

Are Psychology University Student Gamblers Representative of Non-university Students and General Gamblers? A Comparative Analysis

Sally M. Gainsbury · Alex Russell · Alex Blaszczynski

Published online: 11 October 2012
© Springer Science+Business Media New York 2012

Abstract Students recruited from psychology undergraduate university populations are commonly used in psychology research, including gambling studies. However, the extent to which the use of this subpopulation produces findings that can be extrapolated to other groups is questionable. The present study was designed to compare results from university-recruited psychology student gamblers to those obtained from a sample of gamblers recruited from the general population that also included students. An online survey measuring gambling behavior and Internet gambling, attitudes and knowledge about gambling and problem gambling severity was posted on websites accessed by gamblers. Participants were recruited from two sources, a psychology undergraduate university population ($n = 461$) and online websites ($n = 4,801$). Results showed university-recruited students differed significantly from both adults and students recruited from the general population in respect to demographic variables and gambling behavior. Psychology undergraduate students were younger, more likely to be female, and had lower incomes. When relevant demographic variables were controlled, psychology undergraduate students were found to gamble less frequently, at different times, and to be at lower-risk for gambling-related problems, but had more irrational beliefs and more negative attitudes towards gambling than gamblers recruited from the general population. Results suggest that caution should be used in extrapolating findings from research using university-recruited psychology student gamblers to wide community populations due to differences related to gambling thoughts, attitudes and behaviors.

S. M. Gainsbury (✉)
Centre for Gambling Education & Research, Southern Cross University,
P.O. Box 157, Lismore, NSW 2480, Australia
e-mail: sally.gainsbury@scu.edu.au

S. M. Gainsbury · A. Russell · A. Blaszczynski
School of Psychology, University of Sydney, Brennan MacCallum Building (A18),
Sydney, NSW 2006, Australia
e-mail: alex.russell@sydney.edu.au

A. Blaszczynski
e-mail: alex.blaszczynski@sydney.edu.au

Keywords Gambling · University students · Survey · Methodology · Research · Young adults

Introduction

Studies investigating characteristics and behaviors of recreational and problem gamblers recruit participants predominantly from general population samples (Dixon et al. 2011; Martin et al. 2011; Wardle et al. 2011; Welte et al. 2011), clinical services (Blaszczynski et al. 2008; Echeburu'a et al. 2011; Faregh and Derevensky 2011; Wilner-Reid et al. 2012), or use undergraduate university students (Chiu and Storm 2010; Gausset and Jansbøl 2009; King et al. 2010; MacKay and Hodgins 2012; Mercer and Eastwood 2010).

University psychology undergraduate students represent an easily accessible population given that research participation is often a course requirement for which credit points are provided with systems setup to facilitate such participation. Students are used primarily for experimental studies involving the systematic manipulation of independent variables, such as brief interventions designed to correct irrational beliefs, and exposure to (analogue) gambling and decision-making tasks. Methodologies using this subpopulation provide significant advantages over general community or clinical population participants; notably, ease of recruitment, increased retention and follow-up rates, low cost, and greater control over the manipulation of experimental variables/tasks and external factors such as exposure to alcohol, and environmental stimuli. In addition, the high rates of gambling behavior and problem gambling among young adults aged in the 18–30 year age bracket (Burge et al. 2006; Kessler et al. 2008; Productivity Commission 2010; Welte et al. 2011; Winters et al. 2005) provides an implicit assumption that use of undergraduate students will allow for the capturing a diverse range of levels of involvement.

However, the extent to which gambling amongst university-recruited psychology undergraduate students is representative of the wider population of students and young adults remains unknown. This is an important consideration, particularly in relation to Internet gambling where data on gambling is derived from empirical and survey studies conducted on school and university youth (Dowling et al. 2010; Griffiths and Barnes 2008; McBride and Derevensky 2009; Olason et al. 2011; Petry and Weinstock 2007; Wood et al. 2007). Surveys from Australia, Europe, the US and Canada indicate that high school students gamble online (Delfabbro et al. 2005; Dowling et al. 2010; Jackson et al. 2008; McBride and Derevensky 2009; Olason et al. 2011), suggesting that rates of Internet gambling among university students may increase over time as tech savvy youth mature and gain access to funds suitable for online payments.

Furthermore, the extent to which the results can be applied to wider populations is highly questionable and raises serious questions regarding the reliability, validity and generalizability of findings derived from undergraduate populations (Henrich et al. 2010). Henrich et al. (2010) reviewed the behavioral science databases of six sub-disciplines in psychology for the period 2003–2007 and found that the majority of studies relied on participants from Western industrialized societies with, in some instances, two-thirds of data derived from undergraduate students. These authors concluded that participants drawn from Western, educated, wealthy and democratic societies were among the least representative populations and that caution should be exercised in extrapolating results to other populations. It is also noted that requirements are usually imposed to allow only fluent speakers of English into participant pools creates samples unrepresentative of the

populations in which the where actual diversity is much greater. These issues are pertinent when considering decisions made in respect to economic outcomes and worth; perceptions of economic utility and risk aversiveness may differ for students compared to employed individuals with a steady income stream and financial commitments.

More recently, the appropriateness of using university psychology undergraduate students in gambling research has been questioned with regard to electronic gaming machine players (Gainsbury and Blaszczynski 2011). In their study, a gambling task and questionnaire was administered to both psychology undergraduate students and patrons attending gambling venues. Results indicated that although overall both groups were comparable in terms of the impact of the responsible gambling signs being tested, signs were found to have a greater impact on the university students than the regular gamblers. The findings were interpreted to suggest that psychology undergraduate students over-emphasize the effectiveness of signs while regular gamblers potentially underestimate such effects. It was concluded that results reported by studies with psychology undergraduate students challenged the assumption that findings can be validly and/or reliably generalized to wider populations.

The validity of generalizing findings is further questioned by a comparative analysis of a US telephone survey involving 1,000 university and non-university participants aged 18–21 years (Barnes et al. 2010). These authors found significant differences in demographic factors between these two samples. Compared to the non-university participants, university students were younger, more likely to be white, lived with their parents, and came from higher socio-economic groups. Analyses revealed similar levels of past year gambling among university students (75 %) and non-university participants (70 %) but the non-university sample had significantly higher rates of frequent gambling participation (52+ times per year) (25 %) than university students (18 %); however, this difference disappeared when demographic variables were controlled.

In an Australian study, 19-year-old university students were more likely to be from higher socioeconomic backgrounds and have attended independent schools (James et al. 2010). Students aged 25 years and over were more likely to be the first in their family to have attended university and more likely to be enrolled part time or by distance education and have dependents. Such differences further highlight the need for caution in assuming that results from of university-recruited participants can be generalized to other populations of non-university and young adults without controlling for relevant variables.

The purpose of the present study was to conduct a comparative study determining the extent to which results obtained from samples of university-recruited psychology first-year undergraduate students were representative of university students and non-university students recruited from the general population. The specific objective of this research was to determine whether the results of research conducted with samples of undergraduate psychology students can be extrapolated to wider populations. Based on previous research, it was hypothesized that significant differences would exist between the samples in terms of general demographics and gambling behaviors.

Method

Participants

Participants were recruited via two sources; 461 first-year undergraduate psychology students were recruited using an online experiment system and received course credit for

their participation. The university from which participants were recruited was one of Australia's leading universities and has a very large cohort of first year psychology students. Being situated in a major city, many students live in private accommodation rather than dormitories on campus. Students were required to be 18 years of age or older and have gambled at least once in the past 12 months to be eligible to participate in this research. Twenty-nine students did not complete the entire survey, giving a completion rate amongst students of 93.7 %. These respondents are referred to as university-recruited students (UR students).

A further 4,801 participants were recruited via online advertisements posted on several websites seeking any Australian adult (18 years of age or older) who had gambled in the past 12 months. These participants are referred to as general population respondents, with a completion rate of 83.2 %. Of these general population respondents, 232 stated that they were full-time students when asked about their employment status. Of note, this item did not specify the type of studies that were undertaken; therefore, it is possible that some students were not university but technical or trade schools or other college students. These respondents are referred to as general population students (GP students).

Procedure

This research was approved by the appropriate human research ethics committee of the two Australian institutions involved in the research and therefore was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

An online survey was used to explore the use of gambling amongst Australian gamblers, with a particular focus on Internet gamblers. For a full description of this larger study see Gainsbury et al. (2012). Banner advertisements with embedded links to the survey were placed on Internet sites including legal wagering sites, sites of land-based gambling venues, gambling information and help sites, and sites of sporting organizations. Paid advertisements were also placed on a prominent social networking site (Facebook) and search engine (Google) based on relevant key words likely to be used by those interested in gambling. Advertisements highlighted the exploratory nature of the survey and contained phrases such as 'Test your gambling knowledge: Take the online gambling survey' included the logos of the two universities involved in the research. Participants were recruited from the general population over a period of nine consecutive months. No incentives or compensation were given for survey completion for participants recruited through this method.

To recruit undergraduate university psychology student gamblers, a description of the study was placed on the online experiment system of a large Australian university specifically used to recruit first year undergraduate psychology students. Students signed up to complete the survey and were given a link that they could use to access the survey and complete it within a specific period. Upon completion of the online survey, students emailed the principle researcher to verify their participation, and received course credit.

All participants viewed an informed consent preamble before commencing the survey describing the purpose of the research, confirming respondent anonymity, and providing the contact details of the researchers and ethics committees.

Measures

An online survey was used with fixed-choice and open-ended responses. The survey contained several sections:

- a) *Gambling Behavior Scale*. A measure of the frequency of participation and the extent of Interactive gambling for ten different gambling activities: instant win scratch tickets, lottery tickets and keno, wagering on sporting events, wagering on dog or horse races, bingo, games of skill, poker, pokies, slots or electronic gaming machines (EMGs), casino table games, Internet casino games. Participants were also asked how often they drank alcohol or used illegal drugs when gambling.
- b) *Internet Gambling Questions*. Participants who stated that they had gambled online provided details about their use of Internet gambling including the year they first gambled online, time of day typically gamble online, preferred medium for online gambling, and any negative consequences.
- c) *Gambling Attitudes Scale*. Participants were asked their views on the extent to which gambling harms outweighed benefits, whether gambling is morally wrong, and the appropriate policy concerning gambling legalization. Responses were coded and summed to produce a total score denoting positive attitudes or negative attitudes.
- d) *Gambling Knowledge and Beliefs Test*. Multiple choice questions tested resistance to common gambling fallacies, including the independence of randomly determined events, personal luck, winning and losing streaks, probabilities of winning, and outcomes of prolonged gambling sessions.
- e) *Problem Gambling Severity Index* (Ferris and Wynne 2001). Questions assessed the extent of gambling-related harm experienced over the previous 12 months with response options ‘never’, ‘sometimes’, ‘most of the time’, and ‘almost always’. Scores range from 0 to 27 indicating the risk level of gambling problems. Classification of participants was based on categories and the scoring method developed by the authors; scores of 2–7 indicated a participant was a moderate-risk gambler and scores over eight, a possible problem gambler. The PGSI has been independently validated and results suggest that it has excellent reliability, dimensionality, external/criterion validation, item variability, practicality, applicability and comparability (McMillen and Wenzel 2006; Neal et al. 2004).
- f) *Gambling questions*. Participants classified as moderate risk or possible problem gamblers were asked to nominate the most problematic gambling activity and mode (Internet via computers, Internet via mobile phone, Internet via wireless device, interactive TV, land-based gaming and betting via telephone) of gambling. Participants were asked whether they had sought help for gambling problems.
- g) *Demographics*. Standard questions assessed gender, age, marital status, education, employment, household income, and household debt.

Data Preparation and Analyses

The results from the UR students were compared to the total group of 4,801 respondents (general population respondents) and also to the GP subset of students. Because there was some overlap between the GP students and the overall general population sample, an alpha level of 0.025 was used for significance testing (unless stated otherwise).

The UR student and general population respondent samples could not be matched based on their demographics. The UR students differed from the general population respondents in terms of age, gender, marital status and income (see below). Previous analysis demonstrates that these demographic variables are predictive of gambling behavior (Gainsbury et al. 2012) so these variables were therefore controlled for in all analyses to ensure that any observed differences between the groups were not due to these demographic factors.

Categorical variables were dummy-coded with females and never married as the reference groups. The marital status variable was problematic as no UR students indicated that they were widowed. Therefore, respondents from this category were merged with those indicating that they were divorced or separated. All analyses were run as binomial logistic, multinomial logistic, ordinal logistic or multiple linear regressions to control for these demographic factors. The only statistic of interest in these regressions was the coefficient for the student grouping variables and thus no model fit information is reported below. All reported percentages and means were not covariate adjusted, although the results are reported on covariate-adjusted figures.

Results

University-Recruited Students Compared to General Population Respondents

Demographics

As shown in Table 1, UR students differed significantly from the general population sample in terms of demographic characteristics. UR students were more likely to be female (56.6 vs. 13.7 %) and significantly younger ($M = 21.10$, $SD = 5.97$) than the general population respondents ($M = 45.00$, $SD = 15.10$), $t(1144.18) = 67.49$, $p < 0.001$, $d = 2.08$. UR students were most likely to have never married (88.1 %) while general population respondents were most likely to be married (45.7 %). A similar proportion of UR students (11.6 %) and general population respondents (13.1 %) reported a household income of more than \$150,000; however, UR students were most likely to report a household income of less than \$20,000 (49.8 %), while incomes were relatively evenly distributed across available categories for the general population respondents (Table 1).

Gambling Activities

UR students gambled significantly less often than the general population respondents on instant win scratch tickets ($b = -0.27$, $SE = 0.11$, Wald = 6.09, $p = 0.014$), bingo ($b = -0.50$, $SE = 0.20$, Wald = 6.23, $p = 0.013$) and games of skill against others not including poker ($b = -0.80$, $SE = 0.13$, Wald = 36.35, $p < 0.001$). UR students used the following gambling activities significantly more often than general population respondents: lottery tickets ($b = 0.35$, $SE = 0.12$, Wald = 8.79, $p = 0.003$), sporting events ($b = 0.89$, $SE = 0.12$, Wald = 59.53, $p < 0.001$), horse and dog racing ($b = 1.28$, $SE = 0.12$, Wald = 112.15, $p < 0.001$) and playing table games at the casino ($b = 0.40$, $SE = 0.15$, Wald = 9.88, $p = 0.002$). There was no significant difference between the groups in terms of playing poker, using EGMs or Internet casino usage (Table 2a, b).

UR students ($M = 3.82$, $SD = 1.89$) did not engage in a significantly different number of gambling activities compared to general population respondents ($M = 3.92$, $SD = 1.95$), $F(1,5169) = 1.82$, $p = 0.18$.

Alcohol and Drug Use While Gambling

UR students reported drinking alcohol while gambling significantly less often than general population respondents, $b = -0.28$, $SE = 0.10$, Wald = 7.34, $p = 0.007$. No significant

Table 1 Demographic profile of UR students, GP student and general population respondents

	UR students (<i>N</i> = 461) (%)	GP students (<i>N</i> = 232) (%)	General population respondents (<i>N</i> = 4,801) (%)
Gender			
Male	43.4	76.7	86.3
Female	56.6	23.3	13.7
Age bracket			
Under 20	56.6	22.4	2.4
20 to 24	32.5	50.9	8.4
25 or older	10.9	26.7	89.2
Marital status			
Married	3.0	5.2	45.7
Living with partner	7.6	9.1	16.7
Widowed	0.4	0	1.6
Divorced or separated	0.9	3.9	10.2
Never married	88.1	81.8	25.8
Income brackets			
Less than \$20,000	49.8	6.1	9.4
Between \$20,000 and \$30,000	6.6	14.9	7.5
Between \$30,000 and \$30,000	4.8	9.6	7.5
Between \$40,000 and \$30,000	4.2	3.1	8.9
Between \$50,000 and \$30,000	3.1	3.5	8.9
Between \$60,000 and \$30,000	2.6	3.5	7.4
Between \$70,000 and \$30,000	4.8	3.1	7.3
Between \$80,000 and \$30,000	2.4	2.2	6.0
Between \$90,000 and \$30,000	3.3	2.2	7.0
Between \$100,000 and \$120,000	4.4	3.1	8.9
Between \$120,000 and \$150,000	2.4	2.2	8.0
More than \$150,000	11.6	6.6	13.1

Note that GP students are a subset of general population respondents

differences were observed between UR students and general population respondents in terms of recreational drug use while gambling (Table 3).

Proportion of Online Betting

When controlling for demographic factors, UR students used the Internet for a significantly higher proportion of their gambling compared to general population respondents for the following gambling activities: sports betting online via computer ($b = 10.61$, $SE = 2.61$, $t(1897) = 4.06$, $p < 0.001$), sports betting online via mobile phone ($b = 12.80$, $SE = 4.56$, $t(550) = 2.81$, $p = 0.005$) and horse and dog racing online via computer ($b = 12.52$, $SE = 2.40$, $t(2461) = 5.22$, $p < 0.001$).

UR students and general population respondents did not differ significantly in the percentage of their gambling for the following gambling activities: lottery tickets online,

Table 2 Percentage of UR students and general population respondents who engaged in each gambling activity

	Instant win scratchies		Lottery tickets		Sporting events		Horse and dog racing		Bingo	
	UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students
<i>(a)</i>										
Not at all in the past 12 months (%)	41.5	55.4	64.2	38.7	56.9	37.8	66.6	17.0	83.6	95.9
Less than once a month (%)	38.0	28.7	22.7	26.1	24.4	15.4	24.1	10.0	11.8	2.4
Once a month (%)	10.7	6.1	6.4	9.0	7.9	6.2	3.3	4.5	3.3	0.5
2–3 times a month (%)	4.1	4.3	2.2	6.5	4.4	7.9	1.8	7.5	0.4	0.2
Once a week (%)	3.7	3.2	2.2	12.7	3.3	10.0	1.3	15.0	0.7	0.4
2–3 times a week (%)	1.7	1.2	1.8	4.7	1.8	9.4	1.5	17.0	0.2	0.2
4 or more times a week (%)	0.2	1.1	0.4	2.3	1.3	13.4	1.3	29.1	0.0	0.4
Total	458	4,773	453	4,728	455	4,695	452	4,689	451	4,638
<i>(b)</i>										
Games of skill										
UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students
60.8	88.0	62.4	79.3	32.1	45.4	66.4	71.6	96.0	96.8	96.8
Table games at a casino										
UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students
19.6	5.8	20.9	8.5	38.3	23.6	24.7	21.5	2.4	1.1	1.1
Electronic gaming machines										
UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students
9.0	2.4	7.6	2.9	10.2	8.3	4.4	3.5	0.4	0.5	0.5
Internet casino										
UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students
5.1	1.3	4.2	1.6	10.0	6.7	2.2	1.4	0.2	0.3	0.3
Table games at a casino										
UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students
2.4	1.4	2.4	2.2	4.4	7.7	1.3	1.0	0.4	0.5	0.5
Electronic gaming machines										
UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students
2.0	0.6	1.3	2.1	4.0	5.5	0.2	0.6	0.0	0.1	0.1
Internet casino										
UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students
1.1	0.6	1.1	3.4	1.1	2.9	0.7	0.5	0.4	0.7	0.7
Table games at a casino										
UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students	GP students	UR students
454	4,665	449	4,636	452	4,659	450	4,647	452	4,664	4,664

Table 3 Percentage of UR students and general population respondents who use alcohol and drugs whilst gambling

Frequency	Alcohol	Illicit drugs		
	UR students	General population respondents	UR students	General population respondents
Never (%)	24.0	27.7	89.8	91.6
Rarely (%)	18.9	22.3	5.8	2.9
Sometimes (%)	23.8	23.6	3.1	3.4
Often (%)	19.1	17.2	0.7	1.4
Always (%)	14.2	9.3	0.7	0.7
Total	450	4,669	452	4,675

sports betting via land-based agencies, sports betting via telephone, sports betting via interactive television, horse and dog racing via land-based agencies, horse and dog racing via mobile phone, horse and dog racing via telephone, bingo online, games of skill online and poker online. There was a large amount of variance in the responses given to these questions, which may explain some of the non-significant results.

Time Spent Betting Online

No significant differences were found in terms of the length of gambling sessions for bingo, games of skill, poker and Internet casinos. Once again, power was reduced given the large variance in responses.

How Internet Gamblers Use the Internet

UR students were significantly more likely to report having never gambled on the Internet (77.0 %) than respondents from the general population (29.5 %). The results from a multinomial logistic regression, using those who had never gambled on the Internet as a reference group, indicated that UR students were significantly less likely than general population respondents to gamble on the Internet either at home ($b = 1.29$, $SE = 0.14$, $Wald = 82.48$, $p < 0.001$) or at work ($b = 2.13$, $SE = 0.74$, $Wald = 8.28$, $p = 0.004$) (Table 4). UR students tended to gamble via the Internet significantly later in the day compared to general population respondents, $b = 0.13$, $SE = 0.04$, $t(3432) = 3.02$, $p = 0.003$ (Table 5). UR students and general population respondents did not differ significantly in terms of the year that they started to use the Internet for gambling purposes. While there was a four-year difference (2008 vs. 2004), the result was not significant when controlling demographic factors.

Problem Gambling

There was a significantly higher proportion of UR students (32.1 %) in the low-risk gambler condition, compared to 25.0 % of general population respondents, $b = -0.41$, $SE = 0.16$, $Wald = 6.18$, $p = 0.013$. Similarly, there was a significantly lower proportion of UR students (8.8 %) in the possible problem gambling category compared to general population respondents (17.0 %), $b = 1.46$, $SE = 0.22$, $Wald = 45.12$, $p < 0.001$.

An error in the survey design meant that ‘sports betting’ was not an available option for participants to nominate this form as the primary cause of their gambling problems.

Table 4 Percentage of each category of respondent who primarily uses the Internet in each location to bet online

Do you primarily use your home or work computer for Internet gambling?	UR students (<i>N</i> = 457) (%)	GP students (<i>N</i> = 230) (%)	General population respondents (<i>N</i> = 4,768) (%)
Home	19.9	49.1	66.6
Work	0.4	0.4	2.5
Away from home and work	2.6	2.6	1.4
I have never gambled on the Internet	77.0	47.8	29.5

Table 5 Percentage of each category of respondent who bets online in each time period

	UR students (<i>N</i> = 105) (%)	GP students (<i>N</i> = 120) (%)	General population respondents (<i>N</i> = 3,335) (%)
6 am–12 pm	1.9	5.8	10.3
12 pm–6 pm	21.0	35.0	58.8
6 pm–midnight	66.7	53.3	29.0
Midnight–6 am	10.5	5.8	1.9

A significantly higher proportion of general population respondents (32.9 %) attributed their problem gambling to betting on horse and dog races, compared to just 3.5 % of UR students, $b = 2.41$, $SE = 0.47$, $Wald = 26.18$, $p < 0.001$. Similarly, a higher proportion of general population respondents (24.8 %) nominated EGMs compared to 18.3 % of UR students, $b = 0.69$, $SE = 0.26$, $Wald = 6.81$, $p = 0.009$, while only 0.6 % of general population respondents indicated their problems were caused by betting on games of skill against other people compared to 4.2 % of UR students, $b = -2.92$, $SE = 0.82$, $Wald = 12.62$, $p < 0.001$.

In terms of mediums for gambling, 24.8 % of general population respondents stated the Internet via computers was the primary cause of their gambling problems compared to 16.2 % of UR students, $b = 0.62$, $SE = 0.26$, $Wald = 5.66$, $p = 0.017$. Furthermore, 35.3 % of general population respondents indicated land-based gambling was the causal mode compared to 24.6 % of UR students, $b = 0.74$, $SE = 0.23$, $Wald = 10.53$, $p = 0.001$.

A significantly lower proportion of UR students (2.1 %) reported having sought help for gambling problems, compared to 16.5 % of general population respondents, $b = 2.39$, $SE = 0.61$, $Wald = 15.64$, $p < 0.001$.

The Role of the Internet in Problem Gambling

A significantly higher proportion of general population respondents (19.3 %) stated that they have had problems due to their gambling, compared to 11.5 % of UR students, $b = 1.12$, $SE = 0.34$, $Wald = 11.24$, $p = 0.001$. A higher proportion of general population respondents (62.7 %) stated that their gambling problems emerged after they first gambled online, compared to 30.8 % of UR students, but this was not significant when controlling for age, marital status, income and gender. There were no significant

differences between UR students and general population respondents in terms of the effect of online gambling on their eating or sleeping patterns. Similarly, UR students and general population respondents did not differ significantly in the perceived impact of using credit cards or electronic bank transfers on their spending.

Gambling Knowledge and Beliefs Score

UR students ($M = 6.33$, $SD = 2.13$) had significantly lower scores than general population respondents ($M = 7.36$, $SD = 1.75$) on the Gambling Knowledge and Beliefs scale, $b = -0.73$, $SE = 0.11$, $t(4546) = 6.77$, $p < 0.001$.

Gambling Attitude Scale Summary Score

UR students ($M = -0.61$, $SD = 1.42$) had significantly less positive attitudes towards gambling than general population respondents ($M = 0.47$, $SD = 1.63$) based on their Gambling Attitude scale summary score, $b = -0.56$, $SE = 0.10$, $t(4637) = 5.79$, $p = 0.001$.

University-Recruited Students Compared to General Population Students

UR students differed from GP students in proportions of gender (43.4 % male from UR compared to 76.7 % male from GP students, $\chi^2(1, N = 693) = 69.19$, $p < 0.001$, $\phi = -0.32$) and marital status ($\chi^2(4, N = 692) = 11.55$, $p < 0.001$, $\phi = 0.13$) (Table 1). GP students ($M = 24.19$, $SD = 7.69$) were significantly older than UR students ($M = 21.10$, $SD = 5.97$), $t(376.01) = 5.35$, $p < 0.001$, $d = 0.45$. No significant differences were observed in overall income, $p = 0.029$.

As for the preceding analyses, all of these factors were controlled in all analyses between UR students and GP students. Overall, the pattern of results between UR students and GP students is much the same as for UR students and general population respondents and only the results that differ are reported below.

Gambling Activities

UR students bought lottery tickets significantly less frequently compared to GP students, $b = -0.61$, $SE = 0.19$, Wald = 10.04, $p = 0.002$. Furthermore, UR students played EGMs significantly less frequently compared to GP students, $b = -0.37$, $SE = 0.16$, Wald = 5.15, $p = 0.023$. The difference between UR students and GP students in terms of gambling via table games at a casino was non-significant.

Proportion of Betting Online

The differences between UR students and GP students in terms of the percentage of sports betting done via computer or sports betting via mobile phone were non-significant.

How Internet Gamblers Use the Internet

The difference between UR students and GP students in terms of proportion of Internet gambling carried out at work was non-significant, $p = 0.79$.

Problem Gambling

The difference between the proportions of UR and GP students claiming to have suffered gambling-related problems was non-significant, $p = 0.27$. Similarly, the difference between the proportions of UR and GP students who indicated that their gambling problems started after first gambling online was non-significant, $p = 0.20$. There was also no significant difference in the proportions of UR and GP students in terms of sleep disruptions due to online gambling, $p = 0.42$. There was no significant difference in the proportion of UR and GP students who attributed their problem gambling to EGMs, $p = 0.65$, nor was there a significant difference in terms of games of skill against other people, $p = 0.20$. There was also no significant difference in the proportion of UR and GP students who indicated that their problem gambling was related to using the internet via a computer, $p = 0.54$, nor was there a significant difference for land-based gambling, $p = 0.06$. Apart from these, the pattern of results for UR students compared to GP students was the same as those reported for UR students compared to general population respondents.

Discussion

Results of the present study revealed that UR student gamblers differed significantly from gamblers recruited from the general population in terms of general demographics. UR students were most likely to be young, single, female, and on low incomes. A substantial proportion of UR students lived in households with high incomes, which is likely representative of students living at home with their parents. Importantly, UR students were also significantly different from student gamblers recruited from the general population. This indicates that recruiting students directly from university courses creates a biased sample, reducing the ability to generalize research findings to other populations of students.

UR students were more likely than students from the general population to be younger females, which may reflect the female gender imbalance of psychology students. This is an important finding as population-based research indicates that young males are of greatest risk for gambling problems (Barnes et al. 2009; Productivity Commission 2010) suggesting that UR student samples, particularly those that specifically recruit psychology students, may not include relevant at-risk subpopulations.

In terms of gambling participation, UR students engaged in gambling activities in significantly different manners than general gamblers. When controlling for relevant demographic variables, UR students engaged in similar numbers of gambling activities, but with different frequencies for most gambling activities. UR students appear to gamble relatively infrequently with most indicating that they played less than once a month for each activity. UR students were also less likely to consume alcohol whilst gambling, perhaps indicating that this sample were less likely to engage in risky behaviors as compared to young adults from the general population.

UR students were significantly less likely to engage in Internet gambling than gamblers recruited from the general population, which may reflect the online nature of recruitment used for the general sample. When demographics were controlled for, UR students used Internet and mobile gambling for a greater proportion of their wagering on sports and races than the general population. This may indicate that this mode of betting is more comfortable and convenient for university students, who engage in many other activities online. When demographic variables were controlled for, UR students appeared to be at lower risk of gambling problems than the general population sample, suggesting that despite the

elevated alcohol use, UR students generally gambled in a more controlled fashion and experienced fewer negative consequences. This is an important finding given that several studies of students recruited from schools and universities have stated that rates of problem gambling are higher amongst Internet gamblers than non-Internet gamblers (Griffiths and Barnes 2008; Olason et al. 2011), as these results may not be representative of the wider population of Internet gamblers.

UR students reported problems related to various modes of gambling and activities to a lesser extent than those from the general population with the exception of betting on games of skill. This refers to placing wagers on the outcome of games such as video games, backgammon, board games and mahjong and indicates that more research is required to further investigate this often overlooked gambling activity. Engagement in Internet gambling in early morning hours may reflect the different schedules of UR gamblers, who may be able to sleep during the morning and day with flexible university schedules. Of interest, despite UR students being more likely to gamble online during the early morning, they did not report greater disruptions to sleep or eating patterns, again perhaps indicating the irregular routines of university students as compared to the general population. UR students had more irrational beliefs about gambling and greater erroneous beliefs about how outcomes were determined, which typically indicates a greater risk for gambling problems. However, they also had more negative attitudes towards gambling, which may indicate that they are more aware of the potential harms related to this activity, acting as a protective factor.

Similar to the comparison with participants from the general population, UR students had significantly different gambling patterns to GP students. Students recruited from the general population appeared to gamble more frequently than the UR students, although the groups appeared to use the Internet for similar levels of sports betting. Furthermore, UR and GP students appear to be similar in terms of self-reported gambling problems. Both groups of students reported similar levels of problems related to EGMs, land-based or Internet gambling. Despite these similarities, GP students differed from UR students in relation to other gambling and problem gambling variables.

It is worth noting that the covariates (demographics) in the regression models varied systematically with both the grouping (independent) variables and many of the dependent variables, which may result in some confounded results. However, controlling for these variables was deemed necessary to demonstrate that differences between the groups was due to factors other than demographic differences. All results were re-run without the covariates and the only result that changed was where UR students conduct their sports betting compared to GP respondents. The non-adjusted percentages are shown in the tables, while the covariate adjusted values are compared in the analyses in the text. One potential confounding factor that was not controlled for was that UR students received course credits as a small incentive to complete the survey, while participants recruited from the general population did not receive any incentives. This may have resulted in general population respondents being more intrinsically motivated to complete the survey than the UR students, and may be an interesting factor to explore in future research.

Conclusions

The results suggest that first-year psychology students are not representative of either the adult general population, as well as not being a good representation of students from the general population. These differences confirm previous findings that university students

recruited for psychology research are not representative of either students or gamblers in the general population (Barnes et al. 2010; Henrich et al. 2010; Gainsbury and Blaszczynski 2011). Specifically, the current research extends the results of Gainsbury and Blaszczynski (2011) that compared the results of identical experimental paradigms using samples of UR students and gamblers recruited from gaming venues. The current study suggests that differences in experimental studies may be due to underlying background factors and confirm that responsible gambling strategies are likely to impact the two samples differently. Unlike the findings of Barnes et al. (2010), the differences between samples in the current study were apparent even when controlling for relevant demographic variables, demonstrating that the use and impact of gambling differed for other reasons. Students who volunteer to participate in psychology experiments for course credit are likely to have different experiences and lifestyles, have more opportunities to study as opposed to working, have fewer demands on their time and financial commitments, and have greater access to and familiarity with technology.

It is clear that directly sampling first-year psychology student gamblers from a university in return for course credit produces different results than recruiting gamblers via online advertisements. The current study suggests that online advertisements results in a sample of students that may be more similar to and representative of the general population. These results highlight the importance of carefully considering the most appropriate method of recruitment to suit the research question being investigated. If behavior amongst a population at a particular university is being investigated, then recruiting students from the university is an appropriate method. However, if the aim is to understand the behavior of a wider population of students or young adults, then advertising directly in the public space may result in more accurate findings.

Acknowledgments The authors would like to acknowledge the invaluable contribution of The Menzies Foundation, a non-profit organisation that provided funding in the form of an Allied Health Grant to the first author to support this research.

References

- Barnes, G. M., Welte, J. W., Hoffman, J. H., & Tidwell, O. (2009). Gambling, alcohol, and other substance use among youth in the United States. *Journal of Studies on Alcohol & Drugs*, 70, 134–142.
- Barnes, G. M., Welte, J. W., Hoffman, J. H., & Tidwell, O. (2010). Comparisons of gambling and alcohol use among college students and non-college young people in the US. *Journal of American College Health*, 58, 443–452.
- Blaszczynski, A., Walker, M., Sharpe, L., & Nower, L. (2008). Withdrawal and tolerance phenomenon in problem gambling. *International Gambling Studies*, 8(2), 179–192.
- Burge, A. N., Pietrzak, R. H., & Petry, N. M. (2006). Pre/early adolescent onset of gambling and psychosocial problems in treatment-seeking pathological gamblers. *Journal of Gambling Studies*, 22(3), 263–274.
- Chiu, J., & Storm, L. (2010). Personality, perceived luck and gambling attitudes as predictors of gambling involvement. *Journal of Gambling Studies*, 26, 205–227.
- Delfabbro, P., Lahn, J., & Grabosky, P. (2005). *Adolescent gambling in the ACT*. Centre for Gambling Research, Australian National University.
- Dixon, M., Harrigan, K. A., Jarick, M., MacLaren, V., Fugelsang, J. A., & Sheepy, E. (2011). Psychophysiological arousal signatures of near misses in slot machine play. *International Gambling Studies*, 11(3), 393–407.
- Dowling, N., Jackson, A., Thomas, S., & Frydenberg, E. (2010). *Children at risk of developing problem gambling*. Melbourne, VIC: The Problem Gambling Research and Treatment Centre.
- Echeburu'a, E., Gonza'lez-Ortega, I., Corral, P. D., & Polo-Lo'pez, R. (2011). Clinical gender differences among adult pathological gamblers seeking treatment. *Journal of Gambling Studies*, 27, 215–227.

- Faregh, N., & Derevensky, J. (2011). Gambling behavior among adolescents with attention deficit/hyperactivity disorder. *Journal of Gambling Studies*, 27, 243–256.
- Ferris, J., & Wynne, H. (2001). *The Canadian problem gambling index: Final report*. Ottawa: Canadian Centre on Substance Abuse.
- Gainsbury, S., & Blaszczynski, A. (2011). The appropriateness of using laboratories and student participants in gambling research. *Journal of Gambling Studies*, 27(1), 83–97.
- Gainsbury, S., Wood, R., Russell, A., Hing, N., & Blaszczynski, A. (2012). A digital revolution: Comparison of demographic profiles, attitudes and gambling behaviour of Internet and non-Internet gamblers. *Computers in Human Behaviour*, 28(4), 1388–1398.
- Gausset, Q., & Jansbøl, K. (2009). “Tell me what you play and I will tell you who you are”: Values and gambling habits in two Danish universities. *International Gambling Studies*, 9(1), 67–78.
- Griffiths, M., & Barnes, A. (2008). Internet gambling: An online empirical study among student gamblers. *International Journal of Mental Health and Addiction*, 6, 194–204.
- Henrich, J., Heine, S. J., & Norenzayan, A. (2010). Most people are not WEIRD. *Nature*, 466, 29.
- Jackson, A., Dowling, N., Thomas, S., Bond, L., & Patton, G. (2008). Adolescent gambling behaviour and attitudes: A prevalence study and correlates in an Australian population. *International Journal of Mental Health and Addiction*, 6, 325–352.
- James, R., Krause, K., & Jennings, C. (2010). *The first year experience in Australian universities: Findings from 1994 to 2009*. Melbourne: Centre for the Study of Higher Education, The University of Melbourne.
- Kessler, R. C., Hwang, I., LaBrie, R., Petukhova, M., Sampson, N. A., Winters, K. C., et al. (2008). DSM-IV pathological gambling in the National Comorbidity Survey Replication. *Psychological Medicine*, 38(9), 1351–1360.
- King, S. M., Abrams, K., & Wilkinson, T. (2010). Personality, gender, and family history in the prediction of college gambling. *Journal of Gambling Studies*, 26, 347–359.
- MacKay, T.-L., & Hodgins, D. (2012). Cognitive distortions as a problem gambling risk factor in Internet gambling. *International Gambling Studies*, 12(2), 163–175.
- Martin, F., Lichtenberg, P. A., & Templin, T. N. (2011). A longitudinal study: Casino gambling attitudes, motivations, and gambling patterns among urban elders. *Journal of Gambling Studies*, 27, 287–297.
- McBride, J., & Derevensky, J. (2009). Internet gambling behaviour in a sample of online gamblers. *International Journal of Mental Health and Addiction*, 7, 149–167.
- McMillen, J., & Wenzel, M. (2006). Measuring problem gambling: Assessment of three prevalence screens. *International Gambling Studies*, 6, 147–174.
- Mercer, K. B., & Eastwood, J. D. (2010). Is boredom associated with problem gambling behaviour? It depends on what you mean by ‘boredom’. *International Gambling Studies*, 10(1), 91–104.
- Neal, P., Delfabbro, P., & O’Neill, M. (2004). *Problem gambling and harm: Working towards a national definition*. Melbourne: Report prepared for the National Gambling Research Program Working Party.
- Olason, D. T., Kristjansdottir, E., Einarsdottir, H., Haraldsson, H., Bjarnason, G., & Derevensky, J. (2011). Internet gambling and problem gambling among 13 to 18 year old adolescents in Iceland. *International Journal of Mental Health and Addiction*, 9(3), 257–263.
- Petry, N., & Weinstock, J. (2007). Internet gambling is common in college students and associated with poor mental health. *The American Journal on Addictions*, 16, 325–330.
- Productivity Commission (2010). *Gambling*, Report no. 50, Canberra.
- Wardle, H., Moody, A., Griffiths, M., Orford, J., & Volberg, R. (2011). Defining the online gambler and patterns of behaviour integration: Evidence from the British Gambling Prevalence Survey 2010. *International Gambling Studies*, 11, 339–356.
- Welte, J. W., Barnes, G. M., Tidwell, O., & Hoffman, J. H. (2011). Gambling and problem gambling across the lifespan. *Journal of Gambling Studies*, 27, 49–61.
- Wilner-Reid, J., Smith, N., Bowden Jones, H., & MacLeod, A. (2012). Affective forecasting in problem gamblers. *International Gambling Studies*. doi:10.1080/14459795.2012.671841.
- Winters, K. C., Stinchfield, R. D., Botzet, A., & Slutske, W. S. (2005). Pathways of youth gambling problem severity. *Psychology of Addictive Behaviors*, 19, 104–107.
- Wood, R. T. A., Griffiths, M. D., & Parke, J. (2007). The acquisition and maintenance of online poker playing in a student sample. *CyberPsychology & Behavior*, 10, 354–361.