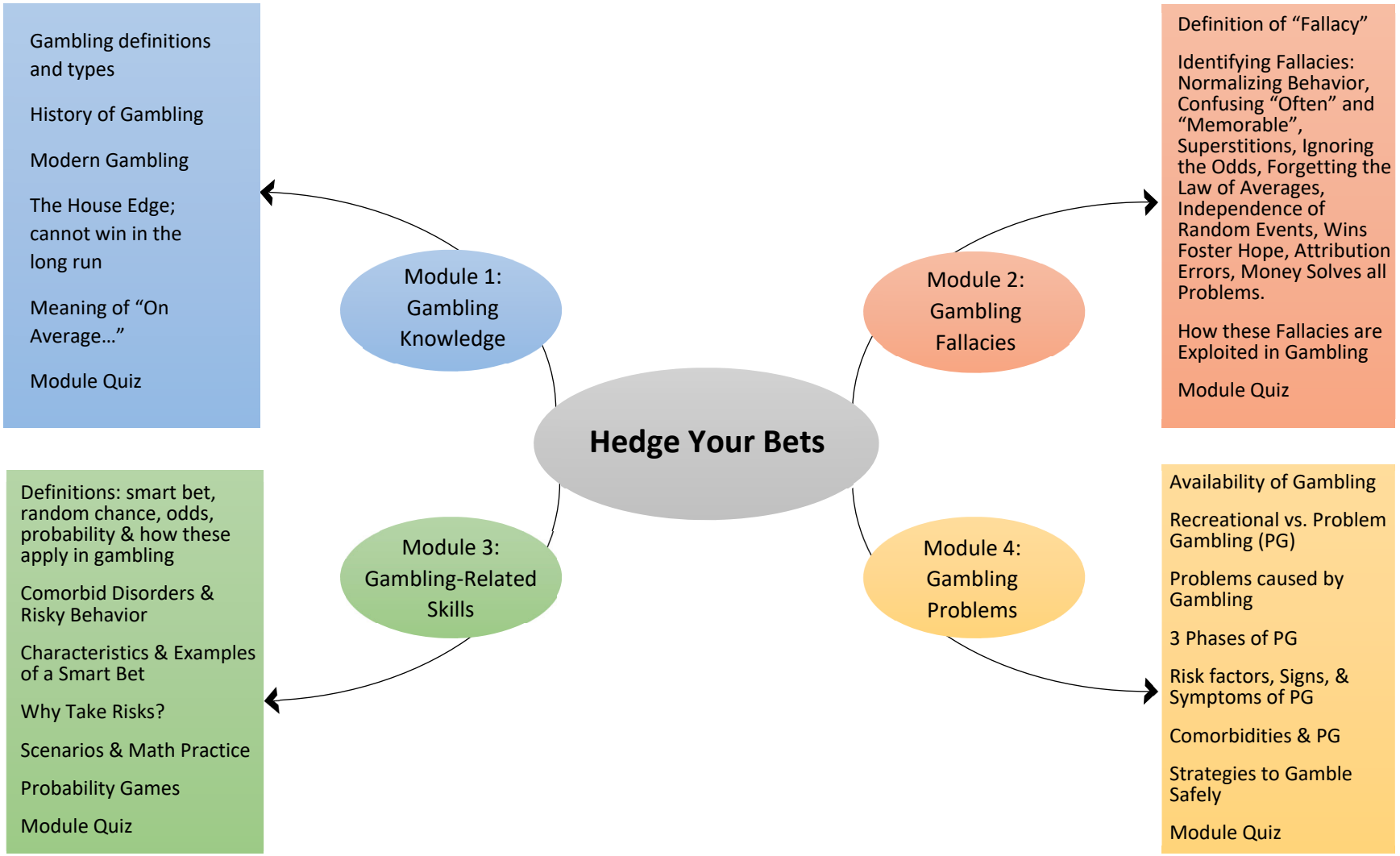
Offenders typically perform at elementary school levels in terms of reading, writing, and arithmetic during their intake educational assessments.[14] As such, I opted to simplify the *Stacked Deck* content. Some content, like that involving random chance and probability, remained somewhat complex even after simplification. In this case, I added slideshows of simple probability calculations done step-by-step and included some opportunities for practice. For example, I used interactive scenarios to provide practice in identifying a smart bet and flashcards of basic probability questions for participants to practice the step-by-step calculations described earlier. I interspersed multiple choice questions among the content, to reinforce learning and provide some formative assessment. I also took the basic probability calculations and applied them to a specific gambling game (roulette) and provided images of the calculations worked out on a white board. Finally, I included a link to an external website that hosted several free probability games that would reinforce learning while participants played.

[14] When they enter the correctional system, all offenders undergo an intake assessment. This process includes a battery of tests and assessments, including one that assesses the offender's expressive (or functional) education level. Oftentimes, the results of these assessments are much lower than their documented grade level.

I also addressed mental illnesses, developmental disorders, and learning challenges by explaining in a concrete way how they make people more susceptible to developing gambling problems. I also provided strategies that would be particularly useful in the face of some of these unique challenges. For example, I explain that people with fetal alcohol spectrum disorder (FASD) are often impulsive and struggle to generalize knowledge (e.g., they have difficulty predicting how things might turn out based on experience. These difficulties are related to brain development, and no amount of willpower can overcome them. In fact, knowing about these difficulties allow people with FASD to employ strategies that compensate for them (Brown et al., 2018). Specifically, strategies that involve external structure work best for people with FASD because they remain in place regardless of the individual's impulsivity or inability to predict outcomes. For example, by only bringing the cash they can afford to lose when they go out to gamble and leaving their ATM card and credit card at home, they will limit how much they spend at the casino (regardless of their impulsive desires or inability to realize that overspending will lead to an inability to pay their rent). See Figure 2 for the *Hedge Your Bets* Module Map.

Figure 2

Hedge Your Bets Module Map



Changes in How the Program is Administered

In addition to considering the unique offender subculture context in developing *Hedge Your Bets*, I also employed both educational and behavior change theories in adapting the original in-person *Stacked Deck* program to an online version of *Hedge Your Bets*. The three main educational theories I employed in designing the *Hedge Your Bets* program were scaffolding, mastery learning, and mental fatigue. First, I used **scaffolding** as described by Richardson et al. (2021), by dividing the content of the *Hedge Your Bets* program first into modules and then into sections that averaged about a page in length. The program began with easier content about the definitions and history of gambling, then moved into more challenging content about gambling fallacies. Next came the mathematical content, which was arguably the most challenging content in the program. Finally, the program ended with content related to risk factors, signs of problem gambling, and strategies to reduce one's own gambling harm (including strategies tailored for the unique challenges offenders face). This scaffolding provided a learning process wherein the material learned previously helped participants to understand the learning that comes next. This idea that previous learning helps future learning, even if the two instances of learning are more distally related, is called carry-over effects (Schunk, 2012). Carry-over effects are a beneficial side effect of scaffolding.

The next educational theory that I used was the concept of **mastery learning**. As explained by Kulik et al. (1990), mastery learning requires students to demonstrate their mastery of current content before they move on to the next section of content. Employing the mastery learning concept ensures that previous content (which is, of course, vital to the student's ability to learn future content) is mastered prior to moving up the scaffold (Kulik et al., 1990; Schunk, 2012). Mastery learning is a powerful and efficacious educational strategy that can meet the needs of diverse learners (Eppich et al., 2015; Péladeau et al., 2003) I used this theory in *Hedge Your Bets* by requiring participants to pass a quiz at the end of each module before allowing them to move on to the next module. Additionally, I allowed participants to review the module content and repeat the quiz as often as they needed to. For participants to benefit from the *Hedge Your Bets* program, they must acquire the knowledge and skills necessary protect themselves from gambling harm. Given the increased likelihood of low education levels and

learning challenges among offender populations, this mastery learning concept coupled with unlimited attempts provided a learning environment in which participants could get the most out of the program.

The final educational theory that guided the design of *Hedge Your Bets* is the concept of **mental (or cognitive) fatigue and distributed practice**. Mental fatigue is a reduced capacity for, and efficiency in, completing cognitive tasks (Shail, 2019). To minimize mental fatigue and support the efficient transfer of knowledge from short-term to long-term memory, learning should occur in shorter periods separated by rest periods (Shail, 2019). I addressed mental fatigue by ensuring modules were between 30 and 45 minutes in length. Though intended to be completed in a single session, participants could take as many breaks as they wanted. Additionally, there were one-week waiting periods between each of the modules. This accomplished three goals: (1) it helped to reduce mental fatigue; (2) it capitalized on the superior retention in distributed (versus massed) practice (e.g., Edmonds et al., 2021) and (3) it helped to reduce practice effects artificially influencing the assessment results.[15]

Though educational theory provided a sound foundation to create a clear and effective course, I also considered the behavior change literature. Essentially, when trying to reduce gambling harm, researchers are trying to change gambling behavior. Of the numerous behavior change theories, I chose to use the health belief model (McKenzie et al., 2017) to guide the development of *Hedge Your Bets*. First developed in the 1950s, this model has undergone many reviews and updates, and has been used successfully in decades of health-related behavior change programs (Janz & Becker, 1984). It is a logical and straightforward model that worked well with an online intervention. In the health belief model, health decisions are based on three specific factors: (1) whether a health concern exists; (2) the individual's perceived susceptibility to the negative outcomes of the health concern (referred to as the perceived threat); and (3) the belief that taking action would reduce the likelihood of negative outcomes and would come at a reasonable cost to the individual. This cost of change is called the perceived barrier. In recent

[15] Practice effects are the influence of assessment repetition on assessment results (Schunk, 2012).

decades, the model has been revised to include self-efficacy; that is, the individual must believe they can overcome any perceived barriers to change.

I designed *Hedge Your Bets* to address each of the criteria outlined in the health belief model. First, I included content on the prevalence and negative repercussions of problem gambling. I outlined what behaviors constitute gambling, emphasizing that common activities like playing bingo or the lottery are gambling to highlight the first factor of the health belief model. That is, the content highlighted that this health concern likely existed for most participants. Secondly, by explaining the house edge and why electronic gambling machines increase the risk of developing gambling problems, I made it clear that the risk of developing problematic gambling behavior exists for most people, highlighting the second factor of the health belief model. Third, I included content on how participants can modify their gambling behavior in small, easy ways to reduce their risk of experiencing gambling harm. That is, participants learned that they could make low-cost changes to reduce the potential negative outcomes of the health concern. Fourth, the content in *Hedge Your Bets* is accessible and nonjudgemental, allowing participants to review content as often as necessary to build their self-efficacy and thus believe they are capable of changing their behavior. In the end, participants have been equipped with both the tools they need to reduce their risks of gambling harm and the confidence to use those tools effectively. Using these cultural, educational, and behavioral lenses, I created the five modules that made up the *Hedge Your Bets* Program. Participants proceeded through the modules in the order they are presented in below. For the knowledge, fallacies, and skills modules, participants had to pass the quiz before they could move on to the next module, and for the problems module, participants had to pass the quiz to complete the program.

Hedge Your Bet Modules

Each of the modules described below ended with a module quiz consisting of eight questions. Participants were required to show mastery of the module content before proceeding to the next module by passing the module quiz. To pass, participants had to attain either a minimum score of 5/8 or a quiz score that was at least two points higher than their pre-program score for that module. In this way, I created individualized learning expectations that recognized improvement as mastery. I chose this method because many offenders have low education levels, some reading and math comprehension issues, cognitive impairments, and diverse learning challenges. These many challenges are likely to

result in lower scores than those achieved by people who are unimpaired in this way. Accommodating for different skill levels and abilities through a “pre-program+2” passing score was an equitable way to require mastery while maintaining accessibility for the target population.

The Program Orientation Module. This introductory module served several functions. First, it explained how to use the software. Second, it highlighted the audio option, which allowed participants to listen to the content rather than read it if they so chose. This module also identified icons that could be found in each module labelled “resources”. Clicking an icon took participants to the “Problem Gambling Resources” page on the program website, in case they realized they (or someone they know) needed help with their gambling behavior. Additionally, this module described the different types of interactives and formatting used throughout the program. This module also included a description of the *Hedge Your Bets* research study and the gift card lottery for completion of the program. Finally, this module ended with directions on how to request a certificate of completion at the end of the program.

Knowledge Module. This module included content on the behaviors that constitute gambling (both in prison and in the community). Content also covered the vulnerabilities that are common to offender populations and increase a person’s likelihood of experiencing gambling problems. Additionally, this module addresses how the offender subculture influences gambling behavior both in prison and in the community. Furthermore, content covered how coping functions as a motivation for gambling; both coping with emotions by escaping into gambling and coping with boredom through the stimulation provided by gambling.

Fallacies Module. This module described the most common fallacies (i.e., cognitive distortions) that influence gambling behavior. One such fallacy is known as the “gambler’s fallacy”, where someone assigns a non-existent association between random events leading them to believe they can accurately predict the unpredictable (Leonard et al., 2015). For example, in the case of repetitive coin tosses, a person bets that the coin will come up “heads” because several previous tosses have come up “tails”. Another example is the belief that a gambling machine (e.g., slot machine or pull-tab machine) is “due for a win” because it has been paying out several small wins but has not had a big win in a long time. This module addressed the most common fallacies that gamblers use to justify ongoing gambling in bad

situations (e.g., when they are losing). In addition, this module identified the most harmful types of gambling and briefly explained why they are the most harmful.

Skills Module. This module explained random chance and probability at an introductory level. Ideally, this skill development would increase participants' confidence in their ability to identify a bad bet and make smart decisions around what bets to place. Additionally, the module covered ways to reduce potential harm from a bad bet if they cannot simply refuse to make the bet or walk away from the situation. This is highly relevant to offenders, as the offender subculture does not allow for one to back down from a challenge (including bets) without appearing weak and loosing status (Mitchell et al., 2017; Ricciardelli, 2014).

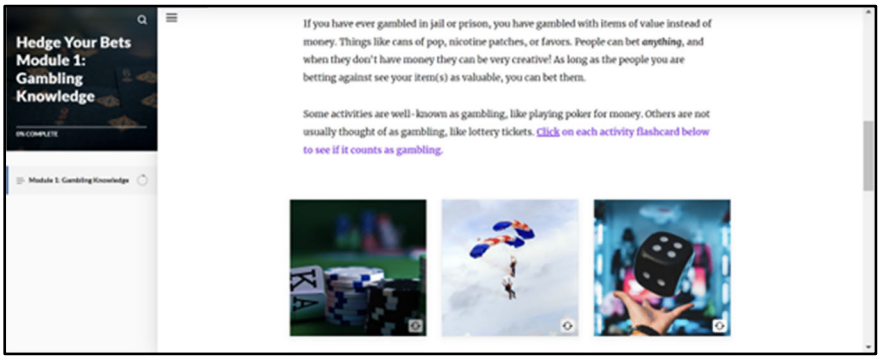
Problems Module. This module included content on the differences between recreational and problem gambling and the progression from one to the other through the spectrum of gambling behavior categories. Content covered how gamblers are likely to shift back and forth between recreational, at-risk, and problem gambling categories throughout their lifetime. Further, this module described the risk factors for problem gambling as well as the warning signs that indicate gambling behavior is becoming problematic. Strategies to minimize risk of gambling harm for those who do choose to gamble were also covered. At the end of this module, participants are advised of several problem gambling resources.

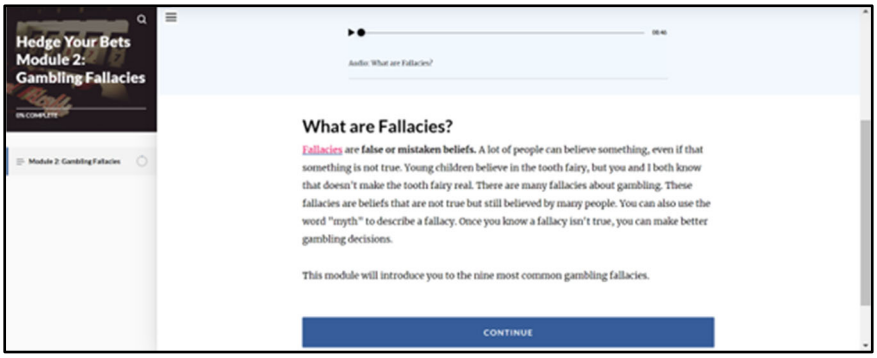
Hedge Your Bets Program Software and Website

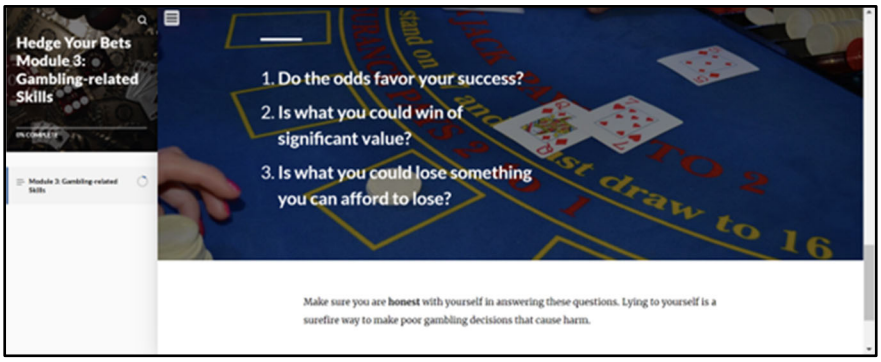
I created the *Hedge Your Bets* program using the Rise 360 course design software, which is contained within the Articulate suite of programs. I then housed the *Hedge Your Bets* Program on a website (www.hedgeyourbetsprogram.com) hosted in Squarespace. I selected Rise 360 and Squarespace because they are intuitive and user-friendly, require no account creation or login on behalf of participants, and they include a vast array of design options that allowed me to create a visually-appealing, highly interactive program (see figure 3). Aside from the actual program, the website also contained information about the program and access to any associated research studies. I plan to also post study updates, the results of the gift card lotteries we used to incentivize participation, and the study results to the website. It is a centralized location containing all the participant-facing information about the study.

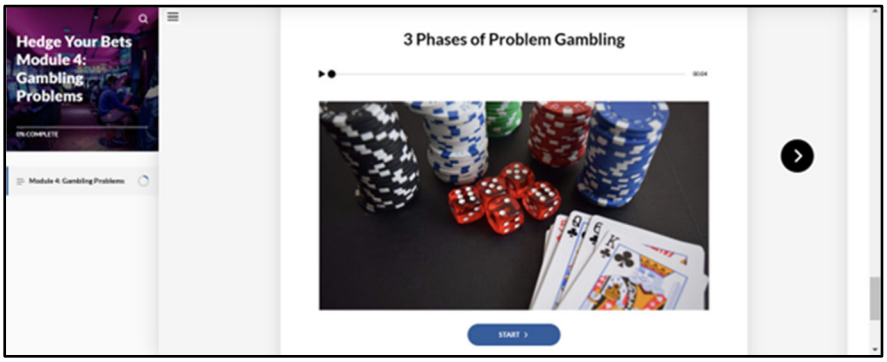
Figure 3

Screenshots from the Hedge Your Bets Program









The *Hedge Your Bets* Program website has a visually appealing home page (see figure 4) that allows users to scroll down to read about the program, or visitors can simply click buttons to go directly to

the pertinent parts of the research study. These buttons are visible immediately upon accessing the website, so participants who do not want to read through the program information do not have to do so. The *Hedge Your Bets* website consists of several pages, some visible to visitors while others operate in the background.

Figure 4

Hedge Your Bets Website Homepage (after program closed)

Aside from the home page, visitors could access several other pages. The “about” page describes me, my current PhD program, identifies my academic affiliation and supervisor, and discloses my funding from the Alberta Gambling Research Institute (AGRI). The *Hedge Your Bets* Program page serves two purposes. First, it has a button to click if the visitor wants to start the program. Second, it describes the modules that make up the *Hedge Your Bets* Program. The Problem Gambling Resources page contains links to problem gambling help programs: Gamblers Anonymous, GameSense, and Gam-Anon. This page also serves as the problem gambling resources for the *Hedge Your Bets* program. That is, if participants click on the link for problem gambling resources within the *Hedge Your Bets* program, they are taken to this page on the website. There is also a Glossary page, which is linked to the *Hedge Your Bets* program in the same way as the problem gambling resources. Participants can click on a term they do not know and be redirected to the glossary page on the website. Finally, the website also

contains the reference list for the *Hedge Your Bets* Program. A banner across the bottom of each page with contact information, and the University of Lethbridge and AGRI logos.

Once the program was ready to go, I decided to conduct a pilot study prior to testing the program with a sample of offenders, ex-offenders, and those who live or work with offenders or ex-offenders. Given the years of development and testing that went into the final – and effective – *Stacked Deck* program, I knew that pilot testing my program was necessary. Despite the time commitment involved, I knew that pilot testing would increase the likelihood of efficacious results in the end. I used the results of the pilot study to guide revisions to the *Hedge Your Bets* program, and then tested the revised program. In Chapter 3 I will discus Study 1 (the pilot study) and in Chapter 4 I will discuss Study 2 (the main study to evaluate *Hedge Your Bets*).

Chapter 3: Study 1 *Hedge Your Bets* Pilot Study

Chapters 3 and 4 describe the evaluation of the *Hedge Your Bets* program across two studies. In Study 1 (Chapter 3), I piloted the *Hedge Your Bets* module content and post-module assessments in a sample of university and college students. In Study 2 (Chapter 4), I evaluated the efficacy of the final *Hedge Your Bets* program in a community sample, including offenders and those who are friends with/related to/work with offenders across six timepoints.

Study 1: *Hedge Your Bets* Pilot Study

The *Hedge Your Bets* pilot study was conducted for several purposes. First, to establish a baseline[16] for the scores on each of the post-module assessments in a sample of post-secondary students that could serve as an indication of the appropriate baseline in Study 2 with offenders. Because post-secondary students likely have different experiences than offenders, I realized there would be limited utility in using these scores as an absolute baseline for Study 2. However, equally if not more important, Study 1 allowed me to get valuable feedback on the knowledge, fallacies, skills, and problems modules with the intent to revise as needed before launching the main study. Study 1 also allowed me to test the functionality of the modules. Finally, the pilot study allowed me to examine the difficulty level of each question to see whether any questions needed to be modified.

The pilot study was approved by both the Research Ethics Boards at the University of Alberta (which manages University of Lethbridge research studies; Pro00121825) and Lethbridge College (Protocol LC-23-01).

Method

Recruitment

I recruited participants at two post-secondary institutions in Lethbridge, Alberta: the University of Lethbridge and Lethbridge College. At the University of Lethbridge, I recruited participants through the SONA system, whereby psychology students receive 0.5% course credit for every 30 minutes of

[16] By baseline level, I mean the level of gambling knowledge and/or understanding before any sort of gambling-specific education or intervention.

participation in a research study, to a maximum of 3%. Participants first read descriptions of the various studies available, signed up for those studies if they wish, completed them, and received credit for participation toward their course grade.

At Lethbridge College, I recruited students using posters in public areas and emails sent to program assistants throughout the College. Participants simply scanned a QR code from one of the posters or clicked the link in the email sent to them by the program assistant to go to the *Hedge Your Bets* program website. From the website, they clicked the button for the *Hedge Your Bets* Lethbridge College Pilot Study. As an incentive, I ran a gift card lottery wherein Lethbridge College students could win one of 10 $5 Tim Hortons gift cards.

The participants in the pilot study consisted of 131 students from the University of Lethbridge and 13 students from Lethbridge College. Given the purpose of the pilot study, I did not collect demographic data.

Materials and Measures

The Study 1 Modules Survey (S1MS). In the *Hedge Your Bets* program, participants complete post-module quizzes at the end of each of the four content modules (i.e., the knowledge, fallacies, skills, and problems modules). The Study 1 Modules Survey (S1MS) contains the pilot version of all four post-module quizzes. Each module quiz has eight questions, meaning the S1MS has 32 questions (see Appendix A).

Participant Feedback. I assessed feedback on the modules using both open and closed-ended questions. Participants responded to three Likert-type items about how understandable the content was, if the images were attention-grabbing, and if the interactives helped them learn. Participants also responded to three open ended items, asking about any problems with module functionality, how the modules could be improved, and if participants had any other comments they wanted to share (see Appendix B).

Procedures

The *Hedge Your Bets* Pilot Study ran from Monday, March 13, 2023, to Thursday, April 6, 2023, at both institutions.

University of Lethbridge. Through the SONA system, participants were taken online to Qualtrics to complete the Study 1 Modules Survey (S1MS), which established their level of baseline knowledge in each of the four modules prior to be exposed to the modules themselves. The first page contained the implied consent form. Once participants read the form, they clicked "next page" to consent to participate and begin the survey questions. After completing the S1MS, participants reviewed at least one of the four content modules (for 0.5% credit).[17] Participants then had the opportunity to review as many additional modules as they chose (for 0.5% credit each). After each module, participants were redirected to Qualtrics to complete the Participant Feedback Questions.

Lethbridge College. Participants accessed the *Hedge Your Bets* program through the QR codes on the posters or the links in the recruitment emails. Once on the *Hedge Your Bets* Program website, participants clicked the button for the Lethbridge College Pilot Study. This took participants to the S1MS in Qualtrics, where the first page was the implied consent form. By clicking "next page", participants consented to the study and were taken to the beginning of the survey. Participants who wanted to enter the gift card lottery had to provide an email address for delivery of the electronic gift card. Additionally, as per provincial legislation, those participants who entered the gift card lottery had to answer a skill testing question. Lethbridge College students did not review any modules or provide any participant feedback on any module because I could not offer them additional incentives for the time investment required. At the end of the survey, participants saw a message thanking them for participating and providing them information on the gift card lottery.

Results

First, I will discuss the results of the S1MS across both samples (the University and the College); then, I will discuss the participant feedback on the modules and the revisions that resulted from that feedback. For all quantitative analyses in this dissertation, I used SPSS v.26, and for all qualitative analyses I used NVivo v.12.

[17] A description of the content of each module can be found in the "materials" section of the program design chapter.

Study 1 Modules Survey (S1MS)

There were 144 participants across both locations, with 131 (91.0%) from the university and 13 (9.0%) from the college. First, I calculated an average score for each question (Table 1).

Table 1

Study 1 (Pilot) Modules Survey (S1MS) Average Score

Items	Pilot Study	
Knowledge Module	*n* = 144	Average % Correct
Question 1	101	70.14
Question 2	105	72.92
Question 3	122	84.72
Question 4	87	60.42
Question 5	115	79.86
Question 6	92	63.89
Question 7	142	98.61
Question 8	57	39.58
Module Average	5.70	71.27
Fallacies Module		
Question 1	134	93.06
Question 2	78	54.17
Question 3	99	68.75
Question 4	118	81.94
Question 5	124	86.11
Question 6	119	82.64
Question 7	112	77.78
Question 8	117	81.25
Module Average	6.26	78.21
Skills Module		
Question 1	132	91.67
Question 2	38	26.39
Question 3	10	6.94
Question 4	75	52.08
Question 5	132	91.67
Question 6	59	40.97
Question 7	88	61.11
Question 8	116	80.56
Module Average	4.51	56.42
Problems Module		
Question 1	128	88.89
Question 2	84	58.33

Question 3	30	20.83
Question 4	90	62.50
Question 5	132	91.67
Question 6	132	91.67
Question 7	134	93.06
Question 8	80	55.56
Module Average	5.63	70.31

Note. Pilot study questions and response options can be found in Appendix A.

I anticipated that the skills module would return the lowest scores, as it is arguably the most difficult module. As illustrated in Table 1, this is exactly what happened. While average scores were between 70% and 80% for the knowledge, fallacies, and problems module, the average score for the skills module was only 56%. The average scores for the knowledge, fallacies, and problems module were higher than I would anticipate for an offender sample. However, this is explained by the educational level and context of my pilot sample (i.e., all being current college or university students).

Each module quiz contained a range of difficulty levels in the eight questions. Some were easier questions, while others were considerably more difficult to answer for participants with no (or limited) knowledge and/or understanding of gambling. As such, some questions (i.e., knowledge module question 8, fallacies module question 2, and skills module questions 2 and 3) returned lower average scores than other questions. However, this question-by-question analysis did lead to some question modifications after the pilot study and before the *Hedge Your Bets* study.

Updates to the Study 1 Modules Survey (S1MS) following the Pilot Study. Several revisions were made to questions throughout the S1MS. In most cases, the changes resulted from the question analysis noted above, and in one case the change was to correct researcher error. I will discuss these changes in further detail below.

First, in the knowledge module, revisions were made to four questions. For question 1 “Which of the following is true?”, the response options were modified to make the answer more difficult to simply guess correctly. The response options during the pilot study were: (a) gambling has been around for thousands of years; (b) gambling has been around for hundreds of years; (c) gambling has only been around for the past 100 years; or (d) gambling has only been around for the past 50 years. After revisions, the response options for this question were: (a) gambling has been around for thousands of

years and in almost all societies; (b) gambling has been around for thousands of years but only in some societies; (c) gambling has been around for over 100 years and in almost all societies; or (d) gambling has been around for over 100 years but only in some societies.

The next revisions to the knowledge module questions occurred in question 2: “Which is the best definition of gambling?”, where the response options were (a) taking a risk on something with an uncertain outcome; (b) betting money or items of value on a chance outcome; or (c) betting money or items of value (i.e., canteen items, cigarettes, etc.) on something with an uncertain outcome in hope of winning money or items of value. The example in parentheses in response option c was removed “(i.e., canteen items, cigarettes, etc.)” so that option c paralleled response options (a) and (b). Also in this module, item 7: “Gambling can become as addictive as alcohol or other drugs” was removed from the knowledge module entirely, as it is more appropriately asked in the problems module. It was replaced with: “Which of the following is true?” and the following response options: (a) gambling is less available today than it was in the past; (b) gambling availability has stayed the same; (c) gambling is more available than it was in the past; or (d) none of the above. Finally, question 8 was missing a response option (due to researcher error). Question 8 was: “Which of the following is not one of the most common reasons for legalizing gambling?” and response options were: (a) to provide citizens an easy way to increase their wealth; (b) to raise money for governments; (c) to keep the money spent on gambling in the local area by making sure people don’t have to travel to gamble; or (d) to decrease illegal gambling. There was supposed to be a fifth response option for this question: (e) all of the above. This option was added to the response options for the *Hedge Your Bets* study.

Second, in the fallacies module, revisions were only made to one question. Question 2 was: “Which of the following is not a fallacy?” and the response options were (a) normalizing behavior by believing everyone behaves the same way you and your family does; (b) thinking that something you remember really well happened more often than it really did; (c) knowing that every time a coin is flipped there is a 50% chance it will come up heads, regardless of what it has come up before; or (d) believing a good luck charm can increase your odds of winning. In this case, the first three words of response option (a) “normalizing behavior by…” were removed. This is the question that received the lowest average score in the fallacies module. I removed the phrase “normalizing behavior by…” as I felt it unnecessarily

further complicated the question. I was also concerned that an offender population may struggle to understand this phrase.

Third, in the skills module, none of the questions were revised. This module was expected to be the most difficult for most participants, as probability, random chance, and the independence of random events are challenging concepts for many people regardless of education level (Reyna & Brainerd, 2008). Questions 2 and 3 performed quite poorly during the pilot study, likely because they asked about gambling-specific contexts that would be covered in the *Hedge Your Bets* program. For these reasons, revisions were not made to these questions.

Finally, in the problems module, two questions were changed. Question 1 was “Which of the following is true?” with response options: (a) gambling is less available today than it was in the past; (b) gambling availability has stayed the same; (c) gambling is more available than it was in the past; or (d) none of the above. This question was removed from the problems module entirely, as it belonged more appropriately in the knowledge module. Indeed, this question simply swapped places with item 7 in the knowledge module “Gambling can become as addictive as alcohol or other drugs.” Item 5: “Gambling problems can affect which of the following life areas” was also removed entirely, as it was deemed too easy (91.7% of participants got this question correct). It was replaced with the item: "What are some symptoms of problem gambling?” with response options “true” and “false.” Though questions 6: “What are some risk factors for problem gambling?” (also 91.7% correct responses) and 7: “What are some symptoms of problem gambling? (93% correct responses) were also quite easy, both were considered essential to the core purpose of the *Hedge Your Bets* program, and so I retained these questions.

Analysis of Module Scores across the Pilot Study Sample Subgroups. I calculated the means and standard deviations for each module for the college sample, the university sample, and the total sample. Prior to conducting the study, I anticipated that the mean scores from the university would be higher than the mean scores from the college. I expected this because colleges generally accept students with lower high school Grade Point Averages (GPAs) than universities do. Therefore, I expected university students to outperform college students on the S1MS. However, except for the skills module, this did not appear to be the case.

Mean scores per module were similar for each group (i.e., university students and college students), however, the college students' mean scores were slightly higher across three of the four modules (the exception being the skills module). Because the samples from each institution were so unbalanced, I did not conduct any statistical analyses on the difference between these means. However, visual examination indicates the difference was minimal (Table 2).

Table 2

Hedge Your Bets Pilot Study Mean Modules Survey (S1MS) Scores

Module	Pilot: College			Pilot: University			Pilot: Full Sample		
	n	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
Knowledge	13	6.31	1.32	131	5.64	1.36	144	5.70	1.37
Fallacies	13	6.69	1.25	131	6.21	1.71	144	6.26	1.68
Skills	13	4.31	1.38	131	4.53	1.74	144	4.51	1.71
Problems	13	6.00	1.22	131	5.59	1.45	144	5.63	1.43

Note. Maximum score for each module quiz was 8.

Participant Feedback Results: Quantitative

I calculated means and standard deviations of the three Likert-type participant feedback items (Table 3).

Table 3

Hedge Your Bets Study 1 Participant Feedback Likert Scores

Modules	Easy to Understand			Pictures Grabbed my Attention			Interactives Helped me Learn		
	n	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
Knowledge	40	3.90	0.30	40	3.85	0.36	40	3.85	0.36
Fallacies	40	3.68	0.76	40	3.38	0.84	39	3.67	0.66
Skills	30	3.52	0.31	29	3.52	0.57	30	3.73	0.45
Problems	37	3.86	0.35	36	3.81	0.58	36	3.83	0.38

Note. Items were rated on a four-point scale: 1 = *disagree,* 2 = *somewhat disagree,* 3 = *somewhat agree,* 4 = *agree*.

Every score but one was greater than 3.50 out of 4.00, indicating that in general, participants rated the modules highly. For one question, however, the score was a bit lower. On the question about whether the pictures were attention-grabbing, the fallacies module received a score of 3.38. Indeed, this question generally received the lowest scores across all the modules, indicating that the pictures in all the

modules could be more interesting. In combination with the qualitative feedback I will discuss next, this led to my decision to revise many of the images I used throughout the program.

Participant Feedback Results: Qualitative

Participants were asked some basic, open-ended questions about the program. These questions were (1) Did you experience any problems with how the module functioned? If so, please describe these issues; (2) How could we have improved the modules; and (3) Please provide any other feedback or comments you'd like to share. These questions were analyzed simply, by compiling the substantive comments and assessing the feasibility of acting on them.

Participants responses to the open-ended questions were overwhelmingly positive. Numerous participants indicated the content was highly informative, easy to understand, and that no improvements were needed. Some participants identified typos or minor formatting errors, while others made suggestions about formatting. Several participants requested more examples, more visuals, more review questions, and more interactives. Additionally, some participants indicated that there was too much content. Three participants described the content as “repetitive”: twice for the problems module and once for the fallacies module. Furthermore, two participants requested a “read-aloud” option so they could listen to the content rather than read it. Several participants specifically suggested that important terms be made to stand out from the rest of the text by using bold font or colour. Another formatting suggestion was that I use boxes to outline different sections or to indicate interactives. Finally, one participant requested a page-by-page format, rather than the scroll-through format that was used in the pilot.

Updates to Hedge Your Bets Program Based on Participant Feedback

I next revised the *Hedge Your Bets* program, based largely on the qualitative feedback I received from participants in the pilot program as well as feedback from my supervisory committee. The feedback from my supervisory committee generally paralleled the feedback I received from the pilot study participants. I began with the most basic revisions, which involved correcting all typographical errors.

Next, I considered the feedback regarding general formatting. The suggestions to bold or use color to highlight important terms aligned with techniques used in learning materials like textbooks. Therefore, I implemented this suggestion. Furthermore, I used a specific colour to indicate words that were interactively linked to the course glossary, so they could be more easily identified. I chose not to

implement the suggestion that I outline different sections or interactives in boxes, because adding outlines or boxes can make a page choppy and break up the flow of the content in such a way that makes it harder to follow for some learners (Lethbridge College, 2018). Next, I addressed the request for a page-by-page format.

This page-by-page format suggestion resonated with me and my experience as a post-secondary instructor. All the online courses I have designed, as well as most of the more successful online courses I have taught, have utilized such a page-by page format. Additionally, my interactions with students who I've sent to a website to find information reinforced the belief that the longer they must scroll, the less they see and absorb. Scrolling, in itself, is a leisure activity in a world of modern smart phones and social media. In my experience, many people do not pay careful attention while scrolling. Beyond my experience, Baughan et al. (2022) found that scrolling was associated with participants being completely unaware of the content they had read and feeling like their time had been wasted. Therefore, I implemented this suggestion, using a "continue" button to simulate a page-by-page experience. At the end of each section of content (within each module), I created a button that participants had to click on to continue to the next section. It did not actually take participants to a new page; rather, it automatically scrolled to the next section of content. I used this approach due to software limitations. The main drawback was that participants could not scroll back up the page to review content if they clicked the "continue" button. They could, however, return to the module to review during a different sitting if they so chose. Next, I considered the feedback regarding a read-aloud option. To create the audio overlay, I recorded myself reading aloud all the content, and added the narration as an audio clip at the beginning of each section. I did this because I believe it significantly increased the accessibility of the *Hedge Your Bets* Program, especially as the program was intended for offenders who may have more difficulty reading than the general population.

Next were some content-specific suggestions. Several participants requested more visuals. I added more images throughout the program, but specifically in the modules/sections where participants indicated they would improve the content. Several participants also requested more examples, particularly in the skills module. To accommodate this, I recorded video clips of a whiteboard on which I worked through the basic mathematical equations, so participants could work through the examples with

me. Participants also requested more review questions and more interactives. I reviewed the program and added more of each of these wherever I felt it was appropriate (but not overwhelming or distracting) to do so.

Finally, I will address some suggestions that I chose not to implement. One participant requested international examples and one requested non-gambling examples. I did not implement either request, as I felt they were beyond the scope of the program. A few participants indicated there was too much content, with one participant simply stating “less words.” However, other participants indicated the amount of content was appropriate, and still others requested more content. In the end, I felt these comments simply reflected personal preference and balanced each other out, so I did not modify the amount of content based on these comments. Finally, a few participants stated that the content was repetitive, specifically in the problems module and the fallacies module. However, repetition was intentionally built into the modules to address the unique factors of offender populations that impact their learning, including lower average education levels, increased rates of ADHD and FASD, and increased prevalence of learning challenges. As such, I chose not to reduce the repetition.

Study 1 Discussion

The first purpose of this study was to establish a rough baseline level of knowledge for the module content prior to be exposed to the module itself and to ensure that the module quizzes and individual questions were neither too easy nor too difficult. Reassuringly, the average module scores ranged from 4.51/8 to 6.26/8, which suggests an appropriate level of difficulty. That said, examination of individual questions showed that some were too easy/difficult, so I revised questions in preparation for Study 2.

An additional purpose of this study was to elicit feedback and identify potential issues in the module content. Though the overall feedback was quite positive, I did gain some valuable feedback and subsequently significantly revised the modules. I believe these revisions substantially improved the *Hedge Your Bets* program. The third purpose was to test the functionality of the program. I had to link multiple computer programs together (Rise 360, where the *Hedge Your Bets* program was located; Squarespace, where the *Hedge Your Bets* website was hosted; and Qualtrics, where the post-module assessments and surveys were located). As these programs were not designed to work together, I felt it

necessary to test their combined functionality as participants would need to transition between the platforms. Overall, this went quite smoothly.

As with most studies, this pilot study has limitations. First, the samples were self-selected rather than random, meaning the results do not generalize to all college or university students. Second, my sample consisted of solely post-secondary educated participants. Because low education is associated with problem gambling (Williams et al., 2012) and low intelligence is associated with belief in gambling fallacies (Leonard & Williams, 2014), it cannot be assumed the results from a post-secondary sample will generalize to a general public sample or an offender sample. Next, I will discuss the evaluation of the revised *Hedge Your Bets* program.

Chapter 4: Study 2 *Hedge Your Bets* Implementation and Evaluation

Study 1 directed revisions necessary to *Hedge Your Bets* that made the program more widely accessible and, likely, more effective. After revising *Hedge Your Bets* based on the results of Study 1, I launched the *Hedge Your Bets* program with a sample of offenders, ex-offenders, and those who work or live with offenders or ex-offenders. The purpose of Study 2 was to assess the efficacy of the revised *Hedge Your Bets* program across seven timepoints. Study 2 was approved by the Research Ethics Board at the University of Alberta (which manages research ethics approvals at the University of Lethbridge; Pro00121825).

Method

Recruitment

Originally, I intended to deliver the program in person to offenders currently incarcerated. I planned to use my professional network and understanding of the corrections system in Canada to offer *Hedge Your Bets* as a correctional program. Unfortunately, the COVID-19 pandemic made this impossible, as correctional facilities were forced to close to all non-essential personnel and visitors during the pandemic. As correctional facilities experienced very high rates, and recurring outbreaks, of COVID-19, inmates proved to be inconsistently accessible. By 2022 I realized there was no guarantee I would be able to get consistent in-person access to inmates in a timeframe that would meet my PhD timelines.

Disappointed, I moved to the next best option: recruiting offenders who were serving sentences in the community. Initially, Alberta Community Corrections (probation) agreed to post recruitment posters for this program in probation offices throughout the province. They also agreed to forward a recruitment email to Probation Officers (POs), so POs could share information about the study with their clients. However, between this initial approval and the launch of the study, the province of Alberta held an election. After this election, there were changes to staffing and processes throughout many government departments, including the Ministry of Justice and the Community Corrections department. As a result of these changes, the prior agreement I had with Community Corrections was rendered null and void. The Ministry was in the process of creating new procedures for approving research-related activities, and they would not be ready to consider my request within my PhD program timeframes. As such, I chose to move forward without this partnership.

Losing this recruitment partner presented significant challenges. To overcome some of these challenges, I consulted my supervisory committee and decided to broaden my eligibility criteria. Initially, participants had to be (1) 18 years of age or older; (2) able to read English at a functional level; (3) able to legally access the internet; (4) a current or former criminal offender. The first three criteria remained unchanged, but the fourth criteria changed as follows: (4) must meet one of the following criteria: (a) be a current or former criminal offender; (b) be the family or close friend of a current or former criminal offender; or (c) work or volunteer with current or former criminal offenders.

I proceeded to share recruitment posters with two community service organizations who work with offenders and former offenders in the city of Lethbridge: the Salvation Army and Parkside Home (operated by Streets Alive Mission). I also shared the approved recruitment email throughout my personal and professional network. This process was slow and laborious and resulted in the recruitment of only 8 participants.

Finally, I reached out to online panel providers Qualtrics and Leger to inquire about the process and cost of accessing their online panels. Qualtrics responded with a quote that was significantly beyond my budget. Leger requested a meeting to first discuss the project in more detail. Next, Leger informed me that approximately 10% of the Canadian population would meet my participation criteria. Leger further conducted a brief screen of their panel participants and expressed confidence they would have significantly more than 50 people on their panels who met the criteria for my study. Then Leger provided a fee for service arrangement that was flexible and affordable. In the end, Leger's online panel participants made up most of my final sample. Leger pre-screened their panel participants to identify those who would meet my study criteria. Then, they provided me with lists of email addresses on a regular basis (six lists over a period of 10 weeks or so) totalling 1,937 email addresses. Of the 1,937 recruitment emails I sent out, a total of 76 participants completed the first timepoint (representing 90.5% of my total sample). The recruitment email can be found in Appendix C.

Participants

A demographic profile of the 84 participants who initially participated in the study is presented in Table 4. The survey that collected this information is contained in Appendix D.

Table 4

Study 2 Participant Demographics

Demographic Factor		Percentage
Gender	Women	59.5%
	Men	39.3%
	Non-Binary	1.2%
Age	18-25	4.8%
	26-33	16.7%
	34-41	21.4%
	42-49	14.3%
	50+	42.9%
Race	White	82.1%
	Indigenous	15.5%
	Black	6%
	South Asian	3.6%
	Middle Eastern	1.2%
Education	High school diploma	15.5%
	Some post-secondary education	20.2%
	Two-year post-secondary diploma	27.4%
	Four-year post-secondary degree	23.8%
	Graduate or Professional degree	13.1%
Income	< $20,000	14.3%
	$20,000 and $39,999	21.4%
	40,000 and $59,999	9.5%
	$60,000 and $79,999	11.9%
	$80,000 and $99,999	15.5%
	$100,000 or more	25%
Mental Health Disorder	Substance Use Disorder (SUD)	15.5%
	Depression	38.1%
	Anxiety	32.1%
	Attention Deficit-Hyperactivity Disorder (ADHD)	13.1%
	Fetal Alcohol Spectrum Disorder (FASD)	1.2%
	Post-Traumatic Stress Disorder (PTSD)	7.1%
	Bipolar	2.4%
	Panic Disorder	3.6%
	Personality Disorder	2.4%

53 Participants completed the entire *Hedge Your Bets study*. Of these, 62.3% were women, 35.8% were men, and 1.9% were nonbinary. 50.9% of participants were 50 years old or older, 35.9% were between the ages of 26 and 41, and the remaining 13.2% were either between 18 and 25 or 42 and

49. Racially, 83% of participants were White, 17% were Indigenous, 5.7% were Black, and 3.8% were Middle Eastern. Overall, the sample was fairly well-educated, with 26.4% having a two-year post-secondary diploma, 24.5% having a four-year post-secondary degree, and 17% having an advanced post-secondary degree (i.e., Masters, PhD., M.D., LL.B, etc.). At the lower end of the education spectrum, 18.9% had some post-secondary and 13.2% had their high school diploma. Perhaps unsurprisingly, given the education levels held by participants, 60.4% of participants earned $60,000 per year or more (17% earned between $60,000 and $79,999, 17% earned between $80,000 and $99,999, and 26.4% earned $100,000 or more). At the lower end of the income spectrum, 9.4% earned less that $20,000, 20.8% earned between $20,000 and $39,999, and 5.7% earned between $40,000 and $59,999. Lastly, participants reported mental health disorders: 34% had depression, 28.3% had anxiety, 13.2% had substance use disorder (SUD), 13.2% had attention deficit-hyperactivity disorder (ADHD), 5.7% had panic disorder, 1.9% had fetal alcohol spectrum disorder (FASD), 1.9% had post-traumatic stress disorder (PTSD), and 1.9% had a personality disorder.

Attrition

Fifty-three participants completed all of the timepoints in Study 2 (63.1% of those who began the study). Further details can be seen in Table 5 below.

Table 5

Participant Attrition across Time

Assessment/Module	Timepoint	*n*	Attrition from Timepoint 0	Attrition from Previous Timepoint
Pre-Program	0	84	--	--
Module 1	1	76	8 (9.5%)	8 (9.5%)
Module 2	2	70	14 (16.7%)	6 (7.9%)
Module 3	3	69	15 (17.9%)	1(1.4%)
Module 4	4	61	23 (27.4%)	8 (11.6%)
Post-Program	5	58	26 (31.0%)	3 (5.0%)
Follow-up	6	53	31 (36.9%)	5 (8.6%)

I conducted a binomial logistic regression to examine the characteristics of people who completed the *Hedge Your Bets* program versus those who did not. I included the following six variables: gender (man/woman), White/non-White, income, education, mental health disorder (yes/no), criminal offender

yes/no. The overall model was not significant, $\chi^2(6) = 6.489$, $p = .371$, $R^2_N = .102$, nor were any of the predictors (see Table E1 in Appendix E). This result indicates that attrition from the *Hedge Your Bets* study occurred randomly, rather than due to any specific participant characteristics.

Measures

Participants began the *Hedge Your Bets* study by completing the pre-program survey,[18] which included the following measures in the following order: the demographics measure, the criminal history questionnaire, the gambling behavior questionnaire (GBQ), the problem and pathological gambling measure (PPGM; Williams & Volberg, 2010), the gambling attitudes questionnaire (GAQ), and the Study 2 Modules Survey (S2MS).[19] The post-program[18] and follow-up[18] surveys only contained the GBQ, the GAQ, and the S2MS. I collected data across seven timepoints (Table 6; Figure 5).

Table 6

Measures Schedule by Timepoints

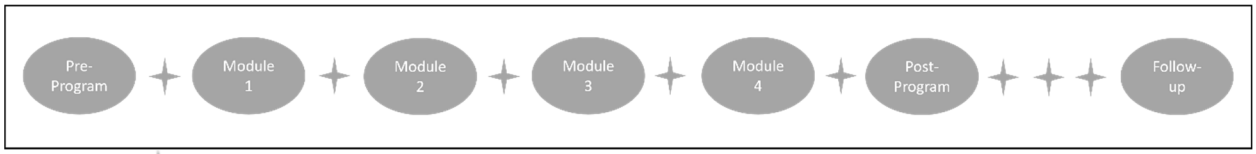
Measures	Pre-Program	Module Quizzes				Post-Program	Follow-up
	T0	T1	T2	T3	T4	T5	T6
Demographics Measure	X						
Criminal History Measure	X						
GBQ	X					X	X
PPGM	X						
GAQ	X					X	X
S2MS	X					X	X
Knowledge Post-assessment		X					
Fallacies Post-assessment			X				
Skills Post-Assessment				X			
Problems Post-Assessment					X		

Note. GBQ = Gambling Behavior Questionnaire; PPGM = Problem and Pathological Gambling Measure; GAQ = Gambling Attitudes Questionnaire; S2MS = Study 2 Modules Survey.
T0 = pre-program, T1 = knowledge module quiz, T2 = fallacies module quiz, T3 = skills module quiz, T4 = problems module quiz, T5 = post-program, T6 = follow-up.

Figure 5

[18] All components of the pre-program, post-program, and follow-up surveys are described in further detail in the Program Design chapter.
[19] The Study 2 Modules Survey (S2MS) contains all four module quizzes that are used to assess module learning at various timepoints throughout the program. It is described in greater detail in the Program Design chapter.

HYB Study Timeline



Note. Each ✦ represents a one-week waiting period.

The Demographics Measure (Timepoint 0 Only)

I created the 6-item Demographics Measure (Appendix D) to assess several demographic traits of my participants: age, gender, race, education level, annual income, and mental health (lifetime). Participants responded to this measure at only the first timepoint because demographic factors tend to be static in the short-term (such as the eight-week timeline of the *Hedge Your Bets* program).

Mental health. I collected data on mental health disorders because they are known to occur disproportionately both among the offender population (Kouyoumdjian et al., 2016) and among people who have gambling problems (Lorains et al., 2011; Waluk et al., 2016). Therefore, I chose to collect data on comorbid mental disorders to avoid having this become an extraneous variable that I did not account for. I asked about the following nine mental health conditions: substance use disorder (SUD), depression, anxiety, bipolar disorder, panic disorder, attention deficit/hyperactivity disorder (ADHD), fetal alcohol spectrum disorder (FASD), post-traumatic stress disorder (PTSD), and any personality disorder. I chose these disorders as they are overrepresented among offenders, as per both my professional experience and the literature (Kouyoumdjian et al., 2016). Additionally, several mental disorders (e.g., depression) and/or developmental disorders (e.g., ADHD) are more prevalent among those with gambling problems (Lorains et al., 2011; Waluk et al., 2016). Further, some of these (specifically substance use disorder, depression, and ADHD) have been found in at least one study to correlate with gambling problems among offenders (Preston et al., 2012). I also included an 'other' option with a text box. Given comorbidities are higher for both the gambling populations and the offender populations, it makes sense that comorbidity rates will be high for the combined population of offenders who gamble.

The Criminal History Measure (Timepoint 1 Only)

I created the 8-item Criminal History Measure to gather information about the participants' criminal history (Appendix F). The criminal history measure was administered at Timepoint 1 only, as it

measured factors that change slowly over time. For example, questions include whether the participant had ever been convicted of a crime, ever served a sentence of incarceration, and types of offending they had been convicted of, etc. In my experience in corrections, these factors take time to change. While it is possible that a participant may have attended court, been convicted, and been sentenced within the eight weeks they were participating in the program, it is not likely. It is also unlikely that someone involved in an ongoing court process would be motivated to participate in a research study. For these reasons, I chose to administer the criminal history measure only once, at the pre-program timepoint.

In the criminal history measure, participants first responded to a filter question that asked if they had ever been convicted of a criminal offence. If they responded no, they proceeded to the Gambling Behavior Questionnaire. If they responded yes, they completed the remaining items in the Criminal History Measure. A sample item is “are you currently serving a sentence?” (yes/no response option). I included a single question about offence type on this measure because research shows that having committed any criminal offence increases the likelihood of gambling problems (Turner et al., 2009), but prior research has largely focused on financial crimes. The remaining items on this measure were designed to assess institutionalization.

Institutionalization items. Institutionalization is the “process of assimilation and adaptation” to the offender subculture; it involves learning the behavior expectations, social expectations, norms, and hierarchies of the offender subculture and prison life (Ricciardelli, 2014, p. 236). I measured institutionalization using four items. A sample item is “How long ago did you complete your most recent sentence? (response options: I am still serving a sentence; less than 1 year; 1 to 2 years less a day; 2 to 3 years less a day; 3 to 4 years less a day; 4 to 5 years less a day; 5 years or more). It is important to measure institutionalization for two reasons. First, institutionalization corresponds to involvement in the offender subculture, and both of these elements increase with the length of incarceration (Mitchell et al., 2017; Ricciardelli et al., 2014). Second, gambling is a regular part of institutional life, the offender subculture, and the culture of low-SES neighborhoods in North America (Anderson, 1999; Beauregard & Brochu, 2013; Binde & Romild, 2020; Casey, 2020; Williams & Hinton, 2006). Gambling is also a regular activity in prisons around the world (Lelonek-Kuleta, 2020; Smith et al., 2022). Sensibly, as institutionalization increases, so should gambling behavior and gambling harm.

Through my work with offenders on parole, I have learned that institutionalization decreases slowly over time such that offenders are most institutionalized upon their initial release from custody. I assessed this concept of recency by asking about the length of time (if any) that has passed since they finished serving their last sentence (and, more specifically, since they were released from custody). Additionally, institutionalization takes longer to decrease for offenders who spent more time incarcerated. For those who have spent much of their lives in jail or prison, it may never go away entirely (Mitchell et al., 2017). Through this measure, I explore the cumulative amount of time participants have spent incarcerated. Greater levels of institutionalization and adherence to the offender subculture are likely to correlate with more gambling behavior and greater levels of gambling harm.

Twenty-seven out of 84 participants had criminal convictions (35.5%). The most common offence type was driving offences (15.5%), followed by violent offences (11.9%). Four participants selected "other" for offence type, which I recoded according to the classification system I was trained to use in corrections. One participant reported prostitution-related offences and shoplifting, which I recoded as sexual offences and property offences, respectively. Another reported fraud, which I recoded as financial/fraud offences. Another reported assault, which I recoded as a violent offence. And the last reported arson, which I recoded as a violent offence. Table 7 provides the frequencies of all reported offence categories.

Table 7

Participant Offence Type

Item	Frequency	
	n	%
What types of offence(s) have you ever been convicted of, including any current offences? Please choose all that apply.		
Breach offences[20]	6	22.2
Driving Offences	13	48.1
Drug Offences	4	14.8

[20] Breach offences refer to any offences where a court order, prohibition order, or legally-imposed restrictions/conditions (e.g., like those on bail orders, probation orders, parole releases, etc.) has been breached or violated.

Fraud/Financial Offences	5	18.5
Property Offences	6	22.2
Sexual Offences	1	3.7
Violent Offences	10	37.0
Total	45	

Note. Some participants selected more than one category of offence.

Only two participants were currently serving a sentence, and neither served time in custody as part of their current sentence. Most participants (59.3%) with criminal convictions finished their most recent sentence five or more years before taking the *Hedge Your Bets* program. Additionally, most participants reported limited time spent in custody. Though the longest consecutive time spent in custody was three to five years less a day (one participant), most spent less than one year (63%) or no time (29.6%) in custody. Furthermore, the most cumulative time spent in custody was five years to seven years less a day (one participant). Most participants spent a cumulative total of less than one year (40.7%) or no time (33.3%) in custody.

The Gambling Behavior Questionnaire (Timepoints 0, 5, and 6)

Next, participants completed the gambling behavior questionnaire (GBQ, Appendix G). Participants completed the GBQ at the pre-program, post-program, and follow-up. I created the 18-item GBQ to gather information about each participant's level and pattern of gambling behavior in the prior 30 days. To assesses both community and institutional gambling behavior, I created or adapted items from existing gambling measures (Wynne, 2003, Williams & Volberg, 2010, Williams et al., 2017). I could not use any existing measure in its entirety because, to the best of my knowledge, no existing measure assesses gambling behavior in both the community and forensic institutional environments. Additionally, no known existing measure investigates the relationship between gambling behavior and a criminal lifestyle.[21] This questionnaire contained binary, Likert-type, and open text response options. The following

[21] Previous research has explored the relationship between gambling and financial crimes, such as fraud and embezzlement. I want to explore this further, as I have observed increasing numbers of offenders turning to drug crimes (e.g., selling or trafficking drugs) to make money. Additionally, I want to explore a potential relationship between gambling behavior and living a criminal lifestyle, even in cases where crime was not used to fund gambling behavior.

topics were assessed in this questionnaire: type and frequency of gambling behavior, losses, debt, payment methods, and criminal behavior.

To begin, participants indicated if they had been incarcerated at all during the past month (30 days). The 30-day timeframe was selected so behavior could be compared pre- and post-program. This was a branching question, as those who responded “yes” completed both the “jail or prison” and “community” sections of the questionnaire, while those who responded “no” completed only the “community” section of the questionnaire. Though the sections are similar, containing some of the same items, each section contains some additional items that are not relevant to the other environment. For example, I only asked about using a credit card to pay for gambling in the community, because inmates do not have access to credit cards.

The first item in both the “jail or prison” and “community” sections of the questionnaire assessed frequency of various types of gambling during the past month. The response options were different in each section, with the “jail or prison” section containing fewer response options due to the limited gambling choices available in jail or prison. I collected information on gambling type and frequency for two reasons. First, the extant literature contains limited information about gambling in jail or prison. Second, those with gambling problems are more likely to engage in multiple gambling formats, play continuous gambling formats (e.g., EGMs), and gamble more frequently (Williams et al., 2015). Unsurprisingly, research indicates that gambling in multiple formats, playing continuous gambling formats, and frequent gambling significantly predict a gambling problem (William et al., 2015). These behaviors, in turn, correspond to increased gambling harm (Williams et al., 2015). Thus, it is important to measure gambling type and frequency.

Next, participants in both sections indicated the largest amount they have lost while gambling. Losses are important in assessing gambling behavior. Chasing losses, wherein the gambler loses money but continues to gamble in a targeted effort to “win back” what they’ve lost, is indicative of a loss of control and is central to the diagnosis of gambling disorder (American Psychiatric Association, 2013; Williams & Volberg, 2010). Additionally, questions about chasing losses are included on most popular problem gambling screens (Lesieur & Blume, 1987; Williams & Volberg, 2010; Wynn, 2003). Though I did not gather information specific to chasing losses, the value being lost in the face of ongoing gambling may be

an indicator of increased gambling harm. Additionally, exploring losses from gambling in an institutional environment is novel information that will expand the small body of forensic gambling research. The next set of items assessed how participants paid for gambling and only appears in the “community” section of the questionnaire. Response options included withdrawing money from a bank machine, using a credit card, borrowing money, and taking out a payday loan. I adapted most of these items from the Gambling Participation Instrument (Williams et al., 2017). I did not include these items in the “jail or prison” section of the questionnaire because the payment methods are not available in jail or prison. Other financial concepts are also important in gambling research.

Next, participants responded to items about going into debt in both sections of the questionnaire because debt accrued through gambling is an important indicator of gambling harm. Financial harm is one of the most common types of gambling harm (Langham et al., 2016), and increasing debt is one of the ways that financial harm is operationalized. In the “community” section, there were also items about paying off debt. Specifically, whether participants gambled or committed crimes to make the money they need to pay off debts (gambling debts or other debts they have accrued). Committing crimes to pay debts or to obtain money to gamble speaks to the severity of the gambling behavior and likely correlates with greater gambling harm. Lastly, I asked participants if they tend to gamble while involved in their crime cycle to explore the relationship between gambling and criminal activity.

The Problem and Pathological Gambling Measure (Timepoint 0 Only)

The PPGM (Appendix H; Williams & Volberg, 2010; 2014) is a 14-item measure that was theoretically designed to capture the two dimensions most gambling experts agree are vital to identifying problem gamblers: harmful consequences and impaired control (Christensen et al., 2020; Williams & Volberg, 2010; Williams & Volberg, 2014). The PPGM consists of three sections (problems, impaired control, and other issues) and categorizes gamblers into one of four categories along the gambling continuum: (1) recreational gambler; (2) at-risk gambler; (3) problem gambler; and (4) pathological gambler (Williams & Volberg, 2010). A sample item is “Has your involvement in gambling caused you either to borrow a significant amount of money or sell some of your possessions in the past 12 months?” (response options: yes/no). The PPGM assesses gambling behavior over the past year, so participants responded to it only at the pre-program timepoint.

The PPGM has good internal consistency with a Cronbach's alpha ranging from .76 to .81 and good test-retest reliability (Williams et al., 2015). Williams and Volberg (2010) used Kendall's tau[22] to assess concurrent validity with the other measures of problem gambling including the Canadian Problem Gambling Index (CPGI; .70), the South Oaks Gambling Screen (SOGS; .69), and the National Opinion Research Center DSM Screen for Gambling Problems (NODS; .78). Overall classification accuracy of the PPGM was excellent with kappa[23] = .96, sensitivity > .99, specificity > .98, positive predictive power[24] > .93, negative predictive power[25] > .99, and diagnostic efficiency[26] = .99 (Williams et al., 2015). These strong psychometric properties make the PPGM the best choice for assessing problem gambling status among my participants.

When used as an assessment instrument for problem and pathological gambling, the PPGM divides participants into five categories: non-gambler, recreational gambler, at-risk gambler, problem gambler, and pathological gambler. To indicate either problem or pathological gambling, participants must score a minimum number of points in each subsection (problems, impaired control, and other issues), a minimum total score, and gamble at least once a month on some type of gambling over the past year. Other than the lowest scoring participants (i.e., non-gamblers and recreational gamblers), I am unable to place my participants into one of the remaining categories (i.e., at-risk gamblers, problem gamblers, or pathological gamblers) because I did not ask them about their frequency of gambling over the past year, as I did not need this information to assess the efficacy of *Hedge Your Bets*. Instead, I am using the PPGM Total Score as a proxy for gambling harm, with higher total scores indicating greater harm.

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[22] Kendall's tau is a nonparametric test of association strength and direction between two ordinal variables (Laerd Statistics, 2018)

[23] Kappa is "a quantitative measure of overall agreement after taking chance agreement into account" (Williams & Volberg, 2014, p. 22).

[24] Positive predictive power is the percentage of participants that were identified as problem gamblers by the assessment instrument and confirmed as problem gamblers in the clinical assessment (Williams & Volberg, 2014).

[25] Negative predictive power is the percentage of participants that are identified as non-problem gamblers by the assessment instrument and confirmed as non-problem gamblers in the clinical assessment (Williams & Volberg, 2014).

[26] Diagnostic efficiency is the "number of true positives (correctly identified as problem gamblers) and true negatives (correctly identified as non-problem gamblers) divided by the total sample size" (Williams & Volberg, 2014, p. 22).

The Gambling Attitudes Questionnaire (Timepoints 0, 5, and 6)

Next, participants answered questions about their attitudes toward gambling at the pre-program, post-program, and follow-up (Appendix J). I created the 7-item Likert-type gambling attitudes questionnaire (GAQ) to assess participants' attitudes toward gambling. The GAQ assesses participants' attitudes toward gambling in the following domains: benefits for society, importance as a recreational activity, morality of gambling, legality of gambling, gambling opportunities, acceptability as a leisure activity, and harmfulness. Higher ratings (out of four) indicate more positive attitudes toward gambling while lower ratings indicate more negative attitudes toward gambling. Research shows that educational interventions about problem gambling tend to result in participants endorsing more negative attitudes toward gambling when compared to pre-intervention measures (Nixon et al., 2006; Williams et al., 2010).

The Study 2 Modules Survey (S2MS; Timepoints 0, 5, and 6)

The Study 1 Modules Survey (S1MS) was revised based on the Study 1 participants feedback (see Appendix K for the revised Study 2 Modules Survey, the S2MS, used in Study 2). See Table 8 for the average score per question and the average module scores.

Table 8

Study 2 Modules Survey (S2MS) Average Scores

Items	Pre-Program	
Knowledge Module	*n* = 84	Average % Correct
Question 1	59	70.24
Question 2	54	64.29
Question 3	65	77.38
Question 4	38	45.24
Question 5	59	70.24
Question 6	56	66.67
Question 7	78	92.86
Question 8	36	42.86
Module Average	5.30	66.22
Fallacies Module		
Question 1	78	92.86
Question 2	45	53.57
Question 3	61	72.62
Question 4	61	72.62
Question 5	70	83.33
Question 6	70	83.33

Question 7	14	16.67
Question 8	15	17.86
Module Average	4.93	61.61
Skills Module		
Question 1	76	90.48
Question 2	14	16.67
Question 3	3	3.57
Question 4	59	70.24
Question 5	75	89.29
Question 6	38	45.24
Question 7	32	38.10
Question 8	75	89.29
Module Average	4.43	55.36
Problems Module		
Question 1	82	97.62
Question 2	46	54.76
Question 3	13	15.48
Question 4	44	52.38
Question 5	62	73.81
Question 6	69	82.14
Question 7	70	83.33
Question 8	22	26.19
Module Average	4.86	60.71

Note. *Hedge Your Bets* study questions (i.e., pre-program) can be found in Appendix K.

All items in the knowledge module appear to have performed well at the pre-program timepoint in Study 2. In the fallacies module, participants found items 7 and 8 challenging. Average scores for both of these items were significantly lower at the pre-program timepoint of Study 2 than in Study 1. In the skills module, items 2 and 3 posed a significant challenge for Study 2 participants at the pre-program timepoint, much the same as occurred in Study 1. As for the problems module, the lowest scored questions are entirely different than they were in Study 1. This is likely because the two lowest scored items in Study 1 (items 1 and 5) were replaced. At the pre-program timepoint of Study 2, the lowest scored questions were 3 and 8. The average score for item 3 at the pre-program timepoint was within 5% of the average score in Study 1. In both Study 1 and Study 2 item 8 of the problems module was the same: “What are the three phases of problem gambling?” with response options (a) winning, chasing losses, quitting; (b) winning, chasing losses, panic; losing, chasing losses, panic; or (d) chasing losses, winning, panic. The average score for this item in Study 1 was more than double what it was in Study 2.

Procedures

The *Hedge* Your Bets program and evaluation study opened for participation on May 8, 2023. Due to the recruitment issues outlined above, the study remained open for almost 29 weeks, much longer than I originally planned. The study closed to new participants on November 25, 2023. I had ten hypotheses.

Hypotheses

I planned to test some of these hypotheses with the entire sample and with the non-offender and offender subgroups separately, as noted in the hypotheses below.

1. This primary hypothesis applies to the entire sample, as well as the non-offender and offender subgroups. For each of the four content modules (i.e., Module 1: Knowledge; Module 2: Fallacies; Module 3: Skills, and Module 4: Problems), I expect there to be changes across timepoints. Compared to the pre-program assessments (Timepoint 0), scores on the module assessments (Timepoints 1, 2, 3, and 4) will increase for each module. Compared to the pre-program assessments (Timepoint 0), scores on the post-program assessments (Timepoint 5) will increase for each module. Compared to the pre-program assessments (Timepoint 0), scores on the follow-up assessments (Timepoint 6) will increase for each module. Compared to the post-program assessments (Timepoint 5), scores on the follow-up assessments (Timepoint 6) will either remain steady or decrease slightly for each module. I will assess this using a repeated-measures ANOVA and pairwise comparisons unless there is a severe violation of normality, in which case I will use the Friedman test followed by the Wilcoxon signed rank test or sign test (as appropriate based on assumptions) for pairwise comparisons (Laerd Statistics, 2017; Pett, 2016).
2. This primary hypothesis applies to the non-offender and offender subgroups. For each of the four content modules (i.e., Module 1: Knowledge; Module 2: Fallacies; Module 3: Skills, and Module 4: Problems), I expect there to be significant differences in Module Survey scores between the non-offender and offender groups at each timepoint. I expect the non-offender group to score higher than the offender group at pre-program, module quiz, post-program, and follow-up. I will assess this using t-tests unless there is a severe violation of normality, in which case I will use the Mann-Whitney-U test (Laerd Statistics, 2017; Pett, 2016).

3. This primary hypothesis applies to the entire sample and the non-offender and offender subgroups. For the Gambling Attitudes Questionnaire, I expect there to be changes across timepoints. Compared to the pre-program assessment (Timepoint 0), scores on the post-program assessment (Timepoint 5) will decrease (i.e., become more negative). Compared to the pre-program assessment (Timepoint 0), scores on the follow-up assessment (Timepoint 6) will decrease (i.e., become more negative). Compared to the post-program assessment (Timepoint 5), scores on the follow-up assessment (Timepoint 6) will remain steady. I will assess this using a repeated-measures ANOVA and pairwise comparisons unless there is a severe violation of normality, in which case I will use the Friedman test followed by the Wilcoxon signed rank test or sign test (as appropriate based on assumptions) for pairwise comparisons (Laerd Statistics, 2017; Pett, 2016).
4. This primary hypothesis applies to the non-offender and offender subgroups. For the Gambling Attitudes Questionnaire, I expect the offender subgroup will have significantly more positive attitudes toward gambling than the non-offender group at the pre-program timepoint. I expect the difference to decrease by the post-program timepoint. Finally, I expect scores to hold steady or rebound slightly (toward pre-program levels) from post-program to follow-up timepoints. I will assess this using t-tests unless there is a severe violation of normality, in which case I will use the Mann-Whitney-U test (Laerd Statistics, 2017; Pett, 2016).
5. This primary hypothesis applies to the entire sample and both the non-offender and offender subgroups. Scores on the GBQ gambling frequency composite, the gambling type composite, and the percentage of gamblers (i.e., participants who gambled at all in the last 30 days) will decrease from pre-program to post-program and follow-up. Scores from post-program to follow-up will either remain steady or increase slightly (rebounding slightly toward pre-program levels). For the gambling frequency composite and the gambling type composite, I will assess this using a repeated-measures ANOVA and pairwise comparisons unless there is a severe violation of normality, in which case I will use the Friedman test followed by the Wilcoxon signed rank test or sign test (as appropriate based on assumptions) for pairwise comparisons (Laerd Statistics, 2017; Pett, 2016).
6. This primary hypothesis applies to the non-offender and offender subgroups. For the gambling behavior questionnaire (GBQ), I expect the gambling frequency composite scores to be significantly

higher for offenders than non-offenders at the pre-program timepoint, but not significantly different at the post-program timepoint. I further expect scores to hold steady or increase slightly from post-program to follow-up. I will assess this using t-tests unless there is a severe violation of normality, in which case I will use the Mann-Whitney-U test (Laerd Statistics, 2017; Pett, 2016).

7. This supplementary hypothesis applies only to the entire sample. The recency score of the Criminal History Measure will be negatively correlated with both the impaired control composite and the criminal activity composite of the Gambling Behavior Questionnaire (pre-program) and the Problem and Pathological Gambling Measure total score (Williams & Volberg, 2010). I expect this because immersion in the offender subculture and institutionalization increasingly co-occur as an offender spends more time incarcerated, and gambling is a significant offender pastime in correctional institutions (Beauregard & Brochu, 2013; Mitchell et al., 2017). I will assess this using the same analyses as with hypothesis 3 above.
8. This supplementary hypothesis applies only to the entire sample. The institutionalization composite score of the Criminal History Measure will be positively correlated with both the impulsive spending composite and the criminal activity composite of the Gambling Behavior Questionnaire and the Problem and Pathological Gambling Measure total score (Williams & Volberg, 2010). I expect this because as more time passes after release institutionalization decreases. I will assess this using the same analyses as with hypothesis 3 above.
9. This supplementary hypothesis applies only to the non-offender and offender subgroups. I expected the offender group to attain higher total scores on the PPGM than the non-offender group. As this is a between-groups comparison, I will test for this using t-tests if the data is normally distributed or the Mann-Whitney U test if the data is not normally distributed (Laerd Statistics, 2017; Pett, 2016).
10. This supplementary hypothesis applies only to the non-offender and offender subgroups. I expected the offender group to attain higher scores on the GBQ gambling behavior composite than the non-offender group. As this is a between-groups comparison, I will test for this using t-tests if the data is normally distributed or the Mann-Whitney U test if the data is not normally distributed (Laerd Statistics, 2017; Pett, 2016).

Before I could test my hypotheses, I needed to prepare my data.

Results

Data Preparation

My hypotheses called for the creation of some composite scores for the different measures. These composite scores are described below.

Comorbidity Composite. The mental health disorder items in the pre-program demographics measure were intended to make up the comorbidity composite. First, I cleaned the “other” category on this measure. Three participants selected this option. Of these, the first participant listed physical health conditions, the second listed obsessive-compulsive (OCD) disorder, and the third listed acquired brain injury (ABI). For the first, I deleted the physical health condition. For the second, I changed this response to anxiety because OCD is an anxiety disorder (American Psychiatric Association, 2013). For the third, I changed this response to FASD because it is the only neurological disorder that affects brain function represented among my categories. Though there are many differences between the two, FASD is a neurological disorder that affects cognitive functioning in similar ways to an acquired brain injury. I then excluded the ‘other’ option from all further analyses. Next, I created the comorbidity composite by summing the number of reported comorbidities for each participant, resulting in composite scores with a potential range of zero to nine.

Institutionalization Composites. I intended to create two institutionalization composites, one for recency (time since last release from custody/end of last sentence) and one for length (longest consecutive sentence/total cumulative time in custody). However, due to researcher error, no participants responded to the first item of the recency composite (time since last release from prison or jail). As such, I analyzed recency as a single item – time since last sentence ended – rather than a composite. Next, I created the institutionalization composite by calculating the mean of the following items: “What is the longest period of time you spent in jail or prison without being released?” and "How much time have you spent in jail or prison in your lifetime? For this question, add together all the times you spent in jail or prison to come up with a total number." The response options for these two items were: 1 = *I have not spent any time in jail or prison*, 2 = *less than 1 year*, 3 = *1 to 3 years less a day*, 4 = *3 to 5 years less a day*, 5 = *5 to 7 years less a day*, 6 = *7 to 9 years less a day*, and 7 = *9 years or more*.

Gambling Frequency Composite. I created the gambling frequency composite by summing the frequency per month that each participant engaged in gambling. The frequency response options were *not at all in the last month*, *a couple of times in the last month, once per week in the last month*, *a few days a week in the last month*, and *every day or almost every day in the last month*. I assigned the following values to each of these response options to create my sum as they mapped onto the number of days gambled in the last month: 0, 2, 4, 8, and 25.

Gambling Type Composite. I created the gambling type composite by calculating the average number of types of gambling each participant engaged in during the last month. I did this by calculating the sum of gambling types for each participant. As such, the gambling type composite had a potential range from 0 (engaged in none of the gambling types during the last month) to 8 (engaged in all gambling types during the last month).

Impulsive Spending Composite. Next, I created the impulsive spending composite by calculating the mean for each gambling payment category (taking money out of an ATM after running out of cash, using a credit card, borrowing money, or getting a payday loan). In the gambling behavior questionnaire, the frequency response options for each category were: *not at all in the last month*, *a couple of times in the last month*, *once a week in the last month*, *a few days a week in the last month*, and *every day or almost every day in the last month*. I assigned the following values to each of these response options to create my sum as they mapped onto the number of days gambled in the last month: 0, 2, 4, 8, and 25.

Criminal Activity Composite. I then created the criminal activity composite by summing participants' responses to the following three questions: *To pay off a gambling debt, I have committed a crime (e.g., drug dealing, property crimes, financial crimes/fraud, etc.), I have engaged in criminal behavior (e.g., drug dealing, property crimes, financial crimes/fraud, etc.) to obtain money to continue gambling,* and *When I am involved in my crime cycle (that is, actively committing crimes), I tend to gamble*. The response options for these questions were yes/no and were scored 1/0.

Descriptive Statistics

Once I had finished data preparation, I conducted a series of descriptive statistical analyses to better understand gambling behavior and harm in the sample. Descriptive statistics derived from the

demographics measure and the criminal history measure were described in the participants section above. For a detailed breakdown of the results of these measures, see Tables E2 to E10 in Appendix E.

Gambling Behavior Questionnaire. Only two participants were in custody in the last 30 days, and both reported gambling in multiple ways while in custody. First, at the pre-program timepoint, both participants engaged in all four types of gambling. Both participants engaged in betting on games/competitions with others "a few days per week in the last month". While both engaged in betting on poker and/or other card games, one did so at a frequency of "every day or almost every day in the last month" and the other at a frequency of "a few days per week in the last month." Both also reported engaging in community gambling by having someone on the outside place bets for them, one at a frequency of "every or almost every day in the last month" and the other at a frequency of "a few days per week in the last month." Lastly, both also reported engaging in sports betting at a frequency of "a few days per week in the last month." Second, at the post-program timepoint, both participants engaged in two of the four types of gambling. Both participants engaged in betting on games/competitions with others "a couple of times in the last month" and both engaged in betting on poker and/or other card games "a few days per week in the last month." Third, at the follow-up timepoint, both participants engaged in two of the four types of gambling. Both participants engaged in betting on games/competitions with others and poker and/or other card games "a few days per week in the past month."

Next, participants were asked about their largest in-custody gambling loss in the last 30 days. Both participants indicated their largest gambling loss fell between $101 and $150. Of the two, only one participant indicated going into debt due to in-custody gambling within the last 30 days, and their debt amount was $259.00. At this point, participants began the community gambling section of the GBQ.

Participants were asked similar questions about type and frequency of gambling behavior in the community in the last 30 days (Table 9).

Table 9

Gambling Type and Frequency

Timepoints	Types of Gambling (*n* = 53)		Frequency of Gambling (*n* = 53)	
	M	*SD*	*M*	*SD*
Pre-Program	1.94	1.83	9.58	14.98

Post-Program	1.40	1.52	5.92	10.50
Follow-up	1.51	1.79	6.68	11.14

Note. Means reported only for the 53particiants who completed all timepoints. Types of gambling is a count of gambling types, ranging from 0 to 8 different types. Frequency of gambling ranges from 0 to 25, based on the following scoring system: 25 = Every day or almost every day in the last month; 8 = A few days per week in the past month; 4 = Once a week in the last month; 2 = A couple of times in the last month; 0 = Not at all in the last month.

Next, participants reported their largest gambling loss in the last 30 days. Most participants reported losses of less than $100 (Table 10). In each of the three timepoints, there was one participant who lost more than $1500.

Table 10

Largest gambling loss

Amount Lost	Frequency (%)		
	Pre-Program (n = 52)	Post-Program (n = 52)	Follow-up (n = 52)
Less than $100	80.8	82.7	76.9
$101-$500	11.5	11.5	9.6
$501-$1000	3.8	1.9	5.8
$1001-$1500	1.9	1.9	5.8
More than $1500	1.9	1.9	1.9
Total	100.0	100.0	100.0

Note. Although 53 participants completed all the way to follow-up, one participant failed to answer this question, resulting in the sample size of 52 for this question.

Next, participants were asked about how they paid for their gambling. As shown in Table 11, at pre-program the most frequently used method to pay for gambling was taking extra money out of an ATM, but at post-program and follow-up, it was using a credit card. At all timepoints, the least frequently used was taking out a payday loan.

Table 11

Frequency Use of Methods to Pay for Gambling

Gambling Payment Methods (*n* = 53)	Pre-Program		Post-Program		Follow-up	
	M	*SD*	*M*	*SD*	*M*	*SD*
Took extra money from the ATM	0.83	3.66	0.34	1.29	0.98	4.81
Paid with a credit card	0.83	3.66	0.49	1.66	0.38	1.57
Borrowed money	0.42	1.39	0.58	3.45	0.81	3.64
Took out a payday loan	0.27	0.89	0.47	3.43	0.23	1.22

Note. Although 53 participants completed all three timepoints, one skipped this question at the pre-program timepoint.

Frequency codes 25 = Every day or almost every day in the last month; 8 = A few days per week in the past month; 4 = Once a week in the last month; 2 = A couple of times in the last month; 0 = Not at all in the last month.

Participants were also asked about their largest gambling debt in the last 30 days. Of the 53 participants who completed all timepoints, seven reported their largest gambling debt at one or more timepoints. Since this item asked about the last 30 days and the timepoints are approximately four weeks apart, a participant might report a debt at one timepoint (incurred in the preceding four weeks) but not another (as they may not have incurred gambling debt in that period). At the pre-program timepoint, the largest reported debt was $2,000 (*M* = $971.43, *SD* = 623.74). At the post-program timepoint, the largest reported debt was $4,500 (*M* = $2,000.00, *SD* = 1779.51). Lastly, at the post-program timepoint, the largest reported debt was $1,500 (*M* = $1,166.67, *SD* = 288.68).

Next, participants were asked if they had gambled to win enough money to pay off debt that was not caused by gambling in the last 30 days, and if so what type of debt? Of the 53 participants who completed all timepoints, seven reported gambling to win money to pay off a non-gambling debt. At the pre-program timepoint, six of seven reported gambling to pay the following types of debt: credit card (one participant, $100), household bills (one participant, $140), household bills and a loan (one participant, $10,000) payday loan (one participant, $400), drug debt (one participant, $200), and combined debts for credit cards, loans, and household bills (one participant, $16,000). At the post-program timepoint, two of seven reported gambling to pay the following types of debt: credit card (one participant, $50) and drug debt (one participant, $600). Finally, at the follow-up timepoint, four of seven reported gambling to pay off the following types of debt: credit card (two participants, one $50 and the other $1200), drug debt (one participant, $200), and a mobile phone bill (one participant, $437).

Participants were also asked if they had committed a crime to pay of a gambling debt in the last 30 days, and if so, what crimes? Of the 53 people who completed all timepoints, only three people reported committing crimes to pay off a gambling debt (some reported committing more than a single crime). At the pre-program timepoint, two participants reported committing theft, two reported selling drugs, and one reported committing robbery. At the post-program timepoint, one participant reported committing robbery, theft, and selling stolen property. Lastly, at the follow-up timepoint, one participant reported committing robbery and one reported selling drugs.

The last question on the GBQ asked participants if they tend to gamble when they are in their crime cycle.[27] Of the 53 people who completed all three timepoints, five answered yes to this question.

Problem and Pathological Gambling Measure. As shown in Table 12, most participants scored zero on the PPGM, with the highest total PPGM score being 14. To put this into perspective, it is possible to be assessed as a problem gambler with a score as low as two (one point from each of the problems and impaired control subscales) and a minimum monthly frequency of gambling.

Table 12

PPGM Subscale Scores and Total Score

PPGM Scores	Minimum	Maximum	*M*	*SD*
PPGM P/H	0.00	7.00	1.18	1.94
PPGM I/C	0.00	5.00	1.11	1.60
PPGM O/I	0.00	3.00	0.58	0.93
PPGM Total	0.00	14.00	2.87	4.17

Note. PPGM = Problem and pathological gambling measure; PPGM P/H = Problems and pathological gambling measure problems/harms subscale; PPGM I/C = Problem and pathological gambling measure impaired control subscale; PPGM O/I = Problem and pathological gambling measure other issues subscale; PPGM Total = Problem and pathological gambling measure total score.

Gambling Attitudes Questionnaire. As shown in Table 13, scores tended to decrease across time.

Table 13

Gambling Attitudes Questionnaire (GAQ) Across Timepoints

GAQ Items (*n* = 53)	*M*	*SD*
Pre-Program		
Gambling has benefits for society	2.45	0.85
Gambling is an important recreational activity to me	1.83	0.91
Gambling is morally wrong	3.23	0.70
All forms of gambling should be legal	2.15	0.77
There are too many gambling opportunities in my province	2.11	0.72
Gambling is an acceptable leisure activity	2.85	0.72
Gambling is harmful	2.15	0.60

[27] *Crime cycle* is one of the more common terms we use in correction to describe the pattern of behaviors, associations, and situations that support (even encourage) criminal activity. Other similar terms we use in corrections include *offence cycle* and *crime process*.

Post-Program		
Gambling has benefits for society	2.51	0.80
Gambling is an important recreational activity to me	1.72	0.91
Gambling is morally wrong	3.11	0.72
All forms of gambling should be legal	2.00	0.71
There are too many gambling opportunities in my province	1.83	0.85
Gambling is an acceptable leisure activity	2.72	0.60
Gambling is harmful	1.92	0.73
Follow-up		
Gambling has benefits for society	2.58	0.86
Gambling is an important recreational activity to me	1.74	0.98
Gambling is morally wrong	3.02	0.75
All forms of gambling should be legal	2.21	0.84
There are too many gambling opportunities in my province	1.81	0.79
Gambling is an acceptable leisure activity	2.79	0.57
Gambling is harmful	1.87	0.73

Note. GAQ = Gambling Attitudes Questionnaire. GAQ response options: 1 = *fully disagree*, 2 = *partially disagree*, 3 = *partially agree*, 4 = *fully agree*.

Hypothesis 1: Gambling Knowledge Scores across Timepoints

This hypothesis applies to the entire sample and both the non-offender and offender subgroups. First, I checked the assumptions of the repeated measures ANOVA for each module (knowledge, fallacies, skills, and problems) across all timepoints (pre-program, knowledge module quiz, fallacies module quiz, skills module quiz, problems module quiz, post-program, and follow-up), for both the full sample and the two subgroups (non-offender and offender). Every data set violated the assumptions of the repeated measures ANOVA for both the full sample and both subgroups (according to the *z*-scores and visual inspection of boxplots for outliers and the Shapiro-Wilk test of normality and visual inspection of histograms for normality). This was not surprising, given the mastery learning concept I used in the modules.[28] As such, I chose to use the nonparametric Friedman test, which is a commonly accepted alternative to the repeated measures ANOVA.

The Friedman test compares the distribution of the data across more than two timepoints to determine whether the data share an underlying distribution (Laerd Statistics, 2017; Pett, 2016). There

[28] See the materials section for a full discussion of the mastery learning concept.

are three critical assumptions for the Friedman test: (1) the data must be at least ordinal level; (2) the data represent either multiple observations across more than two timepoints or matched subjects across conditions; and (3) the subjects are independent (Laerd Statistics, 2017; Pett, 2016). My data met all three assumptions. Like the repeated measures ANOVA, the Friedman test is an omnibus test that requires pairwise comparisons to identify which specific results were significant.

Where my data met the assumptions, I used the Wilcoxon signed rank test to conduct my pairwise comparisons (Laerd Statistics, 2017; Pett, 2016). The Wilcoxon signed rank test is a commonly accepted nonparametric alternative to the dependent samples *t*-test that compares the median difference between two paired values to zero under the assumption of symmetrical distributions (Laerd Statistics, 2017; Pett, 2016). If the median difference score is significantly different from zero, the test returns a significant result (Laerd Statistics, 2017; Pett, 2016). There are three critical assumptions for the Wilcoxon signed rank test: (1) the data are paired observations; (2) the data must be at least ordinal level; and (3) there is symmetry of the difference scores about the true median for the population (Laerd Statistics, 2017; Pett, 2016). My data met these assumptions in most cases. In the few cases where my data did not meet the assumptions of the Wilcoxon signed rank test, I used the less powerful (but more flexible) sign test to conduct my pairwise comparisons (Laerd Statistics, 2017; Pett, 2016). Much like the Wilcoxon signed rank test, the sign test determines if the median of the paired differences is equal to zero, but without the necessity of symmetrical distributions (Laerd Statistics, 2017; Pett, 2016). Caution is required when interpreting the results for the non-offender group, given the sample size was only 14 by the last timepoint. Next, I will speak individually about the results for the entire sample, then the results for both subgroups.

Hypothesis 1 Results for Entire Sample. Across all modules, participants scored higher (with medium to large effect sizes) on the module quiz, the post-program survey, and the follow-up survey when compared to the pre-program survey (see Table 14).

Table 14

Friedman Test, Entire Sample

Module	Medians							Friedman		
	T0	*T1*	*T2*	*T3*	*T4*	*T5*	*T6*	χ^2	*df*	*p*

Knowledge	6.00	7.00_{ab}				7.00_{c}	7.00_{abc}	43.48	3.00	<.001
Fallacies	5.00		6.00_{de}			6.00_{df}	6.00_{ef}	30.90	3.00	<.001
Skills	5.00			6.00_{gh}		6.00_{gi}	6.00_{hi}	67.80	3.00	<.001
Programs	5.00				6.00_{jk}	6.00_{jl}	6.00_{kl}	27.83	3.00	<.001

Note. Subscripts denote nonsignificant comparisons within modules.
T0 = pre-program, T1 = knowledge module quiz, T2 = fallacies module quiz, T3 = skills module quiz, T4 = problems module quiz, T5 = post-program, T6 = follow-up.

These data indicate that each module increased participants' knowledge and understanding of the program content, supporting my hypothesis. Overall, the *Hedge Your Bets* program is effective at improving gambling knowledge, comprehension of gambling fallacies, gambling-related math skills, and increased understanding of the nature of – and how to reduce or prevent – gambling problems and harm. Additionally, across all modules, improvements in score were retained from the post-program survey to the follow-up survey that participants completed three weeks after finishing the program (Table 15). This retention to follow-up indicates that much of the knowledge gained during the *Hedge Your Bets* program was retained three weeks after the program was completed, illustrating the long-term benefits of the *Hedge Your Bets* program.

Table 15

Pairwise Comparisons, Entire Sample

Module	Wilcoxon						Sign	
	Diff +	Diff -	No Diff	*z*	*p*	Effect Size	*z*	*p*
Knowledge								
T0-T1	37	4	12	5.03	<.001	0.49**		
T0-T5	37	9	7	4.34	<.001	0.42*		
T0-T6	35	7	11	4.54	<.001	0.44**		
T5-T6	14	14	25	0.20	0.838	0.02		
T1-T5	25	12	16	2.19	0.015	0.21		
T1-T6	22	8	23	2.65	0.004	0.26		
Fallacies								
T0-T2	24	4	24	3.60	<.001	0.35*s		
T0-T5	24	2	27	4.15	<.001	0.40*		
T0-T6	22	5	26	3.23	0.001	0.31*		
T5-T6	4	11	38	-1.89	0.059	-0.18		
T2-T5	7	3	42	1.27	0.103	0.12		
T2-T6	7	11	34	-0.83	0.203	-0.08		
Skills								
T0-T3	37	0	16				5.92	<.001
T0-T5	39	4	10	5.04	<.001	0.49**		

T0-T6	41	3	9	5.47	<.001	0.53**
T5-T6	12	7	34	1.13	0.260	0.11
T3-T5	8	15	30	-2.00	0.023	-0.19
T3-T6	11	17	25	-1.03	0.151	-0.10
Problems						
T0-T4	25	13	15	2.23	0.013	0.22
T0-T5	32	9	12	3.83	<.001	0.37*
T0-T6	30	7	16	3.58	<.001	0.35*
T5-T6	13	13	27	-1.04	0.300	-0.10
T4-T5	31	9	13	2.76	0.003	0.27
T4-T6	27	12	14	2.10	0.018	0.20

Note. T0 = pre-program; T1 = knowledge module quiz; T2 = fallacies module quiz; T3 = skills module quiz; T4 = problems module quiz; T5 = post-program; and T6 = follow-up. Diff + is the number of positive difference scores, Diff – is the number of negative difference scores, and No Diff is the number of difference scores in which the difference = 0.
I calculated effect size for the Wilcoxon signed rank test according to Pallant (2016): $r = z/\sqrt{n}$ (where n = the number of observations over two timepoints). Pallant (2016) identifies .1 as a small effect size, .3 as a medium effect size, and .5 as a large effect size.
*Denotes medium effect size.
**Denotes large effect size.

My hypothesis that scores would either stay the same or decrease slightly between the post-program survey and the follow-up survey was also supported by the data. The results of the Wilcoxon signed rank test for all modules from post-program (T5) to follow-up (T6) indicate the median difference between the paired values is not significantly different than zero. As scores were so similar between post-program and follow-up, I can conclude knowledge gains made during the program were largely retained three weeks following program completion. This can be seen in Table 14, where the median scores are the same for post-program and follow-up within each module.

Finally, I hypothesized that the post-program scores (T5) and the follow-up scores (T6) would either remain the same as or decrease slightly when compared to the module quizzes (T1, T2, T3, and T4). Indeed, the data show that within each module, the median difference between the paired values is not significantly different from zero, for all four modules. Indeed, as can be seen in Table 14, the median scores were the same within each module across all three timepoints: module quizzes (T1, T2, T3, and T4), post-program (T5), and follow-up (T6). However, in a few instances there were significant findings despite the medians being the same.

First, when comparing the quiz to post-program on the knowledge module, the Wilcoxon signed rank test indicated that the median difference between the module quiz (*Mdn* = 7.00) and the post-

program measure (*Mdn* = 7.00) was significant, even though the difference between the medians is clearly zero. This is because the Wilcoxon signed rank test considers the mean rank of the difference scores as well as the medians. In this case, the module quiz mean rank = 21.74 and the post-program mean rank = 19.21, indicating that the post-program score degraded significantly from the module 1 quiz score. The same results, in which the medians are the same but the results are significant due to the mean ranks, occurs for the module quiz to follow-up comparison as well. The same pattern occurs in the skills module, from module quiz to post-program. There were also some comparisons in which the sample size was greatly reduced due to how the Wilcoxon signed rank test functions.

In the Wilcoxon signed rank test, pairs with no difference (i.e., pairs that have difference scores of zero) are excluded from analysis and the overall sample size decreases accordingly (Riina et al., 2023). Where there are many pairs resulting in no difference (and therefore excluded), the remaining sample may be so small as to negatively effect the outcome of the test (Riina et al., 2023). This can result in increased error, either type 1 (i.e., finding significance where there is none) or type 2 (i.e., failing to find significance when it is in fact present; Andrade, 2020). There are four instances in which the decrease in sample size is worthy of note. When comparing the module quiz to follow-up on the knowledge module, there were 23 no difference pairs, reducing the sample size to 30. When comparing follow-up to post-program on the skills module, there were 32 no difference pairs, reducing the sample size to 26. When comparing pre-program to post-program on the fallacies module, there were 30 no difference pairs, reducing the sample size to 28. Lastly, when comparing pre-program to follow-up on the fallacies module, there were 26 no difference pairs, resulting in a sample size of 27.

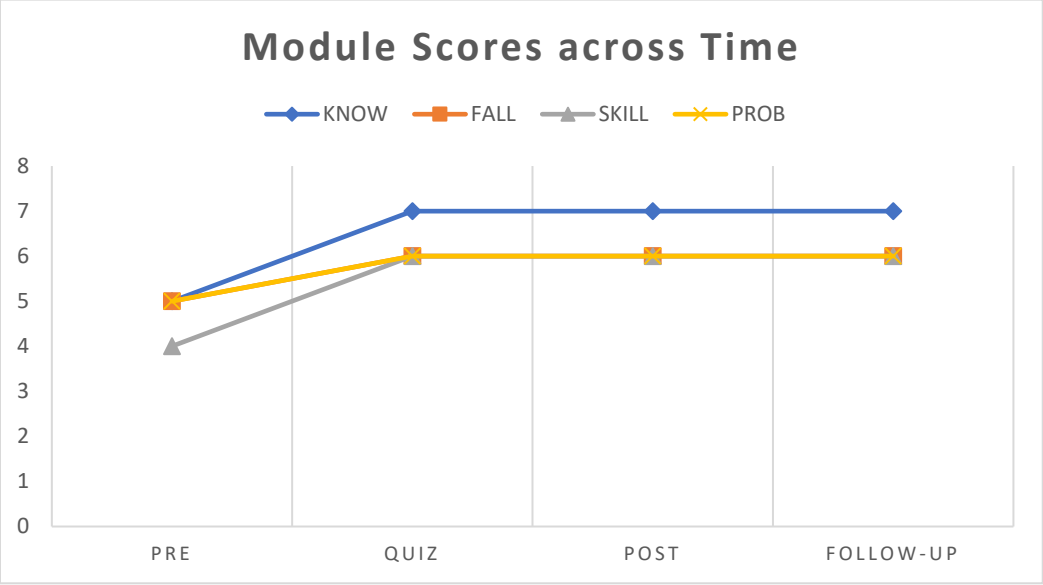
Though these are small sample sizes, there are three reasons to be optimistic that these increases were truly significant. First, the Wilcoxon signed rank test is used throughout the extant literature for much smaller sample sizes than I have here. Second, the medium effect size indicates the likelihood of practical significance. Third, and most persuasive, the *Hedge Your Bets* program is based on the *Stacked Deck* program designed and tested by Williams and Wood (2022). *Stacked Deck* was an effective problem gambling prevention program for students in grades 9-12 that resulted in improved gambling/problem gambling knowledge, increasingly negative attitudes toward gambling, better decision-making, improved problem solving, increased resistance to gambling fallacies, while also decreasing

gambling frequency and problem gambling rates. Much of the content of the *Hedge Your Bets* Program was taken directly from *Stacked Deck* (with permission from the creators), with additions and/or modifications made to incorporate information particularly relevant to offender populations. These three factors suggest that the findings of significance noted in this section are likely to be accurate, despite the small sample sizes.

Finally, there are two instances in the problems module that also merit further consideration. Specifically, the post-program and follow-up scores were significantly lower than the module quiz scores. The difference between the module quiz score (*Mdn* = 6.00, mean rank = 27.15) and the post-program score (*Mdn* = 6.00, mean rank = 21.13) was significantly different from zero ($z = 2.10$, $p = .018$). Additionally, the difference between the module quiz (*Mdn* = 6.00, mean rank 20.50) and the follow-up score (*Mdn* = 6.00, mean rank = 19.78) was significantly different from zero ($z = 2.72$, $p = .004$). These data do not support my hypothesis. However, there remains a significant increase from pre-program scores across all timepoints. This indicates that, while there is room to improve knowledge retention, the *Hedge Your Bets* program still significantly increased participants' knowledge when compared to their pre-program levels of knowledge. This overall significant increase is illustrated in Figure 6.

Figure 6

S2MS Scores Across Time



Note. Graph is based on median scores.

Hypothesis 1 Results for the Study 2 Module Survey (S2MS) Scores Within each of the Non-Offender and Offender Groups. Once again, there were significant differences in S2MS scores for all modules across time for both groups (Table 16).

Table 16 *Friedman Test, S2MS Scores for Non-Offender and Offender Subgroups*

Modules		Medians							Friedman		
	Offender	T0	T1	T2	T3	T4	T5	T6	X^2	*df*	*p*
Knowledge	No	6.00	7.00_{a}				7.00_{ab}	7.00_{b}	35.07	3	< .001
	Yes	6.00_{c}	7.50				7.00_{cd}	7.00_{d}	12.24	3	0.007
Fallacies	No	6.00		6.00_{fg}			6.00_{ef}	6.00_{eg}	18.62	3	< .001
	Yes	5.00		6.00_{i}			6.00_{h}	6.00_{hi}	13.48	3	0.004
Skills	No	5.00			6.00		6.00_{j}	6.00_{j}	49.91	3	< .001
	Yes	4.50			6.00_{lm}		6.00_{kl}	6.00_{km}	19.03	3	< .001
Problems	No	5.00				6.00_{o}	6.00_{n}	6.00_{no}	18.65	3	< .001
	Yes	6.00_{pq}				5.00_{p}	6.00_{r}	6.50_{qr}	10.86	3	0.013

Note. Subscripts denote nonsignificant comparisons within modules. T0 = Timepoint 0 (pre-program), T1 = Timepoint 1 (knowledge module quiz), T2 = Timepoint 2 (fallacies module quiz), T3 = Timepoint 3 (skills module quiz), T4 = Timepoint 4 (problems module quiz), T5 = Timepoint 5 (post-program assessment), T6 = Timepoint 6 (follow-up assessment).

To determine exactly how scores changed across timepoints, I conducted pairwise comparisons using either the Wilcoxon signed rank or the sign test, depending on if my data met the relevant assumptions. Both non-offenders and offenders saw significant increases across time in all modules (for a detailed account of the pairwise comparisons, see Table E13 in Appendix E).

With a few exceptions, scores increased as I hypothesized for both groups: from pre-program to module quiz, from pre-program to post-program, and from pre-program to follow-up. Additionally, in most cases scores held steady or decreased slightly from module quiz to post-program and follow-up and from post-program to follow-up, as I expected. There were few exceptions that are likely the result of the small sample sizes (offender group, knowledge module: pre-program to post-program; offender group, fallacies module: pre-program to module quiz which was borderline significant at $p = .053$, module quiz to post-program, and module quiz to follow-up; offender group, problems module: pre-program to module quiz, pre-program to follow-up, and module quiz to post-program which was borderline significant at $p = .056$; non-offender group, knowledge module: module quiz to post-program; fallacies module: module quiz to post-program and module quiz to follow-up). I further explore these exceptions in the discussion.

Hypothesis 2: Module Survey Scores Comparison Between the Non-Offender and Offender Groups.

I also conducted between groups comparisons on module scores using the non-parametric Mann-Whitney-U test (all data sets met the assumption of similarity in distributional shape). I tested the module survey scores for all modules at each timepoint (pre-program, module quiz, post-program, and follow-up). The results are detailed below.

For the knowledge module, there were no significant differences between the non-offender and offender groups at the pre-program or follow-up timepoints. At the module quiz, the difference between the non-offender and offender group was approaching significance, $U = 519.50$, $z = -1.365$, $p = .086$. Although the medians for both groups were the same (7.00), the mean rank of the non-offender group (40.81) was higher than the mean rank of the offender group (33.78), indicating that the non-offender group scored higher on the module quiz than the offender group. At the post-program timepoint, the difference was borderline significant, $U = 251$, $z = -1.536$, $p = .062$. The non-offender group median (7.00) and mean rank (31.52) were higher than the offender group median (6.50) and mean rank (24.19), indicating that the non-offender group scored higher at post-program than the offender group.

For the fallacies module, the difference between the non-offender and offender groups was not significant at either the pre-program or follow-up timepoints. At the module quiz, the difference between the non-offender and offender groups was significant, $U = 410.50$, $z = -1.716$, $p = .043$. Although the medians for both groups were the same (6.00), the mean rank of the non-offender group (37.62) was higher than the mean rank of the offender group (30.55), indicating the non-offender group scored higher on the module quiz than the offender group. At the post-program timepoint, the difference between the groups was borderline significant, $U = 278$, $z = -1.607$, $p = .054$. Although the medians for both groups were the same (6.00), the mean rank of the non-offender group (30.88) was higher than the mean rank of the offender group (25.88) indicating the non-offender group scored higher at post-program than the offender group.

For the skills module, there was a significant difference between the non-offender and offender group at the pre-program timepoint, $U = 558.50$, $z = -2.079$, $p = .019$, with the non-offender group scoring significantly higher ($Mdn = 5.00$) than the offender group ($Mdn = 4.00$) There was also a significant

difference between the groups at the module quiz, $U = 299.50$, $z = -2.830$, $p = .003$, where the non-offender group again scored higher (*Mdn* = 6.00) than the offender group (*Mdn* = 5.00). There were no significant differences between the groups at either post-program or follow-up.

For the problems module, there were no significant differences between the non-offender and offender groups at any of the timepoints (i.e., pre-program, module quiz, post-program, or follow-up).

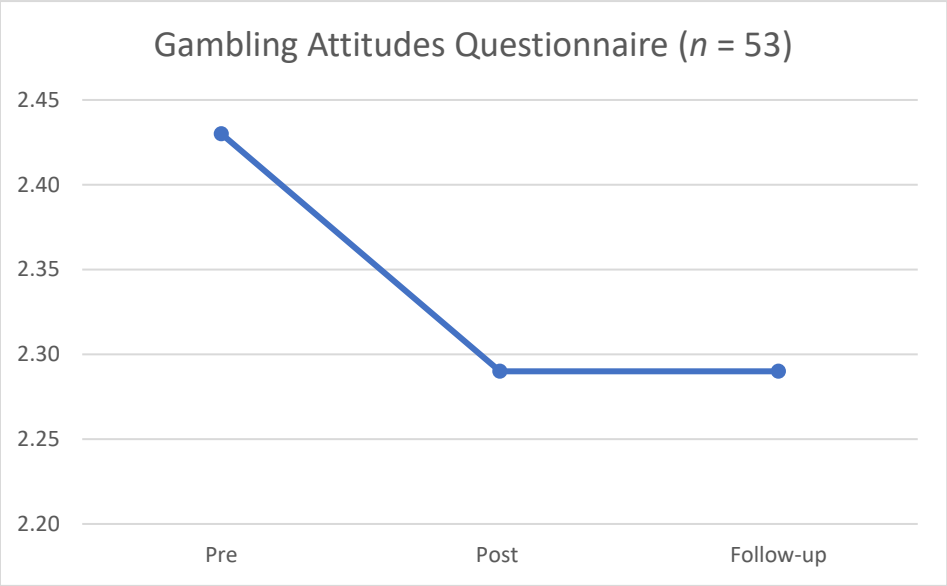
Hypothesis 3: Gambling Attitude Questionnaire (GAQ) Scores across Timepoints

This hypothesis applies to the entire sample and both the non-offender and offender subgroups. First, I checked the assumptions of the repeated measures ANOVA against the data for the GAQ across all timepoints (pre-program, post-program, and follow-up) for both the full sample and the two subgroups. In all cases, all three data sets contained outliers according to the box plots, although only follow-up failed this assumption by assessment of *z*-scores (maximum $z = 4.27$). Two of the three timepoints also violated the normality assumption according to the Shapiro-Wilk test, although only one appeared non-normal upon visual inspection of histograms. Regardless, these assumption violations led to my decision to conduct the nonparametric Friedman test followed by pairwise comparisons using either the Wilcoxon signed rank test or the sign test, as appropriate, for all analyses related to this hypothesis. Next, I will speak individually about the results for the entire sample, then the results for both subgroups.

Hypothesis 3 Results for Entire Sample. The Friedman test results were significant ($\chi^2 = 7.30$, $p = .013$). The results of pairwise comparisons supported my hypotheses. When compared to pre-program ($M = 2.43$), participants' attitudes toward gambling were statistically significantly more negative at both post-program ($M = 2.29$, $z = -2.508$, $p = .006$, $r = -.23$) and follow-up ($M = 2.29$, $z = -2.426$, $p = .015$, $r = .05$), both with small effect sizes. However, participants' attitudes were not significantly different at follow-up when compared to post-program, nor were they any difference in the mean scores (i.e., mean at both timepoints was 2.29). This indicates that the change in attitudes toward gambling plateaued at the post-program level (see Figure 7). Detailed results can be found in Table E11 and Table E12 in Appendix E.

Figure 7

Gambling Attitudes Questionnaire, Entire Sample



Note. Graph is based on mean scores.

Hypothesis 3 Results for the Gambling Attitudes Questionnaire Within each of the Non-Offender and Offender Groups. Contrary to my hypothesis, there were no significant differences in attitudes across timepoints in just the non-offender or the offender group. As a result, I did not conduct any further within-groups tests. Because this analysis was significant when run on the entire sample, it is likely the reason for null findings was the small sample sizes.

Hypothesis 4: Gambling Attitudes Questionnaire Comparison Between the Non-Offender and Offender Groups

There were no significant differences between non-offenders and offenders on their gambling attitude scores at any of the three timepoints. From pre-program (*M* = 2.43 for both the non-offender and offender groups) to post-program (*M* = 2.29 for both the non-offender and offender groups), both groups' mean attitudes toward gambling scores declined uniformly. At follow-up the offender groups' attitudes toward gambling (M = 2.07) had declined further while the non-offender groups' attitudes stayed the same (M = 2.29).

Hypothesis 5: Changes in Gambling Behavior

This hypothesis applies to the entire sample and both the non-offender and offender subgroups. In testing this hypothesis, I began by checking the repeated measures ANOVA assumptions. As with previous hypotheses, my data violated these assumptions for the entire sample and both subgroups

(specifically, by having some outliers and being non-normally distributed at one of the timepoints). As such, I proceeded with the nonparametric Friedman omnibus test, followed by the Wilcoxon signed rank test (or Sign test, where the distribution of the difference scores was not symmetrical) for pairwise comparisons.

Hypothesis 5 Results for Entire Sample. My hypothesis was supported for gambling frequency. According to the Friedman test, there were significant decreases in the number of participants who engaged in gambling across time as per the gambling frequency composite ($\chi^2 = 6.37$, $p = .021$). Pairwise comparisons revealed significant differences in gambling frequency between pre-program and post-program ($p = .0495$) and pre-program and follow-up ($p = .033$), but not between post-program and follow-up ($p = .423$). My hypothesis was also supported for gambling types, as the Friedman test indicated there were significant decreases in the number of gambling types participants engaged in ($\chi^2 = 7.949$, $p = .010$). Pairwise comparisons revealed significant differences in the number of gambling types between pre-program and post-program ($p = .036$) and between pre-program and follow-up ($p = .033$), but not between post-program and follow-up ($p = .481$). Finally, my hypothesis was also supported for the percentage of participants who engaged in gambling (i.e., “gamblers”). According to Cochran’s Q test, there were significant decreases in the percentage of gamblers who participated in gambling across time ($Q = 5.375$, $p = .034$). Similar to the other results for this hypothesis, pairwise comparisons revealed significant difference in the number of participants engaged in gambling from pre-program to post-program ($p = .033$) and from pre-program to follow-up ($p = .016$), but not from post-program to follow-up.

Hypothesis 5 Results Within each of the Non-Offender and Offender Groups. I conducted the Friedman test to determine if the significant differences noted above occurred once the sample was split into non-offender and offender groups. First, I analyzed gambling frequency. After splitting the sample, I did not find significant differences within either the non-offender ($\chi^2 = 4.280$, $p = .059$) or the offender group ($\chi^2 = 3.318$, $p = .095$). However, as the results for both groups are trending toward significance, it seems likely that gambling frequency scores would reach significance with larger sample sizes. Next, I analyzed gambling type. After splitting the sample, I found significant differences in the non-offender sample ($\chi^2 = 5310$, $p = .035$), specifically between the number of gambling types participants engaged in at both post-program ($z = -2.33$, $p = .01$) and follow-up ($z = -2.01$, $p = .022$) when compared

to pre-program. There was no significant difference between post-program and follow-up (z = .276, p = .783). I did not find significant differences across any timepoints for the offender sample (χ^2 = 3.059, p = .109). Once again, it seems likely the offender group would reach significance with larger sample sizes.

Lastly, I analyzed the percentage of gamblers across time within each of the non-offender and offender groups. I conducted Cochran's Q test within each group and found that the percentage of gamblers was significantly different across time only for the offender group (Q = 6.50, p = .020). I conducted McNemar tests for pairwise comparisons. None of the McNemar pairwise tests returned significant results, although the pre-program to post-program test was borderline significant (χ^2 = 2.250 p = .063). I suspect this was due to the very small sample sizes in the offender subgroup; at pre-program, 25 offender participants were gamblers; at post-program 11 offender participants were gamblers, and by follow-up there were only 10. Similar decreases could be seen in the non-offender group, although the decreases were not significant (χ^2 = 2.000, p = .184): at pre-program, there were 41 non-offender gamblers, at post-program there were 28 non-offender gamblers, and at follow-up there were 24 non-offender gamblers. This pattern, where there was a large decrease in the number of gamblers from pre-program to post-program followed by a much smaller decrease from post-program to follow-up, can be seen for both the non-offender and offender groups.

Hypothesis 6: Gambling Frequency and Gambling Type Composites Comparison Between the Non-Offender and Offender Groups

I compared the gambling frequency composite of non-offender group with the composite of the offender group at each individual timepoint. As the distribution of scores for each group met the assumption of having similarly shaped distributions, I was able to compare the gambling behavior frequency composite medians between groups. There was a statistically significant difference between the non-offender group (*Mdn* = 4.00) and the offender group (*Mdn* = 14.00) at pre-program, U = 1077.50, z = 2.97, p = .002. There was no significant difference between the non-offender group (*Mdn* = 2.00) and the offender group (*Mdn* = 6.00) at post-program, U = 411.50, z = 1.35, p = .090, or follow-up (non-offender *Mdn* = 2.00, offender *Mdn* = 6.00), U = 344, z = 1.1.47, p = .071. The lack of significance at post-program and follow-up is evidence of the closing gap in gambling frequency scores between the offender and non-offender groups.

Additionally, I compared the gambling type composite between the non-offender and offender group at each individual timepoint using the Mann-Whitney-U test. Distributions of the gambling type composite scores were not similar at any of the timepoints so I only discuss the mean ranks below, as it is inappropriate to assess the medians where the assumption of similarly shaped distributions was violated (Laerd Statistics, 2017). At the pre-program timepoint, there was a statistically significant difference between the groups, $U = 1012$, $z = 2.356$, $p = .009$, with the offender group engaging in more types of gambling (mean rank = 51.18) than the non-offender group (mean rank = 38.25). There were no significant differences between the groups at post-program, $U = 405.50$, $z = 1.254$, $p = .105$, although the mean ranks indicate that offenders were still engaging in more types of gambling (mean rank = 33.84) than non-offenders (mean rank = 27.85). Finally, there were no significant differences between the groups at follow-up either although this score was approaching significance, U = 345, z = 1.508, p = .066. Offenders were still engaging in more types of gambling (mean rank = 32.14) than non-offenders (mean rank = 25.15). The lack of significance at post-program and follow-up may be because the offender group's gambling frequency and number of types was trending towards the levels of the non-offender group. However, it may also be that the small sample size of the offender group led to type 2 error (i.e., there is a significant difference that cannot be detected due to the test being underpowered).

Hypotheses 7 and 8: Correlations

These two hypotheses apply only to the entire sample. I had two hypotheses regarding correlations between the PPGM and the Criminal History Measure (the recency score and the institutionalization composite). My original plan was to use Pearson's correlation to test for these hypothesized associations; however, my data was not normally distributed. I then tried transforming the data using both logarithmic and inverse transformations (Tabachnick & Fidell, 2019). Neither was effective in bringing the data closer to meeting the assumptions of Pearson's correlation, so instead I used the non-parametric Kendall's Tau-b.

However, contrary to my hypothesis, neither the recency scores nor the institutionalization composite were significantly correlated with the PPGM scores. This lack of correlation should be interpreted with caution, however, as there were very low rates of incarceration and institutionalization in the data. Looking at the longest cumulative length of incarceration provides a good indicator of the

minimal levels of institutionalization. Of these 27 participants, 41% (*n* = 11) spent less than one year in prison and 33% (*n* = 9) served no time in custody at all. Given that longer periods of incarceration lead to greater levels of institutionalization, it is fair to say that institutionalization was a minor concern among my participants.

Hypothesis 9: Increased PPGM scores among the Offender Population when compared to the Non-Offender Population

This hypothesis applies only to the non-offender and offender subgroups. The extant literature suggests that offender populations have higher rates of problem gambling than the general public (Turner et al., 2013a). As a result, I expected the offender group to attain higher total scores on the PPGM than the non-offender group. I chose to test this hypothesis in my sample to see if this relationship persists after they have finished serving their sentences. To do this, I used the Mann-Whitney-U test, due to the PPGM data failing *t*-test assumptions.

After verifying that the PPGM data for both groups met the assumption of similar distributions, I conducted a Mann-Whitney-U test. Results indicated that PPGM total scores were statistically significantly higher for offenders (*Mdn* = 6.00) than non-offenders (*Mdn* = 0.00), *U* = 1085.00, *z* = 3.307, *p* < .001. Therefore, despite most of the offender sample having completed their last sentence five or more years ago, they still scored significantly higher than non-offenders on the PPGM.

Hypothesis 10: Increased GBQ scores among the Offender Population when compared to the Non-Offender Population

This hypothesis applies only to the non-offender and offender subgroups. Again, based on the extant literature indicating gambling is significantly more frequent among offender populations than the general population (Turner et al., 2013a), I expected to see higher scores on the GBQ gambling behavior composite for the offender group. The GBQ behavior composite data failed the assumptions of the t-test but met the assumption of similar distribution across groups necessary for the Mann-Whitney-U test. Results of this test showed that the GBQ total scores were statistically significantly higher for the offender group (*Mdn* = 1.75) than the non-offender group (*Mdn* = 1.25), *U* = 1069.50, *z* = 2.89, *p* = .002. In further exploring this result, I chose to conduct the Mann-Whitney-U test specifically on frequency scores for playing EGMs. I did this because playing EGMs has been identified as a significant risk factor for problem

gambling and increased gambling harm among the general population (Williams et al., 2012), so I thought it prudent to assess the frequency with which offenders were playing EGMs. The results of this test indicated that EGM scores were indeed statistically significantly higher for offenders (*Mdn* = 2.00) than non-offenders (*Mdn* = 1.00), $U = 1046$, $z = 3.43$, $p < .001$.

Post-Hoc Analysis 1: Module Efficacy across Time within Problem Gambler – Non-Problem Gambler Subgroups

After completing the above analyses, I decided to analyze the efficacy of the program within two additional subgroups: problem gamblers (which included everyone assessed as either a problem or pathological gambler according to the PPGM) and non-problem gamblers (everyone else). In this case, the sample size of the non-problem gamblers ($n = 11$) is even smaller than the sample size of offenders, leading to the need for caution in interpreting the results. Again, I used the Friedman test followed by the Wilcoxon signed rank test for pairwise comparisons.

According to the Friedman test, there were significant differences within each subgroup in all modules (Table 17). Pairwise comparisons revealed significant differences in all modules for both problem gamblers and non-problem gamblers. To identify the specific instances of significant increase from pre-program in each module, I conducted pairwise comparisons using the Wilcoxon signed rank test.

Table 17

Friedman Test Results within Problem Gambler and non-Problem Gambler Subgroups

Modules		Medians							Friedman		
	PG	T0	T1	T2	T3	T4	T5	T6	χ^2	*df*	*p*
Knowledge	No	6.0	7.0				7.0_{a}	7.0_{a}	33.51	3	<.001
	Yes	5.0	7.0_{c}				7.0_{bc}	6.0_{b}	10.13	3	0.018
Fallacies	No	6.0		6.0_{ef}			6.0_{de}	6.0_{df}	22.25	3	<.001
	Yes	5.0		6.0_{hi}			6.0_{gh}	6.0_{gi}	9.00	3	0.029
Skills	No	5.0			6.0_{k}		6.0_{j}	6.0_{jk}	49.65	3	<.001
	Yes	4.0			6.0_{mn}		6.0_{lm}	6.0_{ln}	18.94	3	<.001
Problems	No	5.0				6.0_{p}	6.0_{o}	6.0_{op}	19.90	3	<.001
	Yes	6.0_{qr}				6.0_{qt}	6.0_{s}	7.0_{rst}	8.31	3	0.040

Note. Subscripts denote nonsignificant comparisons within modules. PG = problem gambler. T0 = Timepoint 0 (pre-program), T1 = Timepoint 1 (knowledge module quiz), T2 = Timepoint 2 (fallacies module quiz), T3 = Timepoint 3 (skills module quiz), T4 = Timepoint 4 (problems module quiz), T5 = Timepoint 5 (post-program assessment), T6 = Timepoint 6 (follow-up assessment).

In the knowledge module, scores were significantly increased for both subgroups from pre-program to module quiz (non-problem gamblers: $z = 4.40$, $p < .001$, $r = .48$; problem gamblers: $z = 2.46$, $p = .007$, $r = .52$), from pre-program to post-program (non-problem gamblers: $z = 3.79$, $p < .001$, $r = .41$; problem gamblers: $z = 2.09$, $p = .018$, $r = .45$) and from pre-program to follow-up (non-problem gamblers: $z = 3.91$, $p < .001$, $r = .43$; problem gamblers: $z = 2.36$, $p = .009$ $r = .50$). These significant differences are reflected in the median score increases listed in Table 17. As expected, there were no significant differences between post-program and follow-up scores for either group. Furthermore, module quiz to post-program was only significant for non-problem gamblers while module quiz to follow-up was significant for both subgroups. Detailed statistical information on these findings can be found in Table 14 in Appendix E.

A similar pattern was seen in the fallacies module, where scores were significantly increased for both subgroups from pre-program to module quiz (non-problem gamblers: $z = 3.21$, $p < .001$, $r = .35$; problem gamblers: $z = 1.78$, $p = .038$, $r = .38$), pre-program to post-program (non-problem gamblers: $z = 3.68$, $p < .001$, $r = .40$; problem gamblers: $z = 2.05$, $p = .020$, $r = .44$) and pre-program to follow-up (non-problem gamblers: $z = 2.40$, $p = .008$, $r = .26$; problem gamblers: $z = 2.23$, $p = .013$, $r = .48$). However, in this case, these significant increases were not reflected in the median scores for the non-problem gamblers. Rather, the increases can be seen in the mean ranks of each timepoints' median scores (pre-program mean rank: 1.99; module quiz mean rank: 2.67; post-program mean rank: 2.82; follow-up mean rank: 2.52). As expected, there were no significant differences between post-program and follow-up scores. Additionally, in this module, there were no significant differences between module quiz and post-program or module quiz and follow-up. Detailed statistical information on these findings can be found in Table 14 in Appendix E.

This pattern was again apparent in the skills module, where scores significantly increased for both subgroups from pre-program to module quiz (non-problem gamblers: $z = 4.74$, $p < .001$, $r = .52$; problem gamblers: $z = 2.69$, $p = .004$, $r = .57$), pre-program to post-program (non-problem gamblers: $z =$

4.49, $p < .001$, $r = .49$; problem gamblers: $z = 2.49$, $p = .007$, $r = .53$), and pre-program to follow-up (non-problem gamblers: $z = 4.68$, $p < .001$, $r = .51$; problem gamblers: $z = 2.83$, $p = .003$, $r = .60$). In this case, once again, these significant increases are reflected in the median scores at each timepoint. As expected, there were no significant difference between post-program scores and follow-up scores. From module quiz to post-program, there was a significant difference for non-problem gamblers only ($z = -1.97$, $p < .024$, $r = .21$). In this case, however, scores significantly decreased at post-program when compared to module quiz, based on mean ranks (module quiz mean rank = 2.98, post-program mean rank = 2.65). The mean rank at follow-up (2.85) was also lower than the module quiz mean rank, but this decrease was not significant. The remainder of the module quiz to post-program and follow-up differences were not significant. Detailed statistical information on these findings can be found in Table 14 in Appendix E.

The problems module deviated slightly from the previously established pattern. From pre-program to module quiz, only the non-problem gambler group saw significant score increases ($z = 2.31$, $p = .011$, $r = .25$). From pre-program to post-program, both subgroups saw significant score increases (non-problem gamblers: $z = 3.43$, $p < .001$, $r = .37$; problem gamblers: $z = 1.68$, $p = .047$, $r = .36$). Then, from pre-program to follow-up, again the significant score increase was only seen for the non-problem gambler group ($z = 3.61$, $p < .001$, $r = .39$). Again, there were no significant differences between the post-program and follow-up scores. There were significant difference between module quiz and post-program for both subgroups (non-problem gamblers: $z = 2.03$, $p = .022$, $r = .22$; problem gamblers: $z = 2.17$, $p = .015$, $r = .46$), although this significant increase is reflected only in mean ranks (non-problem gambler module quiz mean rank = 2.30, post-program mean rank = 2.92; problem gambler module quiz mean rank = 2.14, post-program mean rank = 2.95). There were no significant differences for either subgroup from module quiz to follow-up. Detailed statistical information on these findings can be found in Table 14 in Appendix E.

Post-Hoc Analysis 2: Module Scores between Problem Gambler – Non-Problem Gambler Subgroups

I also analyzed between groups differences on the modules survey scores at each timepoint. Due to the data being non-normally distributed, I conducted Mann-Whitney-U tests just as I did for the non-offender/offender subgroups. This time, my focus was on the non-problem gambler/problem gambler

subgroups. I anticipated significant differences in module scores at pre-program only, with the problem gambler group scoring lower than the non-problem gambler group. I expected this because having the knowledge contained in the module should have an impact on their gambling behavior; i.e., if they had this information, perhaps they would have been able to manage their gambling behavior better in the first place. However, I did not expect significant differences after the pre-program timepoint, as I expect that both subgroups would be able to learn and retain the information in the modules.

My expectations were partially supported by the results of the Mann-Whitney-U tests. In the knowledge module, there were no significant differences between the two subgroups at any timepoints. In the fallacies module, the non-problem gambler subgroup scored higher (*Md* = 6.0) that the problem gambler subgroup (*Md* = 5.0) at the pre-program timepoint only, $U = 146.00$, $z = -1.99$, $p = .024$. In the skills module, the non-problem gambler subgroup scored higher (*Md* = 5.0) than the problem gambler subgroup (*Md* = 4.0) at the pre-program timepoint only, $U = 139.00$, $z = -2.08$, $p = .019$. In the problems module, there were no significant differences between the two subgroups at any timepoints.

Post-Hoc Analysis 3: Gambling Attitudes across Time within Problem Gambler – Non-Problem Gambler Subgroups

I next analyzed gambling attitudes within each of the non-problem gambler and problem gambler subgroups. In this case, there was a significant difference in attitudes for the non-problem gambler group only ($\chi^2 = 4.89$, p = .044). Pairwise comparisons were once again done using the Wilcoxon signed rank test, which revealed attitudes toward gambling became significantly more negative from pre-program (*Md* = 2.43) to post-program (*Md* = 2.29; $z = -2.13$, $p = .017$, $r = .23$) and from pre-program to follow-up (*Md* = 2.29; $z = -1.88$, $p = .03$, $r = .21$). As expected, there were no significant differences between post-program and follow-up timepoints. Furthermore, there were no significant differences in the problem gambler subgroup across time.

Post-Hoc Analysis 4: Gambling Attitudes between Problem Gambler – Non-Problem Gambler Subgroups

Next, I analyzed between groups differences in attitudes toward gambling, again using the Mann-Whitney-U test. I expected that non-problem gamblers would have significantly more negative attitudes toward gambling than problem gamblers. This expectation was not supported, as there were no

significant differences in attitude between the non-problem gambler and problem gambler subgroups at any of the three timepoints (pre-program, post-program, or follow-up).

Post-Hoc Analysis 5: Changes in Gambling Behavior across Time within Problem Gambler – Non-Problem Gambler Subgroups

Next I analyzed gambling behavior. There were no significant differences in gambling frequency or type within either the non-problem gambler or problem gambler subgroups. The medians For gambling frequency, the medians for non-problem gamblers (2.0) stayed the same at all timepoints, while the medians for problem gamblers fluctuated (pre-program *Md* = 10.0; post-program *Md* = 8.0; follow-up *Md* = 10.0). For gambling types, the medians for both non-problem gamblers (1.0) and problem gamblers (3.0) stayed the same at all timepoints.

Post-Hoc Analysis 6: Changes in Gambling Behavior between Problem Gambler – Non-Problem Gambler Subgroups

Lastly, I compared gambling behavior between the non-problem gambler and problem gambler subgroups, again using the Mann-Whitney-U test. I expected to find significant differences, such that problem gamblers would gamble more frequently and would play more types of gambling games. This expectation was upheld for all timepoints, for both gambling frequency and type.

For gambling frequency, the problem gambler subgroup gambled significantly more frequently than the non-problem gambler subgroup at pre-program (problem gambler *Md* = 10.0, non-problem gambler *Md* = 2.0), $U = 369.50$, $z = 3.13$, $p = .001$. The same held true for the post-program timepoint (problem gambler *Md* = 12.0, non-problem gambler *Md* = 2.0), $U = 477.00$, $z = 3.53$, $p < .001$ and the follow up timepoint (problem gambler *Md* = 10.0, non-problem gambler *Md* = 2.0), $U = 369.50$, $z = 3.13$, $p = .001$.

For gambling types, the problem gambler subgroup engaged in significantly more types of gambling than the non-problem gambler subgroup at pre-program (problem gambler *Md* = 1.0, non-problem gambler *Md* = 3.0), $U = 376.00$, $z = 3.30$, $p < .001$. The same held true for the post-program timepoint (problem gambler *Md* = 1.0, non-problem gambler *Md* = 3.0), $U = 483.50$, $z = 3.69$, $p < .001$ and the follow up timepoint (problem gambler *Md* = 1.0, non-problem gambler *Md* = 3.0), $U = 391.50$, $z = 3.65$, $p = .001$.

These between groups results for the non-problem and problem gambler subgroups reflects the current research found in the extant literature; that is, that people with gambling problems gamble significantly more often and in significantly more ways than those who do not have gambling problems.

Study 2 Discussion

The purpose of Study 2 was to assess the efficacy of the *Hedge Yours Bets* program. *Hedge Your Bets* is an effective intervention that increased participants' gambling knowledge, improved understanding of and resistance to gambling fallacies, expanded participants' mathematical skills and understanding of probability, and developed their understanding of problem gambling risk factors and strategies to gamble in a safe way that may reduce their chances of experiencing gambling harm. These improvements were seen for the entire sample, as well as for both the non-offender and offender subgroups and the non-problem gambler and problem gambler subgroups at most timepoints. Improvements over pre-program levels were seen not only immediately after the program but also three weeks later. The few exceptions to this that occurred in specific instances for the non-offender/offender subgroups and the non-problem gambler/problem gambler subgroups do not take away from the fact that all participants finished the *Hedge Your Bets* program with more knowledge about gambling, a better understanding of gambling harm, and increased insight on how to reduce their own risk of gambling harm. Participants also experienced decreases in positive attitudes toward gambling and gambling behavior, though these results did not always extend to the final time point. Specifically, gambling behavior was significantly lower at the post-program compared to the pre-program for the offender subgroup, but this difference did not last until the follow-up. Though this is a fairly common pattern in the effects of digital health programs designed to change behavior (i.e., significant behavior changes occur in the short-term, but revert toward pre-intervention levels in the long-term; Davies et al., 2012), in the case of the *Hedge Your Bets* program this pattern may be related to the small sample size. This possibility is supported by the long-term efficacy of the *Stacked Deck* program (on which *Hedge Your Bets* is based; Williams et al., 2010; Williams & Wood, 2022). Of course, *Stacked Deck* was delivered in-person while *Hedge Your Bets* is an asynchronous, independent, online program, so it is possible that the mode of delivery moderates the magnitude of efficacy. Whether mode of delivery (specifically, online vs. in-person) has an effect on behavioral outcomes is still being debated, with at least one recent study noting that neither modality was

superior (Au et al., 2017). In addition to the impacts of the program on all participants, there may be some evidence that *Hedge Your Bets* is particularly effective for offenders. In terms of gambling attitudes and behavior, no significant differences occurred across time for either the non-problem gambler or problem gambler subgroups.

Specifically, the between-groups comparison of the non-offender and offender subgroups suggests that *Hedge Your Bets* may be particularly efficacious for offenders. For example, non-offenders and offenders started the program with significantly different gambling frequencies and number of gambling types they engaged in. However, by post-program and follow-up, these differences were no longer significant. This appears to be mainly the result of the offender group making large decreases in these areas, from a gambling frequency median of 14 at pre-program to a gambling median frequency of 6 at post-program and follow-up. For number of gambling types, offenders were engaging in significantly more types of gambling at pre-program than non-offenders. However, once again, this difference ceased to be significant by post-program and follow-up. While both the non-offender and offender groups decreased their gambling frequency and the number of gambling types they engaged in, the decrease was larger for the offender group. Whether this is because *Hedge Your Bets* addresses the unique needs of the offender population or because the offender group started out with higher rates of gambling behavior is impossible to say from this data. Investigating the cause of this difference would be a good direction for future research. Additionally, it is possible that the these results were impacted by the small sample size, such that this lack of significance is reflective of type 2 error. To determine which of these interpretations is most accurate, *Hedge Your Bets* needs to be evaluated with a large sample of offenders. Though the results highlight the efficacy of *Hedge Your Bets*, the program was not always efficacious longitudinally.

One likely reason for the lack of significant longitudinal results is the small sample size. Offender populations can be exceedingly difficult to access. Even with my years of experience working in the correctional system and a network of professional connections, I could not navigate the bureaucracy to partner with a correctional agency in a timely fashion. This type of gatekeeping makes large sample sizes very unlikely, by restricting ready access to the offender population. Correctional agencies are secretive; they do not easily share information with the public. There is an aversion to allowing anyone from outside

the correctional system in and a belief that outsiders will not understand the nature of the work being done. In my experience, correctional agencies attempt to protect themselves from public criticism by hiding behind a blue wall. However, by not authentically engaging with the public, correctional agencies create a public that is misinformed, discontent, and judgmental of the correctional system. Furthermore, where research like this is concerned, the persistent barriers to working with outside experts only hinders their ability to achieve their mandate: protecting society while rehabilitating offenders. It behooves the correctional system in Canada to engage with outside experts and researchers in an open, honest, and accessible way. Additionally, future researchers should make every effort to work in partnership with correctional agencies to ensure access to larger sample sizes.

Another reason for lacking significant longitudinal results may be due to the forgetting curve. For example, in several instances throughout the study, S2MS scores peaked at the module quiz and gradually degraded over time (in both the entire sample and the two subgroups). This is a real-world example of the forgetting curve, a term coined by psychologist Hermann Ebbinghaus to describe the phenomenon we see, at least partially, in this study: knowledge retention declines exponentially over time (Schunk, 2012; Wollstein & Jabbour, 2022). Ebbinghaus noted that repetition and review were the best methods to reduce this decline, with an optimal schedule being review of the newly learned information within 24 hours, then again within the next week, and finally again within the next month time (Schunk, 2012; Wollstein & Jabbour, 2022). In this study, the retention decline is not exponential, as participants do not regress to pre-program baseline levels even one month later. Indeed, because the *Hedge Your Bets* study measured scores over time, participants' learning was refreshed on a schedule similar to the one proposed by Ebbinghaus, which may have slowed the retention decline considerably from the exponential decline Ebbinghaus reported. Overall, the minor decline in knowledge retention upon completion of the program, and the slightly larger decline in knowledge retention three weeks after program completion, is to be expected.

Next, I would like to discuss some of the unexpected results. First, in one instance in the knowledge module, post-program scores for the offender group dipped below the level of module quiz and follow-up scores. In most cases, post-program scores were the highest of all scores. Thus, this result was odd and difficult to explain beyond simply small sample size. However, the fact that the median for

this group rebounded to module quiz levels at follow-up indicates that the module was effective overall for the offender group.

Second, in the problems module, the offender group did not increase from pre-program to module quiz, but then increased at post-program and again at follow-up. This is an interesting pattern, as it seems to reflect a lack of learning immediately after the problems module, but then ongoing, cumulative learning at post-program and follow-up. This pattern may be related to the study timeline, which incorporated regular one-week waiting periods between modules and a final three-week waiting period between the post-program and follow-up assessments. This timeline was used in efforts to minimize the practice effects that could result from participants completing each S2MS module assessment four times throughout the duration of the study. However, the learning pattern in the problems module may reflect a combination of practice effects[29] and carry-over effects[30] that come from repetition. Given the problems module is the last module of the program, I would expect practice effects to have a stronger impact on the problems section of the post-program assessment. That is, there was only one week between the problems module quiz and the post-program assessment, whereas there are increasingly longer amounts of time between each of the earlier module quizzes and the post-program assessment (i.e. two weeks between the skills module quiz and the post-program assessment, three weeks between the fallacies module quiz and the post-program assessment, and four weeks between the knowledge module quiz and the post-program assessment).

Third, in the skills module for the non-offender group, S2MS scores significantly decreased between the module quiz and the post-program assessment. This is likely at least partially explained by the forgetting curve, similar to what we saw when analyzing the entire sample (Schunk, 2012). It may also be partially attributable to the content of the skills module, which was largely mathematical in nature and involved concepts of probability. This is the module that had the largest number of participants retake the

[29] Practice effects are the influence of assessment repetition on assessment results (Schunk, 2012).
[30] Carry-over effects happen when instructions or learning from one level of a course, program, or intervention help the participant to perform better in the next level, and is sometimes referred to as scaffolding (Schunk, 2012).

module quiz to pass, some as many as four or five times. As the intrinsic cognitive load[31] for this module was heavier, it stands to reason that knowledge degradation would be greater.

Fourth, depression and anxiety did not significantly impact the GBQ gambling behavior composite or the PPGM total score composite. I expected there would be a significant difference, based on the extant literature indicating that the top three mental health disorders to co-occur with problem and pathological gambling are SUD (including nicotine dependence), mood disorder, and anxiety disorder (Lorrains et al., 2011). Though I found the expected results for SUD, the results were not significant (though in the right direction) for depression and anxiety. Here, it seems likely that the small sample size, in tandem with the fact that SUD is the strongest comorbidity with problem gambling, is the cause of this departure from the literature.

Overall, these results of Study 2 reflect the biopsychosocial model. The biopsychosocial model posits that a myriad of biological, psychological, and social factors (some current, some historical) combine to create gambling problems. There is significant overlap between factors that create risk for criminal activity, factors that create risk for substance addiction, and factors that create risk for problem or pathological gambling (Dowling et al., 2017; Public Safety Canada, 2015; Skewes & Gonzales, 2013). For example, I found that the offender group scored significantly higher than the non-offender group for the PPGM total score composite, indicating that offenders experienced more problem and pathological gambling. I found this result despite the fact that all offender participants had completed their most recent sentence five years or longer ago. Not only is this a novel finding, as existing research focuses on offenders currently under sentence, but it may also speak to the etiology of problem gambling (and perhaps other behavior or substance addictions as well).

The existence of higher PPGM scores in the offender subsample compared to the non-offender subsample many years after the end of the most recent sentence points toward the importance of non-criminogenic factors in the maintenance of problematic gambling behavior. However, these important

[31] Intrinsic cognitive load concerns the relative difficulty of the substantive content to be learned, and it can only be eased once the learner develop an effective cognitive schema to understand and incorporate the information (Schunk, 2012).

non-criminogenic factors must be found at much higher rates among offender populations if they are to explain the higher rates of problem gambling among offenders. From a rehabilitation perspective, identifying these specific non-criminogenic factors is important, as we cannot address that which we have not recognized. Future research should focus on comparing ex-offenders with and without gambling problems to identify the non-criminogenic factors that differentiate offenders with gambling problems from offenders without gambling problems. Given the connections between gambling and crime for moderate to severe problem gamblers, identifying those differentiating factors could provide a rehabilitative focus to work on reducing both problem gambling and criminal behavior.

I believe this study highlights another point that should be addressed by future research. Participants in Study 2 revealed that selling drugs is more commonly used to fund a gambling habit or pay off gambling debt than found in previous research. This reinforces patterns my colleagues and I have witnessed in the last decade or so; that is, that selling drugs is commonly seen as an easy way to make some quick cash, with a lower risk of getting caught and generally lighter punishments (for small amounts, at least) than some other income-generating crimes (e.g., embezzlement, robbery, etc.). Therefore, the possibility that offence types associated with problem gambling may have changed during the last 10 to 15 years indicates that research in this area should be updated.

Hedge Your Bets fills a significant gap in both the current research and the programs offered to address the criminogenic needs of the offender population. The goal of corrections is to reduce recidivism, which is generally done through a combination of punishment, deterrence, and rehabilitation programs. Rehabilitation programs are designed to address the factors that contribute to an offender's risk for recidivism, and the corrections industry in Canada currently addresses many common criminogenic factors in this way (e.g., substance abuse, mental health disorders, cognitive distortions, etc.). However, despite evidence that gambling is in fact a criminogenic factor for offenders who also suffer from moderate to severe problem gambling, the Canadian corrections industry does not consistently offer programming to address this need (Adolphe et al., 2018; Riley & Oakes, 2015; Turner et al., 2017). The few programs that have been tried have not been rigorously assessed to see if they work (Turner et al., 2017). *Hedge Your Bets* is based on a validated and reliable problem gambling prevention program (*Stacked Deck*; Williams et al., 2010; Williams & Wood, 2022). *Hedge Your Bets* addresses the

gap in research through rigorous program evaluation and demonstrated efficacy. Additionally, by being affordable, accessible, self-directed, and designed specifically for offender populations, *Hedge Your Bets* fills the need for a correctional program that addresses gambling in a practical and useful way.

Limitations and Future Research

Though *Hedge Your Bets* proved to be efficacious, this study is not without limitation. The use of Leger online panel participants for this study was not ideal. Recruiting participants from online panels can result in sampling bias, if only because people who choose to be part of an online panel may not be representative of the Canadian public in myriad ways. In my sample, this may be reflected in the large proportion of participants who have high education and income levels, as well as the lack of racial and gender diversity. Additionally, the use of online panels left me with a much smaller sample of offenders than I would have liked. Despite this, the sample was somewhat representative of the offender population. For example, though the non-offender group consisted of mostly women, as did the entire sample, the offender group was mostly men. This corresponds to the offender population in Canada, where men offenders significantly outnumber women offenders (Government of Canada, 2019). Additionally, although Indigenous people only made up 15-17% of the Study 2 sample, they account for 52.9% of the offender group. This is reflective of the persistent and well-documented overrepresentation of Indigenous people in the criminal justice system (Government of Canada, 2023). The offender group also had lower overall education levels and lower income levels than the non-offender group, again reflecting the demographic characteristics of offenders in Canada (Kouyoumdjian, et al., 2016). Thus, though the offender group in this sample was small, it appears to have been roughly representative of the offender population in Canada broadly. This increases my confidence in the generalizability of these results to the offender population in Canada. Regardless, future research on *Hedge Your Bets* should be done with a larger offender sample to further verify its efficacy in addressing the gambling behavior of criminal offenders.

Relatedly, future research on *Hedge Your Bets* should assess the efficacy across a longer amount of time. The longitudinal component of Study 2 was only three weeks. Though this is a common length of time for longitudinal studies, future research should endeavour to test the retention of program efficacy over a longer term; six weeks to three months or more would be beneficial. Ideally, future

research will involve implementing the *Hedge Your Bets* program with a correctional population that will allow for a much larger sample size, as well as longer term follow-up. Doing so would address most of the limitations to the current study outlined in this discussion.

Chapter 5: Comparison of S1MS Scores and Pre-Program S2MS Scores

I chose to compare the Study 1 Modules Survey (S1MS) scores (the pilot study) to the Study 2 Modules Survey (S2MS) scores at one timepoint (i.e., the pre-program survey) to see if there were significant differences between the baseline knowledge of the pilot sample (i.e., post-secondary students) and the Study 2 sample (offenders, ex-offenders, family and close friends of offenders and ex-offenders, and those who work or volunteer with offenders and ex offenders). The purpose of this analysis was to determine if the pre-program either S1MS or S2MS scores could serve as a benchmark for comparison in future studies. I expected the S2MS scores to be significantly lower than the S1MS scores.

Method

Hypothesis

For this comparison study, I had the following hypothesis:

1. S1MS scores will be higher than S2MS scores. I expected this because I believed the mean education levels of the Study 1 sample would be higher than the mean education levels of the Study 2 sample. While I did not collect education data in Study 1, the fact that all participants were current college students (therefore, currently in a diploma or undergrad program) or university students (in first- or second-year psychology courses), I believe their education level to be at least equivalent to the "some college/university/trade school" option from the demographics survey (completed by the *Hedge Your Bets* study sample). I will assess this using either a *t*-test (for normally distributed data) or a Mann-Whitney-U test (for non-normally distributed data; Pett, 2016; Laerd Statistics, 2017).

Results

Before comparing the S1MS and pre-program S2MS scored, I conducted a question-by-question analysis similar to the one I conducted during Study 1 (Table 17).

Table 18

Pre-Program Average Score per Question

Items	Pilot Study		Pre-Program	
Knowledge Module	*n* = 144	Average % Correct	*n* = 84	Average % Correct
Question 1	101	70.14	59	70.24
Question 2	105	72.92	54	64.29
Question 3	122	84.72	65	77.38

Question 4	87	60.42	38	45.24
Question 5	115	79.86	59	70.24
Question 6	92	63.89	56	66.67
Question 7	142	98.61	78	92.86
Question 8	57	39.58	36	42.86
Module Average	5.70	71.27	5.30	66.22
Fallacies Module				
Question 1	134	93.06	78	92.86
Question 2	78	54.17	45	53.57
Question 3	99	68.75	61	72.62
Question 4	118	81.94	61	72.62
Question 5	124	86.11	70	83.33
Question 6	119	82.64	70	83.33
Question 7	112	77.78	14	16.67
Question 8	117	81.25	15	17.86
Module Average	6.26	78.21	4.93	61.61
Skills Module				
Question 1	132	91.67	76	90.48
Question 2	38	26.39	14	16.67
Question 3	10	6.94	3	3.57
Question 4	75	52.08	59	70.24
Question 5	132	91.67	75	89.29
Question 6	59	40.97	38	45.24
Question 7	88	61.11	32	38.10
Question 8	116	80.56	75	89.29
Module Average	4.51	56.42	4.43	55.36
Problems Module				
Question 1	128	88.89	82	97.62
Question 2	84	58.33	46	54.76
Question 3	30	20.83	13	15.48
Question 4	90	62.50	44	52.38
Question 5	132	91.67	62	73.81
Question 6	132	91.67	69	82.14
Question 7	134	93.06	70	83.33
Question 8	80	55.56	22	26.19
Module Average	5.63	70.31	4.86	60.71

Note. Pilot Study questions and response options can be found in Appendix A. *Hedge Your Bets* study questions (i.e., pre-program) can be found in Appendix K.

Hypothesis 1: Between Groups Comparison on S1MS and S2MS Scores

Both S1MS and S2MS scores met the assumptions of the *t*-test. My hypothesis was supported, as shown in Table 18. There were significant differences between S1MS and S2MS scores on three of

the four modules. Study 1 participants scored significantly higher than Study 2 participants on the knowledge module, the fallacies, module, and the problems module. The mean score for Study 1 was higher on the skills module as well, but this difference did not reach statistical significance. This is not surprising, as even post-secondary students taking statistics classes that teach probability do not demonstrate a significantly improved understanding of gambling-related probability (Williams & Connolly, 2006). Therefore, post-secondary students did not have much of an advantage in the skills module.

Table 19

Differences between S1MS Scores and S2MS Pre-Program Scores

Modules	Study 1 (n = 144)		Study 2 (n = 84)		Independent Samples t-tests			
	M	*SD*	*M*	*SD*	*t*	*df*	*p*	*d*
Knowledge	5.70	1.37	5.30	1.76	**1.81**	141.62	0.037	0.25
Fallacies	6.26	1.68	4.93	1.32	**6.63**	207.21	<.001	0.88
Skills	4.51	1.71	4.43	1.39	0.41	202.18	0.341	--
Problems	5.63	1.43	4.86	1.57	**3.78**	226.00	<.001	0.51

Note. Statistically significant *t*-values are bolded ($p < .05$). The assumption of homogeneity of variances was violated for all but the problems module, as assessed by Levene's test for equality of variances (knowledge $p = .004$; fallacies $p = .001$; skills $p = .035$; problems $p = .398$). Therefore, I used Welch's *t*-test to account for the unequal variances for all but the problems module. I did not calculate an effect size for the skills module as the difference was not significant. Study 1 = pilot study; Study 2 = *Hedge Your Bets* Study (pre-program scores).

Comparison of Study 1 and Study 2 Discussion

The significant differences I found between the S1MS scores and the S2MS scores did not fall according to the pattern I expected. This is likely related to the S2MS sample being composed of more non-offenders than offenders, and thereby having higher education levels than I anticipated. I suspect there may be several factors influencing these results.

First, Study 1 participants' higher scores on the skills module, with its heavy math-based cognitive load, may be related to their proximity in time to math classes. The Study 2 sample, being considerably older than most first- or second-year post-secondary students, are likely many years removed from math class. It is likely that Study 1 participants have greater retention of mathematical knowledge and skills than Study 2 participants. Second, there may be generational differences superstitious belief systems, which are closely related to fallacies. Study 1 participants may be less inclined to believe fallacies than Study 2 participants. Third, Study 2 participants' higher scores on the problems module may be related to

their lived experience, which is likely to be more diverse than Study 1 participants' lived experience. Additionally, the generally high levels of education seen in Study 2 participants increases the possibility that they have prior learning and knowledge of the biopsychosocial factors that are predominant in the problems module. Fourth, this increased education level may also explain Study 2 participants' higher scores on the knowledge module.

Future research should consider establishing a baseline level of gambling knowledge in the Canadian offender and non-offender populations. This information will help to highlight areas in need of additional attention in education-based gambling interventions and awareness campaigns.

This comparison is very limited in scope and the results are not generalizable. Without demographic information, I cannot speak to the diversity of the Study 1 sample. Additionally, sample sizes in Study 1 (n = 143) and Study 2 (n =84) were unbalanced, which can inflate error. Neither the mean S1MS scores nor the mean S2MS scores should be used as a benchmark for assessing program efficacy in future research.

Chapter 6: Conclusion

In this dissertation, I conducted two studies and numerous analyses to develop, implement, and evaluate the *Hedge Your Bets* program. In Study 1, I developed the program with university and college student feedback. Using tried and true educational and behavior change theories, *Hedge Your Bets* was designed to address the unique needs of the offender population. In Study 2, I tested the efficacy of the program across time with a sample of the general public. Throughout these studies, I established initial support for the *Hedge Your Bets* program as efficacious for both offenders and those who are related to, friends with, or work with offenders. Specifically, *Hedge Your Bets* is effective at increasing participants' knowledge and skills to reduce gambling harm, making attitudes toward gambling more negative, and changing gambling behavior in the short term. Future research should replicate findings with a larger sample of offenders.

These results are practically important because the Canadian correctional system needs to address gambling as a criminogenic factor. This is demonstrated by research that indicates gambling occurs at significantly higher rates among offender populations (Turner et al., 2013; Williams et al., 2005) and that there are connections between gambling and criminal behavior for offenders who are also moderate to severe problem gamblers (Turner et al., 2009). Additionally, in my operational experience working in corrections, I have seen gambling cause significant life problems for offenders including physical assault, revocation of conditional release, and/or reoffending. Furthermore, there are few if any resources available within corrections that address gambling behavior and none that address gambling behavior within the contexts of harm reduction and the offender subculture. *Hedge Your Bets* provides a much-needed intervention in a forensic context in Canada.

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Appendix A: Study 1 Modules Survey (S1MS)

Directions for University Student Participants

Welcome to the *Hedge Your Bets* Pilot Study!

Hedge Your Bets is an online gambling harm reduction program for offenders living in the community. In this pilot study you will test some of the program assessments, complete Module 1 of the program, and then provide some feedback on Module 1 so we can make any needed improvements or changes. After you provide feedback on module 1, you will be redirected back to SONA.

You will be asked to enter your SONA Identity Code after you read the consent form. This is necessary, as this study does not grant credit automatically. In order for the researcher to manually grant your SONA credit, you must provide your SONA Identity Code. You can find your SONA Identity Code by clicking on "my profile" in right corner of the blue banner in SONA. Your Identity Code is on the left side of the screen, under the "name" field.

Scroll down to continue with captcha verification and the consent form.

Directions for College Student Participants

Welcome to the *Hedge Your Bets* Pilot Study!

Hedge Your Bets is an online gambling harm reduction program for offenders living in the community. In this pilot study you will complete the quizzes that will be used in each of the modules of the program. You are not expected to know all the answers. The purpose of this pilot is to see how much the average person knows about gambling, without having taken a course or program on the topic. The survey should only take 10-20 minutes.

To thank you for participating in this study, you can enter a draw to win one of ten $5 Tim Horton's gift cards. You will be asked to enter your email address after you read the consent form. Your email address will be used in the gift card lottery. If you win, you will receive your electronic gift card by email. After entering your email, you will have to answer a skill-testing question. The skill-testing question is a legal requirement of all lotteries in Canada. If you want to enter the gift card draw, you must enter your email address and answer the skill-testing question.

Scroll down to continue with captcha verification and the consent form.

Module 1: Gambling Knowledge

1) Which of the following is true?
    - **a. Gambling has been around for thousands of years.**
    - b. Gambling has been around for hundreds of years.
    - c. Gambling has only been around for the past 100 years.
    - d. Gambling has only been around for the past 50 years.

2) Which is the best definition of gambling?
    - a. Taking a risk on something with an uncertain outcome
    - b. Betting money or items of value on a chance outcome
    - c. **Betting money or items of value (i.e., canteen items, cigarettes, etc.) on something with an uncertain outcome in hope of winning money or items of value**

3) How does modern gambling differ from older forms of gambling?
    - a. The games have changed.
    - b. Gambling is much more widely available today.
    - c. Most gambling today is commercially provided with a built-in ‘house edge’
    - **d. All of the above are true.**
    - e. None of the above are true.

4) Worldwide, what is the most popular type of gambling?
   a. Lottery tickets
   b. Sports betting
   c. Poker
   d. Slot machines

5) Which of the following is least likely to happen to the average person this year?
   a. Being killed in a car crash
   b. Being murdered
   c. Winning the national lottery
   d. Being hit by lightning

6) Casinos make most of their money from
   a. Table games such as blackjack, poker, and roulette
   b. Slot machines
   c. Food and drink
   d. Door/cover charges

7) Gambling can become as addictive as alcohol or other drugs.
   a. True
   b. False
   c. Unsure

8) Which of the following is **not** one of the most common reasons for legalizing gambling?
   a. To provide citizens an easy way to increase their wealth
   b. To raise money for governments
   c. To keep the money spent on gambling in the local area by making sure people don't have to travel to gamble
   d. To decrease illegal gambling

Module 2: Gambling Fallacies

1) What is the definition of a fallacy?
   a. A universal truth
   b. A false or mistaken belief
   c. A strategy to win at gambling
   d. A logical argument

2) Which of the following is **not** a fallacy?
   a. Normalizing behavior by believing everyone behaves the same way you and your family does
   b. Thinking that something you remember really well happened more often than it really did
   c. Knowing that every time a coin is flipped there is a 50% chance the coming will come up heads, regardless of what it has come up before
   d. Beliving a good luck charm can increase your odds of winning

3) Look at the sets of lottery numbers below. Choose the set you think has the best chance of winning.
   a. 1, 2, 3, 4, 5, 6
   b. 14, 43, 5, 32, 17, 47
   c. The two sets have an equal chance of winning

4) Which slot machine gives you a better chance of winning the jackpot?
   a. a machine that has not had a jackpot in more than a month
   b. a machine that had a jackpot an hour ago
   c. **Your chances of winning the jackpot are the same on both machines**

5) How lucky are you? If you entered a draw with nine other people, how likely is it that you would win the prize?
    a. the same likelihood as everyone else
    b. less likely than other people
    c. more likely than other people

6) If you were to buy a lottery ticket, which would be the best place to buy it?
    a. a place that has sold many previous winning tickets
    b. a place that has sold few previous winning tickets
    c. It makes no difference; one place is as good as another

7) A positive attitude increases your chances of winning money at bingo or slot machines.
    a. false
    b. true

8) Your chances of winning a lottery are better if you choose your own numbers.
    a. false
    b. true

Module 3: Gambling-Related Skills

1) When you flip a coin, what are the odds that the coin will come up heads?
    a. 2 in 6
    b. 1 in 3
    c. **1 in 2**
    d. 2 in 5

2) A gambler has won money 75% of the time that he has gone to the casino (i.e., left with more money than they came with). How often has that person likely gone to the casino?
    a. **four times**
    b. 100 times
    c. It's equally likely that the person has gone four or 100 times.

3) You go to a casino with $100, hoping to double your money. Which strategy gives you the best chance of doubling your money?
    a. **betting all your money on a single bet**
    b. betting small amounts of money on several bets
    c. The two strategies give you equal chances of doubling your money.

4) Which game can you consistently win money at if you use the right gambling strategy?
    a. slot machines
    b. roulette
    c. bingo
    d. **none of the above**
    e. all of the above

5) You and a friend are flipping a coin. The coin has come up heads the last four times in a row. Which side of the coin is most like to come up on the fifth flip?
    a. heads
    b. tails
    c. **there is an equal chance that either heads or tails will come up**

6) You roll two standard six-sided dice (with the numbers 1-6 on it). What are the odds that you will roll a pair of 6s?
    a. 1 in 6
    b. 1 in 12
    c. 1 in 24
    d. **1 in 36**

7) You flip two coins. What are the odd that two heads will come up?
    a. 75%
    b. 50%
    c. **25%**
    d. 10%

8) Who is more likely to roll a pair of sixes with two dice?
    a. Someone who has rolled pairs of sixes on their last three rolls
    b. Someone who rolled a pair of sixes on their last roll, but not before that
    c. Someone who has not rolled a pair of sixes at all this game
    d. **None of the above**

Module 4: Gambling Problems

1) Which of the following is true?
    a. Gambling is less available today than it was in the past.
    b. Gambling availability has stayed the same.
    c. **Gambling is more available than it was in the past.**
    d. None of the above.

2) How is problem gambling defined?
    a. Impaired control over gambling that has led to significant life problems
    b. Loss of control over gambling behaviour
    c. Total preoccupation with gambling that has resulted in major gambling losses
    d. Losing more than $10,000 per month

3) What tends to be the most addictive form of gambling for most people?
    a. Lottery tickets
    b. Slot machines
    c. Sports betting
    d. Bingo
    e. All of the above are equally addictive

4) Choose two items that do not increase a person's risk of becoming a problem gambler:
    a. Parents who are problem gamblers
    b. Gambling at an early age
    c. **female gender**
    d. **older age (60+)**
    e. having other addictions
    f. having friends who regularly gamble
    g. playing slot machines or other electronic gambling machines
    h. impulse control problems

5) Gambling problems can affect which of the following life areas:
    a. Finances (money)
    b. Relationships (with family or friends)
    c. School or work

d. Emotional or mental health and wellbeing
e. Behavior (e.g., causing legal problems)
f. Physical health
g. None of the above
h. All of the above

6) What are some risk factors for problem gambling?
   a. Having other addictions (e.g., alcohol, tobacco, drugs, etc.)
   b. Poor impulse control
   c. Having mental health issues (e.g., depression, anxiety, etc.)
   d. Having certain developmental disorders (e.g., Attention-Deficit Hyperactivity Disorder, or ADHD)
   e. Started gambling at a young age
   f. Having parents or close friends who gamble
   g. None of the above
   h. All of the above

7) What are some symptoms of problem gambling?
   a. Gambling to escape problems or bad moods
   b. Preoccupation with gambling (e.g., can't stop thinking about gambling)
   c. Lying to hide gambling activities
   d. Spending more and more money on gambling to get the same feelings of excitement
   e. Chasing losses
   f. None of the above
   g. All of the above

8) What are the three phases of problem gambling?
   a. Winning, chasing losses, quitting
   b. Winning, chasing losses, panic
   c. Losing, chasing losses, panic
   d. Chasing losses, winning, panic

Appendix B: Participant Feedback Surveys

Directions

In this survey you will be asked to provide feedback on Module 1 of the *Hedge Your Bets* program. The purpose of this survey is to fix problems, makes changes, and or improve the content where needed before the launch of the program. Thank you for your assistance in piloting the *Hedge Your Bets* Program.

Please enter your **SONA Identity Code** in the field below. This is necessary, as this study does not grant credit automatically. In order for the researcher to manually grant your SONA credit, you ***must*** provide your SONA Identity Code. **You can find your SONA Identity Code by clicking on "my profile"** in right corner of the blue banner in SONA. Your Identity Code is on the left side of the screen, under the "name" field.

1) Did you experience any problems with how the module functioned? If so, please describe these issues. [open text box]

2) Please indicate the extent to which you disagree or agree with the following statements.

    a. The module was easy to understand.
    b. The pictures grabbed my attention.
    c. The interactives (e.g., flashcards, quizzes, audio/video clips, etc.) helped me learn the content.

Response Options for Question 2:

Disagree	Somewhat Disagree	Somewhat Agree	Agree

3) How could we have improved the modules? [open text box]

4) Please provide any other feedback or comments you'd like to share. [open text box]

Appendix C: Recruitment Email

Subject Line: Invitation to Participate in an Online Gambling Harm Reduction Program

Hi there,

You are invited to participate in an online gambling harm reduction program called *Hedge Your Bets*. This program addresses gambling knowledge, attitudes, and harm reduction techniques specific to offender populations. This program is free, online, and available to anyone who meets the following eligibility criteria:

- Is an offender or ex-offender; **OR**
- Is the family/significant other/friend of an offender or ex-offender; **OR**
- Works or volunteers with offenders.

AND

- Is at least 18 years old; **AND**
- Can legally access the internet using a computer, laptop, tablet, or smartphone.

Please note: at this time, the Hedge Your Bets program is only available in English.

Below is a summary of the program. Or you can always visit www.hedgeyourbetsprogram.com for full details!

The *Hedge Your Bets* program consists of the following modules:

- Program Orientation Module: introductory and orientation information (10-15 minutes to complete)
- Pre-Program Survey: this surve must be completed before the program begins (about 30 minutes to complete); wait 3 days to continue with module 1
- Content Module 1: Gambling knowledge & attitudes (about 30 minutes to complete); wait 1 week to continue with module 2
- Content Module 2: Gambling fallacies (about 30 minutes to complete); wait 1 week to continue with module 3
- Content Module 3: Gambling-related skills (about 30 minutes to complete); wait 1 week to continue with module 4
- Content Module 4: Gambling problems (about 30 minutes to complete); wait 1 week to continue with the post-program survey
- Post-Program Survey: this survey that must be completed to finish the program (about 30 minutes to complete); wait 3 weeks to continue with follow-up survey
- Follow-up Survey: this survey is the same as the post-program survey (about 30 minutes to complete).

Overall, the program will take 3-4 hours of work spread out over 8 weeks.

Why should you participate in this program? For the following reasons:

1. All participants will learn to gamble in a way that reduces their chances of experiencing gambling harm;
2. Successful completion certificates will be available for those who want them. If you are currently serving a sentence, this certificate may useful for you to demonstrate your accountability and engagement in your rehabilitation efforts. You can save or print this certificate to share with whomever you like.
3. There is an incentive program involved in the research study, giving participants up to three opportunities to win Amazon gift cards (participants can enter to win once for each phase of the study they participate in).

Phase 1: begins with clicking the link to participate in the program and ends with the pre-program survey. Anyone who participates in any portion of this phase (regardless of whether or not they complete it) can enter to win one of five $20 Amazon gift cards.
Phase 2: begins with content module 1 and ends with the post-program survey. Anyone who participates in any portion of this phase (regardless of whether or not they complete it) can enter to win one of ten $50 Amazon gift cards.
Phase 3: begins and ends with the follow-up survey. Anyone who participates in any portion of this phase (regardless of whether or not they complete it) can enter to win one of four $100 gift cards.

This study is being conducted by Jami Albright-Tolman, PhD Candidate in Population Studies in Health at the University of Lethbridge. Jami can be reached by email at hybprogram@gmail.com or jami.albrighttolman@uleth.ca with any questions about the Hedge Your Bets Program. This study has been approved by the University of Alberta's Research Ethics Board.

Additional information:
Lead Researcher: Jami Albright-Tolman, Ph.D. Candidate, Population Studies in Health, University of Lethbridge.
Email: hybprogram@gmail.com OR jami.albrighttolman@uleth.ca
Phone: 403-382-4083

Full study title: Program Evaluation of "Hedge Your Bets": A Gambling Harm Reduction Program for Offenders and Ex-Offenders Living in the Community

Ethics ID: Pro00121825

Thank you,
Jami Albright-Tolman.

University of Lethbridge

Appendix D: Demographics Measure

Directions

These questions are about you and your life experiences, so there are no right or wrong answers. All your responses are confidential. It's important that you be honest. Remember, if you choose to leave the survey and return later, you must use the same device and internet browser, or your progress will not be saved.

1) How old are you right now? Please select your age range. Please choose one option.
    a. Under 18 [ineligibility message, go to end of survey]
    a. 18 – 25
    b. 26 – 33
    c. 34 – 41
    d. 42 – 49
    e. 50+

2) What is your gender[32]? Please choose one option.
    a. Man
    b. Woman

[32] Gender categories as per Bauer et al. (2017).

c. Transgender Man
d. Transgender Woman
e. Non-Binary/Gender non-conforming
f. Other – please specify [open text box]

3) What race are you? Please choose all that apply.
   a. Indigenous (First Nations, Metis, Inuit, Native American descent)
   b. Black (African, Afro-Caribbean, African-Canadian descent)
   c. White (European descent)
   d. South Asian (East Indian, Pakistani, Sri Lankan, Indo-Caribbean, etc.)
   e. East Asian (Chinese, Korean, Japanese, Taiwanese descent)
   f. Southeast Asian (Filipino, Vietnamese, Cambodian, Thai, other Southeast Asian descent)
   g. Middle Eastern (Arab, Persian, West Asian descent e.g., Afghan, Egyptian, Iranian, etc.)
   h. Latino (Latin American, Hispanic descent)
   i. Other – please specify [open text box]

4) What was your total household income before taxes for the last year that you were not incarcerated? Your best guess is fine. Please choose one option.
   a. 0 - $19,999
   b. $20,000-$39,999
   c. $40,000-$59,999
   d. $60,000-$79,999
   e. $80,000-$99,999
   f. $100,000 or more
   g. Do not know

5) Which of the following have you completed, if any? Please choose one option.
   a. Some elementary school grades – specify highest grade completed
   b. Elementary school
   c. Middle school
   d. High school
   e. Some college/university courses or trade school
   f. College/university two-year diploma program
   g. college/university four-year degree program
   h. Master's degree, PhD, or professional degree (M.D., LL.B., etc.)

6) Have you been **diagnosed** with, or **suspected** of having, any of the following disorders? Please choose all that apply.
   a. Substance Use Disorder (SUD)
   b. Depression
   c. Bipolar Disorder
   d. Anxiety
   e. Panic Disorder
   f. Attention Deficit Hyperactivity Disorder (ADHD)
   g. Fetal Alcohol Spectrum Disorder (FASD)
   h. Post-Traumatic Stress Disorder (PTSD)
   i. Any personality disorder (e.g., anti-social personality disorder)
   j. Other -please specify [open text box]
   k. None of the above

Appendix E: Supplemental Tables

Table E1

Attrition Analysis - Logistic Regression

Demographics	Attrition			
	B	*SE*	*p*	*OR*
Gender (man/woman)	0.328	0.417	0.432	1.388
White/non-White	-0.009	0.633	0.989	0.991
Income	0.190	0.169	0.261	1.209
Education Level	0.024	0.193	0.901	1.024
Mental disorder (yes/no)	-0.599	0.489	0.221	0.549
Criminal Offender (yes/no)	-0.320	0.536	0.550	0.726
Constant	-0.412	1.317	0.754	0.662

Note. B values are in odds-log metric.

Table E2

Participant Ages

Age	T0		T1		T2		T3		T4		T5		T6	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
18 - 25	4	4.8	4	5.3	4	5.8	4	5.9	3	5.1	2	3.4	2	3.8
26 - 33	14	16.7	12	15.8	11	15.9	11	16.2	9	15.3	10	17.2	10	18.9
34 - 41	18	21.4	17	22.4	15	21.7	14	20.6	11	18.6	10	17.2	9	17.0
42 - 49	12	14.3	12	15.8	10	14.5	11	16.2	9	15.3	8	13.8	5	9.4
50 or older	36	42.9	31	40.8	29	42.0	28	41.2	27	45.8	28	48.3	27	50.9
Total	84	100	76	100	69	100	68	100	59	100	58	100	53	100

T0 = pre-program, T1 = knowledge module quiz, T2 = fallacies module quiz, T3 = skills module quiz, T4 = problems module quiz, T5 = post-program, T6 = follow-up.

Table E3

Participant Gender

Gender	T0		T1		T2		T3		T4		T5		T6	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Man	33	39.3	28	36.8	25	36.2	26	38.2	22	37.3	33	39.3	19	35.8
Woman	50	59.5	47	61.8	43	62.3	41	60.3	36	61.0	50	59.5	33	62.3
Non-Binary/Gender Non-conforming	1	1.2	1	1.3	1	1.4	1	1.0	1	1.7	1	1.2	1	1.9

T0 = pre-program, T1 = knowledge module quiz, T2 = fallacies module quiz, T3 = skills module quiz, T4 = problems module quiz, T5 = post-program, T6 = follow-up.

Table E4

Participant Race

Race	T0		T1		T2		T3		T4		T5		T6	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%

Indigenous	13	15.5	11	14.5	11	15.9	11	16.2	10	16.9	10	17.2	9	17.0
Black	5	6.0	5	6.6	5	7.2	5	7.4	4	6.8	3	5.2	3	5.7
White	69	82.1	63	82.9	56	81.2	55	80.9	48	81.4	49	84.5	44	83.0
South Asian	3	3.6	3	3.9	3	4.3	3	4.4	3	5.1	2	3.4	2	3.8
Middle Eastern	1	1.2	1	1.3	1	1.4	1	1.5	1	1.7	0	0.0	0	0.0

T0 = pre-program, T1 = knowledge module quiz, T2 = fallacies module quiz, T3 = skills module quiz, T4 = problems module quiz, T5 = post-program, T6 = follow-up.

Table E5

Participant Education

Education	T0	T1	T2	T3	T4	T5	T6
	n(%)	*n*(%)	*n*(%)	*n*(%)	*n*(%)	*n*(%)	*n*(%)
High School	13(15.5)	12(15.8)	11(15.9)	12(17.6)	10(16.9)	13(15.5)	7(13.2)
Some college/university or Trade School	17(20.2)	16(21.1)	13(18.8)	14(20.6)	11(18.6)	17(20.2)	10(18.9)
College/University 2-year Diploma	23(27.4)	19(25.0)	19(27.5)	18(26.5)	14(23.7)	23(27.4)	14(26.4)
College/University 4-year Degree	20(23.8)	18(23.7)	16(23.2)	15(22.1)	15(25.4)	20(23.8)	13(24.5)
Masters/PhD/Professional Degree (M.D. LL.B, etc.)	11(13.1)	11(14.5)	10(14.5)	9(13.2)	9(15.3)	11(13.1)	9(17.0)

T0 = pre-program, T1 = knowledge module quiz, T2 = fallacies module quiz, T3 = skills module quiz, T4 = problems module quiz, T5 = post-program, T6 = follow-up.

Table E6

Participant Income

Income	T0		T1		T2		T3		T4		T5		T6	
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
0 - $19,999	12	14.3	9	11.8	7	10.1	8	11.8	7	11.9	12	14.3	5	9.4
$20,000- $39,999	18	21.4	17	22.4	14	20.3	15	22.1	11	18.6	18	21.4	11	20.8
$40,000- $59,999	8	9.5	7	9.2	7	10.1	7	10.3	4	6.8	8	9.5	3	5.7
$60,000- $79,999	10	11.9	10	13.2	10	14.5	9	13.2	9	15.3	10	11.9	9	17.0
$80,00- $99,999	13	15.5	12	15.8	11	15.9	10	14.7	10	16.9	13	15.5	9	17.0
$100,000 or more	21	25.0	19	25.0	18	26.1	17	25.0	16	27.1	21	25.0	14	26.4
Do not know	2	2.4	2	2.6	2	2.9	2	2.9	2	3.4	2	2.4	2	3.8

T0 = pre-program, T1 = knowledge module quiz, T2 = fallacies module quiz, T3 = skills module quiz, T4 = problems module quiz, T5 = post-program, T6 = follow-up.

Table E7

Participant Education Levels by Non-Offender/Offender Subgroups

Education	Non-Offenders		Offenders	
	n	%	n	%
High School	5	8.8	8	29.6
Some college/university courses or Trade School	10	17.5	7	25.9
College/university two-year diploma program	16	28.1	7	25.9
College/University four-year degree program	18	31.6	2	7.4
Master's Degree, PhD, Professional Degree (M.D., LL.B, etc.)	8	14.0	3	11.1
Total	57	100.0	27	100.0

Table E8

Participant Income Levels by Non-Offender/Offender Subgroups

Income	Non-Offenders		Offenders	
	n	%	n	%
0 - $19,999	8	14.0	4	14.8
$20,000-$39,999	7	12.3	11	40.7
$40,000-$59,999	5	8.8	3	11.1
$60,000-$79,999	8	14.0	2	7.4
$80,00-$99,999	11	19.3	2	7.4
$100,000 or more	16	28.1	5	18.5
Do not know	2	3.5	0	0
Total	57	100.0	27	100.0

Table E9

Participant Comorbidities across Timepoints

Mental Illness	T0		T1		T2		T3		T4		T5		T6	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
SUD	13	15.5	12	15.8	9	13.0	9	13.2	8	13.6	8	13.8	7	13.2
Depression	32	38.1	27	35.5	23	33.3	22	32.4	20	33.9	21	36.2	18	34.0
Bipolar	2	2.4	2	2.6	1	1.4	1	1.5	0	0	0	0	0	0
Anxiety	27	32.1	25	32.9	23	33.3	22	32.4	18	30.5	18	31.0	15	28.3
Panic Disorder	3	3.6	3	3.9	3	4.3	3	4.4	3	5.1	3	5.2	3	5.7
ADHD	11	13.1	10	13.2	10	14.5	10	14.7	7	11.9	8	13.8	7	13.2
FASD	1	1.2	1	1.3	1	1.4	1	1.5	1	1.7	1	1.7	1	1.9
PTSD	6	7.1	4	5.3	4	5.8	4	5.9	2	3.4	2	3.4	1	1.9
Personality Disorder	2	2.4	2	2.6	2	2.9	2	2.9	1	1.7	1	1.7	1	1.9

Note. Several participants selected more than one disorder, so totals do not add to 100%. T0 = pre-program, T1 = knowledge module quiz, T2 = fallacies module quiz, T3 = skills module quiz, T4 = problems module quiz, T5 = post-program, T6 = follow-up.

Table E10

Participant Comorbidities: Non-Offender and Offender Subgroups

Mental Disorder	Total Sample		Non-Offenders		Offenders	
	n	%	*n*	%	*n*	%
Substance Use Disorder	13	15.5	1	1.8	12	44.4
Depression	32	38.1	18	31.6	14	51.9
Bipolar Disorder	2	2.4	0	0.0	2	7.4
Anxiety	27	32.1	16	28.1	11	40.7
Panic Disorder	3	3.6	1	1.8	2	7.4
Attention Deficit/Hyperactivity Disorder	11	13.1	7	12.3	4	14.8
Fetal Alcohol Spectrum Disorder	1	1.2	1	1.8	0	0
Post-Traumatic Stress Disorder	6	7.1	2	3.5	4	14.8
Any Personality Disorder	2	2.4	1	1.8	1	3.7

Table E11

Friedman Test, Gambling Attitudes Questionnaire, Entire Sample

	T0	T5	T6	Friedman		
	Mdn	*Mdn*	*Mdn*	*χ2*	*df*	*p*
GAQ	2.43	2.29_a	2.29_a	7.30	2.00	*p* = .026

Note. Subscripts denote nonsignificant comparisons within modules.

T0 = pre-program, T5 = post-program, T6 = follow-up.

Table E12

Pairwise Comparisons, Gambling Attitudes Questionnaire, Entire Sample

GAQ	Wilcoxon Signed Rank Test							
	Timepoints (*Mdn*)		Diff +	Diff -	No Diff	*Z*	*p*	Effect Size
T0-T5	T0 (2.43)	T5 (2.29)	16	32	10	-2.51	*p* = .012	-0.23
T0-T6	T0 (2.43)	T6 (2.29)	14	27	12	-2.43	*p* = .015	-0.24
T5-T6	T5 (2.29)	T6 (2.29)	24	24	5	0.48	*p* = .634	0.05

Note. T0 = pre-program, T5 = post-program, T6 = follow-up.

I calculated effect size for the Wilcoxon signed rank test according to Pallant (2016): *r* = *z*/square root of n (where n = the number of observations over two timepoints). Pallant (2016) identifies .1 as a small effect size, .3 as a medium effect size, and .5 as a large effect size.

Table E13

Pairwise Comparisons, S2*MS Scores for Non-Offender and Offender Subgroups*

						Wilcoxon			Sign	
Offender	*n*	Module	Diff +	Diff -	No Diff	*z*	*p*	Effect Size	*z*	*p*
Knowledge										
No	39	T0-T1	28	4	7	4.31	< .001	0.49**		
Yes	14	T0-T1	9	0	5	2.70	.004	0.51**		
No	39	T0-T5	29	4	6	4.24	< .001	0.48**		
Yes	14	T0-T5	8	5	1	1.22	0.111	0.23		
No	39	T0-T6	27	5	7	4.06	< .001	0.46**		
Yes	14	T0-T6	8	2	4	2.07	0.019	0.39*		

No	39	T5-T6	11	9	19	0.55	0.582	0.06		
Yes	14	T5-T6	3	5	6	-0.51	0.608	-0.10		
No	39	T1-T5	15	10	14	1.13	0.130	0.13		
Yes	14	T1-T5	10	2	2	2.35	0.010	0.44**		
No	39	T1-T6	15	7	17	1.81	0.036	0.20		
Yes	14	T1-T6	7	1	6	2.13	0.017	0.40*		
Fallacies										
No	39	T0-T2	17	4	17	2.74	0.003	0.31*		
Yes	14	T0-T2	7	0	7	2.41	0.008	0.46**		
No	42	T0-T5	17	2	20				3.21	< .001
Yes	16	T0-T5	7	0	7				2.27	0.008
No	39	T0-T6	16	5	18				2.18	0.015
Yes	14	T0-T6	6	0	8				2.04	0.021
No	39	T5-T6	2	7	30	-1.73	0.083	-0.20		
Yes	14	T5-T6	2	4	8	-0.82	0.414	-0.15		
No	39	T2-T5	7	3	28				0.949	0.17
Yes	14	T2-T5	0	0	14				0.000	0.00
No	39	T2-T6	5	7	26	-0.50	0.307	-0.06		
Yes	14	T2-T6	2	4	8	-0.82	0.207	-0.15		
Skills										
No	39	T0-T3	27	0	12	4.61	< .001	0.52**		
Yes	14	T0-T3	10	0	4	2.91	0.002	0.55**		
No	39	T0-T5	27	2	10				4.46	< .001
Yes	14	T0-T5	12	2	0				2.41	< .007
No	39	T0-T6	30	3	6	4.60	< .001	0.52**		
Yes	14	T0-T6	11	0	3	2.96	0.002	0.56**		
No	39	T5-T6	8	4	27	0.77	0.439	0.09		
Yes	14	T5-T6	4	3	7	0.88	0.380	0.17		
No	39	T3-T5	4	12	23	-2.17	0.015	-0.25		
Yes	14	T3-T5	4	3	7	0.00	.500	0.00		
No	39	T3-T6	8	15	6	-1.66	0.048	-0.22		
Yes	14	T3-T6	3	2	9	0.97	0.167	0.18		
Problems										
No	39	T0-T4	20	9	10	2.48	0.007	0.28		
Yes	14	T0-T4	5	4	5	0.19	0.426	0.04		
No	39	T0-T5	23	7	9	3.41	< .001	0.39*		
Yes	14	T0-T5	9	2	3	1.79	0.037	0.34*		
No	39	T0-T6	20	5	14	3.49	< .001	0.39*		

Yes	14	T0-T6	10	2	2	1.31	0.095	0.25		
No	39	T5-T6	8	11	20				-0.459	0.648
Yes	14	T5-T6	5	2	7				0.756	0.453
No	39	T4-T5	24	7	8	2.06	0.020	0.23		
Yes	14	T4-T5	7	2	5	2.00	0.023	0.38*		
No	39	T4-T6	18	10	11	1.23	0.110	0.14		
Yes	14	T4-T6	9	2	3	1.77	0.039	0.33*		

Note. T0 = Timepoint 0 (pre-program assessment), T1 = Timepoint 1 (module 1 quiz), T2 = Timepoint 2 (module 2 quiz), T3 = Timepoint 3 (module 3 quiz), T4 = Timepoint 4 (module 4 quiz), T5 = Timepoint 5 (post-program assessment), and T6 = Timepoint 6 (follow-up assessment).
I calculated effect size for the Wilcoxon signed rank test according to Pallant (2016): *r* = *z*/square root of n (where n = the number of observations over two timepoints). Pallant (2016) identifies .1 as a small effect size, .3 as a medium effect size, and .5 as a large effect size.
*Denotes medium effect size.
**Denotes large effect size.

Table E14

Pairwise Comparisons, S2MS withing the Non-Problem Gambler and Problem Gambler Subgroups

			Wilcoxon					
PG	*n*	Module	Diff +	Diff -	No Diff	*z*	*p*	Effect Size
Knowledge								
No	42	T0-T1	29	3	10	4.40	< .001	0.48**
Yes	11	T0-T1	8	1	2	2.46	0.007	0.52**
No	42	T0-T5	30	7	5	3.79	< .001	0.41*
Yes	11	T0-T5	7	2	2	2.09	0.018	0.45**
No	42	T0-T6	27	6	9	3.91	< .001	0.43*
Yes	11	T0-T6	8	1	2	2.36	0.009	0.50**
No	42	T5-T6	10	11	21	-0.17	0.867	-0.02
Yes	11	T5-T6	4	3	4	0.60	0.546	0.13
No	42	T1-T5	19	10	13	1.81	0.036	0.20
Yes	11	T1-T5	6	2	3	1.41	0.079	0.30*
No	42	T1-T6	17	7	18	1.98	0.024	0.22
Yes	11	T1-T6	5	1	5	1.82	0.034	0.39*
Fallacies								
No	42	T0-T2	17	3	21	3.21	<.001	0.35*
Yes	11	T0-T2	7	1	3	1.78	0.038	0.38*
No	42	T0-T5	18	1	23	3.68	<.001	0.40*
Yes	11	T0-T5	6	1	4	2.05	0.020	0.44*
No	42	T0-T6	16	5	21	2.40	0.008	0.26

Yes	11	T0-T6	6	0	5	2.23	0.013	0.48**
No	42	T5-T6	2	8	32	-1.94	0.052	
Yes	11	T5-T6	2	3	6	-0.45	0.655	
No	42	T2-T5	5	2	34	1.13	0.129	
Yes	11	T2-T5	2	1	8	0.58	0.282	
No	42	T2-T6	5	8	28	-1.00	0.159	
Yes	11	T2-T6	2	3	6	0.00	0.500	
Skills								
No	42	T0-T3	28	0	14	4.74	<.001	0.52**
Yes	11	T0-T3	9	0	2	2.69	0.004	0.57**
No	42	T0-T5	29	3	10	4.49	<.001	0.49**
Yes	11	T0-T5	10	1	0	2.49	0.007	0.53**
No	42	T0-T6	31	3	8	4.68	<.001	0.51**
Yes	11	T0-T6	10	0	1	2.83	0.003	0.60**
No	42	T5-T6	10	4	28	1.21	0.225	
Yes	11	T5-T6	2	3	6	0.41	0.679	
No	42	T3-T5	6	13	23	-1.97	0.024	0.21
Yes	11	T3-T5	2	2	7	-0.38	0.353	
No	42	T3-T6	9	14	19	-1.15	0.125	
Yes	11	T3-T6	2	3	6	0.00	0.500	
Problems								
No	42	T0-T4	20	11	11	2.31	0.011	0.25
Yes	11	T0-T4	5	2	4	0.43	0.335	
No	42	T0-T5	25	7	10	3.43	< .001	0.37*
Yes	11	T0-T5	7	2	2	1.68	0.047	0.36*
No	42	T0-T6	22	5	15	3.61	< .001	0.39*
Yes	11	T0-T6	8	2	1	0.98	0.164	
No	42	T5-T6	9	10	23	-0.76	0.446	
Yes	11	T5-T6	4	3	4	-0.69	0.488	
No	42	T4-T5	24	8	10	2.03	0.022	0.22
Yes	11	T4-T5	7	1	3	2.17	0.015	.46**
No	42	T4-T6	20	10	12	1.60	0.055	
Yes	11	T4-T6	7	2	2	1.33	0.092	

Note. PG = problem gambler. T0 = Timepoint 0 (pre-program assessment), T1 = Timepoint 1 (module 1 quiz), T2 = Timepoint 2 (module 2 quiz), T3 = Timepoint 3 (module 3 quiz), T4 = Timepoint 4 (module 4 quiz), T5 = Timepoint 5 (post-program assessment), and T6 = Timepoint 6 (follow-up assessment).
I calculated effect size for the Wilcoxon signed rank test according to Pallant (2016): $r = z/\sqrt{n}$ (where n = the number of observations over two timepoints). Pallant (2016) identifies .1 as a small effect size, .3 as a medium effect size, and .5 as a large effect size.
*Denotes medium effect size.
**Denotes large effect size.

Appendix F: Criminal History Measure

Directions

Welcome to the Criminal History Measure! These questions are about you and your life experiences, so there are no right or wrong answers. Remember, all your responses are confidential. It's important that you be honest. Remember, if you choose to leave the survey and return later, you must use the same device and internet browser, or your progress will not be saved.

Criminal History

1) Have you ever been convicted of a criminal offence?
   Yes [go to question 2]
   No [go to end of survey]

2) What types of offence(s) have you ever been convicted of, including any current offences? Please choose all that apply.
   a. Breach offences
   b. Driving offences
   c. Drug offences
   d. Fraud and/or financial offences
   e. Property offences
   f. Sexual offences
   g. Violent offences
   h. Other - please specify [open textbox]

3) Are you currently serving a sentence? Please choose one option.
   a. Yes [go to question 3]
   b. No [go to question 4]

4) [if 2 = yes] Did your current sentence include any time in jail or prison? Please choose one option.
   a. Yes [go to question 4]
   b. No [go to question 4]

For this question, please choose the best answer from the options listed. If you do not remember exactly, please answer with your best guess.

5) How long ago was your last release from jail or prison?
   a. Less than 1 year
   b. 1 to 2 years less a day
   c. 2 to 3 years less a day
   d. 3 to 4 years less a day
   e. 4 to 5 years less a day
   f. 5 years or more

6) For this question, please choose the best answer from the options listed. If you do not remember exactly, please answer with your best guess. How long ago did you complete your most recent sentence?
   a. I am still serving a sentence
   b. Less than 1 year
   c. 1 to 2 years less a day
   d. 2 to 3 years less a day
   e. 3 to 4 years less a day
   f. 4 to 5 years less a day
   g. 5 years or more

7) For this question, please choose the best answer from the options listed. If you do not remember exactly, please answer with your best guess. What is the longest period of time you spent in jail or prison without being released?
    a. I have not spent any time in jail or prison
    b. Less than 1 year
    c. 1 to 3 years less a day
    d. 3 to 5 years less a day
    e. 5 to 7 years less a day
    f. 7 to 9 years less a day
    g. 9 years or more

8) For this question, please choose the best answer from the options listed. If you do not remember exactly, please answer with your best guess. How much time have you spent in jail or prison in your lifetime? For this question, add together all the times you spent in jail or prison to come up with a total number.
    a. I have not spent any time in jail or prison
    b. Less than 1 year
    c. 1 to 3 years less a day
    d. 3 to 5 years less a day
    e. 5 to 7 years less a day
    f. 7 to 9 years less a day
    g. 9 years or more

Appendix G: Gambling Behavior Questionnaire

Adapted from Williams et al. (2017)

Directions

Welcome to the Gambling Behavior Questionnaire! This survey asks about your gambling behavior. There are no right or wrong answers. The goal is simply to learn about your gambling behaviors. It is important that you answer all questions honestly. Remember, your responses are confidential.

This survey is divided into two sections: (A) Jail or Prison; and (B) Community. If you have never been to jail or prison, you will skip to the community section.

Anywhere you are asked for frequency or amount, please answer with your best guess. Remember, people can make bets for money or items of value (e.g., cigarettes, favors, nicotine patches, canteen items, etc.). If you are answering questions about the value of a bet you made with items of value (e.g., cigarettes), you can state what the item was, how many of the items you bet, and/or the dollar value of the items (your best guess is fine).

Remember, if you choose to leave the survey and return later, you must use the same device and internet browser, or your progress will not be saved.

1) Have you been in jail or prison in the past month (30 days) of your life?
    a. Yes [go to question 2]
    b. No [go to question 6]

2) Section A: Jail or Prison

    This section asks about your gambling behavior while you were in jail or prison in the last 30 days. While in jail or prison, I have done the following in the last 30 days... Choose all that apply.

Response Options for Question 2

Every day or almost every day in the last month	A few days a week in the last month	Once a week in the last month	A couple of times in the last month	Not at all in the last month

    a. Betting on games or competitions with other people (dice games, board games, pool, who can run the fastest, etc.)
    b. Betting on card games (poker, gin rummy, blackjack, etc.)
    c. Getting someone to gamble for me in the community
    d. Sports betting (professional sports, horse racing, etc.)
    e. Other – please specify [open text box]

3) This section asks about gambling losses and debt during the last 30 days. First, let's talk about gambling losses. While in jail or prison, the largest amount of money or value of items I have lost while gambling is...
    a. More than $150
    b. $101-$150
    c. $51-$100
    d. $11-$50
    e. Less than $10

4) Next, let's talk about going into debt during the last 30 days. While in jail or prison, I have gone into debt due to gambling.
    a. Yes
    b. No

5) Roughly, how much was your largest gambling debt from jail or prison in the last 30 days? Please enter an amount in dollars (or the dollar value of items you owe).
[open text box]

6) Section B: Community

This section asks about your gambling while you were living in the community. All of the options for this item apply to either in-person or online (internet) forms of games in the last 30 days in the community. While living in the community (that is, while not in jail or prison) I have done the following... Choose all that apply.

Every day or almost every day in the last month	A few days a week in the last month	Once a week in the last month	A couple of times in the last month	Not at all in the last month

a. Betting on games or competitions with other people (poker or other card games, dice games, board games, bowling, darts, pool, etc.)
b. Bingo
c. Casino table games (roulette, blackjack, craps, etc.)
d. Instant lotteries (scratch-and-wins, pull-tabs, etc.)
e. Lotteries/Raffles
f. Playing electronic gambling machines (slot machines, video lottery terminals, etc.)
g. Sports betting (professional sports, horse racing, etc.)
h. Other – please specify [open text box]

7) Next, let's talk about your gambling losses in the last 30 days. While living in the community, the largest amount of money or value of items I have lost while gambling is…
   a. More than $1500
   b. $1001-$1500
   c. $501-$1000
   d. $101-$500
   e. Less than $100

8) Next, let's talk about how you have paid for your gambling in the community during the last 30 days. Choose only one option for each item.

Every day or almost every day in the last month	A few days a week in the last month	Once a week in the last month	A couple of times in the last month	Not at all in the last month

a. I have taken money out of a bank machine (ATM) to keep gambling after I ran out of cash.
b. I have used a credit card to pay for gambling.
c. I have borrowed money to pay for gambling.
d. I have taken out a payday loan to pay for gambling.

9) Next, let's talk about going into debt. Unless otherwise stated, the questions are asking about the past 30 days. While living in the community, I have gone into debt due to gambling.
   a. Yes
   b. No
10) Roughly, how much was your largest gambling debt from gambling in the community? Please enter an amount in dollars.
   a. [open text box]

11) Next, let's talk about paying off debt. Unless otherwise stated, the questions are asking about the past 30 days. I have gambled to win enough money to pay off a debt that was not caused by gambling (e.g., drug debt, household bills, etc.).
    a. Yes
    b. No

12) What kind of debt was it? For example, was it a drug debt, credit card, household bills, a loan, etc.
    a. [open text box]

13) How much was this debt? Please enter an amount in dollars.
    a. [open text box]

14) To pay off a gambling debt, I have committed a crime (e.g., drug dealing, property crimes, financial crimes/fraud, etc.).
    a. Yes
    b. No

15) What crimes have you committed to get the money you needed to pay off a gambling debt? Please name the specific crimes (e.g., theft, selling drugs, etc.)
    a. [open text box]

16) Lastly, let's talk about gambling and crime. Unless otherwise stated, these questions are asking about the last 30 days. I have engaged in criminal behavior (e.g., drug dealing, property crimes, financial crimes/fraud, etc.) to obtain money to continue gambling.
    a. Yes
    b. No

17) What crimes have you committed to get the money you needed to continue gambling? Please name the specific crimes (e.g., theft, selling drugs, etc.)
    a. [open text box]

18) When I am involved in my crime cycle (that is, actively committing crimes), I tend to gamble.
    a. Yes
    b. No

Appendix H: Problem and Pathological Gambling Measure (PPGM)

(Williams & Volberg, 2010)

1. Has your involvement in gambling caused you either to borrow a significant amount of money or sell some of your possessions in the past 12 months? Significant means something that either you or someone else would say is considerable, important, or major.
    a. Yes
    b. No

2. Has your involvement in gambling caused significant **financial concerns** for you or someone close to you in the past 12 months? (Note: do not score 1 for question 2 if 1 has already been scored for question 1).
    a. Yes
    b. No

3. Has your involvement in gambling caused significant **mental stress** in the form of guilt, anxiety, or depression for you or someone close to you in the past 12 months?
    a. Yes
    b. No

4. Has your involvement in gambling caused serious problems in your **relationship with your spouse/partner, or important friends or family** in the past 12 months? **Family** includes anyone you consider to be your family.

5. Has your involvement in gambling caused you to repeatedly neglect your children or family in the past 12 months? (Note: do not score 1 for 5 if 1 has already been scored for 4).
    a. Yes
    b. No

6. Has your involvement in gambling resulted in significant **health problems** or injury for you or someone close to you in the past 12 months?
    a. Yes
    b. No

7. Has your involvement in gambling caused significant **work or school problems** for you or someone close to you in the past 12 months?
    a. Yes
    b. No

8. Has your involvement in gambling caused you to miss a significant amount of time off work or school in the past 12 months? (Note: do not score 1 for 8 if 1 has already been scored for 7).
    a. Yes
    b. No

9. Has your involvement in gambling caused you or someone close to you to write bad cheques, take money that didn't belong to you or commit other **illegal acts** to support your gambling in the past 12 months?
    a. Yes
    b. No

10. Is there anyone else who would say that your involvement in gambling in the past 12 months has caused any significant problems regardless of whether you agree with them or not?
    a. Yes
    b. No

PROBLEMS SCORE	**/7**

11. In the past 12 months, have you often gambled longer, with more money or more frequently than you intended to?
    a. Yes
    b. No

12. In the past 12 months, have you often gone back to try and win back the money you lost? 4
    c. Yes
    d. No

13. In the past 12 months, have you made any attempts to either cut down, control, or stop your gambling? (go to 15 if 'no') (this item not scored)
    e. Yes
    f. No

14. Were you successful in these attempts? (score '1' for no and '0' for yes)
    g. Yes
    h. No

15. In the past 12 months, is there anyone else who would say that you have had difficulty controlling your gambling, regardless of whether you agreed with them or not?
    i. Yes
    j. No

IMPAIRED CONTROL SCORE	**/4**

16. In the past 12 months, would you say you have been preoccupied with gambling?
    k. Yes
    l. No

17. In the past 12 months, when you were not gambling did you often experience irritability, restlessness or strong cravings for it?
    m. Yes
    n. No

18. In the past 12 months, did you find you needed to gamble with larger and larger amounts of money to achieve the same level of excitement?
    o. Yes
    p. No

OTHER ISSUES SCORE	**/3**

TOTAL SCORE	**/14**

PPGM Scoring & Classifications

Pathological Gambler (4)

1. Problems Score of 1 or higher, plus

2. Impaired Control Score of 1 or higher, plus

3. Total Score of 5 or higher, plus

4. Reported gambling frequency of at least once a month on some form of gambling.

Problem Gambler (3)

1. Problems Score of 1 or higher, plus

2. Impaired Control Score of 1 or higher, plus

3. Total Score of 2 to 4, plus

4. Reported gambling frequency of at least once a month on some form of gambling.

OR

1. Total Score of 3 or higher, plus

2. Frequency of gambling AND average reported gambling loss > median for unambiguously identified Problem and Pathological Gamblers in the population (i.e., as established by the most recent population prevalence survey).

At Risk Gambler (2) (this category also includes people who may be problem gamblers in denial)

1. Does not meet criteria for Problem or Pathological gambling, plus

2. Total Score of 1 or higher

3. Reported gambling frequency of at least once a month on some form of gambling.

OR

1. Frequency of gambling3 AND average reported gambling loss4 > median for unambiguously identified Problem and Pathological Gamblers in the population (i.e., as established by the most recent population prevalence survey).

Recreational Gambler (1)

- Gambler who does not meet criteria for Pathological, Problem or At-Risk gambler.

Nongambler (0)

- No reported gambling on any form in past year.

Appendix J: Gambling Attitudes Questionnaire

Directions

Welcome to the Gambling Attitudes Questionnaire!! This survey asks for your opinion about gambling. You will see a series of statements, and for each statement you just need to choose the option that reflects your opinion.

Response Options:

Fully Agree	Partially Agree	Partially Disagree	Fully Disagree

1) Gambling has benefits for society.

2) Gambling is an important recreational activity to me.

3) Gambling is morally wrong.

4) All forms of gambling should be legal.

5) There are too many gambling opportunities in my province.

6) Gambling is an acceptable leisure activity.

7) Gambling is harmful.

Appendix K: Study 2 Modules Survey (S2MS)

*Includes Assessments for the Gambling Knowledge Module (1), the Gambling Fallacies Module (2), the Gambling-Related Skills Module (3), and the Gambling Problems Module (4).

*S2MS will be used in its entirety during the Pre-Program Assessment, the Post-Program Assessment, and the Follow-up Assessment. Each of the eight-question module assessments (knowledge, fallacies, skills, and problems) will be used as the module quiz for the corresponding module.

Directions for Pre-Program Assessment

Hedge Your Bets: Gambling Knowledge Survey - Directions

Welcome to the *Hedge Your Bets* Knowledge Survey! The point of this survey is to see what you know about gambling BEFORE you take the program. For the answers you don't know, please make your best guess. You will not know all the answers. In fact, you may only know a few of the answers. That is okay, because this program is going to teach you what you need to know. You will answer these questions again after the program, and we bet your score will go up!

You will work through four sections, as follows:

- Gambling Knowledge
- Gambling Fallacies
- Gambling-related Skills
- Gambling problems

Remember, if you choose to leave the survey and return later, you must use the ***same device and internet browser***, or your progress will not be saved.

Directions for Module Quizzes

This quiz is made up of 8 multiple-choice or true/false questions to see what you learned from Module #. Please do your best and answer all questions. To pass this quiz and move on to Module #2, you must get either:

- a score of 5 out of 8 correct, or
- a score that is two marks higher than you got on the knowledge portion of the pre-program survey.

If you do not pass this quiz the first time, you can keep re-taking it until you pass. Once you pass, you will receive an email letting you know when you can start Module #2. You should receive that email about one week after you past this quiz.

Directions for Post-Program Assessment

Welcome to the *Hedge Your Bets* Knowledge Survey! This survey contains all four of the module quizzes, exactly the same as the one you did at the end of each program module. This section will allow us to analyze how effective the program is at teaching you about safe gambling. Please do your best to answer all of the questions.

Remember, if you choose to leave the survey and return later, you must use the ***same device and internet browser***, or your progress will not be saved.

Click 'next page' to get started with the Gambling Knowledge section!

Directions for Follow-up Assessment

Welcome to the *Hedge Your Bets* Knowledge Survey! This survey contains all four of the module quizzes, exactly the same as the one you did at the end of each program module. This section will allow us to

analyze how effective the program is at teaching you about safe gambling. Please do your best to answer all of the questions.

Remember, if you choose to leave the survey and return later, you must use the ***same device and internet browser***, or your progress will not be saved.

Knowledge Module

1) Which of the following is true?
    - **a. Gambling has been around for thousands of years and in almost all societies.**
    - b. Gambling has been around for thousands of years but only in some societies.
    - c. Gambling has been around for over 100 years and in almost all societies.
    - d. Gambling has been around for over 100 years but only in some societies.

2) Which is the best definition of gambling?
    - a. Taking a risk on something with an uncertain outcome
    - b. Betting money or items of value on a chance outcome
    - **c. Betting money or items of value on something with an uncertain outcome in hope of winning money or items of value**

3) How does modern gambling differ from older forms of gambling?
    - a. The games have changed.
    - b. Gambling is much more widely available today.
    - c. Most gambling today is commercially provided with a built-in 'house edge'.
    - **d. All of the above are true.**
    - e. None of the above are true.

4) Worldwide, what is the most popular type of gambling?
    - **a. Lottery tickets**
    - b. Sports betting
    - c. Poker
    - d. Slot machines

5) Which of the following is least likely to happen to the average person this year?
    - a. Being killed in a car crash
    - b. Being murdered
    - **c. Winning the national lottery**
    - d. Being hit by lightning

6) Casinos make most of their money from
    - a. Table games such as blackjack, poker, and roulette
    - **b. Slot machines**
    - c. Food and drink
    - d. Door/cover charges

7) Which of the following is true?
    - a. Gambling is less available today than it was in the past.
    - b. Gambling availability has stayed the same.
    - **c. Gambling is more available than it was in the past.**
    - d. None of the above.

8) Which of the following is not one of the most common reasons for legalizing gambling?

a. **To provide citizens an easy way to increase their wealth**
b. To raise money for governments
c. To keep the money spent on gambling in the local area by making sure people don't have to travel to gamble
d. To decrease illegal gambling
e. All of the above are true

Fallacies Module

1) What is the definition of a fallacy?
   a. A universal truth
   b. A false or mistaken belief
   c. A strategy to win at gambling
   d. A logical argument

2) Which of the following is not a fallacy?
   a. Believing most people behave in a similar way to what you do
   b. Thinking that something you remember really well happened more often than it really did
   c. Knowing that every time a coin is flipped there is a 50% chance it will come up heads, regardless of what it has come up before
   d. Believing a good luck charm can increase your odds of winning

3) Look at the sets of lottery numbers below. Choose the set you think has the best chance of winning.
   a. 1, 2, 3, 4, 5, 6
   b. 14, 43, 5, 32, 17, 47
   c. The two sets have an equal chance of winning

4) Which slot machine gives you a better chance of winning the jackpot?
   a. a machine that has not had a jackpot in more than a month
   b. a machine that had a jackpot an hour ago
   c. Your chances of winning the jackpot are the same on both machines

5) How lucky are you? If you entered a draw with nine other people, how likely is it that you would win the prize?
   a. the same likelihood as everyone else
   b. less likely than other people
   c. more likely than other people

6) If you were to buy a lottery ticket, which would be the best place to buy it?
   a. a place that has sold many previous winning tickets
   b. a place that has sold few previous winning tickets
   c. It makes no difference; one place is as good as another

7) A positive attitude increases your chances of winning money at bingo or slot machines
   a. False
   b. True

8) Your chances of winning a lottery are better if you choose your own numbers
   a. False
   b. True

Skills Module

1) When you flip a coin, what are the odds that the coin will come up heads?
    a. 2 in 6
    b. 1 in 3
    c. 1 in 2
    d. 2 in 5

2) A gambler has won money 75% of the time that he has gone to the casino (i.e., left with more money than they came with). How often has that person likely gone to the casino?
    a. four times
    b. 100 times
    c. It's equally likely that the person has gone four or 100 times.

3) You go to a casino with $100, hoping to double your money. Which strategy gives you the best chance of doubling your money?
    a. betting all your money on a single bet
    b. betting small amounts of money on several bets
    c. The two strategies give you equal chances of doubling your money.

4) Which game can you consistently win money at if you use the right gambling strategy?
    a. slot machines
    b. roulette
    c. bingo
    d. none of the above
    e. all of the above

5) You and a friend are flipping a coin. The coin has come up heads the last four times in a row. Which side of the coin is most like to come up on the fifth flip?
    a. Heads
    b. Tails
    c. there is an equal chance that either heads or tails will come up

6) You roll two standard six-sided dice (with the numbers 1-6 on them). What are the odds that you roll a pair of 6s?
    a. 1 in 6
    b. 1 in 12
    c. 1 in 24
    d. 1 in 36
7) You flip two coins. What are the odds that two heads will come up?
    a. 75%
    b. 50%
    c. 25%
    d. 10%

8) S8) Who is more likely to roll a pair of sixes with two dice?
    a. Someone who has rolled pairs of sixes on their last three rolls
    b. Someone who rolled a pair of sixes on their last roll, but not before that
    c. Someone who has not rolled a pair of sixes at all this game
    d. None of the above

Problems Module

1) Gambling can become as addictive as alcohol or other drugs.
    a. True
    b. False

2) How is problem gambling defined?
    a. Impaired control over gambling that has led to significant life problems
    b. Loss of control over gambling behaviour
    c. Total preoccupation with gambling that has resulted in major gambling losses
    d. Losing more than $10,000 per month

3) What tends to be the most addictive form of gambling for most people?
    a. Lottery tickets
    b. Slot machines
    c. Sports betting
    d. Bingo
    e. All of the above are equally addictive

4) Choose two items that do not increase a person's risk of becoming a problem gambler:
    a. Parents who are problem gamblers
    b. Gambling at an early age
    c. female gender
    d. older age (60+)
    e. having other addictions
    f. having friends who regularly gamble
    g. playing slot machines or other electronic gambling machines
    h. impulse control problems

5) After recovering from problem gambling a person is very unlikely to develop these problems again in the future.
    a. True
    b. False

6) What are some risk factors for problem gambling?
    a. Having other addictions (e.g., alcohol, tobacco, drugs, etc.)
    b. Poor impulse control
    c. Having mental health issues (e.g., depression, anxiety, etc.)
    d. Having certain developmental disorders (e.g., Attention-Deficit Hyperactivity Disorder, or ADHD)
    e. Started gambling at a young age
    f. Having parents or close friends who gamble
    g. None of the above
    h. All of the above

7) What are some symptoms of problem gambling?
    a. Gambling to escape problems or bad moods
    b. Preoccupation with gambling (e.g., can’t stop thinking about gambling)
    c. Lying to hide gambling activities
    d. Spending more and more money on gambling to get the same feelings of excitement
    e. Chasing losses

f. None of the above
g. All of the above

8) What are the three phases of problem gambling?
a. Winning, chasing losses, quitting
b. Winning, chasing losses, panic
c. Losing, chasing losses, panic
d. Chasing losses, winning, panic