

# Longitudinal protective factors for problem gambling and related harms: Building resilience among young adult gamblers

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## Executive summary

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Research in the field of gambling has expanded significantly over the past 10 years, yet there remains very little research on modifiable behavioural and social environmental factors contributing to the development of problem gambling and gambling-related harms. In this context, risk factors are behavioural or social environmental factors that are associated with a higher likelihood of negative or socially undesirable outcomes, such as problem gambling. On the other hand, protective factors are those associated with a lower likelihood of problem gambling, or which modify the influence of risk factors (Carlo et al., 2011).

The research presented herein addresses two separate but related research objectives which focus on understanding the protective impact of the social environmental system on problem gambling and gambling-related harms:

- Part A investigates the relationship between problem gambling and internalising symptoms (anxiety and depression), and examines the common and specific social environmental protective factors for these comorbid conditions.
- Part B investigates longitudinal problem gambling patterns and examines the social environmental predictors and adult behavioural adjustment outcomes associated with these patterns.

The sample comprised 2,280 young adults from Victoria, Australia, who were part of the International Youth Development Study (IYDS); an ongoing bi-national longitudinal study investigating the development of healthy and problem behaviours among young people in Victoria, Australia, and Washington State, United States. Participants completed an extensive survey in both 2010 (average age 21 years; time-point 1) and 2012 (average age 23 years; time-point 2) as part of the IYDS. These surveys included measures of the constructs relevant to the research aims: problem gambling was measured via two items derived from established measures of problem gambling; social environmental risk and protective factors (covering the domains of the community, family, and peer/individual) were measured using a version of the Communities That Care youth survey which was adapted for use in Australia; internalising symptoms were measured with the Kessler K-10 psychological distress scale; and adult behavioural adjustment outcomes were measured using items from the Communities That Care youth survey.

With respect to Part A, a cross-sectional association was found between internalising symptoms and problem gambling. However, a longitudinal relationship between internalising symptoms and problem gambling was not observed, over the span of two years. Further, there were no common prospective social environmental protective factors identified for internalising symptoms and problem gambling. While protective factors within the domains of the community, family, and peer group were identified for internalising symptoms, there were no statistically significant social environmental protective factors for problem gambling. These findings suggest that it is necessary to address separate factors to protect against each condition, if we are to tackle the comorbidity between internalising symptoms and problem gambling. Further, there is a need to focus on other biological, personality, cognitive, and community level factors (e.g., availability), as possible targets to reduce the risk of problem gambling among young adults.

With respect to Part B, despite overall rates of problem gambling remaining stable over time, different longitudinal problem gambling patterns were observed at an individual level. The majority of the sample (91.69%) reported no problem gambling at both time points (i.e., resisters). Of those individuals who reported problem gambling, the new incidence group (i.e., developed problem

gambling during the two year follow up) was the most prevalent (3.62%), followed by the desistors (2.63%), who reported problem gambling at time-point 1 but not at time-point 2. The persistent problem gambling group (problem gambling at both time-points) was the least prevalent (2.07%).

Regarding the predictors of these longitudinal patterns, activism was protective of new incidence problem gambling, and thus the promotion of civic and social engagement should be further investigated as a potential protective factor against the development of problem gambling in young adults. Alcohol use and affiliation with antisocial peers were risk factors for the persistence of problem gambling, and are potential ecological targets for secondary prevention and intervention. Finally, higher frequency of cigarette use was the only statistically significant predictor of problem gambling desistance. However, post hoc comparisons of problem gambling persistence versus desistance revealed no statistically significant differences in risk or protective factors. Future research is required to investigate other factors that may distinguish between these two problem gambling patterns, in order to identify targets to promote desistance.

In terms of the behavioural adjustment outcomes associated with the longitudinal problem gambling patterns, persistors experienced the greatest number of adjustment problems at follow up, including more frequent substance use and antisocial behaviours, as well as an escalation in cannabis use over and above cannabis use two years prior. Encouragingly, desistance from problem gambling, relative to resistance, was not associated with any of the measured adjustment problems, when controlling for adjustment two years earlier, suggesting that there is no significant escalation in these outcomes following desistance. However, in analyses that did not control for prior behaviour, desistance from problem gambling was associated with cigarette use, suggesting that desistors may still be characterised by a higher frequency of cigarette use, though this is not over and above their cigarette use prior to desistance

The findings of Part B of this research clearly highlight the need to consider the varied patterns of problem gambling over time in order to provide efficacious prevention and intervention approaches.

The research presented in this report has been accepted/published in a peer reviewed journal which is openly accessible:

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## Background

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Gambling is a significant public health problem in many countries, with an estimated 0.5% to 7.6% of the adult population experiencing gambling disorders worldwide (average rate across all countries of 2.3%) (Williams et al., 2012). 'Problem gambling' generally refers to gambling behaviours that cause social, financial and/or psychological harms to individuals, and their family, friends or society (Delfabbro, 2012; Ferris & Wynne, 2001; Neal et al., 2005). This term is intended to encompass a continuum of severity that includes the diagnostic classification of pathological or disordered gambling.

Research in the field of gambling has expanded significantly over the past 10 years, yet there remains very little research on modifiable behavioural and social environmental factors contributing to the development of problem gambling and gambling-related harms. More importantly, there is even less research examining modifiable factors which protect against the development of problem gambling and related harms (Scholes-Balog et al., 2014). Much of the existing literature is cross-sectional in design (Shead et al., 2010); longitudinal research is needed to examine factors that are present before gambling problems (and their related harms) emerge. This research would provide valuable knowledge about how gambling problems develop and the factors that can help make individuals more resilient to developing gambling problems and gambling-related harms (Shead, et al., 2010). Further, given the higher prevalence of problem gambling among young adults than among both adolescents and older adults (e.g., Welte et al., 2008), research which focuses on this developmental period is of particular importance.

Ecological models of human development acknowledge the interconnected relationship that exists between an individual and their environment, and the multiple interacting contexts in which behaviours occur (Bronfenbrenner, 1993). Increasingly, it is recognised that the development of problem behaviours, such as problem gambling, can be better understood when considering the social environmental system in which development occurs. Social Development Model (SDM), a model used to explain the origins and development of delinquent behaviour among children and adolescents (Catalano & Hawkins, 1996), is one model that emphasises the importance of the social environment in the development of healthy and problem behaviours. The SDM is based on the premise that youth adopt the beliefs and behavioural patterns of their social environment, including family, peers, school, and neighbourhood. As such, this model hypothesises that if the social environment is characterised by factors that promote prosocial attachment (that is, engagement with prosocial entities), then an individual will assume a prosocial orientation, whereas if the social environment promotes antisocial attachment, the individual will engage in problem behaviour (Catalano & Hawkins, 1996). The research presented in this report adopts this social perspective and focuses on the protective influence of the social environment of young Victorians.

The research that follows addresses two separate but related research objectives which focus on understanding the protective impact of the social environmental system on problem gambling and gambling related harms:

- Part A investigates the relationships between problem gambling and internalising symptoms (anxiety and depression), and examines common and specific social environmental protective factors for these comorbid conditions.
- Part B investigates longitudinal problem gambling patterns and examines the social environmental predictors and adult behavioural adjustment outcomes associated with these patterns.

## Part A- Common and specific social environmental protective factors for problem gambling and internalising symptoms

Comorbidity between problem gambling and internalising disorders such as depression and anxiety has long been recognised (Dowling et al., 2015; Lorains et al., 2011). For example, an estimated 37.9% of problem gamblers in the community have a comorbid mood disorder, and 37.4% have a comorbid anxiety disorder (Lorains, et al., 2011). Problem gamblers who suffer depression or anxiety are also at increased risk for suicide (Blaszczynski & Farrell, 1998; Petry & Kiluk, 2002). Moreover, depression and anxiety (Eisenberg et al., 2006; Smith et al., 2011) have been shown to influence treatment outcomes among problem gamblers. Therefore, preventing and addressing internalising symptoms among problem gamblers may improve treatment outcomes (Smith, et al., 2011).

Much of the research assessing the relationship between internalising disorders and problem gambling is cross-sectional in design (Dussault et al., 2011). Therefore, the direction of this relationship is unclear. A recent longitudinal study found that the escalation of gambling problems and depressive symptoms from adolescence into adulthood could be explained by a mutual direct link between the two disorders, influencing each other in a vicious cycle (Dussault, et al., 2011). Depressive symptoms may precede the development of gambling problems when gambling is used as a way to regulate negative aversive emotional states, achieve distraction from personal problems, and to fight a state of apathy (Blaszczynski & Nower, 2002; Christensen et al., 2014; Francis et al., 2014). On the other hand, social isolation, money problems, repeated unsuccessful efforts to chase losses, feelings of guilt, and legal problems, that may all result from gambling problems, may also trigger depressive symptoms in problem gamblers (Dussault, et al., 2011). Given the comorbid and possibly reciprocal relationship between problem gambling and internalising symptoms such as anxiety and depression, it is of utmost importance to understand what factors protect against the development or escalation of both conditions.

The majority of problem gambling literature to date focuses on risk factors (Dowling, Cowlshaw, et al., 2014; Dowling, Suomi, et al., 2014; Johansson et al., 2009). Efforts to prevent tobacco, alcohol, and illicit substance use have focused on not only decreasing risk factors, but also increasing protective factors (Brounstein et al., 1999). The success of these initiatives in preventing problem behaviours emphasises the importance of designing prevention approaches for problem gambling and related harms which enhance resiliency.

Therefore Part A of this research sought to utilise longitudinal data to achieve two goals:

1. Investigate the cross-sectional and longitudinal relationships between problem gambling and internalising symptoms (specifically, anxiety and depressive symptoms); and
2. Investigate common and specific social environmental factors that are protective against internalising symptoms and problem gambling in young adulthood

Protective factors within the community, family, and peer/individual domains measured during young adulthood will be examined as prospective predictors of both internalising symptoms and problem gambling two years later. Protective factors will be measured with an adapted version of the Communities that Care (CTC) youth survey. The CTC framework is based on the Social Development Model (SDM). The protective factors measured in the CTC survey provide an overview of many of the modifiable social environmental influences that shape the development of youth behaviour.

Consistent with previous research (Dussault, et al., 2011), it was hypothesised firstly that both internalising symptoms and problem gambling would predict each other two years later. Given the comorbid relationship between internalising symptoms and problem gambling, and the similarities in adolescent predictors of internalising symptoms and problem gambling reported in the literature (e.g. Bond et al., 2005; Dussault, et al., 2011; Scholes-Balog, et al., 2014), it was hypothesised secondly that both problem gambling and internalising symptoms would share common protective factors within the family domain (i.e. family concord). Identification of shared risk and protective factors for problem gambling and other problem behaviours and/or disorders, such as internalising symptoms, has been noted as an important step for future research to inform prevention policies and programs (Suomi et al., 2014).

## Part B- Longitudinal problem gambling patterns

There is growing recognition of the varied course of problem or disordered gambling over time (LaPlante et al., 2008). Contrary to previously held beliefs that disordered gambling is a chronic, progressive and enduring condition, recent longitudinal studies have shown that there are patterns of change in levels of gambling behaviour across time despite overall rates of problem gambling remaining stable across time (Fröberg et al., 2014; LaPlante, et al., 2008; Shaffer et al., 2004; Winters et al., 2005). These studies also highlight the notion of 'natural recovery' which refers to the observation that many individuals with a history of problem gambling 'recover' from the disorder with no formal treatment (Slutske, 2006). Such findings emphasize the importance of examining the gambling behaviour trajectories (patterns) of individuals over time (Bray et al., 2014). Studies that investigate problem gambling trends and predictors at an aggregate level (variable centred approaches, e.g., Scholes-Balog, et al., 2014), such as in Part A, may obscure sub-group differences in problem gambling patterns which are identifiable with person-centred approaches (Slutske et al., 2003; Winters, et al., 2005), and which may have potentially important implications for intervention and prevention of relapse (LaPlante, et al., 2008).

Different sub-groups of problem gamblers have been identified based on the course of the disorder over time (LaPlante, et al., 2008). For example, Winters et al. (2005) studied a non-representative community sample of 305 adolescents in the United States (U.S.) across an eight year period (three waves of data; age 16, 17 and 23). They found that the most prevalent pattern was resistance (no problem gambling at any time-point; 60%), followed by new incident cases (developed problem gambling during the study; 21%), desistance (moved away from problem gambling during the study; 13%), and persistence (consistent problem gambling throughout the study; 4%). A large ( $n = 4,358$ ) representative study of Swedish adolescents and young adults found much smaller prevalence rates for non-resistant pathways: 2.64% were desistors; 2.26% were new incidence cases; and 0.67% were persistors (Fröberg, et al., 2014). Cultural, sample size and composition, and measurement differences may have resulted in discrepancies in the prevalence of the different sub-groups in these two studies.

Nonetheless, while there are a growing number of studies investigating these different patterns of problem gambling over time, there remains a lack of research investigating their behavioural, social, and contextual determinants (LaPlante, et al., 2008). Although there are retrospective studies examining correlates of recovery and relapse (Hodgins et al., 2002), prospective longitudinal studies are necessary to make inferences about temporality. Understanding the factors that influence problem gambling progression, and in particular, those associated with persistence of, or desistance from, problem gambling, will serve as a foundation for the development of efficacious prevention and intervention efforts (LaPlante, et al., 2008). For example, understanding the factors that make an individual more or less likely (i.e., risk and protective factors) to show a pattern of desistance would

also allow health care providers to better tailor treatment plans to help maintain and stabilize positive changes, and prevent relapse (LaPlante, et al., 2008).

Similarly, there is a lack of research investigating the outcomes associated with the different patterns of problem gambling across time. For example, it is unclear whether desistance from problem gambling is associated with lasting poor social and/or behavioural adjustment, such as engagement in other problem behaviours, lack of employment, and mental health problems, despite an absence of gambling problems. Such findings would have important ramifications for prevention of relapse and provision of appropriate support services following recovery from problem gambling.

Therefore, Part B of this research will employ longitudinal data to explore temporal changes in young adult gambling behaviour to investigate:

1. Prevalence of sub-groups with similar patterns of problem gambling behaviour over time (defined as resistance, persistence, desistance, and new incidence patterns);
2. Social developmental (community, family, peer/individual) risk and protective factors for these problem gambling patterns; and
3. Young adult behavioural adjustment outcomes (mental health, substance use, employment, antisocial behaviour) associated with these problem gambling patterns.

# Part A: Problem gambling and internalising symptoms: A longitudinal analysis of common and specific social environmental protective factors

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## Overview

Comorbidity between problem gambling and internalising disorders (anxiety and depression) has long been recognised. However, it is not clear how these relationships develop, and what factors can foster resilience to both conditions. The overarching objective of Part A of this project was to understand whether there are overlapping (common) or specific protective factors for both problem gambling and internalising symptoms.

To do this, Part A addressed two specific research aims:

1. Investigate the cross-sectional and longitudinal relationships between problem gambling and internalising symptoms (specifically, anxiety and depressive symptoms); and
2. Investigate common and specific social environmental factors that are protective against internalising symptoms and problem gambling in young adulthood

## Methodology

### Participants

The sample comprised young adults from Victoria, Australia, who were part of the International Youth Development Study (IYDS); an ongoing bi-national longitudinal study investigating the development of healthy and problem behaviours among young people in Victoria, Australia, and Washington State, United States. Original recruitment for the Australian arm of the IYDS occurred in 2002, with 2,884 Victorian students completing the first survey. Sampling for the IYDS, which was designed to yield a state-representative sample of students in grades five, seven and nine, has been described in detail elsewhere (McMorris et al., 2007; Scholes-Balog et al., 2013). The sample for the current study comprised 2,280 (1,266 female, 1,014 male) young adults from Victoria who were surveyed in both 2010 and 2012 as part of the IYDS (this constituted 79% of the original sample who had entered the study in 2002). Attrition from 2010 to 2012 was 5.9%. There was no difference in age ( $t = -0.80, p = 0.424$ ), the proportion of problem gamblers ( $\chi^2 = 0.65, p = 0.421$ ), or the level of internalising symptoms ( $t = 0.42, p = 0.672$ ) between those who completed both waves and those who were lost to follow up. However, there were more males than females lost to follow up ( $\chi^2 = 26.14, p < 0.0005$ ).

In 2010 (referred to as T1), participants ranged in age from 17 to 24 years of age ( $M=21.00, SD=1.67, \text{range}=17.92\text{-}24.62$ ). In 2012 (referred to as T2), participants ranged in age from 19 to 26 years of age ( $M=23.02, SD=1.66, \text{range}=19.95\text{-}26.91$ ). These time-points were chosen as they encompass the legal gambling age in Australia, and questions regarding gambling were only asked at these time-points.

## Measures

Participants completed a self-report survey at T1 and T2 that included measures of problem gambling, internalising symptoms, protective factors, and demographics.

### Problem gambling

A dichotomous measure of past year problem gambling was derived from two questions at both T1 and T2: “In the past year....” 1) “Have you ever tried to keep your family or friends from knowing how much you gamble?” and 2) “Has there ever been a time when you thought you had a gambling problem?”. Individuals were classified as past year problem gamblers if they answered positively to either of these items. These two items were devised for the IYDS based on two commonly employed screening and assessment tools for problem gambling: the Brief Biosocial Gambling Screen (Gebauer et al., 2010), and the South Oaks Gambling Screen (Lesieur & Blume, 1987).

### Internalising symptoms

Anxiety and depressive symptoms at T1 and T2 was evaluated with the K-10 Kessler psychological distress scale (Kessler et al., 2002) which comprises 10 items measuring emotional states during the past 30 days. Scores from the 10 items are summed with higher scores indicating higher levels of anxiety and depressive symptoms. The K-10 has established reliability ( $\alpha = 0.92$ ) and validity (Kessler, et al., 2002) and showed good internal consistency in the current sample ( $\alpha = .93$ ).

### Protective factors

Protective factors were measured at T1 and were drawn from an adapted version of the Communities that Care survey (Glaser et al., 2005). Details on the protective factor scales can be found in Table 1. Higher scores indicated higher levels of protection.

**TABLE 1. Description of protective factors measured in the survey**

Factor	No. of items	Example item	Response options	Cronbach's Alpha
<b>Community</b>				
Stable neighbourhood	1	“Does ‘people moving in and out’ describe your neighbourhood?”	4-point; Strongly Agree (1), Strongly Disagree (4)	N/A
Community opportunities for prosocial involvement	5	“In your community, how much opportunity is there to participate in the following organisations or activities... sports teams or clubs?”	3-point; None (1), A lot (3)	.89
Social cohesion and trust	5	“People in this neighbourhood can be trusted?”	4-point; Strongly Agree (4), Strongly Disagree (1)	.77
Community opportunities for success	2	“Think about yourself in the places that you live and your broader community as a whole... people like me have the chance to be successful”	4-point; Definitely yes (4), Definitely no (1)	.90

<b>Family</b>				
Family concord	3	“People in my family have serious arguments” [reverse scored]	4-point; Definitely yes (1), Definitely no (4)	.83
Family attachment	4	“Do you feel very close to your mother?”	4-point; Definitely yes (4), Definitely no (1)	.76
Family prosocial behaviour	1	“In the past 12 months, how often have members of your family volunteered or performed some community service?”	5-point; Never (1), Very Often (5)	N/A
Family interaction	4	“How often do you socialise with members of your family?”	5-point; Never (1), Very Often (5)	.83
<b>Peer/individual</b>				
Attachment to peers	2	“In the past 12 months how many of your best friends have you shared your thoughts and feelings with?”	5-point; None of my friends (1), 4 of my friends (5)	.69
Interaction with prosocial peers	1	“In the past 12 months how many of your best friends have volunteered or performed some community service?”	5-point; None of my friends (0), 4 of my friends (4)	N/A
Religiosity	2	“How often do you attend religious services or activities?”	4-point; Never (1), About once a week or more (4)	.82
Civic engagement	2	“During the past 12 months, how often have you actively supported organisations that help disadvantaged people?”	5-point; Never (1), 5 or more (4)	.61
Activism	8	“In the past 12 months, how often have you taken part in a demonstration or march?”	5-point; Never (1), 5 or more (4)	.70
Intimate relationships	7	“Do you share your thoughts and feelings with your boyfriend/girlfriend/spouse?”	4-point; Definitely yes (4), Definitely no (1)	.90
Prosocial intimate partner	1	“In the past 12 months how often has your current or most recent boyfriend/girlfriend or spouse volunteered or performed some community service?”	5-point; Never (1), Very often (5)	N/A

## Demographics

In addition to age and gender, disposable income (“During an average week do you pay money towards accommodation and living expenses [e.g. rent, board, bills, etc.]?”) and current employment (“Are you currently employed?”) were measured at T1 and controlled for in regression analyses.

## Procedure

Ethics approval was obtained from The University of Melbourne Human Ethics in Research Committee. At both time-points, participants were contacted by mail, email, and/or phone and asked to

complete the survey online, after providing informed consent. After completion of each survey, participants received a small thank you gift (gift voucher).

## Analyses

Analyses were completed using Stata 13 (StataCorp, 2013). Missing data on the protective factor variables was dealt with using multiple imputation by chained equations. The percentage of missing raw data on each protective factor variable ranged from 0.31-10.53% ( $M=1.5\%$ ). The imputation model contained all predictor and outcome variables as well as demographic and survey sample design characteristics (i.e., clustering of students in schools at recruitment and sample design weight). Fifty imputations were performed. Analyses were performed on the imputed data sets (Rubin, 1987). Findings were consistent when repeated with non-imputed data (i.e., using list-wise deletion). Missing data on the outcome variables (problem gambling and internalising symptoms) was not imputed; therefore, the analytic sample comprised 2,248 individuals (55% female) who were not missing data for the measures of problem gambling and internalising symptoms. All analyses controlled for sample design (i.e. clustering of students in schools at recruitment and sample design weight).

Descriptive statistics were produced for all variables. Means and standard errors were computed for the measure of internalising symptoms and the protective factor variables. Proportions and 95% confidence intervals were computed for problem gambling and demographic (disposable income and employment) variables. Descriptive statistics were calculated for males and females separately.

Primary data analysis consisted of a series of five steps. First, cross-sectional Ordinary Least Squares (OLS) regression (with T2 internalising symptoms as the dependent variable [DV]) and cross-sectional logistic regression (with T2 problem gambling as the DV) were conducted. Cross-sectional relationships were examined at T2 to enable control for prior (T1) problem gambling/internalising symptoms. Second, longitudinal OLS regression (with T2 internalising symptoms as the DV and T1 problem gambling as the independent variable [IV]) and longitudinal logistic regression (with T2 problem gambling as the DV and T1 internalising symptoms as the IV) were run. Third, longitudinal OLS regression analyses were conducted to examine the association between each T1 protective factor (separate analysis for each protective factor) and T2 internalising symptoms (partially adjusted analyses), controlling for age, gender, T1 internalising symptoms, T1 current employment, T1 disposable income. In the fourth step, multivariable OLS linear regression models including all statistically significant T1 protective factors predicting T2 internalising symptoms (fully adjusted model) were performed. Finally, steps 3 and 4 were repeated using logistic regression analyses with T2 problem gambling as the DV.

All linear regression analyses were performed with robust standard errors due to non-normality of residuals of the dependent variable T2 internalising symptoms. Further, all analyses controlled for T1 age, gender, T1 problem gambling/T1 internalising symptoms, T1 current employment, and T1 disposable income. Regression coefficients and 95% confidence intervals are presented for linear regression analyses. Odds ratios and 95% confidence intervals are presented for logistic regression analyses. For linear regression, a positive regression coefficient indicates that the independent variable acts as a risk factor, whereas a negative regression coefficient indicates that the independent variable acts as a protective factor (that is, a decrease in the dependent variable with an increase in the independent variable). For logistic regression, an odds ratio above 1 indicates a risk factor, whereas an odds ratio below 1 indicates a protective factor. The variance inflation factor (VIF) of each independent variable was computed prior to performing the fully adjusted analyses; all VIF's were below 1.54 indicating no multicollinearity (Kutner et al., 2004).

# Results

## Descriptive statistics

Descriptive statistics presented by gender for measures of problem gambling, internalising symptoms, protective factors, and demographics can be found in Table 2. Non-overlapping 95% confidence intervals indicate that the prevalence of problem gambling was significantly higher among males (T1 7.99%; T2 9.59%) than females (T1 1.67%; T2 2.38%) at both time points. There was no statistically significant difference in the prevalence of problem gambling between T1 and T2 for either gender. In contrast, the levels of internalising symptoms were significantly higher among females (T1 20.01; T2 19.66) than males (T1 17.60; T2 17.86). There was no statistically significant difference in the levels of internalising symptoms between T1 and T2 for either gender.

**TABLE 2. Descriptive statistics presented by gender**

	Males		Females	
	%	95%CI	%	95%CI
T1 Problem gambling	7.99	6.31,9.67	1.67	0.96,2.37
T2 Problem gambling	9.59	7.76,11.42	2.38	1.54,3.22
T1 Disposable income				
None of my income	35.64	32.68,38.59	36.71	34.05,39.37
Small part of income	41.86	38.82,44.90	34.34	31.72,36.96
Half of income	12.24	10.22,14.26	16.14	14.11,18.17
Large part of income	6.52	4.99,8.04	8.23	6.71,9.74
Majority of income	3.75	2.58,4.92	4.59	3.43,5.74
T1 Employed	79.07	76.56,81.57	78.58	76.31,80.84
	<b>Mean</b>	<b>Standard Error</b>	<b>Mean</b>	<b>Standard Error</b>
T1 Internalising symptoms	17.60	0.20	20.01	0.21
T2 Internalising symptoms	17.86	0.21	19.66	0.21
T1 Stable neighbourhood	2.99	0.03	3.03	0.02
T1 Community opportunities for prosocial involvement	2.39	0.02	2.37	0.02

T1 Social cohesion and trust	2.78	0.02	2.80	0.02
T1 Community opportunities for success	3.45	0.02	3.43	0.02
T1 Family concord	2.17	0.02	2.17	0.02
T1 Family attachment	2.95	0.02	3.07	0.02
T1 Family prosocial behaviour	2.69	0.03	2.64	0.03
T1 Family interaction	4.64	0.03	5.00	0.02
T1 Attachment to peers	3.67	0.03	3.85	0.03
T1 Interaction with prosocial peers	0.92	0.04	0.90	0.03
T1 Religiosity	1.66	0.03	1.73	0.02
T1 Civic engagement	1.41	0.02	1.58	0.02
T1 Activism	1.22	0.01	1.25	0.01
T1 Intimate relationships	3.38	0.02	3.51	0.02
T1 Prosocial intimate partner	1.87	0.04	1.56	0.03

## Problem gambling and internalising symptoms

The cross-sectional (step 1 of analyses) and longitudinal (step 2 of analyses) relationships between problem gambling and internalising symptoms can be found in Table 3. There was a statistically significant positive cross-sectional association between T2 problem gambling and T2 internalising symptoms. However, there were no statistically significant longitudinal relationships between problem gambling and internalising symptoms.

**TABLE 3. Cross-sectional and longitudinal relationships between problem gambling and internalising symptoms**

Outcome: T2 Internalising symptoms	Cross-sectional			Longitudinal		
	Coef.	95% CI	p-value	Coef.	95% CI	p-value
T1 Problem gambling				-1.23	-3.06,0.61	0.188
T2 Problem gambling	1.69	0.49,2.89	0.006			
Gender (ref: male)	0.81	0.16,1.46	0.015	0.59	-0.00,1.19	0.051
Age	0.01	-0.17,0.18	0.947	0.01	-0.17,0.19	0.904
T1 Internalising symptoms	0.50	0.44,0.55	<0.0001	0.50	0.45,0.55	<0.0001
T1 Current employment	-0.95	-1.77,-0.13	0.024	-0.94	-1.76,-0.13	0.024
T1 Disposable income (ref: none of income)						
Small part of income	0.29	-0.37,0.95	0.382	0.32	-0.33,0.97	0.335
Half income	0.61	-0.34,1.55	0.206	0.60	-0.34,1.55	0.209
Large part of income	0.06	-1.34,1.47	0.928	0.13	-1.21,1.46	0.853
Majority income	2.06	0.29,3.83	0.023	1.99	0.22,3.76	0.028
Outcome: T2 Problem gambling	Cross-sectional			Longitudinal		
	OR	95% CI	p-value	OR	95% CI	p-value
T1 Internalising symptoms				0.99	0.96,1.03	0.712
T2 Internalising symptoms	1.04	1.02,1.07	0.001			
Gender (ref: male)	0.31	0.20,0.48	<0.0001	0.34	0.22,0.53	<0.0001
Age	1.05	0.92,1.20	0.426	1.06	0.93,1.21	0.362
T1 Problem gambling	15.09	9.21,24.72	<0.0001	15.06	9.44,24.03	<0.0001
T1 Current employment	0.93	0.55,1.57	0.782	0.86	0.50,1.48	0.585
T1 Disposable income: (ref: none of income)						
Small part of income	1.30	0.81,2.08	0.274	1.28	0.81,2.04	0.290
Half income	1.23	0.65,2.32	0.518	1.28	0.69,2.41	0.433

Large part of income	1.29	0.54,3.07	0.562	1.27	0.55,2.98	0.573
Majority income	0.28	0.06,1.25	0.095	0.31	0.07,1.40	0.127

## Protective factors for internalising symptoms

The partially adjusted longitudinal associations between T1 protective factors and T2 internalising symptoms can be found in Table 4 (step 3 of the analyses). Within the community domain, stable neighbourhood and social cohesion and trust were statistically significant protective factors. Within the family domain, family concord and family interaction were statistically significant protective factors. Attachment to peers and interaction with prosocial peers were statistically significant protective factors within the peer/individual domain.

**TABLE 4. Partially adjusted regression analyses with T1 protective factors predicting T2 internalising symptoms and T2 problem gambling**

T1 Protective factors	Outcome: T2 Internalising symptoms			Outcome: T2 Problem gambling		
	Coef.	95% CI	p-value	OR	95% CI	p-value
Stable neighbourhood	-0.62	-1.02,-0.22	0.003	0.94	0.73,1.22	0.650
Community opportunities for prosocial involvement	-0.19	-0.17,0.19	0.513	0.75	0.48,1.15	0.187
Social cohesion and trust	-0.97	-1.56,-0.39	0.001	0.89	0.56,1.41	0.621
Community opportunities for success	-0.61	-1.24,0.03	0.060	0.82	0.58,1.14	0.231
Family concord	-0.67	-1.10,-0.24	0.002	1.07	0.81,1.40	0.644
Family attachment	-0.24	-0.66,0.18	0.256	1.06	0.76,1.48	0.715
Family prosocial behaviour	-0.11	-0.34,0.13	0.375	1.03	0.87,1.23	0.704
Family interaction	-0.36	-0.70,-0.03	0.034	1.13	0.89,1.44	0.317
Attachment to peers	-0.38	-1.10,-0.24	0.009	0.93	0.73,1.17	0.518
Interaction with prosocial peers	-0.31	-0.66,-0.10	0.008	0.90	0.76,1.07	0.223
Religiosity	-0.01	-0.53,-0.08	0.965	0.96	0.75,1.22	0.729
Civic engagement	-0.22	-0.30,0.29	0.272	0.77	0.57,1.04	0.087

Activism	0.04	-0.61,0.17	0.923	0.50	0.19,1.31	0.155
Intimate relationships	-0.54	-0.85,0.94	0.098	1.11	0.71,1.74	0.651
Prosocial intimate partner	-0.09	-1.18,0.10	0.512	0.91	0.74,1.12	0.377

T2 internalising symptoms outcome: Ordinary least squares linear regression analyses control for T1 internalising symptoms, T1 age, gender, T1 current employment and T1 disposable income. T2 problem gambling outcome: logistic regression analyses control for T1 problem gambling, T1 age, gender, T1 current employment, T1 disposable income.

Next, all statistically significant T1 protective factors from the partially adjusted analyses were included within a fully adjusted multivariable model to predict T2 internalising symptoms (step 4 of the analyses; see Table 5). Stable neighbourhood, family concord, and T1 current employment remained statistically significant independent protective factors for T2 internalising symptoms. T1 internalising symptoms and female gender were statistically significant independent risk factors for T2 internalising symptoms.

**TABLE 5. Fully adjusted regression analyses with T1 protective factors predicting T2 internalising symptoms**

<b>Outcome: T2 Internalising symptoms</b>			
	<b>Coef.</b>	<b>95% CI</b>	<b>p-value</b>
Gender (ref: male)	0.90	0.23,1.57	0.009
T1 Stable neighbourhood	-0.47	-0.91,-0.03	0.035
T1 Social cohesion and trust	-0.59	-1.24,0.07	0.078
T1 Family concord	-0.58	-1.00,-0.15	0.009
T1 Family interaction	-0.07	-0.40,0.26	0.654
T1 Attachment to peers	-0.27	-0.57,0.04	0.083
T1 Interaction with prosocial peers	-0.21	-0.45,0.04	0.099
T1 Internalising symptoms	0.45	0.39,0.51	<0.0001
T1 Current employment	-0.78	-1.55,-0.01	0.046
T1 Disposable income			
Small part of income	0.17	-0.45,0.79	0.588
Half income	0.38	-0.50,1.26	0.397

Large part of income	0.00	-1.38,1.38	0.997
Majority income	1.71	-0.10,3.51	0.063

## Protective factors for problem gambling

The partially adjusted longitudinal associations between T1 protective factors and T2 problem gambling can be found in Table 4 (step 3 of the analyses). None of the measured T1 protective factors were statistically significant longitudinal predictors of T2 problem gambling (all  $p$ 's > 0.05). Given the lack of statistically significant predictors, a fully adjusted model (step 4 of the analyses) was not performed.

## Summary

Part A of this research found a cross-sectional association between internalising symptoms (anxiety and depressive symptoms) and problem gambling, even when controlling for problem gambling/internalising symptoms two years earlier. However, contrary to predictions, a longitudinal relationship between problem gambling and internalising symptoms, over the span of two years, was not observed. No common prospective ecological protective factors were observed for internalising symptoms and problem gambling in young adulthood. While protective factors within the domains of the community, family, and peer group were observed for internalising symptoms, there were no statistically significant protective factors for problem gambling.

# Part B: Longitudinal problem gambling patterns among Australian youth: Associations with prospective risk and protective factors and adult adjustment outcomes

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## Overview

There is instability in the developmental course of problem gambling over time; however, studies that examine problem gambling at an aggregate level obscure these variations, which have potentially important implications for prevention and intervention. The overarching aim of Part B of this project was, therefore, to understand longitudinal patterns of problem gambling, as well as the predictors and outcomes associated with these varied patterns.

To do this, Part B addressed three specific research aims:

1. Investigate longitudinal problem gambling patterns (i.e., resistance, persistence, desistence, and new incidence)
2. Investigate prospective social developmental risk and protective factors for these problem gambling patterns
3. Investigate the association between these problem gambling patterns and young adult behavioural adjustment outcomes (internalising symptoms, substance use, antisocial behaviour, employment)

## Methodology

### Participants

Part B employed the same sample as Part A: 2,258 (1,261 female, 997 male) young adults from Victoria who were part of the International Youth Development Study.

### Measures

Participants completed a self-report survey at T1 and T2 that included measures of problem gambling, risk and protective factors, adjustment outcomes, and demographic information.

### Problem gambling

At each time point, a dichotomous measure of past year problem gambling was derived from two questions: "In the past year..." 1) "Have you ever tried to keep your family or friends from knowing how much you gamble?" and 2) "Has there ever been a time when you thought you had a gambling problem?" ( $\alpha = 0.73$ ). Classification as a problem gambler was based on a positive response to either of these items. These two items were devised for the IYDS based on two commonly employed screening and assessment tools for problem gambling: the Brief Biosocial Gambling Screen (Gebauer, et al., 2010), and the South Oaks Gambling Screen (Lesieur & Blume, 1987). From this, individuals

were grouped according to their pattern of problem gambling between T1 and T2: resistor (no problem gambling at T1 or T2); persister (problem gambling at T1 and T2); desistor (problem gambling at T1, no problem gambling at T2); and new incidence (no problem gambling at T1, problem gambling at T2).

## Risk and protective factors

Risk and protective factors were measured at T1 with an adapted version of the Communities That Care youth survey (Glaser, et al., 2005); risk and protective constructs were chosen based on their established associations with problem gambling (Scholes-Balog, et al., 2014) and other problem behaviours (e.g., Hemphill et al., 2011). Details on the risk and protective factor scales can be found in Table 6. Higher scores indicated higher levels of risk or protection.

**TABLE 6. Description of risk and protective factors measured at T1**

Factor	No. of items	Example item	Response options	Cronbach's Alpha
<b>Protective factors</b>				
Stable neighbourhood	1	"Does 'people moving in and out' describe your neighbourhood?"	4-point; Strongly Agree (1), Strongly Disagree (4)	N/A
Community opportunities for prosocial involvement	5	"In your community, how much opportunity is there to participate in the following organisations or activities... sports teams or clubs?"	3-point; None (1), A lot (3)	.89
Social cohesion and trust	5	"People in this neighbourhood can be trusted?"	4-point; Strongly Agree (4), Strongly Disagree (1)	.77
Community opportunities for success	2	"Think about yourself in the places that you live and your broader community as a whole... people like me have the chance to be successful"	4-point; Definitely yes (4), Definitely no (1)	.90
Family concord	3	"People in my family have serious arguments" [reverse scored]	4-point; Definitely yes (1), Definitely no (4)	.83
Family attachment	4	"Do you feel very close to your mother?"	4-point; Definitely yes (4), Definitely no (1)	.76
Family prosocial behaviour	1	"In the past 12 months, how often have members of your family volunteered or performed some community service?"	5-point; Never (1), Very Often (5)	N/A
Family interaction	4	"How often do you socialise with members of your family?"	5-point; Never (1), Very Often (5)	.83
Attachment to peers	2	"In the past 12 months how many of your best friends have you shared your thoughts and feelings with?"	5-point; None of my friends (1), 4 of my friends (5)	.69

Affiliation with prosocial peers	1	"In the past 12 months how many of your best friends have volunteered or performed some community service?"	5-point; None of my friends (0), 4 of my friends (4)	N/A
Religiosity	2	"How often do you attend religious services or activities?"	4-point; Never (1), About once a week or more (4)	.82
Civic activism	8	"In the past 12 months, how often have you taken part in a demonstration or march?"	5-point; Never (1), 5 or more (4)	.70
Intimate relationships	7	"Do you share your thoughts and feelings with your boyfriend/girlfriend/spouse?"	4-point; Definitely yes (4), Definitely no (1)	.90
Prosocial intimate partner	1	"In the past 12 months how often has your current or most recent boyfriend/girlfriend or spouse volunteered or performed some community service?"	5-point; Never (1), Very often (5)	N/A
<b>Risk factors</b>				
Family antisocial behaviour	1	"In the past 12 months how often have members of your family stolen things worth more than \$50?"	5-point; Never (1), Very often (5)	N/A
Family drug use	7	"In the past year how often have members of your family used marijuana?"	5-point; Never (1), Very often (5)	.72
Affiliation with antisocial peers	7	"In the past year how many of your friends have stolen something worth more than \$50?"	5-point; None of my friends (0), 4 of my friends (4)	.85
Friend's use of drugs	7	"In the past year how many of your best friends have used marijuana (weed, pot, grass)?"	5-point; None of my friends (0), 4 of my friends (4)	.82
Drug using intimate partner	7	"In the past year how often has your current or most recent boyfriend/girlfriend or spouse used marijuana?"	5-point; Never (1), Very often (5)	.77
Antisocial intimate partner	1	"In the past year how often has your current or most recent boyfriend/girlfriend or spouse stolen something worth more than \$50?"	5-point; Never (1), Very often (5)	N/A
Family antisocial behaviour	1	"In the past 12 months how often have members of your family stolen things worth more than \$50?"	5-point; Never (1), Very often (5)	N/A
Family drug use	7	"In the past year how often have members of your family used marijuana?"	5-point; Never (1), Very often (5)	.72
Affiliation with antisocial peers	7	"In the past year how many of your friends have stolen something worth more than \$50?"	5-point; None of my friends (0), 4 of my friends (4)	.85
Friend's use of drugs	7	"In the past year how many of your best friends have used marijuana (weed, pot, grass)?"	5-point; None of my friends (0), 4 of my friends (4)	.82

Drug using intimate partner	7	"In the past year how often has your current or most recent boyfriend/girlfriend or spouse used marijuana?"	5-point; Never (1), Very often (5)	.77
Antisocial intimate partner	1	"In the past year how often has your current or most recent boyfriend/girlfriend or spouse stolen something worth more than \$50?"	5-point; Never (1), Very often (5)	N/A

N/A- not applicable as the measure comprised one item

## Adult behavioural adjustment outcomes

Seven outcome measures of adult adjustment (internalising symptoms, alcohol use, cigarette use, cannabis use, other illicit drug use, antisocial behaviour, and employment) were assessed at both T1 and T2 to 1) enable control for prior behaviour in the analysis of the outcomes, and 2) examine these behavioural measures as prospective risk factors for problem gambling patterns.

### Internalising symptoms

Internalising symptoms were evaluated with the K-10 Kessler psychological distress scale (Kessler, et al., 2002) which comprises 10 items measuring anxiety and depressive symptoms during the past 30 days. Scores from the 10 items are summed with higher scores indicating higher levels of internalising symptoms. The K-10 has established reliability ( $\alpha = .92$ ) (Kessler, et al., 2002), and showed good internal consistency in the current sample ( $\alpha = .93$ ).

### Alcohol and cannabis use

A single item per substance evaluated the frequency of its use in the past 12 months. Response options were on an eight-point scale ranging from 1 (Never) to 8 (40+ times).

### Cigarette use

A single item evaluated the frequency of cigarette use in the past 12 months. Response options were on a five-point scale ranging from 1 (Never) to 5 (Almost everyday or everyday).

### Other illicit drug use

There were seven items evaluating frequency of use of various other illicit substances (LSD; cocaine; inhalants; stimulants; ecstasy; heroin; other) in the past 12 months. Response options were on an eight-point scale ranging from 1 (Never) to 8 (40+times). The seven items were averaged to obtain an overall measure of frequency of other illicit substance use ( $\alpha = .93$ ).

### Antisocial behaviour

Nine items assessed the frequency of participation in various antisocial behaviours in the past 12 months (carrying handgun; carrying knife; stolen something worth less than \$50; stolen something worth more than \$50; sold illegal drugs; stolen a motor vehicle; attacked someone with the idea of seriously hurting them; illegally accessed a computer network/system/files; purposely damaged or destroyed other peoples property). Each behaviour was measured using a single item; response options were on a five-point scale ranging from 1 (never) to 5 (10 or more times). The nine items were averaged to obtain an overall measure of antisocial behaviour ( $\alpha = .69$ ).

## Employment

Employment was measured using one item (“Are you currently employed?”) with two response options, no (0), yes (1).

## Demographic information

In addition to age, gender and employment, income was measured at T1 with the item “What is your usual, take-home, weekly income from all sources of support (this means after tax has been taken out)?” This item was scored on a 10-point scale ranging from 1 (\$0) to 10 (\$501 or more).

## Procedure

Ethics approval for this study was obtained from The University of Melbourne Human Ethics in Research Committee. At both T1 and T2, participants were contacted by mail, email, and/or telephone and asked to complete the survey online, after providing informed consent. After completion of each survey, participants received a gift voucher as reimbursement for their time.

## Analyses

Analyses were completed using Stata 13 (StataCorp, 2013). Missing data was dealt with using multiple imputation by chained equations. Missing data on the primary variable of interest (problem gambling) was not imputed. The percentage of missing data on each variable prior to imputation ranged from 0.31-7.50% ( $M=4.98\%$ ). The imputation model contained all predictor and outcome variables as well as demographic and survey sample design characteristics (i.e. clustering of students in schools at recruitment and sample design weight). Fifty imputations were performed. Analyses were performed on the imputed data sets (Rubin, 1987). Findings were consistent when repeated with non-imputed data (i.e., using list-wise deletion).

Descriptive statistics were produced for all variables. Proportions and 95% confidence intervals were computed for the problem gambling patterns and the dichotomous demographic (employment) variable. Means and standard errors were computed for the T1 risk factors, T1 protective factors, T2 adult adjustment outcomes, and the demographic variable income.

Primary data analysis consisted of a series of steps; all analyses controlled for sample design (i.e. clustering of students in schools at recruitment and sample design weight). First, partially adjusted multinomial logistic regression analyses were performed with each risk and protective factor measured at T1 predicting problem gambling pattern (resistance [reference category], persistence, desistance, new incidence), controlling for age, gender, T1 employment, and T1 income. Second, all statistically significant risk and protective factors from the partially adjusted analyses were included within a fully adjusted multinomial logistic regression model to determine the unique influence of each risk or protective factor on gambling pattern. Finally, linear (for quantitative outcomes) and logistic (for categorical outcomes) regression analyses were performed to examine the relationship between gambling pattern and adult adjustment outcomes measured at T2. Partially adjusted analyses controlled for age, gender, T1 employment, and T1 income; fully adjusted analyses controlled for all of the above in addition to prior behaviour (i.e. adult adjustment measured at T1).

All linear regression analyses were performed with robust standard errors. Further, the variance inflation factor (VIF) of each independent variable was computed prior to performing fully adjusted analyses; all VIFs were below 1.40 indicating no multicollinearity (Kutner, et al., 2004).

# Results

## Descriptive Statistics

The prevalence of each gambling pattern, together with descriptive statistics for the demographic variables, risk and protective factors, and adult adjustment outcomes can be found in Table 7. The majority (91.69%) of the sample were classified as resisters. The new incidence group was the most prevalent problem gambling group (3.62%), followed by the desistance group (2.63%) and the persistence group (2.07%).

**TABLE 7. Descriptive statistics of study sample (n = 2258)**

	%	95% CI
<b>Prevalence of problem gambling patterns</b>		
Resistors	91.69	90.20,93.17
Persistors	2.07	1.33,2.81
Desistors	2.63	1.79,3.47
New incidence	3.62	2.82,4.41
<b>Aggregate prevalence of problem gambling</b>		
T1 Problem gambling	4.83	3.64,6.02
T2 Problem gambling	5.99	4.65,7.32
<b>Demographics</b>		
T1 Employed	78.56	76.15,80.97
T2 Employed	81.81	80.12,83.50
	<b>Mean</b>	<b>Standard Error</b>
<b>Demographics</b>		
T1 Income	7.27	0.11
<b>T1 Protective factors</b>		
Stable neighbourhood	3.00	0.02
Community opportunities for prosocial involvement	2.37	0.02

Social cohesion and trust	2.79	0.02
Community opportunities for success	3.43	0.02
Family concord	2.81	0.02
Family attachment	2.99	0.02
Family prosocial behaviour	2.05	0.03
Family interaction	4.83	0.02
Attachment to peers	3.75	0.03
Affiliation with prosocial peers	0.89	0.03
Religiosity	1.72	0.03
Civic activism	1.24	0.01
Intimate relationships	3.43	0.02
Prosocial intimate partner	1.68	0.03
<b>T1 risk factors</b>		
Family antisocial behaviour	1.04	0.01
Family drug use	2.32	0.01
Affiliation with antisocial peers	0.21	0.01
Friend's use of drugs	1.75	0.02
Drug using intimate partner	1.97	0.02
Antisocial intimate partner	1.06	0.01
Internalising symptoms	19.09	0.18
Frequency of alcohol use	5.37	0.08
Frequency of cigarette use	2.45	0.04
Frequency of cannabis use	1.91	0.04
Frequency of other illicit drug use	1.16	0.01
Antisocial behaviour	1.13	0.01

<b>T2 adult adjustment outcomes</b>		
Internalising symptoms	19.00	0.16
Frequency of alcohol use	5.08	0.08
Frequency of cigarette use	2.35	0.04
Frequency of cannabis use	1.85	0.04
Frequency of other illicit drug use	1.16	0.01
Antisocial behaviour	1.06	0.00

## Risk and Protective Factors for Patterns of Problem Gambling

The results from the partially adjusted multinomial logistic regression analyses can be found in Table 8. Relative to resistance, family attachment significantly reduced the risk of problem gambling persistence, while affiliation with antisocial peers, friends' drug use, internalising symptoms, frequency of alcohol use, frequency of cigarette use, frequency of other illicit drug use, and antisocial behaviour increased the risk of persistence. Relative to resistance, family concord and family attachment significantly reduced the risk of desistance from problem gambling, while affiliation with antisocial peers, friends' drug use, internalising symptoms, frequency of cigarette use, and antisocial behaviour increased the risk of desistance. Finally, civic activism significantly reduced the risk of new incidence, relative to resistance, while frequency of cigarette use increased the risk.

**TABLE 8. Results of partially adjusted multinomial logistic regression analyses examining risk and protective factors for problem gambling patterns**

	<b>Persistors RRR [95% CI]</b>	<b>Desistors RRR [95% CI]</b>	<b>New Incidence RRR [95% CI]</b>
<b>Protective factors</b>			
Stable neighbourhood	1.07 [0.76,1.48]	0.80 [0.56,1.15]	0.86 [0.66,1.12]
Community opportunities for prosocial involvement	0.87 [0.45,1.67]	0.89 [0.43,1.84]	0.69 [0.44,1.10]
Social cohesion and trust	0.62 [0.35,1.07]	1.11 [0.65,1.89]	1.06 [0.61,1.83]
Community opportunities for success	0.56 [0.25,1.22]	0.78 [0.46,1.32]	0.88 [0.63,1.23]
Family concord	0.71 [0.41,1.21]	0.59 [0.36,0.94]*	0.95 [0.69,1.32]
Family attachment	0.64 [0.42,0.99]*	0.66 [0.45,0.98]*	1.05 [0.73,1.50]
Family prosocial behaviour	0.93 [0.72,1.19]	0.79 [0.59,1.07]	0.99 [0.79,1.23]

Family interaction	0.75 [0.55,1.02]	0.78 [0.59,1.04]	1.22 [0.91,1.61]
Attachment to peers	1.06 [0.77,1.44]	0.94 [0.70,1.27]	0.91 [0.70,1.18]
Affiliation with prosocial peers	1.06 [0.81,1.40]	0.75 [0.54,1.04]	0.80 [0.64,1.02]
Religiosity	0.94 [0.54,1.65]	0.89 [0.61,1.31]	0.95 [0.72,1.24]
Civic activism	1.68 [0.55,5.13]	0.35 [0.09,1.34]	0.18 [0.04,0.71]*
Intimate relationships	0.69 [0.33,1.46]	1.09 [0.58,2.08]	1.68 [0.90,3.11]
Prosocial intimate partner	0.81 [0.57,1.15]	0.94 [0.66,1.36]	0.94 [0.73,1.23]
<b>Risk factors</b>			
Family antisocial behaviour	1.04 [0.40,2.70]	1.34 [0.74,2.43]	0.89 [0.42,1.91]
Family drug use	0.58 [0.22,1.48]	1.56 [0.89,2.73]	1.07 [0.69,1.66]
Affiliation with antisocial peers	2.68 [1.87,3.84]***	1.70 [1.15,2.53]**	1.20 [0.77,1.86]
Friend's use of drugs	2.31 [1.68,3.18]***	1.63 [1.16,2.30]**	1.11 [0.84,1.46]
Drug using intimate partner	0.89 [0.48,1.62]	1.46 [0.91,2.33]	1.04 [0.70,1.53]
Antisocial intimate partner	1.48 [0.65,3.33]	1.70 [0.97,2.96]	1.06 [0.42,2.67]
Internalising symptoms	1.06 [1.04,1.10]***	1.07 [1.02,1.12]**	1.00 [0.97,1.04]
Frequency of alcohol use	1.23 [1.02,1.48]*	1.09 [0.95,1.25]	1.01 [0.93,1.11]
Frequency of cigarette use	1.35 [1.12,1.63]**	1.59 [1.27,2.00]***	1.21 [1.04,1.40]*
Frequency of cannabis use	1.08 [0.96,1.21]	1.06 [0.95,1.19]	1.02 [0.92,1.13]
Frequency of other illicit drug use	1.56 [1.16,2.11]**	1.16 [0.77,1.75]	1.15 [0.78,1.69]
Antisocial behaviour	5.87 [3.11,11.08]***	2.74 [1.57,4.81]**	1.31 [0.69,2.49]

RRR= Relative Risk Ratio. For all analyses, the reference is resisters (i.e. all RRR's relate to comparison between resistor group and relevant gambling group). \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.0005$

The results of the fully adjusted multinomial logistic regression analysis are presented in Table 9. Relative to resistance, female gender independently reduced the risk of problem gambling persistence, while higher income, affiliation with antisocial peers, and frequency of alcohol use all independently increased the risk of persistence. Female gender also independently reduced the risk of desistance relative to resistance, while frequency of cigarette use increased the risk of desistance. Finally, female gender and civic activism independently reduced the risk of new incidence of problem gambling, relative to resistance.

**TABLE 9. Results of fully adjusted multinomial logistic regression analyses examining risk and protective factors for problem gambling patterns**

	<b>Persistors RRR [95% CI]</b>	<b>Desistors RRR [95% CI]</b>	<b>New Incidence RRR [95% CI]</b>
Age	1.08 [0.84,1.38]	0.91 [0.77,1.06]	0.94 [0.81,1.10]
Female gender	0.18 [0.06,0.51]**	0.22 [0.11,0.41]***	0.32 [0.18,0.55]***
Employment	0.59 [0.23,1.50]	1.44 [0.61,3.38]	0.68 [0.35,1.32]
Income	1.27 [1.09,1.48]**	0.90 [0.79,1.04]	1.07 [0.95,1.20]
Family concord	0.94 [0.55,1.60]	0.78 [0.53,1.15]	0.95 [0.64,1.39]
Family attachment	0.69 [0.42,1.15]	0.90 [0.62,1.30]	1.10 [0.73,1.66]
Civic activism	0.79 [0.27,2.30]	0.28 [0.06,1.36]	0.18 [0.04,0.76]*
Affiliation with antisocial peers	1.91 [1.06,3.43]*	0.98 [0.61,1.57]	1.05 [0.57,1.91]
Friend's use of drugs	1.22 [0.74,2.00]	1.18 [1.70,1.99]	0.93 [0.65,1.34]
Internalising symptoms	1.02 [0.97,1.08]	1.04 [1.00,1.09]	1.00 [0.96,1.04]
Frequency of alcohol use	1.29 [1.07,1.55]**	0.99 [0.86,1.15]	1.00 [0.91,1.09]
Frequency of cigarette use	1.02 [0.81,1.28]	1.48 [1.16,1.88]**	1.22 [1.04,1.43]
Frequency of other illicit drug use	0.70 [0.40,1.22]	0.62 [0.32,1.19]	1.00 [0.60,1.65]
Antisocial behaviour	1.71 [0.74,3.94]	1.32 [0.56,3.12]	0.99 [0.42,2.34]

RRR= Relative Risk Ratio. For all analyses, the reference is resisters (i.e. all RRR's relate to comparison between resistor group and relevant gambling group). \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.0005$

## Relationships between Problem Gambling Patterns and Adult Adjustment Outcomes

Results of the regression analyses examining relationships between problem gambling patterns and adult behavioural adjustment outcomes (at T2) are presented in Table 10. In partially adjusted analyses, persistence of problem gambling (relative to resistance) was significantly associated with more frequent alcohol, cigarette, and cannabis use, as well as antisocial behaviour at T2; in fully adjusted analyses, the relationship between persistence and cannabis use at T2 was the only remaining statistically significant association. Desistance from problem gambling (relative to resistance) was associated with increased cigarette use at T2 in partially adjusted analyses, but this was no longer statistically significant in fully adjusted analyses. New incidence of problem gambling (relative to resistance) was associated with increased internalising symptoms and cigarette use at T2 in partially adjusted analyses. In fully adjusted analyses, the association between new incidence and cigarette use was no longer statistically significant.

**TABLE 10. Results of regression analyses for relationships between problem gambling patterns and adult adjustment outcomes**

	Persistors		Desistors		New Incidence	
	Partial adjusted	Fully adjusted	Partial adjusted	Fully adjusted	Partial adjusted	Fully adjusted
	Coef. [95% CI]		Coef. [95% CI]		Coef. [95% CI]	
Internalising symptoms	1.41 [-0.90,3.72]	-0.20 [-2.09,1.76]	0.25 [-1.55,2.04]	-1.91 [-4.76,0.94]	2.49 [0.75,4.24]**	2.42 [0.91,3.93]**
Alcohol use	1.06 [0.19,1.92]*	0.48 [-0.24,1.19]	-0.34 [-1.18,0.50]	-0.61 [-1.59,0.38]	0.40 [-0.10,0.91]	0.36 [-0.11,0.85]
Cigarette use	0.68 [0.22,1.14]**	0.06 [-0.16,0.28]	0.93 [0.36,1.50]**	-0.02 [-0.31,0.27]	0.55 [0.17,0.93]**	0.16 [-0.09,0.42]
Cannabis use	0.95 [0.17,1.74]*	0.76 [0.02,1.49]*	0.16 [-0.39,0.72]	0.02 [-0.48,0.52]	0.23 [-0.20,0.66]	0.18 [-0.18,0.53]
Other illicit drug use	0.18 [-0.01,0.37]	0.07 [-0.09,0.23]	-0.15 [-0.11,0.08]	-0.03 [-0.10,0.04]	0.09 [-0.03,0.21]	0.07 [-0.02,0.16]
Antisocial behaviour	0.19 [0.04,0.34]*	0.09 [-0.02,0.19]	0.04 [-0.04,0.12]	0.00 [-0.07,0.08]	0.01 [-0.04,0.05]	-0.00 [-0.04,0.04]
	OR[95%CI]		OR[95%CI]		OR[95%CI]	
Employment	0.80 [0.28,2.28]	0.88 [0.26,3.01]	1.49 [0.61,3.63]	1.50 [0.63,3.56]	0.72 [0.39,1.31]	0.81 [0.45,1.47]

For all analyses, the reference is resistors (i.e. all coefficient's/OR's relate to comparison between resistor group and relevant gambling group). \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.0005$ . Partially adjusted analyses control for gender, age, T1 employment, and T1 income. Fully adjusted analyses control for all of the above in addition to prior behaviour (e.g., in analysis of the internalising symptoms outcome, T1 internalising symptoms were controlled for in the regression model).

## Summary

Part B of this research confirmed previous findings suggesting that problem gambling is a varied, transitory, and episodic condition. Despite overall rates of problem gambling remaining stable across timepoints, varied pathways were observed at an individual level. The majority of the sample (91.69%) reported no problem gambling at both T1 and T2 (i.e., resistors). The new incidence group (i.e., developed problem gambling during the two year follow up) was the most prevalent problem gambling pattern (3.62%), followed by the desistors (2.63%). For each problem gambling pattern, the partially adjusted analyses revealed several statistically significant predictors within the family, peer, and individual domains. However, there were few statistically significant independent predictors in the fully adjusted analysis.

Activism was protective of new incidence problem gambling, and thus the promotion of civic and social engagement (activism) should be further investigated as a potential protective factor against the development of problem gambling in young adults. Higher income, alcohol use, and affiliation with antisocial peers were clear risk factors for persistence of problem gambling. Higher frequency of cigarette use was the only statistically significant risk factor for problem gambling desistance.

Not surprisingly, persistors experienced the greatest number of behavioural adjustment problems at follow up, including substance use and antisocial behaviours, as well as an escalation in cannabis use over and above cannabis use two years prior. Encouragingly, desistance from problem gambling, relative to resistance, was not associated with any of the measured adjustment problems, when controlling for adjustment two years earlier, suggesting that there is no escalation in these types of outcomes following desistance.

## Discussion and Conclusions

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The overarching goal of this research was to increase understanding of the protective impact of the social environmental system on problem gambling and gambling-related harms. Specifically, this research had two aims:

1. To investigate the relationships between problem gambling and internalising symptoms, and to examine common and specific social environmental protective factors for these co-occurring conditions (Part A).
2. To investigate social environmental predictors and adult behavioural adjustment outcomes associated with longitudinal problem gambling patterns (Part B).

This final section provides a general discussion of the results from this project with respect to these aims. It also describes limitations of the research, and discusses the implications of the findings for prevention efforts.

### **Common and specific social environmental protective factors for problem gambling and internalising symptoms- Part A**

The first focus of Part A of this research was to investigate the cross-sectional and longitudinal relationships between problem gambling and internalising symptoms. Consistent with a large body of literature demonstrating comorbidity between internalising disorders and problem gambling (for a review see Dowling, et al., 2015; Lorains, et al., 2011), a cross-sectional association between internalising symptoms (anxiety and depressive symptoms) and problem gambling was found, even when controlling for problem gambling/internalising symptoms two years earlier. However, contrary to predictions, a longitudinal relationship between problem gambling and internalising symptoms, over the span of two years, was not observed. A study by Dussault et al. (2011) found that both gambling problems and depressive symptoms at age 17 predicted each other at age 23; however, other studies have not observed statistically significant longitudinal relationships between gambling and depressive symptoms in older adults (Vander Bilt et al., 2004), nor among adolescents (Lee et al., 2011; Winters et al., 2002).

Discrepancies across studies may be due to differences in measurement of the constructs, or due to longitudinal time lags. The longitudinal lag in the present study was two years and it is possible that temporal relationships between internalising symptoms and problem gambling in young adulthood may be more transient, occurring over shorter time periods (e.g., immediate distress from heavy gambling loss events). Alternatively, Blaszczynski and Nower's (2002) pathways model of problem gambling may explain the lack of a longitudinal relationship in the current study. This model proposes that there are three distinct subgroups of gamblers, one of which comprises "emotionally vulnerable problem gamblers". According to the model, emotionally vulnerable problem gamblers have a premorbid history of depression and employ gambling to modulate negative mood states. Thus, if only a proportion of the current sample belongs to the 'emotionally vulnerable' group of problem gamblers, then the effect of any longitudinal association between internalising symptoms and problem gambling

may have been 'washed out' in the full sample. Future research using person-centred methods such as latent class analysis over shorter time frames, or using event related methodology, may help clarify these interpretations. Further, investigation of these relationships in a sample of individuals clinically diagnosed with anxiety and depression would be valuable and would allow understanding of whether these relationships are clinically significant.

The second focus of Part A of this research was to investigate common and specific social environmental protective factors for both problem gambling and internalising symptoms. Protective factors for internalising symptoms were found within the community, family, and peer domains. This is consistent with previous research among adolescents (Bond, et al., 2005) and suggests that the social environmental measures of protection covered in the *Communities That Care* youth survey (which was originally designed for adolescent samples) are also important longitudinal predictors of internalising symptoms among young adults. When controlling for prior internalising symptoms and demographic characteristics, stable neighbourhood and family concord remained statistically significant independent prospective predictors of internalising symptoms in the fully adjusted analyses. Indeed, past research has shown that family (attachment to parents and family cohesion) relationships are some of the strongest social environmental predictors of adolescent depression (Bond, et al., 2005; Carbonell et al., 2002).

On the other hand, none of the measured protective factors were found to be longitudinally associated with problem gambling. While there is a large body of literature detailing risk factors for problem gambling (e.g., Dowling, Jackson, et al., 2014; Johansson, et al., 2009; Lorains et al., 2014), there is a paucity of research examining protective factors. Further, many of the risk factors identified in cross-sectional studies have not been identified in subsequent longitudinal studies (Shead, et al., 2010), suggesting that many of these apparent 'risk factors' are in fact consequences of problem gambling, or co-exist because they share common causes. With regard to social environmental predictors, studies have identified adolescent protective factors such as family concord/cohesion (Dickson et al., 2008; Scholes-Balog, et al., 2014), family rewards for prosocial involvement (Scholes-Balog, et al., 2014), and school connectedness (Dickson, et al., 2008). The findings of the current study suggest that, among young adults who are of legal gambling age in Australia, which is also a time period of peak gambling involvement (Welte et al., 2011), the social environmental protective factors examined were poor prospective predictors of problem gambling. It is possible that risk processes for problem gambling occur earlier in adolescence, and thus, the protective role of social environmental factors may no longer be relevant or important in young adulthood. In order to build resilience to problem gambling among young adults, these findings suggest that there is a need to focus more on other biological, behavioural, personality, cognitive, and community level factors (e.g., availability and characteristics of gambling venues).

The social environmental protective factors considered in the current study have also been shown to be protective of other problem and addictive behaviours, such as substance use (Bond, et al., 2005; Hemphill, et al., 2011). It is striking that, despite problem gambling being conceptualised as an addictive disorder (American Psychiatric Association, 2013), past research has shown that only a few of these ecological predictors are adolescent protective factors (Dickson, et al., 2008; Scholes-Balog, et al., 2014). Moreover, the findings from the current study suggest that none of these factors are protective during young adulthood. Given that there were no common protective factors for both internalising symptoms and problem gambling, our findings also highlight the need to more specifically address separate factors to protect against each condition if we are to tackle their comorbidity.

## Longitudinal patterns of problem gambling- Part B

Part B of this research looked at problem gambling patterns in Australian youth. The majority of the sample (91.69%) reported no problem gambling at both T1 and T2 (i.e., resistors). The new incidence group was the most prevalent problem gambling pattern (3.62%), followed by the desistors (2.63%). Consistent with other studies (LaBrie et al., 2003; Winters, et al., 2005), the persistent problem gambling group was the least prevalent group (2.07%).

In the fully adjusted analyses, female gender was protective of each problem gambling pattern. This is consistent with a large body of literature showing that males are at increased risk of problem gambling (e.g. Hayatbakhsh et al., 2006; LaBrie, et al., 2003). On the other hand, different social developmental and behavioural predictors were associated with each problem gambling pattern. The only statistically significant predictor of new incidence of problem gambling was civic activism; activism was associated with reduced risk of onset of gambling problems relative to resistance (i.e., resistors were more likely to show high levels of activism than individuals who developed problem gambling during the two year follow up). Research has shown that engaging in prosocial behaviour is protective of problem behaviour such as substance use (e.g., Carlo, et al., 2011) which is theorised to be due to prosocial individuals being more likely to endorse societal norms (Eisenberg, et al., 2006). Our study is the first to our knowledge to investigate activism as a potential protective factor for problem gambling, and our findings suggest that engagement with social and civic issues should be further investigated as a potential protective factor to prevent the development of problem gambling among young adults. The lack of independent predictors of new incidence problem gambling within the other social environmental contexts (community, family and peer group) suggests that primary prevention and education efforts that focus on these types of ecological factors (Messerlian et al., 2005) may not independently and directly reduce the risks of developing problem gambling among young adults, though there are likely to be indirect benefits.

New incidence of problem gambling was not associated with later behavioural outcomes such as substance use or antisocial behaviour; however, relative to resistance, new incidence problem gamblers were at increased risk of reporting internalising symptoms at T2, even when controlling for prior internalising symptoms. Comorbidity between problem gambling and internalising symptoms has been found in many studies (Dowling, et al., 2015; Scholes-Balog et al., 2015). The current study suggests that this association occurs specifically around young adult onset of problem gambling. Further, given that the measure of internalising symptoms was not an independent prospective predictor of new incidence, it is possible that internalising symptoms may have occurred secondary to the onset of problem gambling. Future research using event-related or person-centred methodology with multiple short-interval measurements will be required to further investigate these temporal relationships.

In contrast, higher income, affiliation with antisocial peers, and alcohol use were found to predict problem gambling persistence. The peer group is a strong predictor of problem behaviours, including gambling, among youth (Barnes et al., 2005) and interaction with an antisocial peer group may reinforce problem behaviours such as problem gambling, resulting in their persistence. Similarly, drinking alcohol while gambling is common (McCormack & Griffiths, 2012), and may result in impulsivity and impaired decision making, as well as spending more money and staying at gambling venues longer than intended (Dickerson & Baron, 2000). This may lead to reinforcement of gambling problems, resulting in their persistence. Thus, these findings suggest that an antisocial peer group and frequent alcohol use are potential prospective markers of problem gambling persistence, and could be targets for secondary prevention and intervention. Future research which also incorporates questions about peer gambling behaviour (not just peer substance use and antisocial behaviours) is an important next step in understanding the influence of peers on problem gambling. Persistence of

problem gambling was also associated with poor behavioural outcomes, specifically, more frequent substance use and antisocial behaviour. When controlling for prior behaviour, the relationship between problem gambling persistence and cannabis use at T2 remained statistically significant. It is possible that the persistence of gambling problems may result in escalation of more deviant problem behaviours, such as cannabis use. This could be a result of the impact of problem gambling on financial, social, and psychological wellbeing, and/or the influence of an antisocial peer group affiliation.

Finally, higher frequency of cigarette use was the only statistically significant predictor of problem gambling desistance, relative to resistance. Cigarette smoking and gambling commonly co-occur (Dowling, et al., 2015; Welte et al., 2004), and gamblers who smoke cigarettes report more severe gambling problems (Afifi et al., 2010). In turn, research has also shown that gamblers who report more severe gambling problems are also more likely to seek treatment or help (Thornberry et al., 1994). Therefore, one interpretation of these findings could be that the desistors experienced more severe gambling problems, and thus sought treatment or help during follow up, resulting in resolution of, or reduction in, their gambling problems. Given the breadth of the study from which the current data were drawn, detailed measurement of problem gambling severity or access to treatment was not feasible. Future research will be necessary to replicate these findings and further investigate this potential interpretation. It should be noted that post hoc comparisons of persistence versus desistance did not reveal any statistically significant differences in risk or protective factors. Future research is required to investigate other factors that may distinguish between these two problem gambling patterns, in order to identify targets to promote desistance.

Notably, when controlling for prior (T1) behaviour, problem gambling desistance was not associated with any of the behavioural outcomes measured. This is an encouraging finding, suggesting that following desistance from problem gambling, there is no significant escalation in these outcome measures. It should be noted, however, that in analyses that did not control for prior behaviour, desistance from problem gambling was associated with T2 cigarette use, suggesting that desistors may still be characterised by a higher frequency of cigarette use, although this is not over and above their cigarette use prior to desistance.

## Limitations of the research

The research presented in this report possessed a number of strengths. This research is one of a small but growing number of prospective studies of problem gambling. Part B of this research is also the first study, to our knowledge, to examine social developmental predictors and outcomes associated with longitudinal patterns of problem gambling. The strengths of this research include a large data set drawn from a community sample, very good longitudinal retention rates, the examination of a comprehensive range of social environmental predictors, and a focus on the varied patterns of problem gambling over time. Despite these strengths, a number of limitations are noted. Firstly, as this research draws on data from a large longitudinal study, the measure of problem gambling was necessarily brief. Classification of problem gambling at each time point was based on whether the individual answered positively to at least one of two questions regarding self-reported past-year problems with gambling. Nonetheless, these two items were derived from established screening and assessment measures for problem gambling and were internally consistent. Further, the measure of problem gambling showed moderate test-retest reliability, and has been found to be longitudinally reliable (Scholes-Balog, et al., 2015). It is possible that problem gamblers who do not care what others think of their gambling, are in denial, or are unaware of the impact of their gambling on others, may be missed by these two items. Further, this measure may lack sensitivity to occasional harmful gambling as compared to problem gambling. Nonetheless, the aggregate rates of past year

problem gambling at each time point in the current study (Table 7) were similar to rates reported in the literature (e.g. Welte, et al., 2008), as were the prevalence rates of each problem gambling pattern (LaBrie, et al., 2003), supporting the validity of our measure. Nonetheless, given the relatively low prevalence of the problem gambling patterns, future research with a larger sample size is warranted. Further, future research comparing the measure of problem gambling employed in this research to other established measures of problem gambling, such as the Problem Gambling Severity Index (PGSI), would be valuable. This would enable understanding of the correspondence between the various measures and the resulting findings, particularly given that measures such as the PGSI define several categories of problem gambling severity, including low and moderate risk.

Second, like most other studies on problem gambling patterns (e.g., LaBrie, et al., 2003), data on problem gambling was only collected at two time points. While this allowed us to examine the concepts of persistence and desistance between two time-points, and the predictors and outcomes associated with these patterns, future research should measure problem gambling over longer time periods with more shorter-interval time points to allow further investigation into temporal patterns of problem gambling and to enhance sensitivity to the dynamic processes underlying the influence of social environmental factors.

Finally, this study relied on self-report and is subject to the potential limitations of this methodology, including biases and socially desirable responding. Nevertheless, self-report methods have been shown to offer a valid and reliable means of assessing behaviour and psychological symptoms (Kessler et al., 1999).

## Implications and conclusions

In conclusion, Part A of this research found no common prospective ecological protective factors for internalising symptoms and problem gambling in young adulthood. While protective factors within the domains of the community, family, and peer group were observed for internalising symptoms, there were no statistically significant protective factors for problem gambling. These findings indicate that, in young adulthood, there is a need to focus on other biological, personality, cognitive, and community level factors (e.g., availability), as possible targets to reduce the risk of problem gambling. In addition, these findings suggest that it is necessary to address separate factors to protect against each condition if we are to tackle the comorbidity between internalising symptoms and problem gambling.

Part B of this research confirmed previous findings suggesting that problem gambling is a varied, transitory, and episodic condition. Despite overall rates of problem gambling remaining stable across the time points, varied pathways were observed at an individual level. The findings suggest that the promotion of civic and social engagement (activism) should be further investigated as a potential protective factor against the development of problem gambling in young adults. Although these findings are preliminary and warrant replication, the promotion of civic and social engagement may serve as a means to build resilience among young adults and protect against the development of problem gambling. Further, frequent alcohol use and affiliation with antisocial peers are clear risk factors for persistence of problem gambling, and are potential ecological targets for secondary prevention and intervention. Social marketing campaigns which target these 'at-risk' groups may be one effective way to engage these individuals, enabling education and prevention among those who have not or will not seek formal treatment. Finally, higher frequency of cigarette use was the only statistically significant predictor of problem gambling desistance and there were no statistically significant differences in risk or protective factors between persistors and desistors. Future research is required to investigate other factors that may distinguish between these two problem gambling patterns, in order to identify targets to promote desistance.

Not surprisingly, persistors experienced the greatest number of adjustment problems at follow up, including substance use and antisocial behaviours, as well as an escalation in cannabis use over and above cannabis use two years prior. Encouragingly, desistance from problem gambling, relative to resistance, was not associated with any of the measured adjustment problems, when controlling for adjustment two years earlier, suggesting that there is no escalation in these types of problem behaviours following desistance. These findings highlight the need to consider the varied patterns of problem gambling over time in order to provide efficacious prevention and intervention approaches.

Based on the findings of Part B of this research, rather than examining problem gambling at an aggregate level, future research must view problem gamblers as a heterogeneous group, and consider the varied pathways and patterns of problem gambling over time. Therefore, research such as that presented in Part A, which examined problem gambling at an aggregate level, may have obscured differences between the various problem gambler sub-groups. Thus, the findings from Part A will warrant replication using a sub-typing approach to the categorisation of problem gamblers.

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