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# Prevention of Problematic Gambling Behavior Among Adolescents: Testing the Efficacy of an Integrative Intervention

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**Abstract** This study aimed at testing the efficacy of an integrative intervention to prevent adolescent problem gambling acting on a multidimensional set of factors including gambling related knowledge and misconceptions, economic perception of gambling, and superstitious thinking. A pre- and post-test design was performed with 181 Italian adolescents (64 % boys; Mean age = 15.95) randomly assigned to two groups (Training and No Training). Results revealed that the intervention was effective in improving correct knowledge about gambling and reducing misconceptions, perception of gambling's profitability, and superstitious thinking. Except for misconceptions, these effects were obtained both in participants who were classified as Non-problem and At-Risk/Problem gamblers at the beginning of the intervention. Findings attested also that the training effects were stable over time, and that some changes in gambling behavior were produced. Findings were discussed referring to indications for future research aiming at confirming and extending the present results.

**Keywords** Adolescents · Prevention · Problematic gambling · Training · Mixed ANOVA

## Introduction

A number of international studies have showed that gambling is a very popular activity among adolescents, who constitute a high-risk population for developing gambling problems (Blinn-Pike et al. 2010; Splevins et al. 2010). Due to the potential negative consequences on mental health and well-being derivable from gambling, much attention has been paid to the prevention of problem gambling among youth. Referring to the literature, some interventions may be considered as a *first step in prevention* (Ladouceur et al. 2004)

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as they have been directed on modifying knowledge and misconceptions about gambling (Capitanucci et al. 2010; Ferland et al. 2002, 2005; Gaboury and Ladouceur 1993; Ladouceur et al. 2004, 2005; Lavoie and Ladouceur 2004; Taylor and Hillyard 2009). Instead, other interventions can be considered as a *second step in prevention* since they have been predominantly directed on changing other individual factors associated with gambling behavior, such as random events understanding, attitude towards gambling, coping, and self-monitoring (Turner et al. 2008b, c).

Since a multitude of factors seem to affect adolescent problem gambling (e.g., Delfabbro et al. 2006, 2009; Donati et al. 2013; Gupta et al. 2004; Turner et al. 2008a), some authors have suggested the usefulness of adopting an integrative perspective to prevent adolescent gambling behavior (Gupta and Derevensky 2000; Ladouceur 2001) acting both on knowledge and faulty beliefs about gambling (typical of *the first step interventions*) and also on more general aspects, such as decision making and problem solving skills (in line with *the second step interventions*). Specifically, it has been recently proposed a multidimensional approach aimed at changing a set of factors including knowledge, beliefs, attitudes, and skills related to gambling (Williams et al. 2007, 2008, 2010).

Starting from this premise, the present paper aimed at developing an integrative intervention to prevent adolescent problem gambling acting both on knowledge and misconceptions about gambling but also on individual factors. Specifically, based on the findings of a previous study that proposed an integrated model including several adolescent gambling behavior related factors (Donati et al. 2013), we aimed to realize an intervention designed to modify gambling knowledge and misconceptions, probabilistic reasoning, economic perception of gambling, and superstitious thinking.

More in detail, we aimed to improve correct knowledge of gambling, i.e. the awareness of gambling (general meaning and specific activities) and negative effects it can have, and to reduce erroneous beliefs about it, such as the "illusion of control" (Ladouceur and Walker 1998), i.e. the belief that the outcome of a chance event can be influenced or controlled by one's skill or abilities. With regard to probabilistic reasoning, we aimed to reduce the susceptibility to the gambler's fallacy (Tversky 1974), a well-known bias in probabilistic reasoning stemming from the belief that the likelihood of an event is related to preceding, independent outcomes. For instance, in roulette, after a long sequence of Red, Black is judged to be more likely than Red on the next spin. Finally, we aimed to modify economic perception of gambling and superstitious thinking. Specifically, we wanted to decrease adolescents' beliefs about gambling as a good way to obtain money (Delfabbro and Thrupp 2003), and their tendency to perceive biased causal relationships between unrelated events (Ninness and Ninness 1998).

In evaluating the efficacy of the current intervention, we aimed to overcome certain methodological limitations that characterize some previously proposed preventive programs. From the first publication on this issue (Gaboury and Ladouceur 1993 [Evaluation of a prevention program for pathological gambling among adolescents. *Journal of Primary Prevention*, *14*, 21–28]), a number of preventive initiatives have been realized but only few of them have evaluated their efficacy (Blinn-Pike et al. 2010). Among these ones, short-term effects have been examined in the majority of studies (Capitanucci et al. 2010; Ferland et al. 2002, 2005; Gaboury and Ladouceur 1993; Ladouceur et al. 2004, 2005; Lavoie and Ladouceur 2004; Taylor and Hillyard 2009; Turner et al. 2008b, c), but only Turner et al. (2008c) tested the efficacy verifying that both participants with and without previous gambling related problems have obtained the same results from the educational activities. Additionally, long-term stability has been tested in a limited number of studies (Capitanucci et al. 2010; Ferland et al. 2005; Gaboury and Ladouceur 1993) and the effects

on gambling behavior have been rarely analyzed (Ferland et al. 2005; Gaboury and Ladouceur 1993; Turner et al. 2008b; Williams et al. 2010).

Based on these considerations, in the current study the efficacy has been evaluated taking into account short- and long-term effects, participants' previous gambling habits, and the effects on gambling behavior. Specifically, the aims of the current study can be detailed as follows. First, we aimed to evaluate the short-term effects of the intervention. The hypotheses were that the intervention was able to enhance correct knowledge on gambling and normative probabilistic reasoning related to gambling, and to reduce misconceptions about gambling, optimistic perception of gambling as economic activity, and superstitious beliefs. Second, in line with Turner et al. (2008c), we aimed to test the short-term effects considering separately adolescents without gambling related problems and those with gambling problems. We predicted to obtain the above described effects for both of them. Third, we wanted to verify the stability of the short-term effects over time, hypothesizing that the effects on knowledge and misconceptions about gambling, normative probabilistic reasoning, economic perception of gambling, and superstitious thinking persisted over a period of 6 months by the end of the intervention. Fourth, we aimed to test the stability of the effects also considering separately adolescents without gambling related problems and those with gambling problems. We predicted that the persistence of the effects was valid for both categories of gamblers. Fifth, we aimed to test the intervention effects on adolescent gambling behavior. Specifically, we predicted that the training should have reduced gambling participation after 6 months the intervention had ended.

## Method

### Participants

The participants were 181 high school students (64 % boys, $M_{age} = 15.95$, SD = .51, *range* 15–18) enrolled at two public high schools in Tuscany, Italy. From the available schools in the area, four schools were randomly selected. Subsequently, the schools' principals were contacted, apprised of the issue of adolescent problem gambling to generate support for the research, and they were presented with the project. Once the schools agreed to participate (two declined to participate because they were already involved in other projects), the detailed study protocol was approved by the institutional review boards at each school. Written informed consent was requested from students (or their parents, if they were minors), assuring them that the data would be handled confidentially. The research was conducted during school time and all students invited to participate agreed to do so. Thus, sample bias due to denials during recruitment was avoided.

### Measures

Gambling behavior was measured through the *South Oaks Gambling Screen-Revised for Adolescents* (SOGS-RA; Winters et al. 1993; Italian version: Colasante et al. 2013) after having tested its effectiveness as screening tool applying Item Response Theory (Chiesi et al. 2013). The scale is composed of two sections. In the first one, participants were asked to indicate the frequency of gambling (Never, Less Than Monthly, Monthly, Weekly, and

Daily) in a list of gambling activities including: Cards for money, coin tosses for money, bets on games of personal skill, bets on sports teams, bets on horse or dog races, bingo, dice games for money, slot machines, scratch-cards, lotteries and on-line games. Considering responses to this section, participants can be classified into *non-gamblers* (no gambling behavior) and *gamblers* (gambling on at least one activity) (Welte et al. 2009). The second section consists of 12 items related to the *Diagnostic and Statistical Manual of Mental Disorders* (3th, rev.) criteria for pathological gambling (American Psychiatric Association 1987). An example is: "In the past 12 months, how often have you gone back another day to try to win back money that you lost?". A total score was derived summing responses to this section. Since it has been found that gambling frequency is a predictor of the number of problem gambling symptoms (e.g., Chiu and Storm 2010; Derevensky et al. 2010), a classification of gambling problem severity was made adopting the broad criterion, i.e., a combination of gambling frequency and the SOGS-RA score (Winters et al. 1993, modified by Poulin 2000). Specifically, as in a previous study (Donati et al. 2013), adopting a criterion derived from Poulin (2002), *Non-problem* gambling was defined as no gambling activity or gambling less than daily and SOGS-RA score = 0, *At-Risk/Problem* gambling included weekly gambling and SOGS-RA score = 1, gambling less than weekly and SOGS-RA score $\geq$1, daily gambling regardless of the SOGS-RA score, and weekly gambling and SOGS-RA score $\geq$2.

Correct knowledge and misconceptions about gambling were measured through the *Questionnaire of Attitudes and Knowledge About Gambling* (Ferland et al. 2002; Italian version: Capitanucci et al. 2010): It contains 16 Likert-type items using a 4-point scale ranging from *totally disagree* to *totally agree*. Nine items measure knowledge about gambling (yielding a maximum score 36) and seven items measure misconceptions about gambling (yielding a maximum score of 28). The following are examples of items targeting respectively knowledge and misconceptions: "Lottery is a gambling activity" and "When I play bingo, I have more chances of winning if I bring good luck charms".

To measure probabilistic reasoning ability, the *Gambler's Fallacy Task* (GFT, Primi and Chiesi 2011) was used. It consists of a marble bag game in which participants were asked which outcome was more likely at the next draw after a sequence of five equal outcomes (five blue or five green marbles). In more detail, the task was composed of three different trials in which the proportion of Blue and Green marbles in the bag varied (first trial: 15B & 15G; second trial: 10B & 20G; third trial: 25B & 5G). In total, each participant answered six questions. Summing correct answers, we formed a probabilistic reasoning score ranging from 0 to 6, with higher scores corresponding to high ability to reason normatively, avoiding the gambler's fallacy.

For the perception of economic profitability of gambling, the *Gambling Attitude Scale* (GAS, Delfabbro and Thrupp 2003; Italian version: Primi et al. 2013) was used. It contains nine Likert-type items, using a 5-point scale ranging from *strongly agree* to *strongly disagree*, yielding a maximum score of 45. An example of an item is "You can make a living from gambling". Total scores on the scale were calculated so that high scores corresponded to an optimistic perception of gambling (Delfabbro et al. 2006, 2009).

To measure superstitious thinking, the *Superstitious Thinking Scale* (STS, Kokis et al. 2002; Italian version: Chiesi et al. 2010) was used. It is composed of eight Likert-type items using a 5-point scale ranging from *totally false* to *totally true*, yielding a maximum score of 40. Higher scores represent high levels of superstitious thinking. An example of an item is "The number 13 is unlucky".

## Procedure and Design

To evaluate changes in the dimensions considered in the study over time as a function of treatment condition, an experimental design was conducted with two groups (Training vs. No Training) and two measurements (pre-test and post-test sessions).

Classes were randomly assigned to the Training and No Training conditions.[1] The Training group consisted of 145 students (65 % males, $M_{age} = 15.97$, $SD = .53$, *range* 15–18) and the No Training group consisted of 36 students (58 % males, $M_{age} = 15.85$, $SD = .36$, *range* 15–17).

For the Training group, participation involved filling out the above described scales before the intervention (pre-test), receiving training activities, filling out the scales after intervention (post-test), and then compiling the questionnaires 6 months after the intervention has ended (follow-up) (school break over the summer occurred during this interval). The No Training group was administered the pre-test and post-test questionnaires. While the Training group received the intervention, the No Training group continued with usual school activity.

In the pre-test, post-test, and follow-up sessions, the scales were administered within the classroom and students were required to work individually. The order of presentation was the following: *South Oaks Gambling Screen-Revised for Adolescents,*[2] *Questionnaire of Attitudes and Knowledge About Gambling*, *Gambler's Fallacy Task*, *Gambling Attitude Scale*, and *Superstitious Thinking Scale*. Teachers were not present during the administration of the scales. Administration of the instruments required approximately 60 min.

The *Training* group attended the intervention approximately 2 weeks after the pre-test, and the post-test was administrated 1 week after the end of the intervention and 5 weeks after pre-test data were collected. Few days after the follow-up session, a final meeting took place during which all the participants were given a feedback about the research and thanked for their participation.

## The Intervention

The intervention was designed to increase correct knowledge about gambling and reduce gambling related misconceptions, economic optimistic view of gambling profitability, and superstitious beliefs. The specificity of our intervention consisted in the integration of different training techniques for the delivery of the educational contents: activities with random events generators (coins, dice, card decks), Power-Point slides, a video, and collective discussions. Indeed, in some interventions realized to date, a video has been primarily used (Capitanucci et al. 2010; Ferland et al. 2002; Lavoie and Ladouceur 2004; Ladouceur et al. 2004, 2005; Turner et al. 2008c), while activities and discussions led by the trainer have been implemented in others (Ferland et al. 2005; Gaboury and Ladouceur 1993; Taylor and Hillyard 2009; Turner et al. 2008b; Williams et al. 2010). Thus, there is a lack of intervention studies in which video and individual activities have been combined.

As for the methodology, each didactic unit included exercises in which students had to apply the learned ability/concept, and then they had to use the learned ability referring to

[1] School principals' agreement was given under the condition that the majority of the students participated to the training. Thus, only one class *per* school (randomly selected) was assigned to the No Training group.

[2] Due to the relative shortness of time between the training and the post-test, the SOGS-RA was not administered in the post-test. Moreover, in completing the SOGS-RA, participants had to refer to the last 6 months to investigate changes in gambling habits.

fictitious gambling situations. In that way, training activities were aimed to promote the generalization of the proposed contents in real-life contexts.

The intervention comprised two didactic units of 2 h (one *per* week) each implemented in each class, during the normal school time. It was conducted by a developmental psychologist expert in adolescent gambling and school intervention. Teachers were not present during the administration of the training program. To implement it, the trainer employed a treatment protocol to act in the training situation to facilitate the achievement of each proposed objective.

The training contents were presented through Power-Point slides and a video. Each activity was implemented using a specific procedure: (a) initial instructions by the trainer, (b) running the task by the students, (c) interactive discussion and synthesis of the contents, (d) delivery of summary sheets to the students. Each student signed a contract as recognition of the importance of their active participation during meetings.

The first didactic unit ("*Gaming or Gambling? Knowledge and Behavior*") was centered on knowledge of gambling and probabilistic issues, on which five activities were implemented. The aim of the first one was to teach correct meaning of gambling and remove gambling related misconceptions. Students were asked what is gambling and to give five examples of gambling activities. The second activity was directed to introduce the concept of independent random events. Specifically, the students had to indicate the likelihood of Tail in a sequence of five coin tosses and to do five coin tosses with a 0.50 euro coin. The aim of the third activity was to remove biases and improve normative probabilistic reasoning in the case of independent and dependent random events, reasoning with a 40 cards deck. First, students had to extract with replacement a sequence of five cards from the deck and, after each extraction, they had to reason on the likelihood of Ace at the next extraction. Then, students repeated the same task without replacement of the extracted card. To make students aware of emotional involvement influence in gambling activities, the fourth activity consisted in presenting a probabilistic reasoning task in two different frames: no gambling and gambling situation. The aim was to compare the susceptibility to the gambler's fallacy in the two situations. First, students were presented with six series of six outcome coin tosses sequences. For each sequence, students were required to indicate the likelihood of Tail at the next toss. Then, they were proposed the same outcome sequences and they were requested to bet money (from a minimum of 0 to a maximum of 10 euro) on Tail at the next toss for each sequence. The fifth activity was designed to promote the application of the learned probabilistic abilities in the context of the Roulette. Specifically, students were presented with a scenario in which six fictitious young gamblers were betting on the roulette outcomes. Students were provided with information about the series of wins and losses obtained by the gamblers and they were required to make their own bet. Black had been the winning outcome initially while Red had been the winning outcome in the recent bets. Students were requested to identify the answer corresponding to the gambler's fallacy (i.e. betting on Black driven by the belief that long period without reward increases the likelihood of a win) and to find problem solving strategies in order to avoid the gambler's fallacy.

The second didactic unit ("*Gambling's Costs and Irrational Thoughts About It*") was centered on the economic disadvantages associated with gambling activities and irrationality of superstition beginning from the reflection on specific gambling related superstitious beliefs. Four activities were implemented. The aim of the first one was to teach students correct knowledge of gambling, to demonstrate the irrationality of superstitious beliefs and show the economic disadvantages associated with gambling presenting the video "*Le hasard, Lucky, on peut rien y changer*" (Ferland et al. 2002; Italian version: Capitanucci et al. 2010). The aim of the second activity was to highlight the economic

disadvantages of gambling referring to *Superenalotto*, the principal Italian traditional lottery. More in detail, a "*Student Superenalotto"* lottery was implemented in class. After the lottery extractions, students were presented with real data of a *Superenalotto* extraction. Finally, to make more realistic the concept of very low probability to win the biggest lottery prizes, students were provided with the mathematical calculation according to which to have the certainty of winning a prize it would be necessary to make three bets *per* week for about 1,995,560 years. The aim of the third activity was to evidence the susceptibility to superstitious conditioning in gambling activities through a fictitious lottery implemented in the class ("*Student Superenalotto*" lottery). After the lottery extractions, the trainer led a group discussion focused on the absence of a causal relationship between superstitious thoughts (e.g. the belief in lucky numbers) and gambling outcomes. Lastly, the aim of the fourth activity was to evidence the irrationality of superstitious thinking as a dispositional thinking style. More in detail, students were asked the meaning of superstition and to give examples of superstitious beliefs and behaviors.

### Data Analyses

As a first step, we tested the baseline equivalence of the Training and No Training groups with independent sample *t* tests for metrical variables and with $\chi^2$ tests for categorical dichotomous variables. As a second step, we analyzed short-term efficacy of the intervention conducting a Mixed 2 × 2 ANOVA with Time (pre- and post-test) as within factor and Group (Training and No Training) as between factor for each dependent variable. Third, we verified the short-term effects on the basis of gambling problem severity. More in detail, inside the Training group, we conducted a Mixed 2 × 2 ANOVA with Time (pre-test and post-test) as within factor and Gambling problem severity (*Non-problem* and *At-Risk/Problem*) as between factor for each dependent variable for which significant interaction effects were found in the previous analysis step. Subsequently, the long-term efficacy was analyzed considering the Training group. Specifically, using paired sample *t* tests, we compared post-test and follow-up scores for the dependent variables for which the training was found to be effective at post-test. Then, the same analysis was performed considering separately *Non-problem* and A*t-Risk/Problem* gamblers. Finally, using McNemar tests, we compared the percentage distribution of gamblers and *At-Risk/Problem* gamblers respectively found at post-test and follow-up in the Training group.

## Results

### Baseline Equivalence Evaluation

As a preliminary step, we tested the equivalence of the Training and No Training groups considering socio-demographic data, the factors taken into account in the intervention, and gambling behavior. These analyses were conducted with the participants of the Training group who have completed the pre-test, attended both training didactic units, and filling-out the post-test ($n = 119$), and the participants of the No Training who have taken part both in the pre- and post-test sessions ($n = 28$). Thus, if a student did not attend just one of these sessions was excluded from the analyses. No significant differences were found between the two groups as regards socio-demographic variables, correct knowledge and misconceptions about gambling, probabilistic reasoning, perception of gambling's profitability, superstitious thinking, and gambling behavior as measured at the pre-test session (Table 1).

**Table 1** Baseline equivalence evaluation between the Training group ($n = 119$) and the No Training group ($n = 28$)

| | *M* | *SD*[a] | *t* (*df*) | *p* |
|---|---|---|---|---|
| *Age* | | | | |
| Training | 15.91 | .47 | .10 (145) | .921 |
| No Training | 15.90 | .39 | | |
| *Correct knowledge about gambling* | | | | |
| Training | 26.61 | 3.53 | −.01 (145) | .998 |
| No Training | 26.61 | 4.10 | | |
| *Misconceptions about gambling* | | | | |
| Training | 13.62 | 3.40 | 1.61 (145) | .109 |
| No Training | 12.50 | 2.92 | | |
| *Normative probabilistic reasoning* | | | | |
| Training | 3.87 | 1.92 | −.96 (145) | .341 |
| No Training | 4.25 | 1.67 | | |
| *Economic perception of gambling* | | | | |
| Training | 19.80 | 6.22 | 1.33 (144) | .185 |
| No Training | 18.07 | 5.91 | | |
| *Superstitious thinking* | | | | |
| Training | 20.04 | 6.86 | 1.74 (142) | .084 |
| No Training | 17.61 | 5.70 | | |
| | *M* (%) | *F* (%) | $\chi^2$ (*df*) | *p* |
| *Gender* | | | | |
| Training | 83 | 17 | .35 (1) | .556 |
| No Training | 79 | 21 | | |
| | NGs (%) | Gs (%) | $\chi^2$ (*df*) | *p* |
| *Gambling behaviour*[b] | | | | |
| Training | 14 | 86 | .01 (1) | .944 |
| No Training | 15 | 85 | | |
| | NPGs (%) | ARPGs (%) | $\chi^2$ (*df*) | *p* |
| *Problematic gambling behaviour*[c] | | | | |
| Training | 59 | 41 | .75 (1) | .387 |
| No Training | 68 | 32 | | |

[a] Levene's test for homogeneity of variance was non-significant for all the variables ($p > .05$)

[b] Non-gamblers (NGs) versus Gamblers (Gs)

[c] *Non-problem* gamblers (NPGs) versus At-Risk/Problem gamblers(ARPGs)

## Short-Term Efficacy Evaluation

Short-term intervention effects were tested performing a Mixed 2 × 2 ANOVA with Time (pre- and post-test) as within factor and Group (Training and No Training) as between factor. The analyses were performed on each of the following dependent variables: correct knowledge about gambling, misconceptions about it, normative probabilistic reasoning, economic perception of gambling, and superstitious thinking. The main effect of interest was the Group × Time interaction.

In line with the hypotheses, significant Time × Group interactions were found for correct knowledge about gambling ($F(1,145) = 12.62$, $p < .01$, *partial* $\eta^2 = .08$), misconceptions about gambling ($F(1,145) = 10.84$, $p < .01$, *partial* $\eta^2 = .07$), economic perception of gambling ($F(1,143) = 7.16$, $p < .01$, *partial* $\eta^2 = .05$), and superstitious thinking ($F(1,141) = 5.48$, $p < .05$, *partial* $\eta^2 = .04$). Post-hoc *t* tests showed the interaction effects to be due to significant changes from pre- to post-test in the Training group but not in the No Training group (Table 2). Specifically, in the Training group there was a significant improvement in correct knowledge about gambling and a significant reduction of misconceptions about it, economic perception of gambling, and superstitious thinking.

Contrary to the hypotheses, no significant interaction effect was obtained for normative probabilistic reasoning, ($F(1,145) = .05$, $p = .83$), indicating that there was not a significant difference between the Training and the No Training group in the change of this dependent variable from pre- to post-test (Table 2).

## Short-Term Efficacy Evaluation Based on Gambling Problem Severity

To verify the hypothesis that the above described short-term effects were obtained by the Training students regardless of their problem gambling severity status, adolescents without

**Table 2** Mean scores compared with paired-samples *t* test (and related effect sizes) for the Training group ($n = 119$) and the No Training group ($n = 28$) at pre- and post-test

| | Pre-test | | Post-test | | *t* (*df*) | *d* |
|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | | |
| *Correct knowledge about gambling* | | | | | | |
| Training group | 26.61 | 3.53 | 30.24 | 3.87 | −9.27*** (118) | .85 |
| No Training group | 26.61 | 4.10 | 27.18 | 3.97 | −.93 (27) | – |
| *Misconceptions about gambling* | | | | | | |
| Training group | 13.62 | 3.40 | 11.96 | 3.60 | 5.13*** (118) | .47 |
| No Training group | 12.50 | 2.92 | 13.21 | 3.06 | −1.28 (27) | – |
| *Normative probabilistic reasoning* | | | | | | |
| Training group | 3.87 | 1.92 | 4.29 | 1.98 | −1.58 (118) | – |
| No Training group | 4.25 | 1.67 | 4.75 | 1.77 | −1.79 (27) | – |
| *Economic perception of gambling* | | | | | | |
| Training group | 19.72 | 6.19 | 17.92 | 5.93 | 3.48** (116) | .32 |
| No Training group | 18.07 | 5.91 | 19.36 | 5.93 | −1.37 (27) | – |
| *Superstitious thinking* | | | | | | |
| Training group | 20.02 | 6.88 | 17.95 | 6.26 | 4.31*** (114) | .40 |
| No Training group | 17.61 | 5.70 | 17.93 | 6.04 | −.52 (27) | – |

** $p < .01$; *** $p < .001$

gambling related problems (*Non-problem* gamblers) and those who showed problematic gambling behavior (*At risk/Problem* gamblers) were analyzed separately inside the Training group.

Specifically, a Mixed 2 × 2 ANOVA with Time (pre-test and post-test) as within factor and Gambling problem severity (*Non-problem* and *At-Risk/Problem*) as between factor was performed on each of the dependent variable for which significant interaction effects were found (correct knowledge and misconceptions about gambling, economic perception of gambling, and superstitious thinking).

As expected, no significant interaction effects were found for correct knowledge about gambling ($F(1,115) = .09$, $p = .77$), misconceptions about it ($F(1,115) = 2.18$, $p = .14$), economic perception of gambling ($F(1,113) = .05$, $p = .83$), and superstitious thinking ($F(1,111) = .01$, $p = .92$), indicating that quite similar patterns of change between pre- and post test occurred in the two categories of gamblers.

On the contrary, the main effect of Time was significant for correct knowledge about gambling ($F(1,115) = 79.37$, $p < .001$, *partial* $\eta^2 = .41$), misconceptions about it ($F(1,115) = 22.96$, $p < .001$, *partial* $\eta^2 = .17$), economic perception of gambling ($F(1,113) = 12.15$, $p < .01$, *partial* $\eta^2 = .10$), and superstitious thinking ($F(1,111) = 17.73$, $p < .001$, *partial* $\eta^2 = .14$), attesting that a significant change between pre- and post-test was occurred in both categories of gamblers.

Specifically, *t* test comparisons indicated that significantly higher levels of correct knowledge of gambling from pre- to post-test were found both among *Non-problem* and *At-Risk/Problem* gamblers, and that scores of economic perception of gambling were significantly lower from pre- to post-test both among *Non-problem* and *At-Risk/Problem* gamblers. The two groups showed also lower levels of superstitious beliefs from pre- to post-test. Contrary to our hypotheses, a significant decrease in the misconceptions about

**Table 3** Mean scores compared with paired-samples *t* test (and related effect sizes) for *Non-problem* gamblers ($n = 69$) and At-Risk/Problem gamblers ($n = 48$) in the Training group

| | Pre-test | | Post-test | | *t* (*df*) | *d* |
|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | | |
| *Correct knowledge about gambling* | | | | | | |
| *Non-problem* gamblers | 27.33 | 3.06 | 31.07 | 3.20 | −9.14*** (68) | 1.10 |
| *At-Risk/Problem* gamblers | 25.50 | 3.86 | 29.00 | 4.45 | −4.50*** (47) | .65 |
| *Misconceptions about gambling* | | | | | | |
| *Non-problem* gamblers | 12.87 | 2.71 | 10.78 | 2.73 | 5.88*** (68) | .71 |
| *At-Risk/Problem* gamblers | 14.73 | 4.02 | 13.63 | 4.12 | 1.80 (47) | – |
| *Normative probabilistic reasoning* | | | | | | |
| *Non-problem* gamblers | 3.96 | 1.97 | 4.23 | 1.92 | −1.15 (68) | – |
| *At-Risk/Problem* gamblers | 3.75 | 1.88 | 4.29 | 1.84 | −1.80 (47) | – |
| *Economic perception of gambling* | | | | | | |
| *Non-problem* gamblers | 17.76 | 5.47 | 16.01 | 4.65 | 2.86** (67) | .35 |
| *At-Risk/Problem* gamblers | 22.60 | 6.21 | 20.62 | 6.65 | 2.12* (46) | .31 |
| *Superstitious thinking* | | | | | | |
| *Non-problem* gamblers | 18.94 | 6.48 | 16.80 | 5.51 | 3.79*** (64) | .47 |
| *At-Risk/Problem* gamblers | 21.60 | 7.29 | 19.56 | 7.01 | 2.35* (47) | .34 |

* $p < .05$; ** $p < .01$;*** $p < .001$

gambling from pre- to post-test occurred only among *Non-problem* gamblers, indicating that the intervention was insufficient in modifying faulty beliefs about gambling among *At-Risk/Problem* gamblers (Table 3).

As regards normative probabilistic reasoning, the interaction effect was not significant ($F(1,115) = .49$, $p = .49$) as well as the main effect of Time ($F(1,115) = 1.73$, $p = .19$). Moreover, *t* test comparisons did not reveal any significant changes from pre- to post-test in each category of gamblers (Table 3).

## Long-Term Efficacy Evaluation

To verify the stability of the short-term effects over time, for the Training participants, we compared post-test and follow-up scores of each dependent variable for which the intervention was found to be effective in the short-term (correct knowledge and misconceptions about gambling, economic perception of gambling, and superstitious thinking). Participants who completed the post-test and the follow-up sessions were ninety-one.

In detail, using paired *t* tests, we compared post-test scores with the follow-up ones. In line with the hypotheses, results showed no significant differences suggesting the permanence of the intervention effects over time for correct knowledge about gambling, misconceptions about it, economic perception of gambling, and superstitious thinking (Table 4).

## Long-Term Efficacy Evaluation Based on Gambling Problem Severity

To verify that the persistence of the short-term effects was obtained by the Training students regardless of their problem gambling severity status, considering separately *Non-problem* gamblers and *At Risk/Problem* gamblers inside the Training group, we compared their post-test and follow-up scores using paired *t* tests. Results showed no significant differences suggesting the permanence of the intervention effects over time for both categories (Table 5).

## Long-Term Efficacy Evaluation on Gambling Behavior

To verify the hypothesis that the intervention had a decrementing effect on adolescent self-reported gambling, changes in the percentage of *gamblers* and in the percentage of *At-Risk/Problem* gamblers inside the Training group from pre-test to follow-up were evaluated with McNemar tests. Results showed a significant small in size decrease (Cohen 1988) in the prevalence of *gamblers* from pre-test to follow-up (McNemar $\chi^2$ (1, $N = 83$) $= 2.34$, $p < .05$, $\phi = .16$). Specifically, *gamblers* decreased from 86 to 73 %. Results evidenced also a significant and medium in size decrease (Cohen 1988) in the prevalence of

**Table 4** Mean scores compared with paired-samples *t* test for the Training group ($n = 91$) at post-test and follow-up

| | Post-test | | Follow-up | | *t* (*df*) | *p* |
|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | | |
| Correct knowledge about gambling | 30.37 | 3.77 | 29.64 | 3.97 | 1.62 (88) | .109 |
| Misconceptions about gambling | 11.65 | 3.44 | 12.10 | 4.16 | −1.22 (88) | .227 |
| Economic perception of gambling | 17.81 | 5.47 | 17.91 | 7.27 | −.11 (85) | .911 |
| Superstitious thinking | 17.42 | 6.33 | 17.56 | 7.77 | −.28 (88) | .779 |

**Table 5** Mean scores compared with paired-samples *t* test for Non-problem gamblers ($n = 52$) and *At-Risk/Problem* gamblers ($n = 38$) in the Training group

| | Post-test | | Follow-up | | *t* (*df*) | *p* |
|---|---|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* | | |
| *Correct knowledge about gambling* | | | | | | |
| *Non-problem* gamblers | 31.31 | 2.96 | 30.67 | 3.48 | 1.24 (50) | .222 |
| *At-Risk/Problem* gamblers | 28.97 | 4.36 | 28.14 | 4.19 | 1.03 (36) | .312 |
| *Misconceptions about gambling* | | | | | | |
| *Non-problem* gamblers | 10.49 | 2.52 | 11.35 | 3.91 | −1.75 (50) | .087 |
| *At-Risk/Problem* gamblers | 13.24 | 3.95 | 13.11 | 4.40 | .24 (36) | .813 |
| *Economic perception of gambling* | | | | | | |
| *Non-problem* gamblers | 15.96 | 4.53 | 16.15 | 6.15 | −.19 (47) | .847 |
| *At-Risk/Problem* gamblers | 20.14 | 5.77 | 20.19 | 8.12 | −.04 (36) | .971 |
| *Superstitious thinking* | | | | | | |
| *Non-problem* gamblers | 16.53 | 6.10 | 16.10 | 7.46 | .75 (50) | .458 |
| *At-Risk/Problem* gamblers | 18.68 | 6.60 | 19.49 | 7.95 | −.85 (36) | .400 |

*At-Risk/Problem* gamblers (McNemar $\chi^2$ (1, $N = 88$) = 8.77, $p < .05$,$\phi = .32$). Specifically, the percentage of *At-Risk/Problem* gamblers decreased from 41 to 28 % from pre-test to follow-up.

## Discussion

The aim of the present study was to develop a problem gambling preventive intervention adopting an integrative perspective and to provide empirical evidence of its efficacy. Specifically, our training program was designed to act both on factors that traditionally represent a first step in prevention, i.e. correct knowledge and misconceptions about gambling (Capitanucci et al. 2010; Ferland et al. 2002, 2005; Gaboury and Ladouceur 1993; Ladouceur et al. 2004, 2005; Lavoie and Ladouceur 2004; Taylor and Hillyard 2009), and on specific cognitive and dispositional factors, in line with the interventions classified as a second step in prevention (Turner et al. 2008b, c). More in detail, we focused on gambling knowledge and misconceptions, the economic perception of gambling, and superstitious thinking, based on our previous findings that had showed the predictive power of these factors on problematic gambling behavior inside an integrated model (Donati et al. 2013).

Trying to overcome the limit of previous studies, we aimed to test a series of efficacy indicators, such as short- and long-term effects, verifying the effects comparing adolescent without gambling related problems with those who showed problematic gambling behavior, and behavioral changes as regards gambling.

Findings have showed that this intervention produced the hypothesized effects in the short-term with the exception of normative probabilistic reasoning. More in detail, the participants who attended the training program improved their correct knowledge on gambling and reduced their misconceptions about it, economic optimistic perception of gambling profitability, and superstitious thinking, while the participants who did not follow the training program did not show any change from pre- to post-test. The short-term change of correct knowledge and misconceptions about gambling is consistent with the finding

obtained in the majority of first step of preventive initiatives (Capitanucci et al. 2010; Ferland et al. 2002, 2005; Ladouceur et al. 2004, 2005; Lavoie and Ladouceur 2004; Taylor and Hillyard 2009).

In line with the hypotheses, the short-term changes on correct knowledge about gambling, economic perception of gambling, and superstitious thinking were found both in adolescents without gambling problems and adolescents with problematic gambling behavior. However, only *Non-problem* gamblers showed a significant decrement of misconceptions from pre- to post-test.

Concerning long-term efficacy evaluation, as expected, results showed that post-test mean scores did not differ significantly from the follow-up ones, indicating a substantial persistence of the effects over a period of 6 months for participants who have attended the training program. These findings are in line with the results obtained in some previous studies concerning correct knowledge and misconceptions about gambling (Capitanucci et al. 2010; Gaboury and Ladouceur 1993). Regarding dispositional factors, the present results are innovative since, to the best of our knowledge, no previous studies have verified the stability over time of their changes. Additionally, this study satisfied a long-term efficacy prerequisite showing the persistence of the effects in both Non-problem and At-Risk/Problem gamblers.

Concerning the effects on gambling behavior, findings showed that this intervention was able to produce the predicted changes in the long-term. Specifically, among adolescents who attended the training program, it was evidenced a significant reduction of the percentage of gamblers and At-Risk/Problem gamblers from pre-test to follow-up. More in detail, the reduction of problematic gamblers was more consistent than the decrement of the gamblers. This finding seems to satisfy one of the principal objective of a preventive program, that is to prevent vulnerable individuals, such as adolescent gamblers, from the development of severe gambling problems (Dickson-Gillispie et al. 2008). Moreover, this result is interesting since among previous intervention studies that had conducted the behavioral efficacy evaluation (Ferland et al. 2005; Gaboury and Ladouceur 1993; Turner et al. 2008b; Williams et al. 2010), only Williams et al. (2010) had obtained positive results, evidencing that after about 4 months by the end of their intervention, there had been a significant reduction in the percentage of adolescent gamblers and in gambling frequency.

Overall, the present intervention succeeded in producing modifications in several gambling related factors and, as a consequence, it might be deemed adequate and useful in reducing the probability of developing negative consequences from gambling among adolescents (Blaszczynski et al. 2004; Williams et al. 2007). The only aspect in which we failed to intervene was adolescents' normative probabilistic reasoning, i.e. we were not able to reduce the susceptibility to the gambler's fallacy. However, this results confirm previous studies attesting the resistance to change of consolidated probabilistic reasoning biases (for a summary of the literature, see e.g., Gilovich et al. 2002; specifically for adolescents, see Klaczynski 2004).

Moreover, this intervention was not able to reduce misconceptions about gambling in *At-Risk/Problem* gamblers, that continued to perceive gambling to involve individual ability. Despite the current training activities produced a change in this factor, they did not seem to be sufficient to decrement these beliefs among the more at-risk adolescents. Although this fact constitutes a restriction to the efficacy of the intervention, it confirms the difficulty to change gamblers' erroneous beliefs, even when definitive evidence of their incorrectness are given (Delfabbro 2004).

Finally, there are some limitations with this study. First, since this intervention had a school setting, it has not been possible to assign an equal number of participants to the Training and No Training conditions, because of the specific schools' constraints. As a consequence, the unequal sample size of Training and No Training group may reduce the statistical power of the analyses. However, the baseline equivalence evaluation between the two groups (considering socio-demographic data, factors analyzed in the intervention, and self-reported gambling behavior) ensures a certain reliability of the No Training group as a control condition. Second, since we had conducted a follow-up measurement after 6 months by the end of the intervention, some mortality among Training participants occurred. In this regard, normal mortality might be also been threatened by the school break occurred between post-test and follow-up sessions, that might had exacerbated the probability to loss participants because of rejections, changing of school, and school drop-out. Finally, caution has to be paid about the generalizability of the present results obtained with a sample of Italian public school students.

Our results represent a challenge for future intervention programs. Given the difficulty found in this study in improving normative probabilistic reasoning and changing gambling-related misconceptions, future studies would be developed in order to find more effective training activities referring to those dimensions. Specifically, activities in which students have to reason with non-equally like events would be planned, both in no gambling situations, using for example a pencil case with twelve pens of different colors, and in gambling situation, manipulating for instance a card deck to make the likelihood to extract a certain card non-equally like. As for misconceptions, it would be necessary to empirically demonstrate the role of personal abilities and strategies in games of skill and gambling activities, focusing on the difference of personal control on the outcomes in the two conditions. Finally, in order to obtain more effective educational actions, future interventions would be planned to work in separate settings with the more at-risk adolescents in order to realize a more detailed and specific training program with those types of gamblers. Finally, in order to strengthen the empirical evidence of the training effectiveness, future studies would be designed in order to better investigate the specific efficacy of the ingredients of the present training in changing gambling related factors and gambling behaviour.

Overall our results attested short- and long-term effectiveness of an integrated and extensive intervention in changing correct knowledge of gambling, perception of its economic profitability, and superstitious thinking both among Non-problem and At-Risk/Problem gamblers, evidencing some changes in actual gambling behavior. Moreover, it provided indications for future research aiming to improve its effects.

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