Direct and indirect effects of pathological gambling on risk attitudes

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Direct and indirect effects of pathological gambling on risk attitudes

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Abstract

We study individual decision making in a lottery-choice task performed by three different populations: gamblers under psychological treatment ("addicts"), gamblers' spouses ("victims"), and people who are neither gamblers or gamblers' spouses ("normals"). We find that addicts are willing to take less risk than normals, but the difference is smaller as a gambler's time under treatment increases. The large majority of victims report themselves unwilling to take any risk at all. However, addicts in the first year of treatment react more than other addicts to the different values of the risk-return parameter.

Keywords: risky decision making, pathological gambling, attraction and repulsion to chance.

1 Introduction

Since the late 1940s, individual decision making under risk has been one of the most popular issues studied by economists and psychologists. On one hand, theoretical analysis, initially undertaken mostly by economists, has framed the basic problem as a generic situation in which individuals choose from a number of probability-outcome pairs. On the other hand, empirical contributions from both disciplines have adopted a variety of methodologies. These include questionnaires, economic experiments, and real-world data. The most salient and intriguing result across all these different methodologies is that decisions in a risky environment are very sensitive to the framing of the choice task and to some individual characteristics. In this paper, we focus on the effects of problem gambling on individual choice under uncertainty, as a natural field for studying interaction between subjects' characteristics and their observed decision making behavior.

Since 1980, pathological gambling has been included in the Diagnostic and Statistical Manual of Mental Disorders published by the American Psychiatric Association (1980). Patients with spectrum-related disorders show an intense desire to perform a specific behavior preceded by unpleasant feelings and physiological activation, all of which are relieved when the behavior is performed (Cartwright et al., 1998). Thus, several authors consider pathological gambling (PG) as an obsessive-compulsive spectrum disorder (Frost, 2001). Contrary to this view, other authors argue that gambling is essentially egosyntonic for the patients in all phases of the disorder, in contrast to what happens in the obsessive-compulsive spectrum disorders, where the behavior is consistently egodystonic (American Psychiatric Association, 1994). Moreover, compulsive behaviors include increased evasive behavior, anticipatory anxiety and risk aversion, which are not usually observed in the behavior of pathological gamblers (PGs).

This lack of agreement among experts on whether gambling is an egosyntonic or egodystonic disorder could even imply that gamblers may be heterogeneous with respect to their attitudes towards their addiction. Therefore, at a first stage, whether gambling is an egosyntonic or egodystonic disorder would influence the way PGs feel about their condition. At a second stage, this could interfere with the degree to which they feel more attracted than normal subjects by bets involving riskier options. Therefore, studying whether PGs behave differently from normal subjects in risky decision-making tasks would require isolating the first level of pleasure or discomfort due to being a gambler from the second level of pleasure due to betting on riskier options. A natural way of obtaining a more homogeneous population of gamblers with re-

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spect to their attitude towards their addiction is isolating and studying a population of egodystonic gamblers as are those who have voluntarily decided to quit and participate in a Gambler Anonymous (GA) therapy group.

Several aspects of PGs' behavior have been studied so far. Such studies are either aimed at shedding light on specific methodological issues that should be accounted for when studying decision making by PGs[1] or are directly addressing the question whether PGs suffer form some kind of cognitive bias. Among different kinds of cognitive bias, the most obvious suspect is probability distortion due to attraction to risky bets, which could yield irrational behavior reflected on higher degrees of risk taking as compared to normal subjects. Along this line are the studies by Toneatto (1999a,b), Gaboury and Ladouceur (1989) and, especially, Leopard (1978), while Goodie (2005) adopts a slightly different approach to higher levels of risk taking showing that they are the result of overconfidence.

In this paper, we study risky decisions made by subjects whose lives have been directly affected by pathological gambling and have decided to quit by participating in a therapy group of GA. Furthermore, we study the risk taking behavior of people who are indirectly affected by pathological gambling because they are married to a pathological gambler. We want to know whether the decisions of the aforementioned groups in an abstract lottery-choice task significantly differ from those taken by "normal" subjects and, if so, in what way. In order to address this question, 82 subjects played a hypothetical version of the lottery-choice task introduced by Sabater & Georgantzís (2002) and further developed and discussed in Georgantzís et al. (2004). The task is designed to capture two dimensions of decision making under risk. First, it can be used to distinguish between risk-averse and risk-neutral/risk-loving subjects. It also measures an individual's degree of risk aversion. Second, the task captures a subject's reaction to different risk premia.

Our sample consists of three different subsamples. The first, labeled ADDICTS, consists of 32 PGs attending a Gambler Anonymous (GA) session at the Annual Meeting of the Cordobesian Association for Patholical Gamblers (ACOJER)[2]. The second subsample, labeled VICTIMS[3], consists of 30 spouses of subjects from the first subsample. The third subsample consists of 20 subjects which are our control population, labeled NORMALS. Sabater & Georgantzís (2002) and Georgantzís et al. (2004) provide us with a much larger data set obtained with normal student-subjects faced with the same task under different payment methods. However, given the age difference between students and our two focus groups, we have created this new sample of normal subjects for the sake of comparability.

Our results show that addicts exhibit a higher degree of risk aversion than normal individuals, although their behavior tends to convergence towards normals' decision making behavior as the time under treatment increases. Interestingly, victims are even more risk-averse. In fact, a large percentage of them (around 70%) refused to take any risk at all.

A second salient result is that addicts in the first year of treatment appear to be more sensitive to risk-rewarding increases in expected rewards than are all other subjects.

In Section 2, we further discuss our objectives and hypothesis. In Section 3, we explain the experimental design. Section 4 summarizes the results and Section 5 contains the conclusions. The appendix presents an English translation of the instructions.

2 Hypotheses

There are few precedents for experimental economics research on "special subject pools." For instance, Battalio et al. (1973) report the results of a token economy experiment run with 38 patients of the Central Islip State Hospital. More recently, Bosch-Doménech et al. (2005) conducted research with Alzheimer patients, and Ernst Fehr has reported currently ongoing experiments with schizophrenics. Contrary to economists, psychologists have extensively studied cognitive distortions related to pathological gambling (for example, Toneatto (1999a,b), or Gaboury and Ladouceur (1989). These findings motivate our first hypothesis:

Hypothesis 1: Addicts' attitudes towards risk are significantly different from those of normal subjects.

We formulate the first hypothesis in this generic form, because the difference could go in either direction. One possibility is that gambling tasks are sensitive to the underlying attraction that addicts have toward gambling. This is possible because the task itself does not involve real money and is thus different from the compulsive behavior that the addicts are trying to overcome. The other possibility is that the addicts' new aversion toward gambling will extend to the laboratory task. Thus, the way we address this question concerns whether laboratory gambling tasks are sensitive to basic impulses which are presumably still present, or to PGs' reflective commitment to give up gambling.

[1] For example, Ladouceur et al. (2007) show that gamblers exhibit an increased willingness to participate in studies on gambling.

[2] At the moment of the experiment, they were heterogeneous with respect to their times under psychological treatment: 15 of them were in their "first year" under treatment; 4 were in the second year; 2 in the third year; 5 of them in the 5th; 2 in the 6th year; 2 in the 7th year and 2 had been under treatment for over 10 years.

[3] We call gamblers' spouses "victims" because they are the ones who have suffered the negative consequences of pathological gambling without having a gambling problem themselves.

It is not clear how victims should be expected to behave towards risk. On one hand they are people who have not been diagnosed as PGs. So, ex-ante, their behavior could be expected to be indistinguishable from normals. On the other hand, the evidence reported by Darbyshire (2001) concerning children's behavior living in a family where parental gambling is a problem suggest that indirect effects may also affect the behavior of spouses. This motivates the second hypothesis:

Hypothesis 2: Victims behave in a significantly different way towards risk as compared to addicts and to normals.

3 Experimental design

Our main objective is to explore the direct and indirect effects of pathological gambling on risk attitudes. We compare three different subsamples: addicts, victims, and normals.

Our data on the two main groups were collected from a single experimental session at Hotel El Pilar in La Carlota (Córdoba, Spain) in November 2003. The subject pool in this session consisted of members of the "Asociación Cordobesa de Jugadores en Rehabilitación" (ACOJER) during their annual meeting. This is an association dedicated to the psychological treatment of PGs. We ran two treatments in this session:

$i.$ In the first (addicts) treatment, all the subjects were compulsive gamblers belonging to the aforementioned GA group. Thirty-three people participated in the addicts treatment. Nevertheless, we gathered only 32 independent observations because one subject refused to play the game at all.

$ii.$ In the second (victims) treatment, subjects were players' spouses and, thus, victims of their compulsive behavior. We gathered 30 independent observations under the victims treatment.

$iii.$ We compare the results obtained from these two subject populations to those obtained from another experimental session run with normal subjects at the Instituto de Estudios Sociales Avanzados (CSIC). This is a research center which is also located in Córdoba. We made a public announcement for a hypothetical experiment and we recruited 20 volunteers among the administrative staff. This subsample was preferred over college students because of demographic similarities (age, geographic origins, etc.) to the other two subsamples. Table 1 presents descriptives on the composition of the three subsamples in terms of gender and age.

Table 1: Demographic Data

	VICTIMS	ADDICTS	NORMALS
AGE (YEARS)	41.2	42.06	33.35
MALE (%)	13.3%	90.6%	60%
n	32	30	20

In our experiment, no subject received any monetary or other real reward. Subjects made decisions about probabilities of earning hypothetical money. This procedure was followed for ethical reasons: medical protocols advise against offering real rewards in gambling situations to individuals recovering from pathological gambling (see, for instance, Stinchfield, 2003) because abstinence from gambling is the ultimate goal of the treatment. For the sake of comparability, the hypothetical framing was also used in the case of the other two subsamples. Our instructions stressed that we were not asking for names and therefore that the experimental results were going to be analyzed in a completely anonymous way. Moreover, in order to avoid any Experimenter effect, we were introduced as scientists performing an anonymous socio-economic academic research for scientific purposes rather than a medical one.

Note that there is a higher proportion of males in the addicts sample than in the other two subsamples. Some studies indicate that males are less risk averse than females (see Harris et al. (2006) for financial risk; García-Gallego et al. (2006) for a task similar to the one used here; also, Olsen & Cox (2001), and Byrnes et al. (1999) and the recent review by Eckel & Grossman, in press). So, this might introduce a bias in the comparison between addicts and normals, making addicts less risk-averse. Victims are mostly women. In this case, the possible bias would favor a less risky behavior by the victims.

Our experimental design is based on the following slightly revised version of the ternary lotteries approach (see Roth & Malouf, 1979, or Murningham et al. 1988, for example).

Let a lottery (p, X) imply a probability p of earning X (else nothing). Consider a continuum of such lotteries constructed to compensate riskier options with increases in the expected payoff. Formally, each continuum of lotteries will be defined by the pair (c, r) corresponding, respectively, to the certain payoff c above which the expected payoff is increases by r times the probability of earning nothing. Therefore,

$$pX(p) = c + (1-p)r \Longrightarrow X(p) = \frac{c + (1-p)r}{p}.$$

Panel 1										
P	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Xpuntos	1.00	1.12	1.27	1.47	1.73	2.10	2.65	3.56	5.40	10.90
Preferencia										

Panel 2										
P	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Xpuntos	1.00	1.20	1.50	1.90	2.30	3.00	4.00	5.70	9.00	19.00
Preferencia										

Panel 3										
P	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Xpuntos	1.00	1.66	2.50	3.57	5.00	7.00	10.00	15.00	25.00	55.00
Preferencia										

Panel 4										
P	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
Xpuntos	1.00	2.20	3.80	5.70	8.30	12.00	17.50	26.70	45.00	100.00
Preferencia										

Figure 1: Lottery Panels

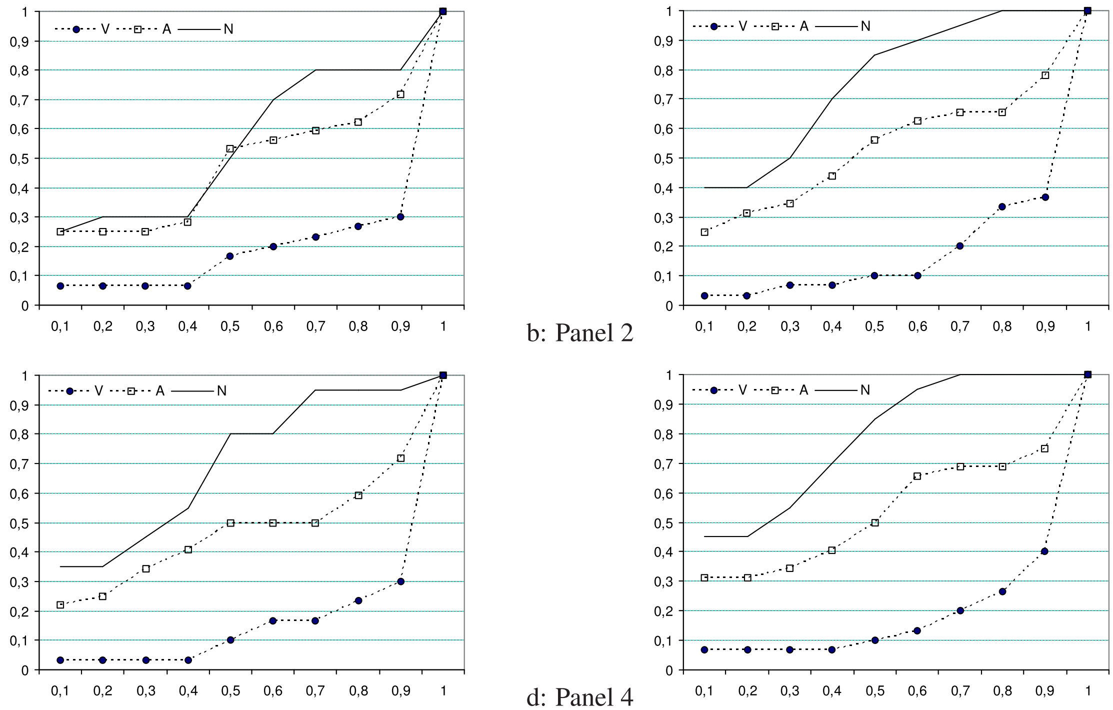
In order to simplify the decision problem faced by our subjects, we used lottery panels. Each panel corresponds to a discrete version of a continuum of lotteries for a different r. Figure 1 presents the four panels used in this study. In the second row of each panel we present the payoffs ($Xpuntos$, expressed in Euros) corresponding to the favorable outcome of each lottery which occurs with probability p. Such probabilities are given in the first row. The third row ($Preferencia$) consists of empty cells, one of which should be used by each subject to mark his or her preference (see a translation of the instructions in the Appendix). These panels were constructed using $c = 1$ and $r = 0.1, 1, 5, 10$.

By inspection, the farther right the lottery chosen by a subject, the less risk-averse the subject is. Risk-neutral (or risk-loving) subjects would choose $p = 0.1$ in all panels. In fact, as shown in Georgantzís et al. (2004), an expected utility maximizing subject with utility $U(X) = X^{1/t}$ would choose the lottery with a winning probability $p = (1 - \frac{1}{t}) \cdot (1 + \frac{c}{r})$, while a Constant Relative Risk Aversion utility maximizer with $U(X) = \frac{X^{1-t}}{1-t}$ would choose $p = \frac{ct}{r} + t$. Apart from guaranteeing that the probabilities chosen in the task relate monotonically to a subject's risk aversion parameter, these predictions imply that a subject should choose riskier lotteries as we move from panel 1 to panel 4. These predictions also hold for other well-known utility functions like those exhibiting Constant Relative Risk Aversion and Constant Absolute Risk Aversion.[4]

Table 2: Between-subject analysis.

A.	Panel 1	2	3	4
KRUSKAL-W χ^2.	15.48	27.62	30.74	29.87
$p - value$	0.00	0.00	0.00	0.00
MEDIAN χ^2	16.82	25.31	34.00	35.20
$p - value$	0.00	0.00	0.00	0.00
B.				
Addicts vs. Victims	-3.34	-3.58	-3.82	-3.61
$p - value$	0.00	0.00	0.00	0.00
Victims vs. Normals	-3.52	-5.15	-5.36	-5.29
$p - value$	0.00	0.00	0.00	0.00
Addicts vs. Normals	-0.38	-1.98	-2.08	-2.23
$p - value$	0.70	0.04	0.03	0.02

[4]However, there are many alternative approaches which could explain our subjects' choices as attraction to some prominent payof (Albers & Albers, 1983), a subject's need to take some optimal degree of risk (Pope, 1998; 2000) or the result of some heuristic (Tversky & Kahneman, 1982) whose exhaustive review is beyond the scope of this article.



a: Panel 1 b: Panel 2

c: Panel 3 d: Panel 4

Figure 2: Cumulative Frequency of Choices per Lottery Panel; A: Addicts, V: Victims, N: Normals.

4 Results

4.1 Differences in risk attitudes

First, we compare behavior across subject subsamples. Figures 2a-d present cumulative frequencies of choices by subject subsample. Each figure presents choices per lottery panel. The horizontal axis represents p, which is the winning probability of a subject's preferred lottery. Notice that lotteries are then ordered in the figures starting by the riskiest and finishing with the certain outcome. The vertical axis represents the cumulative frequency of choices. We can see how a very high percentage of victims (dashed line with black dots) prefer the safe option ($p = 1$) regardless of the panel.

We can see that the baseline population (normal subjects, continuous line) is the riskiest (see, for example, the high percentage of people choosing $p = 0.1$). Finally, in all panels, the behavior of addicts (dashed line with square markers) lies between the behavior of the other two samples.

We can check, now, whether results are statistically different across subsamples in each panel, based on a series of Kruskal-Wallis and Median non-parametric tests for $k = 3$ unrelated samples. The null hypothesis is that the average (or the median) is the same in all the three subsamples (victims, addicts and normals). We perform the same analysis in each panel. Table 2 summarizes these tests.

Both series of tests yield identical results: samples are not drawn from the same population. Neither the average nor the median can be considered invariant across subject populations in any lottery panel. Each group's behavior statistically differs from the other two subsamples' choices. A series of Mann Whitney non-parametric tests for $k = 2$ unpaired samples report a similar message: with the exception of the comparison between addicts and normals in panel 1 (where the risk-premium trade off is very low) the remaining cases show differences among populations.[5] Moreover in all the comparisons where victims are involved we see that test are always significant differences for any value of α. Table 2b shows this series of tests (the $p - value$ is shown between brackets):

Looking at each population's average choice across panels (victims $= 0.867$, addicts $= 0.560$ and normals $= 0.385$), we get that:

Result 1a: Addicts choose safer options than normal individuals, and:

Result 1b: The large majority of victims report themselves unwilling to take any risk at all.

[5]A series of Kolmogorov-Smirnov tests (non reported here) indicate identical results.

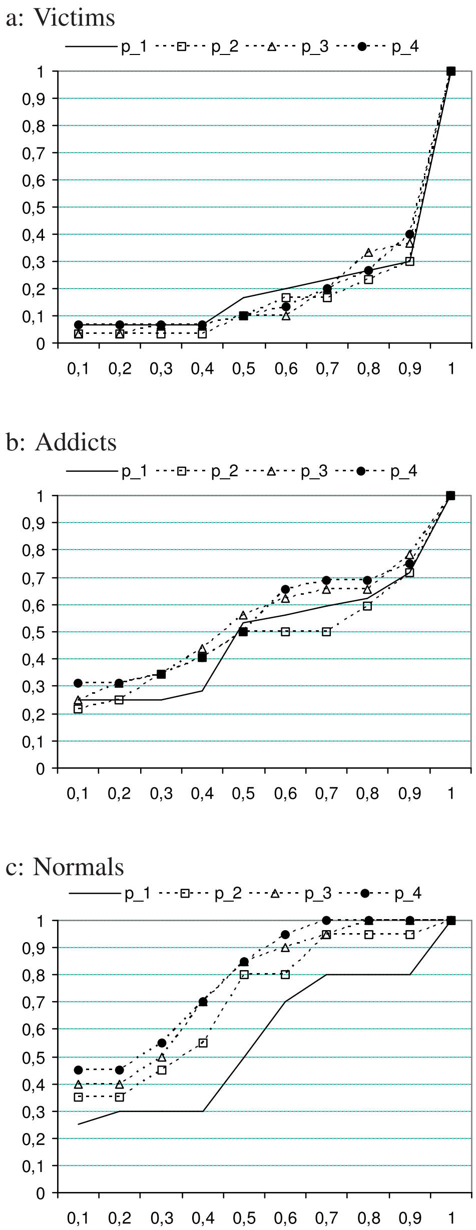


Figure 3: Choice differences across panels for Victims, Addicts & Normals (Cum. Freq.)

4.2 Behavior across panels

Now we explore within-subject behavior across lotteries. Figures, 3a-c show cumulative distributions across panels for each subsample. Again, the horizontal axis represents the winning probabilities of the lotteries chosen (p), starting by the riskiest option and finishing with the sure outcome. The vertical axis represents the cumulative frequency. Here we can observe how behavior does not seem to significantly vary across panels for victims (3-a) and addicts (3-b) while normals (3-c) seem to behave differently across lottery panels.

Formal tests can be used to support these findings informing us on the extent to which subjects within each subsample are sensitive to increases of the risk-return parameter as we move from panel 1 to panel 4.

VICTIMS: Clearly, we do not observe any variation across panels; on average their choices are 0.85 (panel 1, hereafter $p1$), 0.89 ($p2$), 0.87 ($p3$) and 0.86 ($p4$). Both the Friedman ($\chi^2_3 = 2.65; p = 0.44$) and Kendall ($\chi^2_3 = 2.65; p = 0.44$) tests for $k = 4$ related samples do not reject the null hypothesis of equality of distributions. Thus, we cannot reject the hypothesis that all samples are drawn from the same population. Hence, victims do not react to the 4 different values of the risk-return parameter used to construct the four panels.

ADDICTS: The invariant average behavior observed in the previous group is also observed among addicts. The average behavior does not vary across panels: 0.59 ($p1$), 0.59 ($p2$), 0.53 ($p3$) and 0.53 ($p4$). Both the Friedman ($\chi^2_3 = 2.62; p = 0.45$) and Kendall ($\chi^2_3 = 2.62; p = 0.45$) tests do not reject the null hypothesis. Hence, addicts did not vary their behavior across panels.

NORMALS: In contrast to the other samples, our baseline population reacted to the risk-return trade-off in the expected way, choosing riskier lotteries as we move from panel 1 to panel 4. In the first panel (mean choice = 0.52) they behaved similarly to addicts. However, they varied their choices when they were faced with higher values of the risk-return parameter. Therefore, in panels 2, 3 and 4 choice averages clearly fall: $0,38$ ($p2$), $0,33$ ($p3$) and $0,30$ ($p4$). In contrast to what we reported above on victims and addicts, both the Friedman ($\chi^2_3 = 8.84; p = 0.03$) and Kendall ($\chi^2_3 = 8.84; p = 0.03$) tests reject the null hypothesis. Thus, normal subjects do vary their behavior across panels.[6]

In a separate analysis, we defined premium sensitivity as the slope of the best fitting line when choice was plotted against panel (counting panels 1–4 as equally spaced). A higher slope indicates a willingness to take more risk when the premium for risk taking was higher. Premium sensitivity did not depend on age, sex, or on overall risk attitude. It did, however, differ significantly among the three groups by a simple analysis of variance ($F_{2,79} = 4.60$, $p = .013$). Mean slopes (change in response for each step from one panel to the next) were 0.000 for victims, 0.023 for addicts, 0.070 for normals.

[6] A more detailed examination of this finding concerning normal subjects can clarify the origin of the difference across lottery panels. As we move from panel 1 to the following panels, significant differences appear [Z-Wilcoxon tests for p1 vs. p2: -1.97 ($p = 0.04$); p1 vs. p3: -2.24 ($p = 0.02$); p1 vs. p4: -2.52 ($p = 0.01$)]. However, the same test fails to find any difference for the remaining comparisons [Z-Wilcoxon tests for p2 vs. p3: -1.26 ($p = 0.20$); p3 vs. p4: -0.59 ($p = 0.55$); p2 vs. p4: -1.64 ($p = 0.10$)]. That is, subjects are sensitive only to large increases in the risk-return parameter.

Post-hoc examination of the three pairs of groups showed a significant difference only between victims and normals ($F_{1,48} = 10.45$, $p = .007$, with Bonferroni correction). Addicts were in between, with somewhat greater premium sensitivity (but not quite significantly in this analysis) for those in the first year of treatment than those in later years. (We discuss time in treatment further, below.)

We summarize the preceding remarks as follows:

Result 2a: Both addicts and victims tend to maintain their choices invariant across different scenarios of the risk-return parameter.

Result 2b: Normal subjects' choices are sensitive to large risk-return variations, and the normal subjects differ significantly from the victims.

4.3 Effect of time in treatment

Figure 4 presents cumulative frequencies by panel of choices by PGs, distinguishing between those who are in their first year of treatment and those who have undergone treatment for longer periods. A more detailed analysis of the *time under treatment* variable would be desirable, but attempting this in our study would lead to excessively small subsamples for each year. Therefore, both here and in the statistical model below we adopt the dichotomous treatment of the variable.

However, it is also true that the first year of treatment is certainly special and, as we will see, a significant effect of the *first year* dummy is observed.[7] Figure 5 presents the same data in a way which allows us to observe the reaction of each type of PG to the different values of the risk return parameter which were used to construct the four panels. The risky decision making behavior of PGs in the first year of treatment exhibits two major differences with respect to the behavior of PGs under longer treatment periods: First, the former make safer options, especially avoiding lotteries involving the riskiest bets. Second, while the behavior of all other subjects remains largely invariant in the presence of higher risk-return parameters, PGs in the first year of treatment are strongly attracted by higher values of the risk-return parameter.

4.4 Overall analysis of individual differences

Finally, we study in a quantitative way the determinants of individual decisions across the four panels. The estimation results reported in Table 3 refer to a model in which p_{ij} is subject i's choice in panel $j \in \{1, 2, 3, 4\}$.

[7] However a set of non-parametric Mann–Whitney test do not report clear differences: panel 1 ($Z = -1.26$; $p = 0.23$), panel 2 ($Z = -1.23$; $p = 0.23$), panel 3 ($Z = -0.90$; $p = 0.39$), panel 4 ($Z = -0.23$; $p = 0.82$). The largest differences are observed in panels 1 and 2 however these differences disappear for panels 3 and 4.

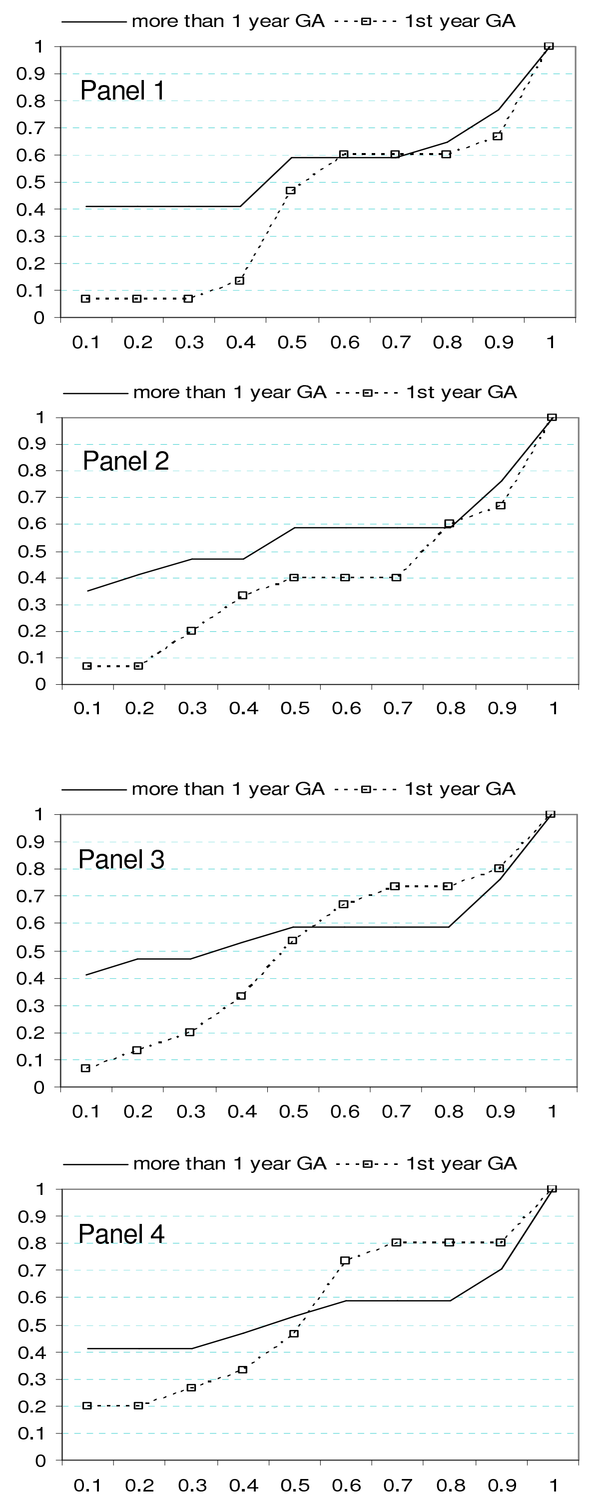


Figure 4: Panels 1–4. Comparison between PGs in the first year of treatment and PGs under longer treatment periods (Cum. Freq.).

Table 3: Individual Behavior Model. Dependent Variable: p_{ij} (i's choice in panel j)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.443966	0.034378	12.91430	0.0000
PREMIUM	-0.004405	0.003738	-1.178490	0.2395
FIRST	0.107583	0.050234	2.141624	0.0330
MALE	-0.073739	0.013846	-5.325516	0.0000
GA	0.149497	0.046938	3.184985	0.0016
VICTIM	0.470210	0.040997	11.46942	0.0000

$R^2 = 0.365123$ $\overline{R}^2 = 0.355265$ S.E. of Regression = 0.2835 F-statistic = 37.03698 Prob(F-statistic) = 0.00000

The independent variables used are: a constant, C; the risk premium r_j used to construct panel j; a FIRST dummy taking the value 1 for gamblers under the first year of treatment and 0 otherwise; a MALE dummy taking the value 1 for male subjects and 0 for female ones; GA is a dummy taking the value 1 for gamblers under treatment and 0 otherwise; and finally, a VICTIM dummy.

It is interesting to note that FIRST separates gamblers under the first year of treatment from both normal subjects and gamblers under longer treatment periods, as well as from victims. This is inspired by the preceding discussion of figures 4 and 5, according to which PGs under the first year of treatment are those whose behavior differs most from that of normal subjects. The regression results confirm that gamblers under the first year of treatment make safer options than other subjects. Therefore, PGs under longer periods of participation in GA sessions are not so different from normal subjects.[8]

The remaining parameter estimates suggest that subjects who are indirectly affected by gambling (victims) are willing to take fewer risks than all other subjects. Also, as reported in most previous studies on gender differences in risky choice, males are willing to take more risk than females.

Finally, when all observations are pooled together, subjects exhibit limited attraction (although on the expected direction) by higher returns to risk. This finding contrasts with what was observed on Figure 5 above concerning the behavior of PGs in the first year of treatment, exhibiting a strong reaction to higher risk-return parameters. It also contrasts with our finding reported in Result 2b concerning normal subjects' attraction by large risk-return parameters.[9]

We summarize the results obtained from the aforementioned model estimation together with some of the findings reported above on Figures 4 and 5 in the following results.

Result 3a: Gamblers and victims exhibit significantly higher degrees of risk aversion.

Result 3b: Gamblers in the first year of treatment are more risk averse than those in posterior years of treatment, but they are attracted more than other subjects by higher degrees of return to risk.

Result 3a is a synthesis of Results 1a and 1b, while Result 3b can be interpreted as the consequence of some consciously egosyntonic behavior by gamblers at an early stage of a psychological treatment. In fact, although if there were more observations on each treatment year it would be interesting to fit a nonlinear model, this finding indicates that the first year of treatment is special, because probably subjects in early stages of the treatment are more concerned with their self-image as people who are free from their pathological attraction to risky bets. Their behavior in the lottery choice task implemented in this study looks as if they were committed to avoid taking risky bets, but they could not hide a secondary element of their attraction to riskier bets when the returns to risk are high.

Finally, we find that:

Result 4: Males are less risk-averse than females.

This result is compatible with numerous previous findings on the relation between gender and risky decision-making.[10]

5 Conclusions

This paper explores attitudes toward risk among two focus populations: pathological gamblers under psycholog-

[8]For instance, in panel 1, a Mann-Whitney test for differences between normal subjects and PG's under more than one year of treatment yields $z = -0.26$ with $p - value = 0.79$.

[9]We have tried to deal with these effects in the framework of the model reported in table 3. The introduction of a premium-subsample interaction variable deals with these effects in a linear way which seems not to fit the data sufficiently well.

[10]See for example, Byrnes et al. (1999), Harris et al. (2006) for the case of financial risk, as well as the literature reviewed and results reported by García-Gallego et al. (2005).

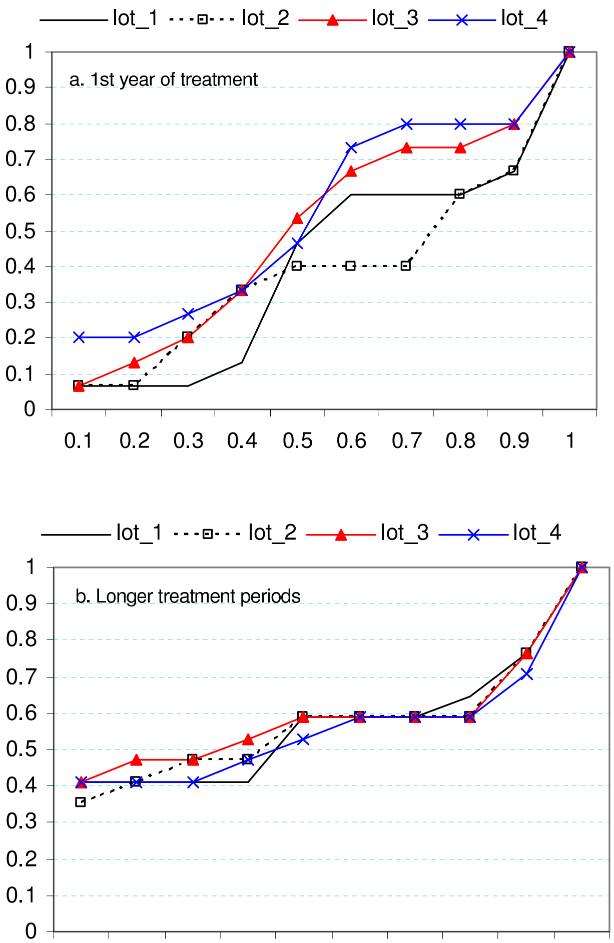


Figure 5: Comparison between PGs in the first year of treatment (top) and PGs under longer treatment (bottom) with respect to their reactions to different risk-return parameters.

ical treatment ("addicts") and gamblers' relatives ("victims"). We compare these subsamples to a control population subsample ("normals"). Our results can be summarized as follows:

- Addicts are willing to take fewer risks than normal individuals.
- Victims are even more risk-averse than addicts and the majority of them are unwilling to take any risk at all.
- Both addicts and victims maintain their choices invariant across different scenarios of the risk-return trade-off.
- In contrast, normals' behavior presents the expected pattern of choosing weakly riskier lotteries in the presence of a higher return to risk.

There is hardly any doubt that behavior in a risky task can be explained as the result of a strategy aiming at what the subject sees as the best option, after uncertainty and reward attraction-repulsion have been accounted for. This issue has been extensively studied so far under different theoretical frameworks. However, our results indicate that the effects of a given strategy or a decision making task as a whole on the perception of oneself and others (Cross et al., 2002) also matter. Gamblers who are voluntarily under treatment exhibit a higher risk aversion than normal subjects, because probably they feel that risky bets have already cost them a lot. In fact, pathological gamblers in the first year of treatment appear to be more risk averse than normal subjects, whereas as the number of years under treatment increase, their degrees of risk taking approach that of normal subjects. As we said before, this may be the result of PGs' willingness to present themselves as totally cured from their attraction to risky bets. However, our results reveal a secondary element in a PG's behavior which should be taken into account because it cannot be easily controlled by consciously egosyntonic intentions. This element is attraction to riskier bets in the presence of higher returns to risk. In that aspect, PGs in the first year of treatment have exhibited the strongest attraction to more profitable risky bets among all other subjects studied here. Furthermore, the partners of PGs under treatment, are even more unwilling to make risky bets, as the majority of them take no risk at all.

Our results tend to confirm our main hypothesis. That is, our three different subsamples behave differently in an abstract lottery-choice task. The result concerning the victims is consistent with the psychological literature focused on children's behavior living in a family where parental gambling is a problem. However, it is not clear how addicts would behave if real rewards were offered. We cannot give monetary prizes to gamblers under treatment, but we can do it with people who go to casinos and are not under medical supervision. This might be an interesting step for further research.

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Appendix: Instructions

Welcome to this decision-making study. This session belongs to a research project directed by Professors Nikolaos Georgantzís (Universitat Jaume I) and Pablo Brañas (Universidad de Jaén and IESA-CSIC). Identical sessions have been run in Valencia, Castellón, Crete and Athens. This session is going to last 15 minutes. We thank you for your participation.

You are going to be asked to take four decisions. In the attached sheet there are four panels [panels are in Figure 1]. Take for example the first one. In the first row (P) you can see decimal numbers between 1 and 0.1 (both included). These numbers represent probabilities with which you can hypothetically earn the amount of money shown in the cell below this number (row "Xpuntos").

For instance, with probability 0.6 you can earn 1.73 EUR. Therefore, if you play this lottery:

- 60 out of 100 times you will earn 1.73 EUR
- 40 out of 100 times you will earn nothing.

However, if you look at the 0.3 cell you will see how payoffs are different:

- 30 out of 100 times you will earn 3.56 EUR
- 70 out of 100 times you will earn nothing.

You have to choose **one** of the 10 lotteries offered in this panel. You have to do the same for **each one** of the other three panels.

When you are done, please fill the survey in sheet 3.

Thank you for your participation. As you can see you do not have to write your name anywhere. This study is completely anonymous.