

PREVENTION OF PROBLEM GAMBLING: LESSONS LEARNED FROM TWO ALBERTA PROGRAMS

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ABSTRACT

The development of effective problem gambling prevention programs is in its infancy. The present paper discusses results of randomized control trials of two programs that have been implemented in Alberta, Canada. The first is a 10 session program delivered to several classes of university students taking Introductory Statistics. This program focused primarily on teaching the probabilities associated with gambling and included several hands-on demonstrations of typical casino table games. The second is a 5 session program delivered to high school students at several sites in southern Alberta. This program was more comprehensive, containing information and exercises on the nature of gambling and problem gambling, gambling fallacies, gambling odds, decision-making, coping skills, and social problem-solving skills. Data concerning gambling attitudes, gambling fallacies and gambling behaviour at 3 and 6-months post-intervention are presented. The findings of these studies are somewhat counter-intuitive and have important implications for the design of effective prevention programs.

Introduction

Gambling is an important and expanding economic growth industry. In Canada, net revenue from government-run lotteries, video lottery terminals, and casinos rose from \$2.7 billion in 1992 to \$11.3 billion in 2002 (Statistics Canada, 2003). Gambling is also a socially acceptable activity, with the large majority of Canadians reporting that they gamble at least occasionally (Azmier, 2000; Statistics Canada, 2003). It is not surprising to observe such high proportions of gamblers in light of the many gambling opportunities available to Canadians. Lotteries, instant-win tickets, sports betting (Sports Select), electronic gaming machines (video lottery terminals or slot machines), bingo and horse racing are available in every province. In addition, all provinces except New Brunswick, Newfoundland and Prince Edward Island have permanent casinos (Azmier, 2001).

The impact of the extensive availability, advertising and sanctioning of legalized gambling is of concern in the fields of public health and addictions. It is currently estimated that 4.0% of adults in North America meet criteria for problem or pathological gambling in the past year (Shaffer & Hall, 2001). Of even greater concern is the impact on the current generation of youth, as they are the first to have been raised

in an environment of extensive legalized and government-sanctioned gambling. An analogous situation may be the sudden wide availability and acceptability of illicit drug use in the late 1960s and 1970s, resulting in youth and young adults from this period having some of the highest prevalence rates of substance use since records have been kept. Indeed, there appears to be reason for concern. A meta-analysis of prevalence studies in the United States and Canada has found the prevalence of both clinical and sub-clinical disordered gambling to be highest among adolescents and young adults (Shaffer & Hall, 2001).

Efforts to prevent problem gambling have recently been undertaken. Across Canada, these efforts have largely been spearheaded by the provincial government agencies that provide treatment for substance abuse and problem gambling. Most of these agencies have developed ongoing 'awareness campaigns' consisting of 24 hour counselling hotlines; media promotion of responsible gambling; posters/pamphlets in gaming establishments letting people know about the signs of problem gambling and where to go for help; videos on problem gambling; and 1-2 hour presentations to high school classes or other interested groups.

As laudable as these efforts are, they are likely insufficient to significantly impact the incidence of problem gambling due to their short duration (i.e., 1-session presentations) and their primarily focus on increasing people's awareness and knowledge. While knowledge is a necessary antecedent to changing or preventing pathological behaviour, it is often not sufficient on its own (Williams & Gloster, 1999). A consistent finding in the field of primary prevention is that programs are fairly effective at changing people's knowledge, but much less effective at changing behaviour (Ammerman, Hersen et al., 1997; Durkal & Wells, 1997; Foxcroft et al., 1997; Franklin et al., 1997; Mazza, 1997; Rooney & Murray, 1996; Tobler, 1992). Prevention programs that tend to produce both knowledge and behavioural changes are usually ones that also repeatedly teach and rehearse specific skills relevant to the problem (e.g., peer-refusal skills for substance use) (Ellickson & Bell, 1990; Tobler, 1992).

There is a clear need for more intensive and extensive efforts. In recognition of this, a few jurisdictions have recently introduced more substantive gambling prevention programs into the schools. These include: "Don't Bet on It" in South Australia for ages 6 to 9; "Gambling, Minimising Health Risks" in Queensland for levels 5 and 6; "Facing the Odds" in Louisiana for grades 5 to 8; "Wanna Bet" in Minnesota for grades 3 to 8; "Count Me Out" in Quebec for ages 8 to 17; and "Gambling: A Stacked Deck" in Alberta for ages 13 to 18.

To date, however, there has been no published evaluation of these programs. In fact, the literature only contains one published evaluation of a gambling prevention program. Gaboury and Ladouceur (1993) evaluated a 3-session program in Quebec that was based on an alcohol prevention model. It covered an overview of gambling, discussion of legal issues, how the gambling industry manipulates the chances of winning, beliefs and myths about gambling, and the development of pathological gambling. A sample of 289 juniors and seniors from 5 high schools completed the program. Although the evaluation showed that the students did learn about gambling and coping skills, what they learned did not significantly influence their gambling attitudes or behaviour six months later.

A more recent study by Ferland, Ladouceur & Jacques (2000) also obtained mixed

results. This program targeted 1207 youths in grades 8, 9 and 10 in Quebec, with half receiving three “interactive meetings” and the other half acting as the control group. The program provided information on knowledge and misconceptions of gambling activities; social problem solving; and excessive gambling. Results at three months post-intervention indicated that the program produced a significant improvement in knowledge about gambling (e.g., “lottery is a gambling activity”) and decrease in gambling misconceptions. However, there was no improvement in social problem solving ability, a skill thought to be lacking in individuals at risk for problem gambling. The impact of the program on actual problem gambling behaviour is unknown, as this was not assessed.

In summary, very few school-based prevention programs exist, even fewer have been evaluated, and the two programs that have been evaluated have not obtained any meaningful behavioural change. Needless to say, it is essential that school-based programs be put in place and that these initiatives be rigorously evaluated. It is important to avoid the situation found in the substance abuse area, where the most commonly used (and entrenched) interventions tend to be the less effective ones (Miller et al., 1995; Tobler, 1992).

Alberta University Project

A natural fit for teaching critical thinking about gambling are Introductory Statistics courses where the fundamentals of probability and randomness are reviewed. We are aware of no research on the issue of whether superior knowledge of gambling probabilities has any impact on gambling attitudes or behaviour of college and university students. However, there are two literatures that would support this contention. The first is research demonstrating a positive impact of educating problem gamblers on the nature of randomness, true gambling probabilities, and the errors of thinking underlying gambling fallacies (e.g., Ladouceur, Sylvain, & Boutin, 2000; Ladouceur, Sylvain, Letarte et al., 1998; Sylvain, Ladouceur, & Boisvert, 1997). The second is research that shows statistically trained college students to be less susceptible to certain specific fallacies (Benassi & Knott, 1993), or to have improved risk assessment (Schoemaker, 1979), or better general reasoning skills for everyday problems (Fong, Krantz, & Nisbett, 1993; Kosonen & Winne, 1995; Nisbett, Krantz, Jepson, & Kunda, 1993).

It is true that college and university students have some of the highest rates of problem gambling (Shaffer & Hall, 2001), presumably because of their age and college/university culture. However, it is also true that individuals who eventually obtain post-secondary degrees tend to have significantly lower rates (NRC, 1999; Abbott & Volberg, 2000; Wynne, 1998; Gerstein et al., 1999) (cf. Productivity Commission, 1999). What this speaks to (in part) is the educational value of higher education, as there is good evidence that post-secondary education improves general critical thinking ability (e.g., Gray & Mill, 1991; Lehman, Lempert, & Nisbett, 1988; Pascarella, 1999; Prendergast, 1998; Tobacyk, 1984; Tsui, 1999). Thus, it is quite possible that college/university students are well primed to change their gambling behaviour in response to a concerted effort to inform them about the negative mathematical expectation of most games of chance.

Method

The sample consisted of 470 students from the University of Lethbridge, in Lethbridge, Alberta recruited between September 2001 and April 2003.

There are 5 sections of “Introduction to Probability and Statistics (1770)” taught at the University of Lethbridge. The sections taught by DC in September 2001, September 2002 and April 2003 served as the Intervention Group (n = 198). The two sections taught by JM and DK in September 2001 served as the Math Control Group (n = 134). An Introductory History class and an Introductory Sociology class served as the Non-Math Control Group (n = 138).

Introduction to Probability and Statistics is composed of 39 fifty-minute lectures and 13 fifty-minute labs. It covers descriptive statistics; graphical representation; probability; discrete and continuous random variables; expectation; binomial, normal and student’s t-distribution; large and small sample inference and estimation; and the central limit theorem. All of these topics are covered in both the Intervention and Math Control groups. The Intervention group differed from the Math Control group in the following respects:

- 5/10 probability lectures were devoted exclusively to the probabilities associated with gambling.
- 4/13 labs provided hands-on demonstrations of specific games of chance (roulette, craps, blackjack).
- There was an assigned supplemental text that dealt exclusively with gambling probabilities: “Can You Win” by Mike Orkin (1991).
- There was one lecture on the gambling fallacies that often underlie pathological gambling (e.g., Toneatto et al., 1997; Toneatto, 1999) delivered by RW.
- The questions on the mid-term and final exams reflected the greater emphasis given to gambling probabilities.

A 30 minute “Gambling Questionnaire (adult version)” was administered at the beginning of each course. Students were told the questionnaire was designed to assess their general gambling knowledge, attitudes and behaviour and that completion of the questionnaire was optional. The questionnaire collected demographic information as well as:

- Knowledge and ability to calculate gambling odds as assessed by the Gambling Odds Scale, a 10 item scale with excellent 1-month test-retest reliability, internal consistency, as well as excellent concurrent and predictive validity (Williams, 2003b).
- Gambling fallacies as measured by the Gambling Fallacies Scale, a 10 item scale measuring awareness of and resistance to common gambling fallacies (e.g., “to win at gambling you need to think positively”). It has very good 1-month test-retest reliability, good internal consistency, and very good concurrent and predictive validity (Williams, 2003b).
- Attitude toward gambling as measured by the Gambling Attitudes Scale. This is a 3 item scale that measures people’s belief about the morality of gambling and its harm versus benefit. It has good 1-month test-retest reliability as well as excellent concurrent and predictive validity (Williams, 2003b).

- Gambling behaviour in the past 6 months. Specifically, type of gambling engaged in, time spent gambling, and amount of money spent gambling.
- Problem Gambling as measured by the 9 item Canadian Problem Gambling Index (CPGI) (Ferris & Wynne, 2001).

The Gambling Questionnaire was readministered again, 6 months after the course had ended. E-mails were sent out to students offering \$15 for completion of the follow-up evaluation. Students were asked to come to a designated room to complete the questionnaire in person and given several options concerning time and day. Students who had not responded after four e-mail requests were sent the questionnaire on-line as an attachment and given the option of resubmitting it on-line.

Results

Virtually all students filled out the baseline questionnaire. Average age of the 470 students was 20.8 (SD = 3.6), and 55% were female. Racial/ethnic background was 89% European-Canadian; 9% Asian-Canadian; 1% Aboriginal; and 1% Other. Forty six percent of students were in their first year; 21% in second year; 27% in third year; 5% in fourth year, and 2% in their fifth year.

Seventy-six percent of students reported gambling in the 6 months prior to the course with the most common types of gambling being lotteries and instant win tickets (44%), and games of skill against other people (34%). Most students who gambled spent very little time and money doing so. The median time spent in the past 6 months was 1.5 hrs and the median amount of money spent was \$1. However, a significant minority gambled much more heavily, with 8.1% of students meeting criteria for moderate or severe problem gambling using the Canadian Problem Gambling Index (Ferris & Wynne, 2001).

Significant differences between the groups were obtained on several baseline variables: gender (fewer males in the NonMath Control group); ancestry (more Asian students in the Intervention Group relative to both other groups); university major (fewer science and management majors in the NonMath Control group); baseline fallacy score (higher in Intervention group relative to both other groups); percentage of gamblers (higher in the Intervention and Math Control groups relative to the NonMath Control group); percentage of problem gamblers (higher in the Intervention Group); and baseline time spent gambling (higher in the Intervention group relative to the NonMath Control groups). Some of these differences can be attributed to the fact that students interested in gambling started preferentially enrolling in the section of Introductory Statistics that contained the intervention. All of these variables were entered as covariates in subsequent ANCOVA analyses.

Seventy-four percent of students (348/470) filled out the follow-up questionnaire 6 months later. There were no statistically significant differences on baseline measures between those subjects who completed the 6-Month-Follow-up Questionnaire and those who were lost to follow-up.

SPSS mixed design ANCOVA was used to assess the effectiveness of the intervention on the following dependent variables: Gambling Math Skill; Awareness and Resistance

to Gambling Fallacies; Attitude toward Gambling; Time Spent Gambling; Money Spent Gambling; and average CPGI score. Group was the between-subjects variable (Intervention, Math Control, Non Math Control) and Time was the within-subjects variable (Baseline, 6-Month Follow-up). A McNemar test also evaluated whether the proportion of individuals who did not gamble at all and the proportion of problem gamblers changed from baseline to follow-up in any of the three groups.

Gambling Math Skill

A statistically significant Group x Time interaction was obtained, $F(2, 330) = 30.3, p < 0.001$. Post-hoc t-tests revealed a significant increase in ability to calculate gambling-related odds from baseline to posttest in the Intervention group. Figure 1 shows the changes from baseline to follow-up in each of the three groups.

Awareness and Resistance to Gambling Fallacies

A statistically significant Group x Time interaction was obtained, $F(2, 330) = 28.6, p < 0.001$. Post-hoc t-tests revealed a significant increase in awareness and resistance to gambling fallacies from baseline to posttest in the Intervention group. Figure 2 shows the changes from baseline to follow-up in each of the three groups.

Attitude Towards Gambling

There was no significant Group x Time interaction. Figure 3 shows the changes from baseline to follow-up in each of the three groups.

Time Spent Gambling

There was no significant Group x Time interaction. Figure 4 shows the changes from baseline to follow-up in each of the three groups.

Money Spent Gambling

There were no significant Group x Time interaction. Figure 5 shows the changes from baseline to follow-up in each of the three groups.

Average CPGI scores

There was no significant Group x Time interaction. Figure 6 shows the changes from baseline to follow-up in each of the three groups.

Proportion of Gamblers and Problem Gamblers

A McNemar test evaluated whether the proportion of individuals who did not gamble at all in the past 6 months changed in any of the three groups from baseline to follow-up. There were no significant changes in any of the three groups. Similarly, there was no significant change in the proportion of problem gamblers in any of the three groups from baseline to follow-up (Twelve percent of students in the Intervention Group were problem gamblers at baseline and 14% were problem gamblers at follow-up).

Predictors of Gambling Behaviour in the Intervention Group at Follow-Up

An SPSS multiple regression was performed with time spent gambling as the dependent

variable and gender, age, ancestry, university year, university major, attitude, fallacies, gambling math skill, and the grade they received in the course as the independent variables. Entry of the independent variables was simultaneous. Three variables contributed significantly to prediction of the time spent gambling: positive attitude toward gambling ($\underline{sr}_i^2 = .46$), being a kinesiology major ($\underline{sr}_i^2 = .19$), and male gender ($\underline{sr}_i^2 = .17$). Altogether, 36% of the variability in time spent gambling was predicted by knowing the scores on all independent variables (R squared).

The same analysis was used to investigate factors related to money spent gambling at follow-up. Three variables contributed significantly to prediction of the money spent gambling: positive attitude toward gambling ($\underline{sr}_i^2 = .22$), Asian ancestry ($\underline{sr}_i^2 = .24$), and obtaining a higher grade in the course ($\underline{sr}_i^2 = .16$). Altogether, 11% of the variability in money spent gambling was predicted by knowing the scores on all independent variables.

The same analysis was used to investigate factors related to CPGI score at follow-up. Three variables contributed significantly to prediction of the CPGI score: positive attitude toward gambling ($\underline{sr}_i^2 = .37$), Asian ancestry ($\underline{sr}_i^2 = .31$), and being a kinesiology major ($\underline{sr}_i^2 = .16$). Altogether, 33% of the variability in CPGI scores was predicted by knowing the scores on all independent variables.

Discussion

The present study implemented a substantial intervention designed to improve knowledge of true gambling odds, the impossibility of winning in the long run, and the errors in thinking that underlie gambling fallacies. As expected, this intervention proved very effective in significantly improving student's ability to calculate gambling odds as well as awareness of and resistance to gambling fallacies. It is interesting to note that these changes only occurred in Statistics classes that received gambling-specific instruction on probabilities. Statistics classes that received generic information on probability theory did not have an improvement in their ability to calculate gambling-specific odds.

However, the true purpose of this intervention was to examine the impact this improved knowledge and skill had on actual gambling behaviour. The presumption was that if students thoroughly understood the negative mathematical expectation of gambling games they would gamble less. Unexpectedly, this proved not to be the case. Students receiving the intervention had no significant decrease in their likelihood of gambling, their likelihood of being a problem gambler, the amount of time they spent gambling, or the amount of money they spent gambling. There was also no significant change in their attitude toward gambling.

To be fair, dramatic decreases in gambling behaviour were not necessarily anticipated, as the intervention was not overtly advocating abstinence. Also, the large majority of students were gambling at non problem levels prior to the intervention and continued to do so after the intervention. A truer test might be whether students receiving the intervention have a lower future incidence of problem gambling. However, the total absence of behavioural change is not very encouraging. Furthermore, the general

absence of correlation between gambling math skill and gambling behaviour at follow-up (and, indeed, the positive correlation between the student's final course grade and the amount of money they spent gambling) provides further evidence that knowledge about gambling odds has a very weak relationship with gambling behaviour.

In retrospect, it may be that teaching people about gambling odds is analogous to telling smokers about the harmful effects of smoking or alcoholics about the harmful effects of drinking. Individuals involved in these behaviours are typically already aware of these facts. Furthermore, this knowledge is usually insufficient in and of itself to change the behaviour (e.g., Williams & Gloster, 1999). As seen in the present study, knowledge does not differentiate abusers from nonabusers as much as attitude toward the behaviour, cultural background, gender, and so forth.

In closing, it should be noted that we are not the first ones to have made this mistake. When the mathematical underpinnings of probability theory were developed in the late 17th and early 18th century many scientists and social reformers presumed that 'mathematicians might cure the reckless of their passion for cards and dice with a strong dose of calculation' (Defoe, 1719). However, not only did this not occur, but it took hundreds of years before the new mathematics influenced how lotteries, annuities, or life insurance odds were calculated (Gigerenzer et al., 1989). More recently, the earliest substance abuse prevention programs were based primarily on promoting people's knowledge of the dangerous long-term effects of drugs and alcohol. These were ineffective. It was only when people accepted the failure of this approach that truly effective programs teaching specific skills relevant to the problem (peer-refusal skills for substance use) were developed (CAMH, 1999; Ellickson & Bell, 1990; Tobler, 1992).

Alberta High School Project

University and college students have the highest rates of problem gambling in the general populace (Shaffer & Hall, 2001). Thus, from a primary prevention perspective, it would seem that prevention efforts should be directed at younger ages, as prevention programs are believed to be most effective when they begin prior to the onset of the behaviour. This was the rationale for the development and implementation of a high school problem gambling prevention program.

Method

The program is called "Gambling: A Stacked Deck". The nature and content of the program was derived from existing programs and a careful study of what was known to be effective in primary prevention (Capuzzi et al., 2000; Durkal & Wells, 1997; Lipsey & Wilson, 1993; Mullen et al., 1997; Weissberg & Gullotta, 1997). As much as possible, there was also incorporation of what was known about effective educational strategies in the schools (e.g., Borich, 1995; Elliot et al., 1999; Hunt et al., 1999). The end result was a program containing the following elements:

- *Information concerning the nature of gambling and problem gambling* (house advantage for all games, actual odds for certain games, prevalence of problem gambling, signs and symptoms of problem gambling, factors that contribute to the

development of problem gambling, consequences of problem gambling, where to get help).

- *Exercises to make students less susceptible to the cognitive errors* that often underlie gambling fallacies (e.g., illusory beliefs of control, beliefs of superior predictive power, misunderstandings of randomness, selective memory for events, denial of their gambling situation, and superstitious beliefs/conditioning).
- *Teaching and rehearsal of generic decision-making and social problem-solving skills.* Problem gambling appears to be part of an inter-related set of high risk/problem behaviours (Dickson, Derevensky & Gupta, 2002). Thus, activities directed at improving these generic skills should have a positive impact on preventing problem gambling.
- *Teaching and rehearsal of adaptive coping skills.* Gambling serves a function for many problem gamblers as evidenced by its strong association with substance abuse, depression, impulsivity, risk-taking, and the tendency to dissociate during gambling (e.g., Crockford & el-Guebaly, 1998; NRC, 1999; Gupta & Derevensky, 1998b). Training alternate methods of dealing with problems was included so as to decrease the tendency to resort to gambling as an escape.

The format of the program was as important as the content. Important elements of the format included:

- *An entertaining and engaging delivery.* There was a strong reliance on visual elements (e.g., video on problem gambling) and all lessons were presented via PowerPoint. All lessons were highly interactive requiring the active participation of all students in group discussions, games, and small group exercises.
- *A strong emphasis on skill learning and application of knowledge.* Changing behaviour continues to be the most difficult task of gambling prevention programs. The potential to actually produce behavioural change is enhanced when the knowledge learned is put into practise and corrective feedback provided.
- *A 5 consecutive session program, with each session lasting 75-100 minutes.* Knowledge and skills are almost always better learned and retained with additional practice.
- *A program that also targeted the social environment of the people receiving the intervention.* The impact of individual skill development is limited unless there are also environmental changes that decrease the opportunities, acceptability, and pressure to participate in gambling activities. This is especially true of the more socially oriented types of gambling engaged in by adolescents. At some sites this was accomplished by ensuring every grade 10 or grade 11 student in the school received the program, as the primary peer group of grade 10/11 students are other grade 10/11 students in the same school. In addition, several posters were placed throughout the hallways of this school to raise awareness of problem gambling. The greater effectiveness of these more pervasive approaches has been demonstrated both in primary prevention (Durlak & Wells, 1997; Ellickson & Bell, 1990; Tobler, 1992) and in the treatment of addictive behaviours (e.g., community reinforcement approach, Miller et al., 1995).

The program has been implemented in 6 different school districts and 12 different high schools in southern Alberta from January 2003 to the present time. At least one school in each school district served as a Control School. By June 2004, 1500 grade 9-12

students will have participated (approximately 1000 in the Intervention Group and 500 in the Control Group). The program is offered in the Career and Life Management class in the senior grades and Health classes in grade 9. Comparisons between the Intervention and Control Schools occur at baseline and 3-months following the end of the intervention.

A 30 minute “Gambling Questionnaire (adolescent version)” is administered at the beginning of each course. Students are told the questionnaire is designed to assess their general gambling knowledge, attitudes and behaviour and that completion of the questionnaire is optional. The questionnaire is anonymous. It collected and assessed demographic information as well as:

- Knowledge of gambling and problem gambling as assessed by the Gambling Knowledge Scale, a 10 item scale measuring knowledge of gambling and problem gambling. It has very good 1-month test-retest reliability, internal consistency, as well as excellent concurrent and predictive validity (Williams, 2003a).
- Gambling fallacies as measured by the Gambling Fallacies Scale (adolescent version), a 10 item scale measuring awareness of and resistance to common gambling fallacies (e.g., “to win at gambling you need to think positively”). It has good 1-month test-retest reliability, internal consistency, and concurrent and predictive validity (Williams, 2003a).
- Attitude toward gambling as measured by the Gambling Attitudes Scale (adolescent version). This is a 2 item scale that measures an adolescent’s belief about the morality of gambling and its harm versus benefit. It has very good 1-month test-retest reliability as well as concurrent and predictive validity (Williams, 2003a).
- Decision-making and problem-solving skill, as measured by an 8 item Decision-Making & Problem-Solving Scale that asks for a self and third-party assessment of their decision-making success in the past 3 months. Preliminary work suggests this scale had good reliability and validity.
- High risk behaviour, as measured by a 9 item High Risk Behaviour Scale that asks about involvement in various high-risk activities in the past 3 months (e.g., substance use, unsafe sex, illegal behaviour, truancy, etc.).
- Gambling behaviour in the past 3 months. Specifically, type of gambling engaged in, time spent gambling, and amount of money spent gambling.
- Problem Gambling as measured by the DSM-IV-Multiple Response-Juvenile (Fisher, 2000).

The Gambling Questionnaire was readministered again, 3 months after the final lesson. In some schools the questionnaire was readministered in the same classroom. In other schools the questionnaire was administered over a 1-week period whenever students had a spare class. Each student was offered \$10 for completion of the follow-up evaluation. Follow-up questionnaires were matched to baseline questionnaires using birth date, gender, last 4 digits of their telephone number, and mother’s first name. There has been an 89% response rate at 3-month follow-up for the 578 students that have been followed so far.

Preliminary Results

To date, data is available for 306 students in the Intervention schools and 272 students in the Control schools. Eighty five percent of the sample was enrolled in either grade 10 or grade 11. The average age was 16.2 and 53% were male. Approximately 52% of the sample had gambled at least once in the past three months and 3.5% of the sample met DSM-IV-MR-J criteria for problem gambling. There were no statistically significant differences in the average grade, age, or gender of the two groups at baseline.

SPSS repeated measures ANOVA was used to assess the effectiveness of the intervention. A separate Group (Intervention, Control) x Time (Baseline, 3-Month Follow-up) analysis was performed on each of the following dependent variables: Knowledge of Gambling & Problem Gambling; Awareness and Resistance to Gambling Fallacies; Attitude toward Gambling; Decision Making Skill; Involvement in High-Risk Behaviour; Time Spent Gambling; and Money Spent Gambling. A McNemar test also evaluated whether the proportion of individuals who did not gamble at all and the proportion of problem gamblers changed from baseline to follow-up in either group.

Knowledge of Gambling & Problem Gambling

A statistically significant Group x Time interaction was obtained, $F(1, 548) = 38.5, p < 0.001$, indicating a significant increase in knowledge from baseline to follow-up in the Intervention group. Figure 7 shows the changes from baseline to follow-up in both groups.

Awareness and Resistance to Gambling Fallacies

A statistically significant Group x Time interaction was obtained, $F(1, 548) = 22.3, p < 0.001$, indicating a significant increase in awareness and resistance to gambling fallacies from baseline to follow-up in the Intervention group. Figure 8 shows the changes from baseline to follow-up in both groups.

Attitude Towards Gambling

A statistically significant Group x Time interaction was obtained, $F(1, 548) = 12.3, p < 0.001$, indicating a significantly more negative attitude toward gambling occurred from baseline to follow-up in the Intervention group. Figure 9 shows the changes from baseline to follow-up in both groups.

Decision & Problem-Solving Skill

No statistically significant Group x Time interaction was obtained. Figure 10 shows the changes from baseline to follow-up in both groups.

Involvement in High-Risk Behaviour

No statistically significant Group x Time interaction was obtained. Figure 11 shows the changes from baseline to follow-up in both groups.

Time Spent Gambling

A statistically significant Group x Time interaction was obtained, $F(1, 548) = 15.8$, $p < 0.001$, indicating a significant decrease in time spent gambling from baseline to follow-up in the Intervention group. Figure 12 shows the changes from baseline to follow-up in both groups.

Money Spent Gambling

A statistically significant Group x Time interaction was obtained, $F(1, 548) = 9.5$, $p < 0.01$, indicating a significant decrease in money spent gambling from baseline to follow-up in the Intervention group. Figure 13 shows the changes from baseline to follow-up in both groups.

Proportion of Gamblers and Problem Gamblers

A McNemar test evaluated whether the proportion of adolescents who did not gamble at all in the past 3 months changed in any of the three groups from baseline to follow-up. There was a significant decrease in the Intervention group, but not the Control group. There was no significant change in the proportion of problem gamblers in either group from baseline to follow-up.

Predictors of Decreases in Gambling Behaviour

An SPSS multiple regression was performed with change in time spent gambling from baseline to follow-up as the dependent variable. The independent variables were gender, age, grade, baseline knowledge, change in knowledge, baseline attitude, change in attitude, baseline fallacies, change in baseline fallacies, baseline decision making skill, change in decision making skill, baseline involvement in high risk behaviour, and change in involvement in high risk behaviour. Entry of the independent variables was simultaneous. Three variables contributed significantly to prediction of decreases in time spent gambling: a negative change in attitude toward gambling ($\underline{sr}_i^2 = .56$), an increase in knowledge about gambling and problem gambling ($\underline{sr}_i^2 = .22$), and an increased awareness of and resistance to gambling fallacies ($\underline{sr}_i^2 = .11$). Altogether, 25% of the variability in change in time spent gambling was predicted by knowing the scores on all independent variables (R squared).

The same analysis was used to investigate factors related to change in money spent gambling from baseline to follow-up. The same three variables contributed significantly to prediction of decreases in time spent gambling: a negative change in attitude toward gambling ($\underline{sr}_i^2 = .42$), an increase in knowledge about gambling and problem gambling ($\underline{sr}_i^2 = .28$), and an increased awareness of and resistance to gambling fallacies ($\underline{sr}_i^2 = .21$). Altogether, 29% of the variability in change in money spent gambling was predicted by knowing the scores on all independent variables (R squared).

Discussion

The present study implemented a substantial intervention designed to improve student's knowledge of gambling and problem gambling, the errors in thinking that underlie gambling fallacies, generic decision and problem-solving skills, and general coping skills. As expected, this intervention proved very effective in significantly improving

student's knowledge of gambling and problem gambling as well their awareness of and resistance to gambling fallacies. Unexpectedly, there was no apparent improvement in decision-making or coping skills.

The true purpose of this intervention was to examine the impact this improved knowledge and skill had on actual gambling behaviour. Unlike the university project, the type of knowledge and skill acquired in this intervention *did* translate into significantly less gambling behaviour. Students receiving the intervention had a significant decrease in their likelihood of gambling, the amount of time they spent gambling, and the amount of money they spent gambling. There was no significance decrease in their likelihood of being a problem gambler. Of importance, there was also a significantly more negative shift in their attitude toward gambling.

Here again, dramatic decreases in gambling behaviour were not necessarily anticipated, as the intervention was not overtly advocating abstinence. Also, the large majority of students were gambling at non problem levels prior to the intervention and continued to do so after the intervention. The truest test concerns whether students receiving the intervention have a lower future incidence of problem gambling. However, the marked decrease in overall gambling behaviour is very encouraging.

Conclusion

There are important differences between the university and high school initiatives that must be taken into account. One is the difference in ages (21 versus 16), another is length of the follow-up (6 versus 3 months), and another is the higher level of baseline gambling in the university students. It must also be recognized that results of the high school project may change once the other two-thirds of the data has been collected. Nonetheless, it seems plausible that the failure of the university initiative and the apparent success of the high school initiative is at least partly due to differences in the nature of the intervention. Indeed, it was the surprising failure of the university initiative that caused us to more thoroughly examine the prevention literature and to more carefully shape the high school intervention.

If there are lessons to be learned from these two initiatives, they are the following:

- Teaching people about gambling odds is perhaps not that important in the prevention of problem gambling, and should never be used as the sole intervention.
- Developing a more negative attitude toward gambling is the variable that most strongly predicts decreased gambling behaviour.
- Improving people's knowledge about problem gambling appears to be important and is perhaps a mechanism by which attitudes change.
- Teaching people about the cognitive errors underlying gambling fallacies appears to be important for some people in changing their gambling behaviour.
- Trying to improve generic decision making, problem solving, and coping skills is very difficult to do and is not necessarily needed to decrease gambling behaviour (in non problem gamblers).

References

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- Abbott, M.W. & Volberg, R.A. (2000). *Taking the Pulse on Gambling and Problem Gambling in New Zealand: A Report on Phase One of the 1999 National Prevalence Survey. June 2000*. New Zealand: Department of Internal Affairs, Government of New Zealand.
- Ammerman, R.T., Hersen, M., et al. (1997). *Handbook of Prevention and Treatment with Children and Adolescents: Intervention in the Real World Context*. New York, NY: Wiley.
- Azmier, J.J. (2000). Canadian Gambling Behaviour and Attitudes. *Gambling in Canada Research Report No. 8*. Public Opinion Gambling Survey conducted for Canada West Foundation, Calgary, Alberta, Canada.
- Azmier, J. 2001. *Gambling in Canada 2001: An Overview*. Calgary, Alberta: Canada West Foundation.
- Benassi, V.A. & Knoth, R.L. (1993). The intractable conjunction fallacy: Statistical sophistication, instructional set, and training. *Journal of Social Behavior & Personality*, 8, 83-96.
- Borich, G.D. (1995). *Effective Teaching Methods (3rd ed.)*. Prentice-Hall.
- CAHM (1999). *Alcohol and Drug Prevention Programs for Youth: What Works? Best Advice Paper*, Centre for Addiction and Mental Health. Toronto, Canada.
- Capuzzi, D., Gross, D.R., et al. (2000). *Youth risk: A Prevention Resource for Counselors, Teachers, and Parents (3rd ed.)*. Alexandria, VA: American Counseling Association.
- Crockford, D.N., & el-Guebaly, N. (1998). Psychiatric comorbidity in pathological gambling: a critical review. *Canadian Journal of Psychiatry*, 43, 43-50.
- Defoe, Daniel (1719). *The Gamester: A Benefit-Ticket for all that are Concern'd in the Lotteries*. London: J. Roberts.
- Dickson, L. M., Derevensky, J. L., & Gupta, R. (2002). The prevention of gambling problems in youth: A conceptual framework. *Journal of Gambling Studies*, 18, 97-159.
- Durlak, J.A., & Wells, A.M. (1997). Primary prevention mental health programs for children and adolescents: A meta-analytic review. *American Journal of Community Psychology*, 25, 115-152.
- Ellickson, P.L., & Bell, R.M. (1990). Drug prevention in junior high: A multi-site longitudinal test. *Science*, 247, 1299-1305.
- Elliot, S.N., Kratochwill, T.R., & Cook, J.L. (1999). *Educational Psychology: Effective Teaching, Effective Learning, 3rd ed.* McGraw Hill College Division.
- Ferland, F., Ladouceur, R., & Jacques, C. (2000). *Evaluation of a gambling prevention program for youths*. Paper presented at the 11th International Conference on Gambling and Risk-Taking, Las Vegas, June.
- Ferris, J. & Wynne, H. (2001). *The Canadian Problem Gambling Index: Final Report*. Submitted for the Canadian Centre on Substance Abuse. February 19, 2001.
- Fisher, S. (2000). Developing the DSM-IV criteria to identify adolescent problem gambling in non-clinical populations. *Journal of Gambling Studies*, 16, 253-273.
- Fong, G.T., Krantz, D.H., & Nisbett, R.E. (1993). The effects of statistical training on thinking about everyday problems. In R.E. Nisbett et al. (eds.), *Rules for reasoning* (pp. 91-135). Hillsdale, NJ: Erlbaum.
- Foxcroft, D.R., Lister-Sharp, D., & Lowe, G. (1997). Alcohol misuse prevention for young people: A systematic review reveals methodological concerns and lack of reliable evidence of effectiveness. *Addiction*, 92, 531-537.
- Franklin, C., Grant, D., Corcoran, J., Miller, P., Bultman, L. (1997). Effectiveness of prevention programs for adolescent pregnancy: A meta-analysis. *Journal of Marriage &*

the Family, 59, 551-567.

Gaboury, A., & Ladouceur, R. (1993). Evaluation of a prevention program for pathological gambling among adolescents. *Journal of Primary Prevention, 14*, 21-28.

Gerstein, D., Volberg, R.A., Murphy, S., Toce, M., et al. (1999). *Gambling impact and behavior study*. Report to the National Gambling Impact Study Commission. Chicago: National Opinion Research Center at the University of Chicago.

Gigerenzer, G., Swijtink, Z., Porter, T., Daston, L., Beatty, J. & Kruger, L. (1989). *The empire of chance: How probability changed science and everyday life*. Cambridge: Cambridge University Press.

Gray, T. & Mill, D. (1991). Critical abilities, graduate education, and belief in unsubstantiated phenomena. *Canadian Journal of Behavioural Science, 22*, 162-172.

Gupta, R., & Derevensky, J.L. (1998b). Adolescent gambling behavior: A prevalence study and examination of the correlates associated with problem gambling. *Journal of Gambling Studies, 14*, 319-345.

Hunt, G.H., Touzel, T.J., & Wiseman, D. (1999). *Effective Teaching: Preparation and Implementation 3rd ed.* Charles C. Thomas Pub Ltd.

Kosonen, P. & Winne, P.H. (1995). Effects of teaching statistical laws on reasoning about everyday problems. *Journal of Educational Psychology, 87*, 33-46.

Ladouceur, R., Sylvain, C., & Boutin, C. (2000). Pathological Gambling. In M. Hersen, M. Biaggio et al. (eds), *Effective Brief Therapies: A Clinician's Guide* (pp. 303-318). San Diego, CA, US: Academic Press.

Ladouceur, R., Sylvain, C., Letarte, H., Giroux, I., & Jacques, C. (1998). Cognitive treatment of pathological gamblers. *Behaviour Research & Therapy, 36*, 1111-1119.

Lehman, D.R., Lempert, R.O., & Nisbett, R.E. (1988). The effects of graduate training on reasoning: Formal discipline and thinking about everyday-life events. *American Psychologist, 43*, 431-442.

Lipsey, M.W., & Wilson, D.B. (1993). The efficacy of psychological, education and behavioral treatment: Confirmation from meta-analysis. *American Psychologist, 48*, 1181-1209.

Mazza, J.J. (1997). Group-based suicide prevention programs: Are they effective? *Group Psychology Review, 26*, 382-396.

Miller, W.R., Brown, J.M., Simpson, T.L., Handmaker, N.S., Bien, T.H., Luckie, L.F., Montgomery, H.A., Hester, R.K., & Tonigan, J.S. (1995). What works? A methodological analysis of the alcohol treatment outcome literature. In R.K. Hester & W.R. Miller (eds.), *Handbook of alcoholism treatment approaches* (2nd ed), (pp 12-44). MA: Allyn & Bacon.

Mullen P.D., Simons-Morton, D.G., Ramirez, G., et al. (1997). A meta-analysis of trials evaluating patient education and counseling for three groups of preventative health behaviors. *Patient Educ Couns, 32*, 157-73.

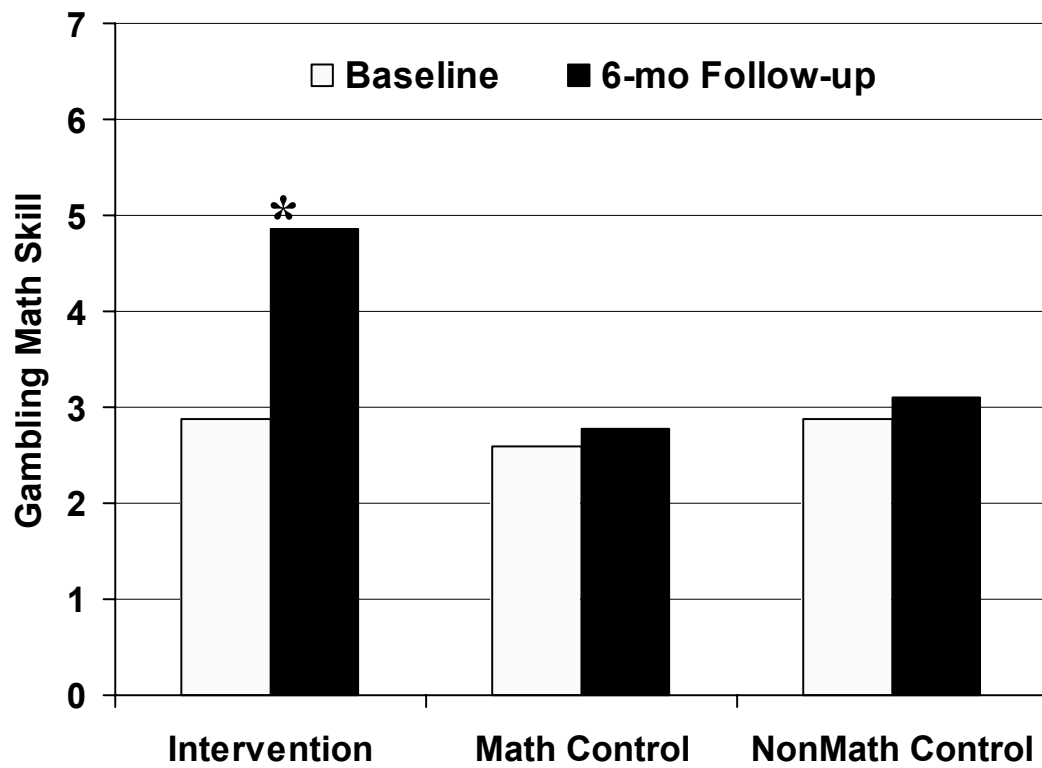
National Research Council (1999). *Pathological Gambling: A Critical Review*. Committee on the Social and Economic Impact of Pathological Gambling, Committee on Law and Justice, Commission on Behavioral and Social Sciences and Education, and the National Research Council. Washington, D.C.: National Academy Press.

Nisbett, R.E., Krantz, D.H., Jepson, C., Kunda, Z. (1993). The use of statistical heuristics in everyday inductive reasoning. In R.E. Nisbett et al. (eds.), *Rules for reasoning* (pp. 15-54). Hillsdale, NJ: Erlbaum.

Orkin, M. (1991). *Can You Win?: The Real Odds for Casino Gambling, Sports Betting, and Lotteries*. W.H. Freeman.

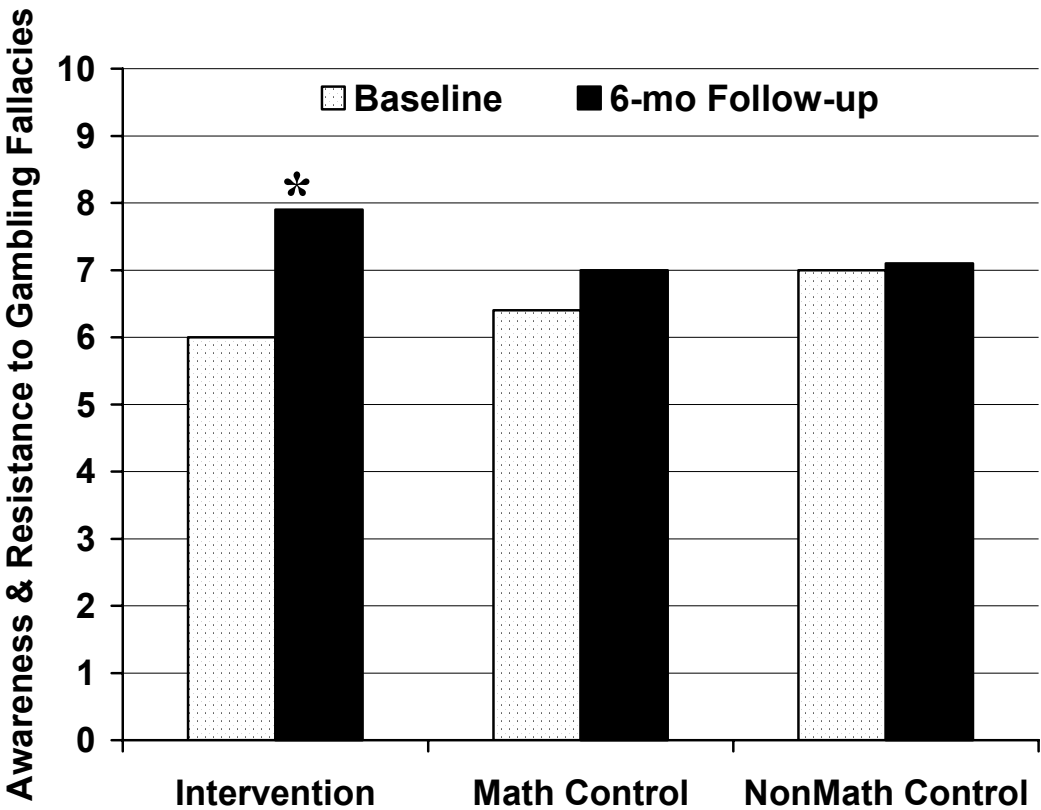
- Pascarella, E.T. (1999). The development of critical thinking: Does college make a difference? *Journal of College Student Development*, 40, 562-569.
- Prendergast, D.L. (1998). Influences of college environments and the development of critical thinking skills in college students. *Dissertation Abstracts International*, 59 (4-A), 1094.
- Productivity Commission (1999). *Australia's Gambling Industries*, Report No. 10, AusInfo, Canberra.
- Rooney, B.L., & Murray, D.M. (1996). A meta-analysis of smoking prevention programs after adjustment for errors in the unit of analysis. *Health Education Quarterly*, 23, 48-64.
- Schoemaker, P.J. (1979). The role of statistical knowledge in gambling decisions: Movement versus risk dimension approaches. *Organizational Behavior and Human Decision Processes*, 24, 1-17.
- Shaffer, H. J., & Hall, M. N. (2001). Updating and refining meta-analytic prevalence estimates of disordered gambling behavior in the United States and Canada. *Canadian Journal of Public Health*, 92, 168-172.
- Statistics Canada. 2003. "Fact-sheet on gambling", *Perspectives on Labour and Income* 4(4): 1-5.
- Sylvain, C., Ladouceur, R., & Boisvert, J-M. (1997). Cognitive and behavioural treatment of pathological gambling: A controlled study. *Journal of Consulting & Clinical Psychology*, 65, 727-732.
- Tobacyk, J. (1984). Paranormal belief and college grade point average. *Psychological Reports*, 54, 217-218.
- Tobler, N.S. (1992). *Meta-Analysis of Adolescent Drug Prevention Programs: Final Report*. Rockville, Md: National Institute on Drug Abuse.
- Toneatto, T. (1999). Cognitive psychopathology of problem gambling. *Substance Use & Misuse*, 34, 1593-1604.
- Toneatto, T., Blitz-Miller, T., Calderwood, K., Dragonetti, R., & Tsanos, A. (1997). Cognitive distortions in heavy gambling. *Journal of Gambling Studies*, 13, 253-266.
- Tsui, L. (1999). Fostering critical thinking in college students: A mixed-methods study of influences inside and outside of the classroom. *Dissertation Abstracts International*, A (Humanities & Social Sciences), 60 (1-A), 0081.
- Weissberg, R.P. & Gullotta, T.P. (1997). *Healthy Children 2010: Enhancing Children's Wellness. Issues in Children's and Families' Lives, Vol 8*. Thousand Oaks, Ca: Sage.
- Williams, R.J. (2003a). Reliability and validity of four adolescent scales to assess gambling attitudes, gambling knowledge, gambling fallacies and ability to calculate gambling odds. *Unpublished technical report*. Lethbridge, Alberta. Available from author.
- Williams, R.J. (2003b). Reliability and validity of four adult scales to assess gambling attitudes, gambling knowledge, gambling fallacies and ability to calculate gambling odds. *Unpublished technical report*. Lethbridge, Alberta. Available from author.
- Williams, R.J. and Gloster, S.P. (1999). Knowledge of Fetal Alcohol Syndrome in northern Manitoba Cree. *Journal of Studies on Alcohol*, 60, 833-837.
- Wynne (1998). *Adult Gambling and Problem Gambling in Alberta, 1998*. Report to the Alberta Alcohol and Drug Abuse Commission. Government of Alberta.

Figure 1. Changes in gambling math skill from baseline to 6 month follow-up (university students).



* $p < .05$

Figure 2. Changes in awareness and resistance to gambling fallacies from baseline to 6 month follow-up (university students).



* $p < .05$

Figure 3. Changes in gambling attitude from baseline to 6 month follow-up (university students).

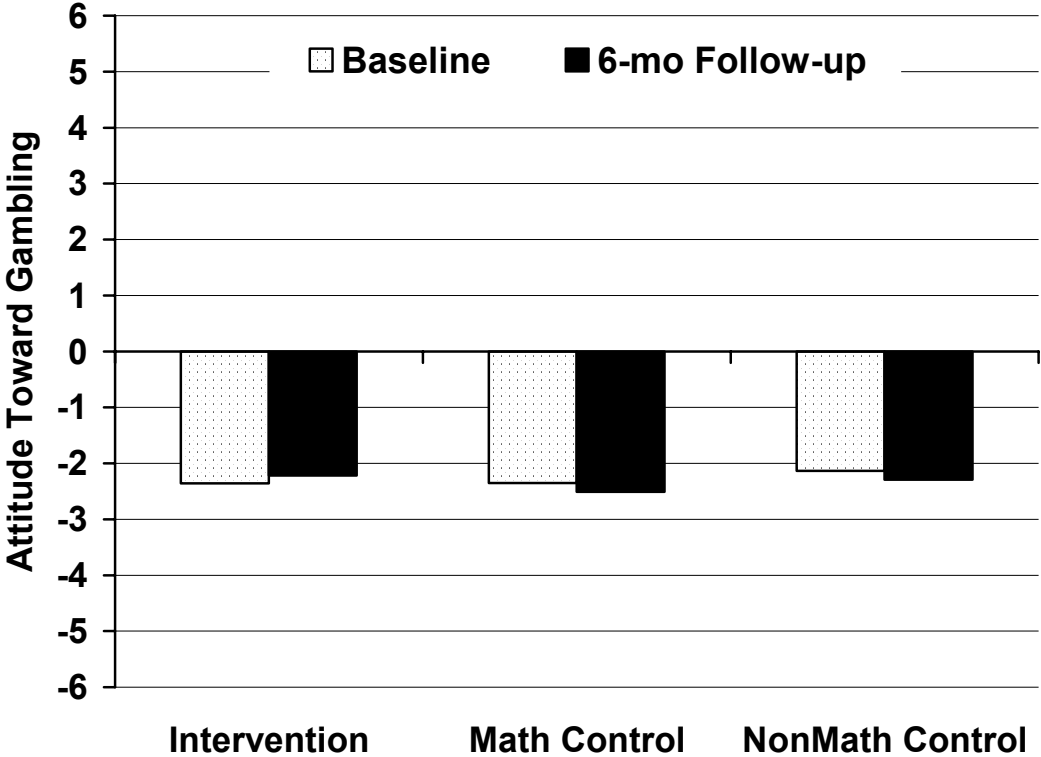


Figure 4. Changes in gambling time (logarithmic) from baseline to 6 month follow-up (university students).

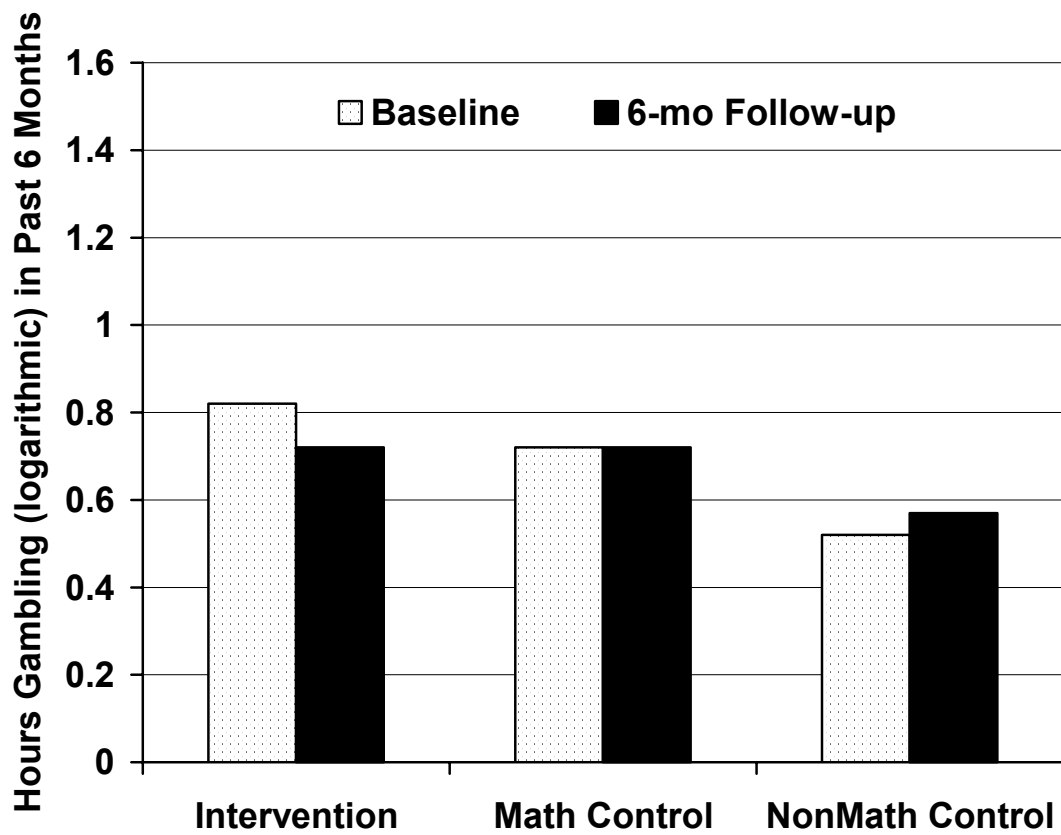


Figure 5. Changes in money lost gambling (logarithmic) from baseline to 6 month follow-up (university students).

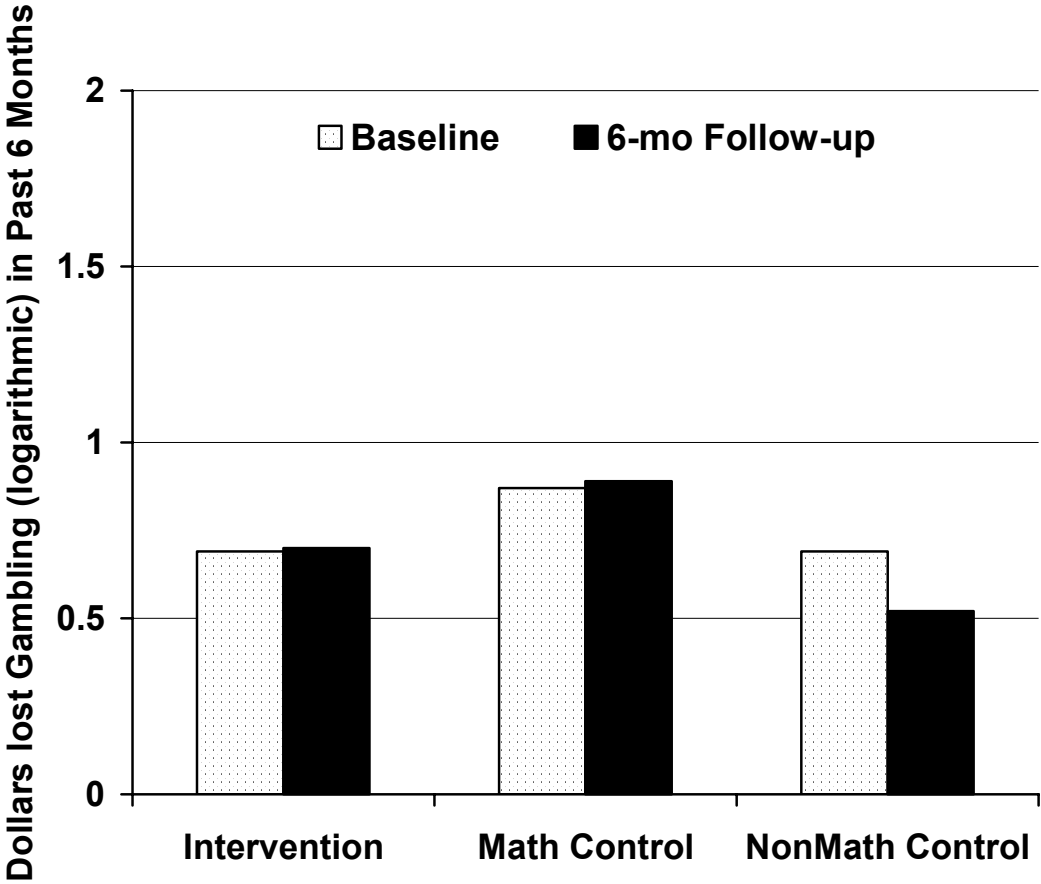


Figure 6. Changes in average CPGI scores from baseline to 6 month follow-up (university students).

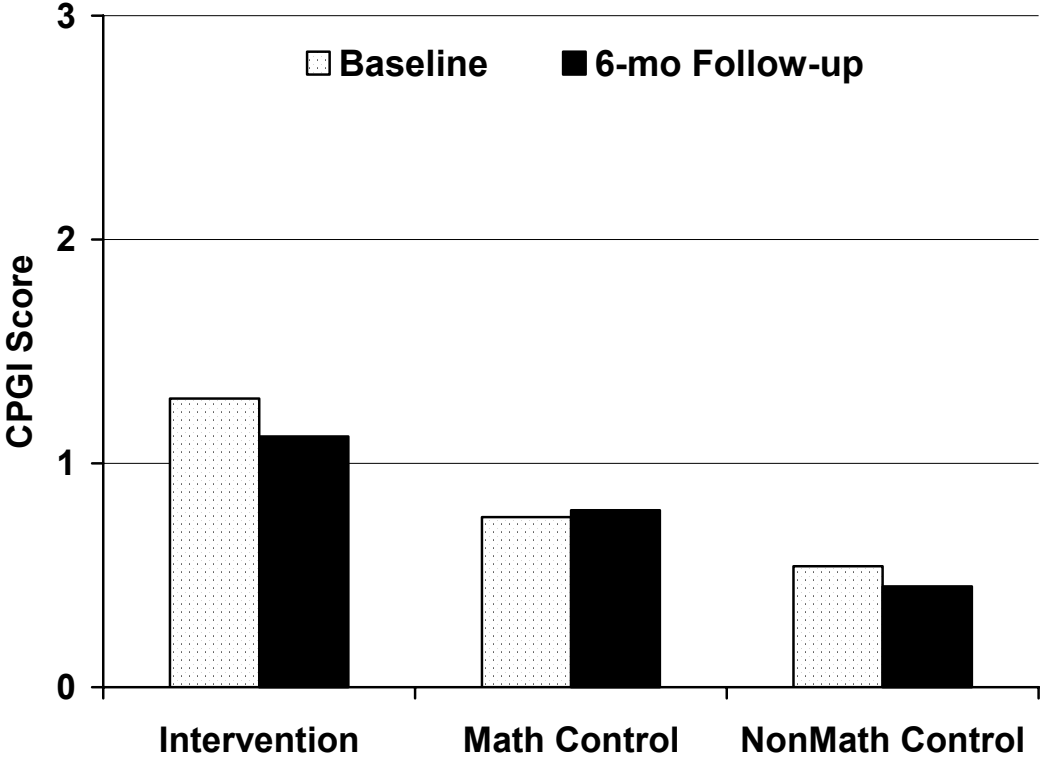
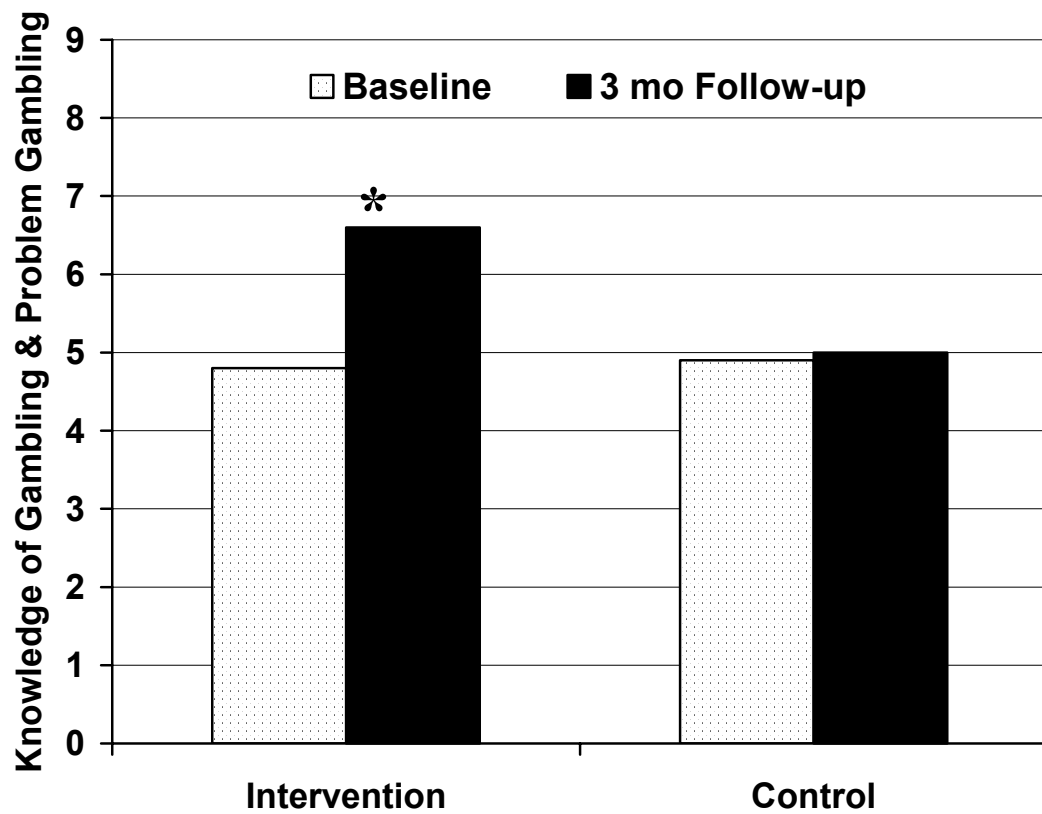
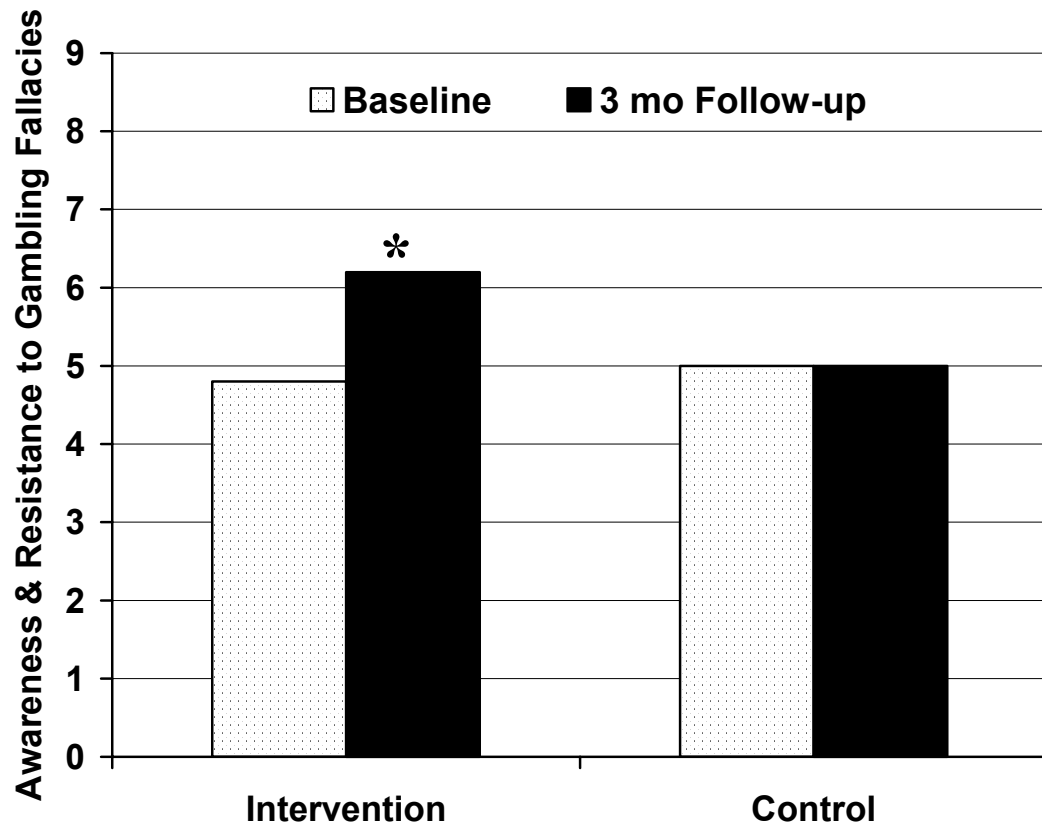


Figure 7. Changes in gambling knowledge scores from baseline to 3 month follow-up (high school students).



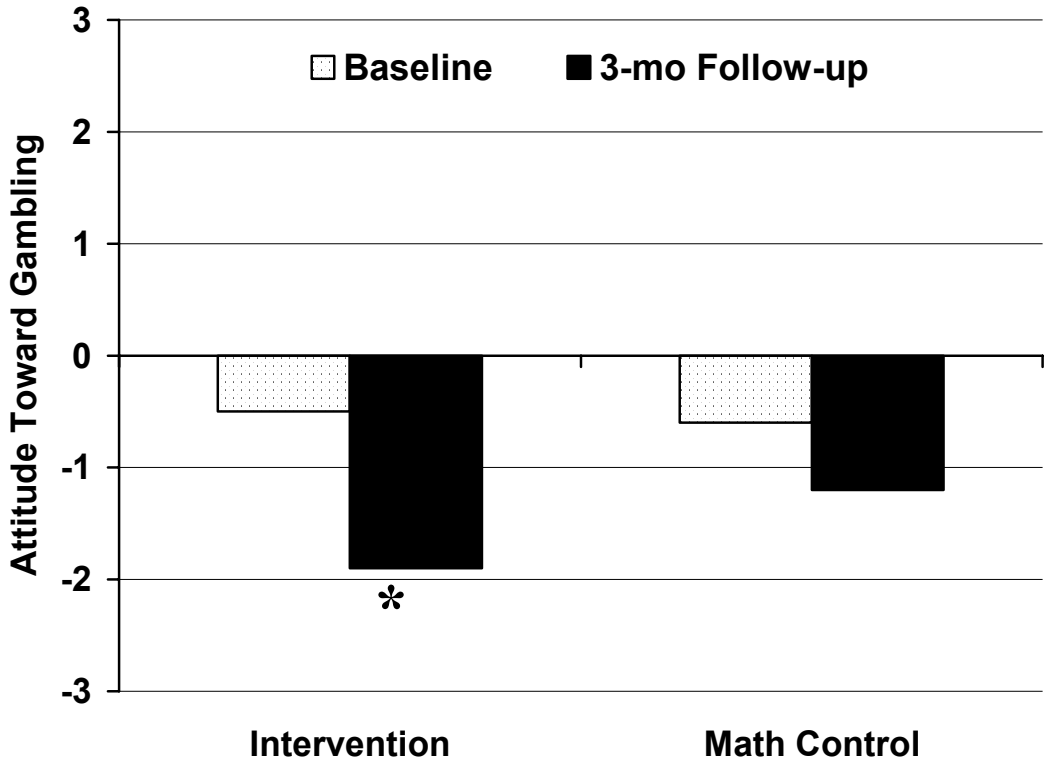
* $p < .05$

Figure 8. Changes in awareness and resistance to gambling fallacies from baseline to 3 month follow-up (high school students).



* $p < .05$

Figure 9. Changes in attitude toward gambling from baseline to 3 month follow-up (high school students).



* $p < .05$

Figure 10. Changes in decision-making skill from baseline to 3 month follow-up (high school students).

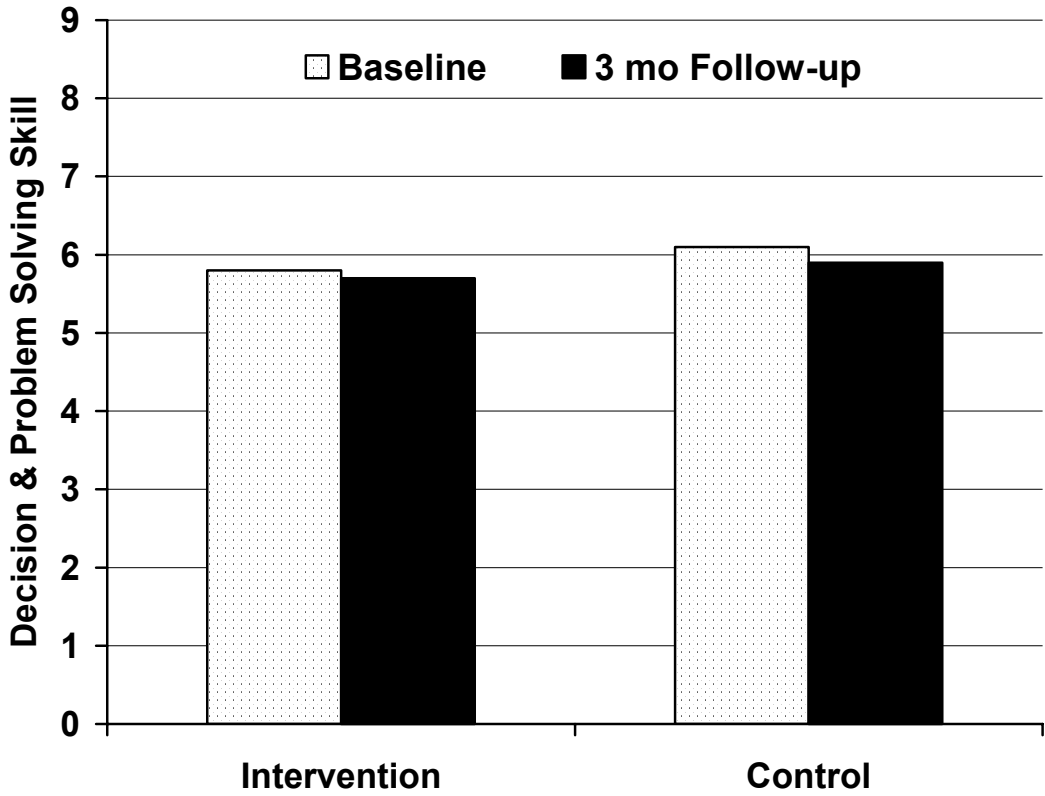


Figure 11. Changes in involvement in high risk behaviour from baseline to 3 month follow-up (high school students).

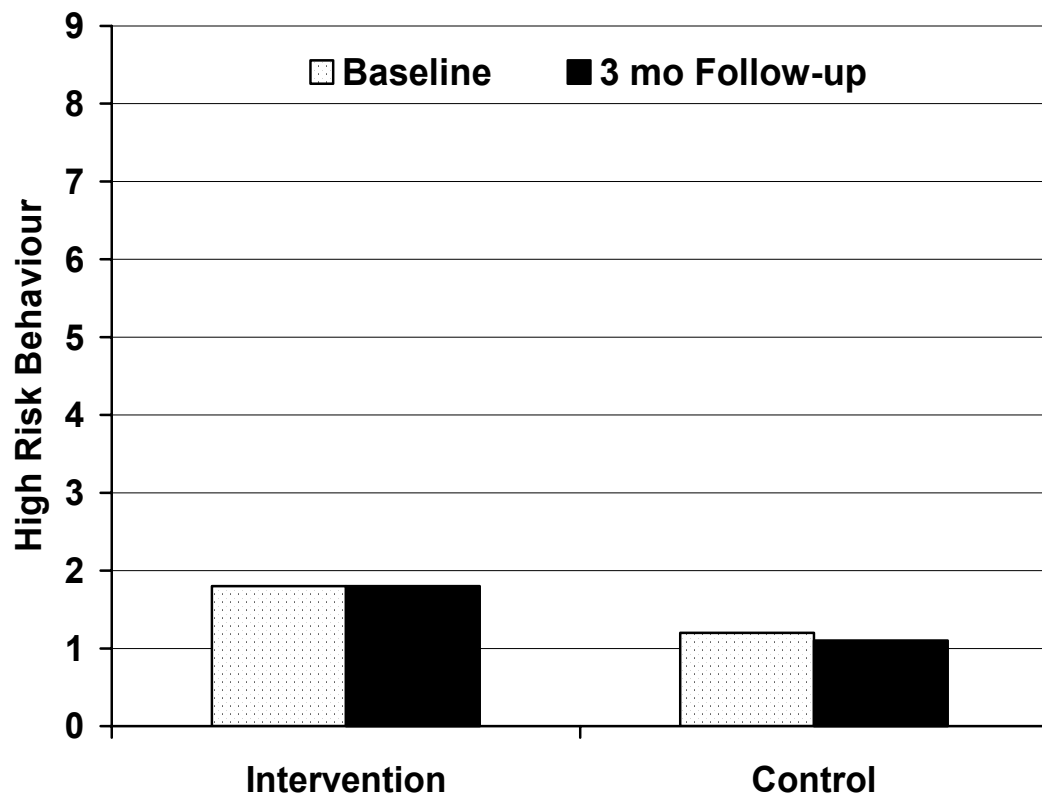
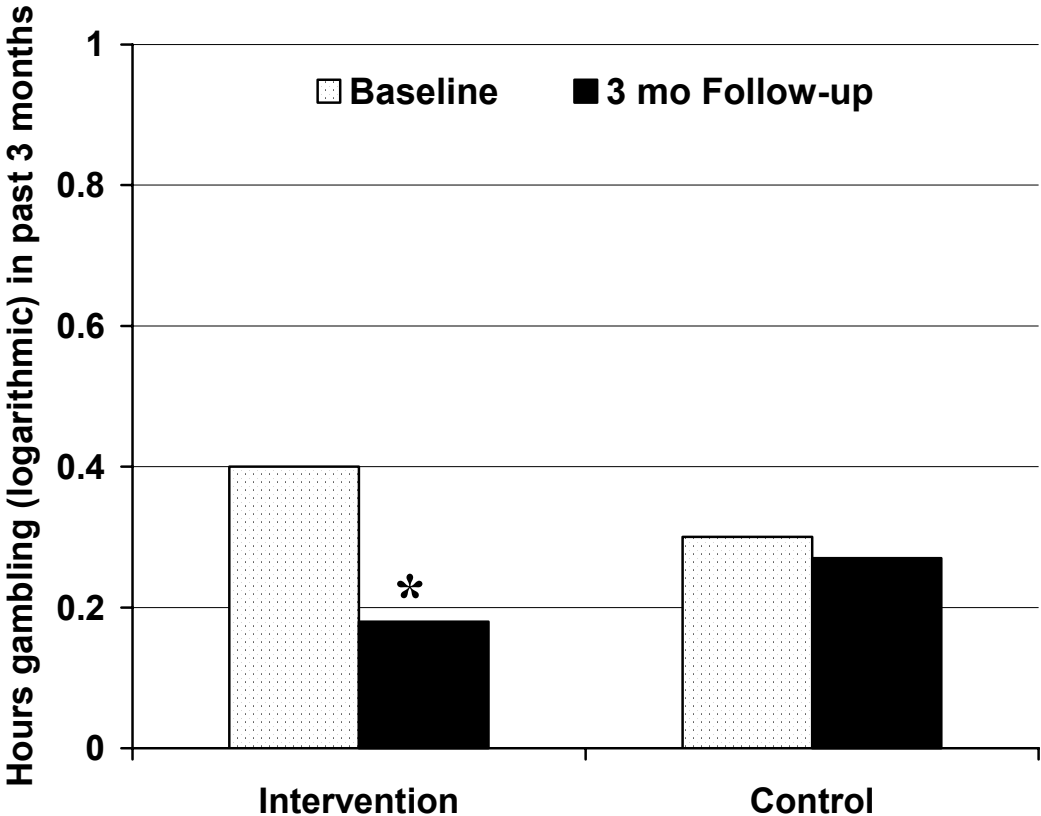
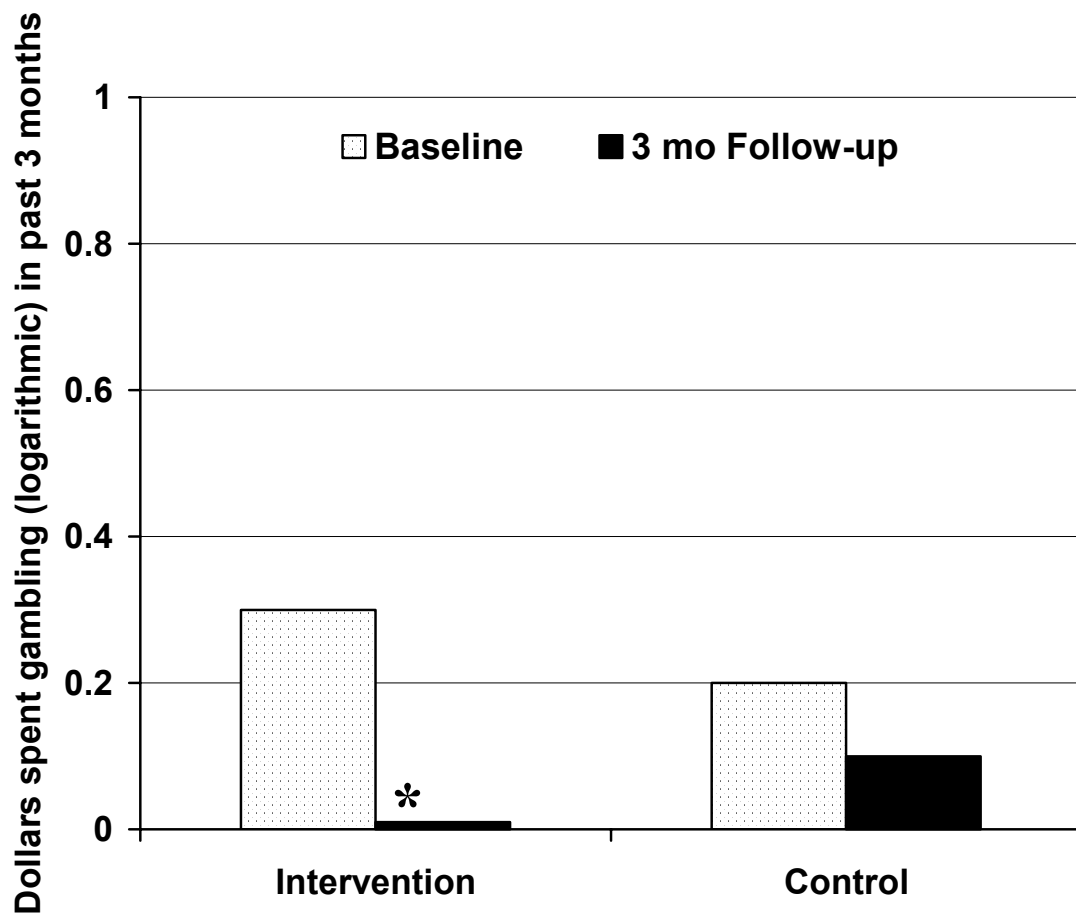


Figure 12. Changes in time spent gambling (logarithmic) from baseline to 3 month follow-up (high school students).



* p < .05

Figure 13. Changes in money spent gambling (logarithmic) from baseline to 3 month follow-up (high school students).



* $p < .05$

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