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Life Skills, Mathematical Reasoning and Critical Thinking: A Curriculum for the Prevention of Problem Gambling

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Abstract Previous studies have shown that youth are two to three times more likely than adults to report gambling related problems. This paper reports on the development and pilot evaluation of a school-based problem gambling prevention curriculum. The prevention program focused on problem gambling awareness and self-monitoring skills, coping skills, and knowledge of the nature of random events. The results of a controlled experiment evaluating the students learning from the program are reported. We found significant improvement in the students' knowledge of random events, knowledge of problem gambling awareness and self-monitoring, and knowledge of coping skills. The results suggest that knowledge based material on random events, problem gambling awareness and self-monitoring skills, and coping skills can be taught. Future development of the curriculum will focus on content to expand the students' coping skill options.

Keywords Prevention of problem gambling · Probability · Coping skills

Introduction

Previous studies have shown that the prevalence of gambling problems amongst youth is two to three times higher than in the adult population (AADAC 2000; Griffiths 1995; Shaffer et al. 1997). The prevalence rate of pathological gambling for adults is about 1.5% but for adolescents it is estimated to be 5.0% (Nower et al. 2004). It has been argued that with the

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ever-increasing availability and promotion of gambling that the problem is likely to worsen (Stinchfield 2002). Many pathological gamblers report that they started gambling as youths (Gullickson and Hartman 2001; Nower et al. 2004). In addition, it has been suggested that youth have a significantly higher risk of experiencing a gambling problem, because their brains are still developing (Chambers et al. 2003). These facts point to the need to focus particular attention on this population in terms of treatment and prevention.

Currently, there is a wide divergence of theory and opinion about the etiology of problem gambling. Various theories have focused on behavioral reinforcement (Skinner 1953), erroneous beliefs (Ladouceur and Walker 1996), difficulty coping with stress (Derevensky et al. 1997; Gupta and Derevensky 1998), and genetic factors (Blum et al. 2000) as possible explanations of the disorder. One promising view has been proposed by Blaszczynski and Nower (2002) that there are three distinct pathways associated with the onset of problem gambling: (1) people who are *otherwise psychologically normal* may have developed a gambling problem because of wins, erroneous beliefs or social encouragement to gamble, (2) *emotionally vulnerable* gamblers may have developed a gambling problem because they were anxious, depressed, or under a lot of stress, and (3) *impulsive gamblers* may have developed a gambling problem because of a pre-existing impulse control disorder such as attention deficit hyperactivity disorder. Blaszczynski and Nower (2002) pathways model provides a convenient means of integrating the various theoretical positions into an overall framework and suggests that problem gamblers are not a single homogenous group, but come in a variety of configurations.

Based on an examination of the problem gambling literature we identified three main opportunities to prevent problematic gambling: (1) improving the students' understanding of the nature of random chance in order to reduce erroneous beliefs (pathway 1); (2) improving the students' repertoire of coping strategies by teaching them about positive coping strategies such as dealing with stressful situations (pathway 2); and (3) teaching the students how to apply knowledge of problem gambling through the use of self-monitoring for indications of emerging negative consequences (pathway 1 and 2).

Research has shown that adolescents who are problem gamblers have poorer coping skills (Gupta and Derevensky 1998) and a poorer understanding of random chance (Turner et al., in press-a; Macdonald et al. 2005) than adolescents who do not have a gambling problem. Based on this evidence we argue that coping skill deficiencies and erroneous beliefs are intrinsically related to both the onset and maintenance of problem gambling.

Gambling appears to be used as an escape or avoidance coping strategy to deal with emotional problems (Gupta and Derevensky 1998; Jacobs 1988). Accordingly to this view (Gupta and Derevensky 1998) people gamble in order to forget about their problems. In fact, problem gamblers often enter a dissociative state while gambling (Gupta and Derevensky 1998) such as losing track of time, feeling as if they are a different person, or even experiencing a black-out of everything that happened to them while gambling.

However, Turner et al. (2006) found a significant correlation between erroneous beliefs about random chance and reliance on escape to cope with stress. Turner et al. (2006) argued that given the player's erroneous beliefs about random chance, the problem gambler actually believes financial escape from their current situation is possible. For example, a failure to understand the independence of random events could lead a person to expect that a big win on a slot machine was due to occur. Thus the emotional escapism of the pathological gambling may be reinforced by erroneous expectations about random chance. Because of the relationship between erroneous beliefs and wishful thinking (escape), we argue that an effective prevention program will have to address both of these elements in tandem.

There have been a number of attempts to develop a problem gambling prevention oriented curriculum. Shaffer et al. (1996), for example, developed a curriculum that focused on the mathematics of gambling. However, Turner et al. (2006) found that what differentiated problem and non-problem gamblers was not their awareness of the odds of winning, but the belief that they could beat the odds. Turner et al. (2006) found that severity of pathological gambling symptoms was positively correlated with knowledge of the odds of winning specific games, $rho = .23$, $p < .05$, but negatively correlated with understanding about the nature of random events, $rho = -.34$, $p < .001$. Similarly, a recent study by Lambos and Delfabro (2007) found that pathological gamblers understand the probability of winning as well as regular non-problem gamblers. In our view, a pathological gambling prevention program should be focused on the concept of the independence random events and the deceptive nature of the experience of random events (e.g., fundamental uncertainty, the occurrence of patterns by random chance, short term versus long term outcomes, streaks of wins or losses etc.), rather than on the low probability of winning.

Many of gambling prevention programs reviewed by Macdonald and Somerset (2003) emphasized risk avoidance messages (i.e., "don't gamble"). These programs provided a good overview of the personal and social negative consequence (Macdonald and Somerset 2003). Evans (2001, 2003), however, has argued that programs based only on fear that are used in many schools are not useful in addressing problematic social influences. In addition, this approach clashes with the contemporary social context in which gambling is a socially accepted entertainment for adults. As such, the program may be seen by youth as another adult attempt to limit their autonomy. It is argued that an effective prevention effort should not only emphasize the connection between coping, stress, emotions and cognitions through self-monitoring, but should also address the adolescents need for increasing autonomy and self-efficacy.

In addition, many curricula lack a significant emphasis on the interrelationship between the emotional and cognitive aspects of problem gambling (Macdonald and Somerset 2003). In particular little emphasis is placed on understanding how emotional experiences such as wins can override reasoning. By emphasizing the link between emotion and cognition on decision-making we believe we can promote greater reasoned action (c.f. Evans 2003). The program therefore included several exercises that allow the students to experience random chance. One exercise involved students playing a dice game (no money) to help the students understand how random chance can fool them into a belief in luck, or skill. This was followed by a discussion exploring their feelings during and after the game. This process is intended to inoculate the person from getting carried away with gambling by helping them understand how the seductive excitement of wins and the aggravation of losses can both lead to poor decisions and problem gambling.

Program Development and Research

Our approach to prevention was derived by cognitive-behavioral theories of self-efficacy (Bandura 1977, 1986) and counseling (c.f. Marlatt and Gordon 1985; Beck et al. 1993), and on educational models of social inoculation and reasoned action (Evans 2001, 2003). The study reported in this paper was part of a multi-year project to develop a curriculum resource to help with the prevention of problem gambling. This project has included focus groups and surveys of students to determine the types of games students play (Turner et al., in press-a), discussions with teachers about gambling, consultations with curriculum

experts about the education of probability and health knowledge, and an examination of the curriculum expectations in the province of Ontario.

Turner et al. (in press-b) conducted a controlled experimental evaluation ($n = 374$) of a 1-h in-class presentation about problem gambling, coping skills and random chance to students ranging from grades 5 to 12 (Turner et al., in press-b). According to post event questionnaires, the program was well received by the students. Over 93% of respondent's felt that the program was a good idea, 87% of students liked the discussion of problem gambling, 82% liked the material on the nature of random chance, and 80% liked the coping skills content. Those students who saw the program showed a significant improvement in their knowledge of random chance on a follow-up test conducted 2 months after the show, however the intervention only accounted for 2% of the variance in post-test random events knowledge. It should also be noted that we found no evidence that exposing the students to information about gambling increased their desire to gamble. Amongst the high school students over 80% report gambling, however out of several activities (e.g., reading, sports, watching movies) the students on average rated gambling as the least interesting activity (Turner et al., in press-a) at both pre-test and post-test. However, Turner et al. (in press-b) failed to find a significant change in the student's coping skills as a result of the intervention. It would appear that the time frame of a 1-h presentation was insufficient to change coping strategies or to have a substantial effect on knowledge.

Based on the feedback from our first program we developed a curriculum supplement that focused on issues related to math and health associated with pathological gambling. The focus of this work was on developing 3 streams of content: (1) knowledge of random chance, (2) coping and life skills, and (3) avoiding problematic behavior and undue risk through self-awareness and self-monitoring. Rather than rely on a 1-h program, the focus would be on integrating gambling related material into the general curriculum of the school that satisfies existing curriculum expectations in the school system and delivers the material in a more sustained manner. Macdonald et al. (2005) conducted a controlled evaluation of the program with 392 students (45% male) in Ontario in grades ranging from 7 to 12. Students who received the curriculum showed a significant improvement in their understanding of random chance (*mean difference score* = 7.0%; 95% *CI* = 0.8%–13.3%), whereas the control group did not show any significant improvement in scores (mean difference score = −6.4%; 95% *CI* = −14.3%–1.3%). However, this effect only accounted for 1.4% of variance of scores on the random events knowledge test. In addition, this first version of our curriculum failed to alter the students coping skills or their knowledge of problem gambling awareness and self-monitoring, After analyzing the data from the outcome measures and examining the teacher feedback from our two previous studies (Turner et al., in press-b; Macdonald et al. 2005), the program was revised. The present paper reports on an evaluation of the revised program. In addition, we found that high school teachers (grade 9–12) were more positive towards the material than were middle school teachers (grade 7 & 8). In particular the middle school teachers felt that the material on chaos (e.g., fundamental uncertainty) was too advanced for the students. Consequently, for the present study, we focused our efforts on high school students.

Purpose and Hypotheses

The purpose of this study was to conduct a controlled study of the retention of curriculum material designed to prevent the onset of problem gambling. Our lesson plans incorporate

content on understanding the impact of emotion on decision making, enhancing coping ability, appreciating how laws of randomness define the outcome of gambling, and how people who choose to gamble can avoid problems by learning how to recognize the onset of warning signs. In addition, our study extends our knowledge base of gambling addiction by collecting pre-test information about the relationship of problem gambling and coping skills, self-monitoring skills, and the nature of random events. It also provides us with additional information on the level of gambling and problem gambling in Ontario schools. It was hypothesized that students in the intervention group would show significant improvement in their understanding of random events, knowledge of coping skills and self-monitoring skills, while those in the control group will show no change.

Method

Participants

The participants were recruited from grades 10 through 12 (ages 15–18). A total of 100 experimental participants and 101 control participants took part in the study. Of these participants, 66 were male and 135 were female. The material itself was administered as part of their class material, however the students were asked to sign a consent form on whether or not they choose to complete the evaluation questionnaires. To thank the students for participating in the study we handed out coupons for a slice of pizza to all the students in the class (whether they completed the questionnaires or not).

Procedure

The Centre for the Addiction and Mental Health research ethics board approved the study as research protocol #38/2003. To recruit participants, we first generated a list of schools available in the Simcoe Country District School Board and randomly selected schools from the list and randomly assigned each school to either the control or experimental group. We then contacted the school, told the principles about the project and asked if they would be willing to participate in the project. Classes within a school were selected through a negotiation process with the principal and teacher.

The teachers were given a curriculum package that consisted of a series of lesson plans, overheads, a text and CD-ROM developed for the study, discussion questions, and some other demonstration materials. The CD-ROM contained skits illustrating problematic gambling, counseling, demonstrations of utilizing coping and critical thinking skills, and a tutorial on random chance. We instructed teachers that each lesson takes approximately 70-min to administer. The curriculum consisted of 6 lessons and a summary lesson.

The curriculum consisted of 3 streams of content: (1) knowledge of random chance, (2) coping and life skills, and (3) avoiding problematic behavior and undue risk through self-awareness and self-monitoring. To improve the students understanding of random events, the students were taught about the origin of how random events occur (fundamental chaotic uncertainty) in order to demystify random chance. This then lead into a discussion of concepts such as the independence of random events and the exposure of numerous myths about games of chance. In addition, an essential feature of our prevention curriculum is the connection between random events and the emotions involved in winning and losing. The section on coping and life skills addressed the needs of the

"emotionally vulnerable" problem gambler to mitigate stressful experiences. The students were taught about the effects of stress and were instructed in the use of constructive strategies to deal with stress. The third stream, self-monitoring for signs of negative consequences stemming from over involvement in gambling involved three components. First, students were instructed on the full range of negative consequences that can stem from problem gambling. Second, students were instructed on common barriers to being fully objective when scrutinizing one's behaviour. Third, students were provided with a list of sample questions to ask themselves that probe whether their emotional disposition, ability to set and stick to limits, value for money, relationships or school performance were being negatively effected by their involvement with gambling. In addition, the students were instructed to be aware of how their expectations about gambling can be affected by experience (e.g., wins can encourage people to take more risks). Our curriculum gives students examples of how pathological gamblers get into problems by not monitoring their own thoughts, feelings and behaviors and instructs the students on how to self-monitor emerging problems in all life areas. In essence, self-monitoring is the link that connects the cognitive and emotional aspects of gambling together through greater self-awareness. The material also stressed that the coping skills and self-monitoring strategies included in the curriculum were not restricted to gambling problems, but also can be applied to any stressful situation.

For the experimental group, participation involved filling out the questionnaires before learning the material, receiving our curriculum instruction, and then filling out the questionnaires a second time. The research team administered the pre-test and post-test questionnaires. The pre-test and post-test questionnaires took approximately ½ h to complete. The teachers then were given 6–7 weeks to deliver the curriculum (approx. one lesson per week). We asked teachers to notify our research team once they had completed the curriculum instruction. The research team then arranged to administer the post-test 4–5 weeks after the curriculum instruction had been completed.

For schools in the control condition, participation involved completing the same outcome-measures at two different times 10–12 weeks apart.

Measures

The outcome and retention of the prevention curriculum was assessed using a number of questionnaires. All questionnaires were pre-tested using a sample of 20 students. Problem gambling was measured using the South-Oaks Problem Gambling Screen—Revised for Adolescents (SOGS-RA; Winters et al. 1993). The SOGS has a well-documented reliability, especially in large samples. We obtained a Cronbach's alpha of .87 from the current study.

We also assessed coping skills using the Preventative Resource Inventory (PRI; McCarthy and Lambert 2001). The PRI measures several types of healthy coping resources including perceived control (14 items, Cronbach Alpha = .91), maintaining perspective (14 items, *alpha* = .87), social resourcefulness (14 items, *alpha* = .87), humor (4 items, *alpha* = .81) and organization (4 items, *alpha* = .74).

The random events knowledge test is a 22-item, true/false questionnaire that tests students' knowledge of the nature of random events. High scores indicate a better understanding of random events (see Table 1 for sample items). This scale was originally developed as a 33-item scale by Turner and Liu (1999) and (Turner et al. 2006) to measure beliefs about random chance. The full scale has an acceptable level of reliability (*alpha* = .70).

Table 1 Sample items for random events knowledge test, problem gambling awareness and self monitoring, and coping content questionnaires

Sample random events knowledge test items
If you lose several times in a row you are most likely to win if you keep playing (*r*).
If you win three times in a row while gambling, you are less likely to win again if you keep playing (*r*).
If you buy a 649 lottery ticket everyday, you would most likely win the jackpot within the next 40 years (*r*).
Betting the same numbers for every lottery draw will not help you win.
If you have lost at several games in a row, your likelihood of winning or losing does not change.
Sample self monitoring skills content quiz
Gambling does not affect problem gamblers' emotions (*r*).
A problem gambler often doesn't participate in many of the activities s/he used to enjoy.
It is impossible for the average person to keep track of how much they spend while gambling (*r*).
You can increase your chances of winning by following your gut feeling. (*r*)
Excitement can make you bet more frequently and bet more money.
A person with a gambling problem will keep playing; making larger bets to try and get his/her money back.
Sample coping skills content questions
It is not possible to make yourself feel better (*r*).
Proactive coping means predicting a stressful situation and preventing it from happening.
Coping is automatic, we can never choose the way we cope (*r*).
Talking about feelings makes them always seem worse (*r*).
A part of problem solving is seeing what can go wrong with a plan.
Having confidence in your ability to handle different situations is just as important as making a plan to cope.

Note: Random events knowledge test items use a true or false format. The coping knowledge test and the problem gambling awareness and self-monitoring content test were scored on a 4-point scale. High scores indicating more accurate responses, however some items were reverse keyed (*r*)

Scores on this test are negatively correlated with problem gambling, $r = -.31$, $p < .01$ (Turner et al. 2006). Turner et al. (in press-a) created a shortened 18-item version tailored for adolescents, however the scale had a fairly poor level of reliability (.44–.66). To improve reliability we added 4 more scored items from the adult version of the random events knowledge test. The scale items are added up and expressed as a percentage of the total possible score.

Problem gambling awareness and self-monitoring was tested using a 14-item 4 point scale (1 = "Strongly Disagree" and 4 = "Strongly Agree"; *alpha* at pre-test = .61, at post-test = .69). See Table 1 for example items. These questions focus the nature of problem gambling and on how the use of self-monitoring of one's emotional and cognitive state can help a person avoid problems. The content includes questions about the students' knowledge of problem gambling, limit setting, risk-taking and the connection between emotions and gambling. These questions focus on the importance of monitoring one's emotional and cognitive state while gambling, in order to avoid problems (see Table 1 for sample items).

In addition, we created a 12-item questionnaire using a four-point scale that assesses students' retention of the coping content. These items were derived from the content of the curriculum package. See Table 1 for example items.

Data Analysis

All variables were first analyzed using a repeated measures analysis of variance that allows us to examine the effectiveness of the program on an individual basis. In addition we conducted a mixed models analysis on difference scores to take into account possible effects of cluster sampling (e.g., where subjects are drawn from intact groups). Variance accounted for was based on eta^2 from the repeated measures analysis; this determined the percentage of the student's variance (as individuals) accounted for by the intervention.

Results

As expected, most of the students (Time 1 = 83.5%, Time 2 = 84.1%) did not report having any gambling related problem. Approximately 3.5% of the total sample scored above 4 on the SOGS-RA indicating a possible pathological gambling problem.

Correlations Between Variables

As expected gambling problems as measured by the SOGS-RA, were significantly negatively correlated with random events knowledge test (Time 1: $r = -.20$, $p < .01$, Time 2: $r = -.21$, $p < .01$), scores on the coping knowledge test (Time 1: $r = -.14$, $p < .05$, Time 2: $r = -.17$, $p < .01$), and scores on the self-monitoring skills quiz (Time 1: $r = -.38$, $p < .001$, Time 2: $r = -.32$, $p < .001$).

Intervention Results

The random events knowledge test item responses were added together and result was expressed as a percentage of the total possible score. Control subjects had equal means on the pre-test and on the post-test (i.e., M = 63%; SD = 13%, and M = 63%, SD = 14%). The experimental group had means of 67% (SD = 13%) and 76% (SD = 11%) at times 1 and 2 respectively. In the repeated measure analysis, both conditions, $F(1,198) = 30.3$, $p < .001$, and time, $F(1,198) = 29.6$, $p < .001$, were highly significant. In addition the interaction was significant, $F(1, 198) = 23.0$ $p < .01$, $eta^2 = .104$. Neither age nor gender added any main effect or interaction to the analysis. Table 2 shows the means for the random events knowledge test by condition and gender. In the mixed model analysis, the difference scores revealed a significant difference between the control and the experimental group, $F(1,9.4) = 14.7$, $p < .01$. The estimated mean difference score for the experimental condition was 11.5% (95% CI = 8.6%–14.4%) suggesting a significant increase in the score. In contrast, the estimated mean difference score for the control group was 1.1% (95% $CI = -1.8\%$–4.0%) indicating no change in scores from pre-test to post-test. In summary, the experimental group showed a significant improvement in their knowledge of random events, while the control group showed no change.

The self-monitoring skills quiz item responses were added together and the result was expressed as a percentage of the total possible score. At time 1, control respondents scored on average 71.0% (SD = 12.7%) whereas at time 2 the control group scored 70.7% (SD = 13.7%), suggesting no change in the control group from time 1 to 2. On the other

Table 2 Random events means percent correct and standard deviations by gender and condition

	Pre-test			Post-test		
	N	Mean	*SD*	*N*	Mean	*SD*
Male						
Experimental	30	73	18	30	86	12
Control	36	66	18	36	65	18
Total	66	69	19	66	75	19
Female						
Experimental	70	74	14	70	84	15
Control	65	62	17	64	70	18
Total	135	71	16	134	78	18
Total						
Experimental	100	74	15	100	85	14
Control	101	67	17	100	68	18
Total	201	70	17	200	77	18

Note: Scores were a percentage of total possible score and could range from 0% to 100%

hand the experimental group scored 71.7% ($SD = 11.3\%$) and 77.7% ($SD = 13.0\%$) at times 1 and 2, respectively, suggesting a moderate change in the experimental group ($d = .46$). Table 3 shows the means and standard deviations of the scores by condition and gender. The main effect of time $F(1,198) = 10.3$, $p < .01$, $eta^2 = .01$, and the main effect of condition were significant, $F(1,198) = 5.8$, $p < .05$, $eta^2 = .029$. The interaction between time and condition was highly significant, $F(1,198) = 11.1$, $p < .001$, $eta^2 = .053$. When gender and age were entered into the analysis, the effect of age was non-significant, but gender was significantly related to self-monitoring skills quiz scores,

Table 3 Self-monitoring mean percent correct and standard deviations by gender and condition

	Pre-test			Post-test		
	Mean	*N*	*SD*	Mean	*N*	*SD*
Male						
Experimental	30	70.3	14.7	30	73.7	12.3
Control	36	68.7	14.6	36	65.3	15.7
Total	66	69.7	14.6	66	69.3	14.7
Female						
Experimental	70	72.3	10.0	70	79.3	13.0
Control	65	72.3	11.2	64	74.0	11.0
Total	135	72.3	10.3	134	76.7	12.3
Total						
Experimental	100	71.7	11.3	100	77.7	13.0
Control	101	71.0	12.7	100	70.7	13.7
Total	201	71.3	12.0	200	74.0	13.7

Note: Scores were a percentage of total possible score and could range from 0% to 100%

$F(1,196) = 10.0$, $p < .01$, $eta^2 = .049$. Females scored higher on the self-monitoring skills quiz. The interaction effect was still significant after controlling for age and gender, $F(1, 196) = 7.5$, $p < .01$, $eta^2 = .037$. When we examined for an improvement in understanding of self-monitoring using mixed model analysis, the change was also significant, $F(1,8.4) = 6.4$, $p < .05$. The experimental group mean difference score was 6.1% (95% $CI = 2.1\%$–10.2%) on the self-monitoring. The control group had a mean change score of -0.1% (95% $CI = -4.1\%$–3.9%). The experimental group appears to have significantly improved in terms of their self-monitoring skills while the control group did not change.

The coping skills quiz item responses were added together and the result was expressed as a percentage of the total possible score. On the Coping Knowledge Test, control subjects scored on average 60.0% ($SD = 11.3\%$) at time 1, and 59.0% ($SD = 12.7\%$) at time 2. Experimental subjects scored 63.3% ($SD = 12.0\%$) and 67.0% ($SD = 11.7\%$) at times 1 and 2, respectively, suggesting a slight increase in scores for the experimental group. Table 4 shows the means and standard deviations of coping knowledge scores by condition and gender. Pre-test scores were significantly lower than post test scores, $F(1,197) = 11.7$, $p < .01$, but the main effect of trial time (test 1 versus test 2) was not significant $F(1, 197) = 0.48, ns$. The interaction of time and condition was significant ($F(1,198) = 11.7$, $p < .01, eta^2 = .056$. When gender and age were entered into the model as covariates, neither age nor gender or any interaction with age or gender reached significance. The mixed models analysis of the difference scores for the coping skill knowledge test indicated that the experimental group improved significantly relative to the control group, $F(1,9.6) = 9.7$, $p < .02$. An examination of the means found that the experimental group increased by 3.4% (95% $CI = 0.5\%$–6.4%). Thus the experimental group showed significant improvement in their scores. The control mean difference score was -2.3% (95% $CI = -5.2\%$–0.6%) indicating no significant change. With both repeated measures and mixed model analysis the findings confirm that the lesson plans significantly improved knowledge of coping scores in the experimental group relative to the control group.

Table 4 Coping knowledge test means percent correct and standard deviations by gender and condition

	Pre-test			Post-test		
	N	Mean	*SD*	*N*	Mean	*SD*
Male						
Experimental	30	64.7	14.3	29	67.7	12.3
Control	36	58.3	13.0	36	56.3	14.3
Total	66	61.0	13.7	65	61.3	14.3
Female						
Experimental	70	63.0	11.3	70	67.0	11.7
Control	64	63.0	10.3	64	60.7	11.7
Total	134	63.0	10.7	134	64.0	12.0
Total						
Experimental	100	63.7	12.0	99	67.0	11.7
Control	100	61.3	11.7	100	59.0	12.7
Total	200	62.3	12.0	199	63.0	13.0

Note: Scores were a percentage of total possible score and could range from 0% to 100%

Effect on Target Audience

One important question to address is the extent to which the program is effective for the students who are most in need of the information, or if it only reaches those students who have a higher aptitude for learning. To answer this question we computed the effect size for those students who scored above zero on the SOGS-RA to those students who scored 0 on the SOGS-RA. For the self-monitoring skills quiz the mean difference score was 6.0% (SD = 12.0%), d = .5, for the people who scored 0 on the SOGS-RA and 6.0% (SD = 17.7%), d = .34, for people who scored 1 or more on the SOGS RA. For the random events knowledge test the mean difference score was 10% (SD = 14%), d = .71, for those who scored zero on the SOGS-RA and 17% (SD = 15%), d = 1.13, for those who scored 1 or more on the SOGS-RA. For the coping knowledge the mean difference score was 3.7% (SD = 12.0%), d = .31, for those who scored zero on the SOGS-RA and 2.3% (SD = 12.7%), d = .18, for those who scored 1 or more on the SOGS-RA. These findings provide some evidence that in terms of random events knowledge test (a large effect) and self-monitoring skills quiz scores (a moderately small effect size) the program reached those students who were most in need of the information. However, in terms of coping knowledge, the results suggest that high-risk students did not benefit very much from the session.

Discussion

The finding that lower SOGS scores were associated with higher scores on knowledge of randomness, self-monitoring and coping skills further supports our view that these issues must be addressed in any problem gambling prevention program. The results of the evaluation of the intervention indicate that the experimental group significantly improved scores on random events, self-monitoring knowledge, and the coping skills knowledge test compared to the control group. These three results were supported by both individual level repeated measures analysis and mixed models analysis that take sample clusters into account. In addition, we found that in terms of problem gambling awareness and self-monitoring and random events knowledge the program had a moderate to strong impact for those students who were most in need of the information (e.g., those students who score 1 or more on the SOGS-RA). That is the program was reaching those students who gambled problematically.

As in our previous studies (Turner et al., in press-b; Macdonald et al. 2005), we interpret the increase in scores in the experimental group on the random events knowledge test to indicate that our curriculum successfully educated students about the nature of random events and their connection to problem gambling. Increases in scores for the experimental group on the Coping Knowledge Test and the self-monitoring skills quiz also indicate that our curriculum was successful in teaching students about these concepts. These findings replicate our earlier work (Turner et al., in press-b; Macdonald and Turner 2002); however, the effect size for the improvement in knowledge of random events was substantially greater than that achieved in our previous studies (e.g., Turner et al., in press-b). In addition, we found significant improvements in knowledge of coping skills and knowledge of self-monitoring skills in this study.

A recent literature review in the field of substance abuse cast doubts on the efficacy of educational interventions (Babor et al. 2003). Babor et al. (2003) report finding very little evidence in support for in-class educational interventions. In the present case however, we believe there is more reason to be positive about the potential effects of interventions

aimed at teaching students about pathological gambling. First, we know from teaching experience on statistics and methodology courses that it is possible to improve students' reasoning about the independence of random chance. Secondly, the goal of our program—improving reasoning about random chance, self-monitoring skills and coping skills—are not incompatible with the students' desire for autonomy. As stated above, our approach is not to tell the students that gambling is inherently bad or that only adults should engage in the activity as is often the case with anti-drinking, smoking or drug campaigns. Such an approach would make no sense given the large percentage of adults who gamble non-problematically (Room et al. 1999). Rather our approach was to focus on how not to be fooled by random chance and how to avoid being carried away by the thrill of a win or the agony of a loss. Adolescents do not want to be fooled by random chance and certainly do not want to be fooled by the adults who design the games. It is argued that an effective educational program needs to tap into a high-risk adolescent's inherent distrust of authority.

In this study we have accomplished one large part of our goal—to improve the student's knowledge of coping skills, problem gambling awareness and self-monitoring skills, and the nature of random chance. If the theory of reasoned action (Evans 2003) is correct we may have improved the student's abilities to resist problematic gambling. However, we have, thus far, been unable to demonstrate any actual improvement in coping skills. Future studies need to focus more on evaluating changes in coping skills and gambling behavior.

There are several limitations with the study. First, our curriculum was administered using an experimental design that is not entirely equivalent to the usual manner in which curriculum is delivered in the classroom. We cannot say with any certainty if the findings in this study could be replicated in a standard classroom setting. For example, we do not know what effect the pre-test and post-test might have had on retention of the material. In addition, we do not know if the teachers and students paid the same degree of attention to the material as they would their normal course material. Second, the impact of our package was assessed in terms of knowledge-based tests rather than in terms of the prevalence of problematic gambling. We cannot say at this point if our package would actually reduce problem gambling; only that we can improve knowledge in areas where poor knowledge is associated with problem gambling (e.g., coping skills and random events). Third, the investigation was relatively short in duration—3 months. Due to time constraints and logistical problems with school populations, we are unable to follow the sample for more than 3 months. Future research could evaluate the program in a longitudinal manner to determine whether retention of the content material translates into reduced problem gambling, and whether retention of our material decays or remains intact over time.

Conclusions and Implications

In the present study we have found that it is possible to teach students about the nature of random events and knowledge of various concepts that pertain to coping skills and self-monitoring for any negative life consequences related to problem gambling. Through previous research (Blaszczynski 1998; Derevensky et al. 1997; Ladouceur and Walker 1996; Turner et al. 2006) it has been shown that problem gamblers lack knowledge and skills in these areas. Our curriculum addresses the "Normal" and "Emotionally Vulnerable" pathways of problem gambling (c.f., Blaszczynski and Nower 2002) by focusing on random events knowledge ("normal") and the development of coping and self-monitoring skills ("emotionally vulnerable"). In addition, our curriculum integrates these domains by

focusing on self-monitoring of emotions and beliefs. It also provides students with an in-depth profile of a problem gambler. By integrating the streams of content it shows that one domain is highly interconnected with another. Having pilot tested the curriculum in schools a next step would be further refinement of the material based on our findings, an evaluation in terms of effectiveness of the program, and an implementation of the curriculum within Ontario schools. There is still much work to be done, but we believe that a prevention initiative in high schools would be valuable in reducing the incidence of problem gambling in youth, as well reducing the strain on the health care system, treatment agencies, social services, families and the community.

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