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RISK-TAKING ATTITUDES OF PEOPLE WHO SEEK HEALTH CARE: AN EXPLORATORY APPROACH THROUGH LOTTERY GAMES USING GENERALIZED ESTIMATING EQUATIONS

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ABSTRACT

Background: The characterization of the risk-taking attitude of individuals may be useful for planning health care interventions. It has been attempted to study expressions of risk-taking attitude and evaluate characteristics of a standard lottery game in a population that seeks health care to elicit these attitudes.

Methods: Multicentric cross-sectional study. Demographic and socioeconomic characteristics, quality of life (EuroQol-5D), and health risk behaviors were collected from 662 users of 23 health centers selected by random sampling. Risk-taking attitude was evaluated by means of a self-evaluation scale and two lotteries games (L1 and L2; L2 included the possibility of economic losses). Generalized estimating equations (GEE) explicative models were used to evaluate the variability of risk-taking attitude.

Results: Nineteen percent out of interviewed people (CI95%: 15.6–22.6%) expressed a high risk appetite, but only 10.0% (CI95% 7.0 to 13.0) were classified as risk-seeking by L2. It was found association between increased risk appetite and having a better perception of health status (0.110. CI95%: 0.007–0.212) or a higher income (0.010. CI95%: 0.017–0.123) or smoking status (0.059. CI95%: 0.004–0.114). Being Spanish was associated with lower risk appetite (-0.105. CI95%: -0.005 –-0.205), as being over 65 (-0.031. CI95%:- 0.061– -0.001) or a woman (-0.038. CI95%:-0.064–-0.012). The intraclass correlation coefficient for self-evaluation scale was 0.511 (95% CI: 0.372 to 0.629), 0.571 (95% CI: 0.441–0.678) for L1 and 0.349 (95% CI: 0.186–0.493) for L2.

Conclusions: People who seek health care express certain inclination to risk, but this feature is attenuated when methodologies involving losses are used. Risk appetite seems greater in young people, males, people with better health, or more income, and in immigrants. Lottery games such as the proposed ones are a simple and useful tool to estimate individuals' inclination to risk.

Key words: Risk-taking, Choice behaviour, Games, experimental, Immigrants, Tobacco use, Alcohol consumption, Primary Health Care.

RESUMEN

La valoración de la actitud ante el riesgo en personas que demandan cuidados en salud: una aproximación mediante juegos de loterías utilizando *generalized estimating equations*

Fundamento: La caracterización de la actitud ante el riesgo puede ser útil en la planificación de las intervenciones sanitarias. El objetivo fue estudiar la actitud ante el riesgo de una población que demanda cuidados de salud y evaluar la capacidad de un juego de loterías para evidenciar dicha actitud.

Métodos: Estudio multicéntrico transversal. Se recogieron características demográficas, socioeconómicas, de calidad de vida y conductas de riesgo en salud de 662 personas usuarias de 23 centros de salud seleccionadas mediante muestreo aleatorio. La actitud ante el riesgo se evaluó mediante una escala subjetiva y mediante dos juegos de azar (L1 y L2; L2 incluía la posibilidad de pérdidas económicas). Se realizaron modelos explicativos para valorar la variabilidad de la propensión al riesgo utilizando *Generalized Estimating Equations* (GEE).

Resultados: El 19,1% (IC95%:15,6–22,6%) de los sujetos expresaron una propensión al riesgo alta, el 10,0% (IC95%:7,0–13,0) fueron clasificados como propensos al riesgo con L2. Se encontró asociación entre una mayor propensión al riesgo y tener mejor percepción del estado de salud (0,110; IC95%:0,007–0,212) o mayor renta (0,010; IC95%: 0,017–0,123) o ser fumador (0,059; IC95%: 0,004–0,114). Ser español se relacionaba con menor propensión al riesgo (-0,105; IC95%: -0,205- -0,005), al igual que ser mayor de 65 años (-0,031; IC95%:-0,061–-0,001) o ser mujer (-0,038, IC95%:-0,064–-0,012). El coeficiente de correlación intraclase para la escala subjetiva fue 0,511 (IC95%:0,372–0,629), 0,571 (IC95%:0,441–0,678) para L1 y 0,349 (IC95%:0,186–0,493) para L2.

Conclusiones: Las personas que demandan cuidados de salud presentan con frecuencia propensión al riesgo, la cual se atenúa cuando se caracteriza mediante metodologías que implican pérdidas. La propensión al riesgo parece mayor en personas jóvenes, varones, con mejor estado de salud, con mayor renta y en inmigrantes.

Palabras clave: Asunción de riesgos, Conducta de elección, Riesgo en Salud, Juegos experimentales, Inmigrantes, Consumo de tabaco, Consumo de alcohol, Atención primaria de salud.

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INTRODUCTION

In the health care setting, we constantly refer to the concept of risk, both for predisposing or precipitating factors for disease and for the evaluation of patients' behaviour when facing situations that can potentially benefit or diminish their own health or that of the people around them. Attitudes towards risk may influence the purchase of health insurance, usage of preventive health care measures, or inclination to fall into behaviours that improve or worsen health condition. For these behaviours and other types of decisions that individuals make regarding their health in times of uncertainty, it is important to be able to assess personal risk-taking attitudes[1].

The relationship between risk attitudes, risky behaviours, and self-perception of health is complex. According to one of the main models of health intervention, the so called "health belief model", the probability for an individual to change behaviours in order to prevent disease is the result of a process in which the person needs to believe their susceptibility to suffering from it, that occurrence of the disease may have a certain effect on their life, and that adopting such a behaviour may be beneficial for them[2]. Susceptibility consists of a subjective risk perception of suffering from a specific disease. If we accepted that groups with different health-related risky behaviours may have a biased subjective perception of the risk of sickening, intervention strategies aimed at this or other groups should be reconsidered and redesigned according to this evidence. This fact highlights the importance of being able to evaluate perceptions and attitudes towards risk. Although risk perception and self-perceived risk attitude are not the same concept[3], the self-perceived risk attitude could be used as a proxy to explore the risk perception.

When people face decision making in any field, including health behaviours, they take into account a wide range of issues regarding to the probability of occurrence for each potential consequence[4]. This process is different if the probabilities of gains or losses are known, or if it takes place under conditions of "ambiguity" when the probability of the outcome is unknown[5]. It is not clear if risk and ambiguity are the extremes of a spectrum of uncertainty[6], but since we have never repeated the same conditions in decision making within the health care setting, we will refer to risk inclination in a generic way.

Risk-taking attitude has been extensively evaluated in experimental settings[1,7,8]. Initially, the theory of expected utility was used to describe the individual maximization problem, which is defined by the magnitude of the gain and its probability of occurrence. However, the introduction of the concept of risk affects the subjective value (or utility) related to choose a more or less safe option[9,10]. Thus, decision-making is a function of the properties of offered choices (value and risk), modulated by the subjective risk evaluation of the choice.

This paper is aimed at understanding how risk attitudes modulate the individual mechanisms of decision-making, in our case, in the field of health. Certain experimental results indicate that most people do not make decisions incorporating and evaluating all the available data, but rather using certain "mental shortcuts" (termed "heuristic" decisions in cognitive psychology), which allow making assessments based on partial data. These "heuristic" decisions are often sophisticated in the sense that individuals reach valuations very close to the ones obtained by the process of the expected value. It is possible that decision rules that have been treated as "heuristic" in the literature were built as a function both of the expected value and the individual risk attitude, controlled by other cognitive processes at the same time[11]. We therefore understand that deviations from the preferences about the expected value found in the experimental environments might be understood as an approximation of the individual proclivity to risk, modulated by their own previous cognitive experience.

On the other hand, there is a debate whether risk inclination depends on the life domain (e.g. financial, ethical, work-related, health, leisure), thus there is a specific risk attitude for each field[12,13]. Other psychological theories deal with risk attitude as a variable resulting from evaluating the interplay between perceived risk and possible outcomes, which is presumed to remain stable throughout situations and domains[14]. In any case, there is certain empirical evidence of a positive relationship between the attitudes towards monetary risks and risk attitudes in the health environment. This positive correlation justify the study of risk attitudes in the health environment through the study of the attitudes towards monetary risk[7].

Proven the importance of knowing the patients' attitude towards risk, and since it can be evaluated under experimental settings, this work attempts to make two contributions. The first contribution is to study the self-reported attitude towards risk of a population that seeks health care along with their personal characteristics. The second contribution is to evaluate characteristics related to the validity and reliability of standard lottery games to measure risk attitudes.

METHODS

Design. Cross-sectional. multicentre study.

Studied population. Patients >18 years old patients, who had attended 1 of 23 health care centres in the Community of Madrid (Spain), asking for health care and who gave their written informed consent to participate in the project were interviewed in the context of a study of economic valuation of health care services[15].

Patients selection and sample size. Twenty three health care centres of the Community of Madrid were chosen thus 12 centres belong to areas with an average income in the top tertile, and 11 are in areas with incomes in the lower tertile. Within each centre, subject selection was done by systematic random sampling from the appointment list. Those patients who did not understand the language perfectly and those who were not able to interpret the consent under the judgment of the clinician who attended them were excluded.

The foreseen sample size (600 subjects) enabled studying correlation coefficients around 0.15 with a type I error of 0.05 and a power of 90%, and also to estimate population values with a precision of 15% of standard deviation, in the presence of "design effects" of order 3 due to the study of clustered data

Variables and measurement tools. The chosen outcome variable, risk-taking attitude, was evaluated in 3 ways: self-reported and defined by two lottery games.

Self-evaluated attitude towards risk was measured by using a scale where 1 represented maximum risk-aversion and 10 stood for maximal risk-inclination.

The "objective" risk-taking attitude was measured through 2 lottery games, adapted from the German Socio-Economic Panel Study (SOEP)[16]. The suggested game was presented as one of those television contests where the participant chooses 1 of 2 possible boxes. One of the boxes had a prize and the other was empty. The contestant received the content of the chosen box. Simultaneously, the participant received economic "offers" that they could accept and quit the contest. The offers gradually increased, so that if they chose the option of continuing to play, another offer of higher value would be set, which they had to accept or refuse in order to continue playing, until accepting a certain amount of money and retiring from the contest, or rejecting the highest offer and choosing to play anyway. Two scenarios were proposed with different risks and gains. In lottery game 1 (L1), there was no possibility of loss and the highest earning was €200. The second lottery game (L2), had the same prizes, but it was necessary to contribute €40 to start participating, so the highest loss was €40 and the highest earning was €160. In any case real money transactions were made, they were imaginary situations. Annex 1 shows both self-reported scale and lottery games and the codifications carried out for the dependent variables. When subjects expressed a transformed point value equal or higher to 0.8 (8 points in the original scale), they were catalogued as "prone to risk", and the same if participants chose to play in a situation whose expected value was equal to or lower than the "safe" in lottery games.

In order to test the consistency of lottery games response, the games were repeated, by telephone interviewing, after ~15 days in 1 out of every 5 subjects, which were randomly selected from the original sample.

Risky behaviours were identified from the clinical record of the patient. Information on tobacco consumption was included, with subjects who had consumed at least one cigarette per day during the last 30 days considered smokers. Excessive alcohol consumption was defined as the intake of more than 280 g. alcohol week for men or 170 for women (or the intake of more than 60 g for men or 40 for women at least once in a month). The consumption of substances considered to be addictive was also recorded.

The included patient demographic characteristics were age, sex, and nationality. We recorded educational level, classified as "low" (primary education completed) or "high" (secondary or higher education), social class in 6 categories according to occupation[17], and family income in thousands of Euros adjusted by the number of household members. The method used to adjust family income was that proposed by the Organisation for Economic Co-operation and Development (OECD). The existence of additional health insurances was also recorded.

In terms of subject's health needs, the existence of chronic pathologies were taken into account (those requiring continuous health care for a period over 6 months). Subject's self-perception of health condition was evaluated by means of EuroQol-5D. The results of EuroQol-5D were expressed in the visual scale and responses to the 5 evaluated dimensions were transformed into utilities according to the method proposed for our country[18].

Clinical information was obtained from the clinical record of the patient. Socioeconomic data, perception of health-related quality of life, and lottery games information were obtained via personal interview carried out between October 2011 and January 2012.

Data analysis. Descriptive analysis of the quantitative variables was expressed by measures of central tendency, dispersion, and their 95% confidence intervals (CI). Medians and interquartile range were used in the case of asymmetric distributions. Qualitative variables were described by their frequencies and percentages with their relative 95% CI. Correlation between variables was evaluated using the Pearson's test if they met its application criteria, or with the Rho Spearman's test if not. The means of the groups were compared using the Student's t-test, or the Mann-Whitney U-test in the case of non-normal distributions.

The validity of the risk measurement tool was assessed. The apparent validity was considered appropriate if exposure to greater risks was related to lower proportions of acceptance of such risks. Convergent validity was assessed by means of the association between subjects classified according to their risk inclination by the measurement tool and characteristics known in the literature to be associated with prone-to-risk people, and the existence of health-related risky behaviours. The reliability of the measurement tool was evaluated using the intraclass correlation coefficient for repeated measures.

Generalized estimating equations (GEE) models were employed to evaluate the association between personal variables and risk inclination as expressed in the lottery games, since the subjects were included from different clusters (health care centres). These GEE models correct for non-independence among subjects from the same cluster, assuming a priori a certain structure of correlation for the dependent variable measured in each group. In addition, these models are not very stringent about the distribution of the outcome variable and offer robust standard errors which are stable even if the chosen correlation is inaccurate or if the correlation is different between groups[19]. In their interpretation, however, they do not allow measuring the influence that a characteristic has on each subject, but they allow for estimating the average of the population response when the independent variables change for the whole population[20].

Ethic aspects. All included patients were asked for written consent to be interviewed The Ethic Review Board of the Hospital Universitario Fundación Alcorcón (Madrid, Spain), was asked for its favourable opinion in order to carry out the fieldwork.

RESULTS

A total of 662 subjects were included, out of which 661 (99.8%. 95%CI: 99.2 – 100.0%) reported self-evaluated risk attitudes based on a risk-taking scale 657 (99.2%. 95%CI: 98.2 – 99.8%) answered L1 questions, 654 (98.8%. 95%CI: 97.9 – 99.7%) answered L2, and 653 (98.6%. 95%CI: 97.7 – 99.6%) answered all questions included about risk. Sample characteristics are shown in table 1.

Out of all interviewed subjects, 126 (19.1%; IC95%: 15.6–22.6%) expressed a score ≥0.8 points on the transformed self-evaluated risk-taking scale, 179 were classified as prone to risk in L1 (27.0%; 95%CI: 21.8-32.2%), and 66 in L2 (10.0%; 95%CI: 7.0- 13.0).

The correlation between self-evaluated risk inclination and behaviours in the lottery games is moderate for L1, (rho Spearman's 0.241; p<0.001), and weak for L2 (rho Spearman's 0.165; p<0.001). There is moderate correlation for the two lottery games (rho Spearman's 0.342; p< 0.001).

The percentage of subjects classified as prone to risk was different depending on various personal characteristics (table 2). Out of all males 24.2% expressed to be prone to risk on the self-evaluated risk-taking scale, versus 15.5% for women. Thirty eight per cent of people under 65 years behaved as prone to risk in L1, compared with 19.7% of those over 65 and the same occurred in L2 (12.0% of younger and 6.8% of patients over 65 years).

Immigrants behaved as risk prone on the self-evaluated risk-taking scale and in lottery games in a greater percentage than autochthonous, this gap is even more relevant for L2 (23.3% in immigrants, 8.2% in autochthonous). People who better perceived their health status (utilities over the median) considered themselves as prone to risk in L1, 32.5% versus 20.2% of those whose utilities are under the median. Those with a family income above the median behaved as risk prone (31.8% in L1 versus 21.1% of those with incomes below the median). Those with higher studies behaved

Table 1
Characteristics of included patients

	Mean (95%CI)	Median (IQ range)	Percentages (95%CI)
Age (years)	65.4 (63.1–67.7)	69 (55–78)	
Sex (female)			60.7% (53.9–63.4%)
Spanish nationality			95.2% (92.9–97.4%)
Chronic condition			82.9% (78.7–87.0%)
VAS – EuroQol-5-D	65.6 (63.6–68.0)	70 (50–80)	
EuroQol-5-D Utilities	0.68 (0.65–0.72)	0.76 (0.48–1.00)	
Additional insurance			16.1% (10.3–22.0%)
Social group			
Manager. director			9.1% (4.9–13.2%)
Intermediate positions			13.3% (9.3–17.3%)
Skilled non-manual worker			26.3% (20.6–31.9%)
Skilled manual worker			23.0% (17.7–28.2%)
Partially-skilled manual worker			11.3% (6.7–15.9%)
Unskilled manual worker			17.1% (10.7–23.4%)
Higher education			37.4% (29.0–45.9%)
Adjusted family income (€1.000)	0.876	0.707	
Current tobacco consumption	(0.803–0.948)	(0.600–1.000)	16.8% (13.5–20.0%)
Excessive alcohol consumption			2.6% (1.0–4.1%)
Other drug consumption			0.8% (0.1–1.7%)

95%CI: Confidence Interval 95%; IQ range: interquartile range (25–75 percentile). VAS-EuroQol-5-D: Visual Analog Scale of EuroQol-5-D questionnaire

as risk prone to risk more often than those without higher education, this effect being more pronounced in L2 (13.6% *vs* 6.1%). Smokers also acted as risk takers more frequently than non-smokers, and this result is more visible in L2 (15.0% *vs* 7.7%).

Table 3 shows the associations between personal characteristics and risk measures by GEE models. Women expressed an average score 0.038 points lower in L2 (95% CI: -0.012 – -0.064) and people over 65 years old 0.031 points lower (95% CI: -0.001 – -0.061). People born in Spain scored an average of 0.079 points lower on the self-evaluated risk-taking scale (95% CI: -0.005– -0.153) and 0.105 points lower in L1 (95% CI: -0.005– -0.205). Having better perception of health status related to more prone to risk attitudes in lottery games.

Having another health insurance was associated with a lower risk appetite on the self-evaluated risk-taking scale, -0.052 points on average (95% CI: -0.001– -0.103), but not in lottery games. Family income

Table 2
Self-evaluated risk inclination and prone-to-risk behavior in lotteries L1 and L2 as a function of certain characteristics

	Self-evaluated risk-inclination			Lottery 1 (% sobre la fila)			Lottery 2 (% sobre la fila)		
	No (row %)	Yes (row %)	p	No (row %)	Yes (row %)	p	No (row %)	Yes (row %)	p
<65 years old	219 (81.7)	49 (18.3)	0.674	165 (62.0)	101 (38.0)	<0.001	234 (88.0)	32 (12.0)	0.019
≥65 years old	316 (80.4)	77 (19.6)		318 (81.3)	73 (19.7)		362 (93.2)	26 (6.8)	
Male	197 (75.8)	63 (24.2)	0.005	183 (70.7)	76 (29.1)	0.186	228 (88.7)	29 (11.3)	0.082
Female	338 (84.5)	62 (15.5)		299 (75.3)	98 (24.7)		367 (92.7)	29 (7.3)	
Spanish	514 (81.7)	115 (18.3)	0.024	466 (74.4)	160 (25.6)	0.016	573 (91.8)	51 (8.2)	0.004
Other nationality	21 (65.6)	11 (34.4)		17 (54.8)	14 (45.2)		23 (76.7)	7 (23.3)	
No chronic pathology	261 (80.8)	62 (19.2)	0.932	257 (79.8)	65 (20.2)	<0.001	298 (93.1)	22 (6.9)	0.079
With chronic pathology	274 (81.1)	64 (18.9)		226 (67.5)	109 (32.5)		298 (89.2)	36 (10.8)	
EQol-5-D Utilities<median	443 (80.1)	110 (19.9)	0.219	411 (74.7)	139 (25.3)	0.111	507 (92.3)	42 (7.7)	0.012
EuroQol-5-D Utilities>median	92 (85.2)	16 (14.8)		72 (67.3)	35 (32.7)		89 (84.8)	16 (15.2)	
High social class	123 (83.1)	25 (16.9)	0.445	101 (68.7)	46 (31.3)	0.134	133 (91.7)	12 (8.3)	0.776
Not high social class	412 (80.3)	101 (19.7)		382 (74.9)	128 (25.1)		463 (91.0)	46 (9.0)	
No higher studies	334 (62.4)	79 (37.6)	0.955	333 (80.8)	79 (19.2)	<0.001	386 (93.9)	25 (6.1)	0.001
Higher studies	201 (62.7)	47 (37.3)		150 (61.2)	95 (38.8)		210 (86.4)	33 (13.6)	
Family income<median	271 (50.7)	58 (49.3)	0.351	258 (78.9)	69 (21.1)	0.002	301 (92.3)	25 (7.7)	0.282
Family income>median	264 (46.0)	68 (54.0)		225 (68.2)	105 (31.8)		295 (89.9)	33 (10.1)	
Current non-smoker	451 (84.3)	99 (15.7)	0.122	414 (75.5)	134 (24.5)	0.008	505 (92.3)	42 (7.7)	0.015
Current smoker	84 (78.6)	27 (21.4)		69 (63.3)	40 (36.7)		91 (85.0)	16 (15.0)	
No alcohol consumption	517 (81.3)	119 (19.7)	0.246	462 (73.1)	170 (26.9)	0.226	573 (91.1)	56 (8.9)	1
Alcohol consumption	18 (72.0)	7 (28.0)		21 (84.0)	4 (16.0)		23 (92.0)	2 (8.0)	
No drug consumption	532 (81.2)	123 (18.8)	0.078	478 (73.4)	173 (26.6)	1	591 (91.2)	57 (8.8)	0.373
Drug consumption	2 (40.0)	3 (60.0)		4 (80.0)	1 (20.0)		4 (80.0)	1 (20.0)	

Table 3
Explicative models of expression of risk-taking attitude measured by self-evaluation on the risk-taking scale and lottery games

	Self-evaluated risk-inclination			Lottery 1			Lottery 2		
	Coefficient	p>z	95% IC	Coefficient	p>z	95% IC	Coefficient	p>z	95% IC
>65 years	-0.013	0.505	-0.051- 0.025	-0.123	<0.001	-0.176– -0.070	-0.031	0.046	-0.061– -0.001
Female	-0.038	0.090	-0.083- 0.006	-0.035	0.302	-0.100–0.0311	-0.038	0.004	-0.064– -0.012
Spanish nationality	-0.079	0.037	-0.153- -0.005	-0.105	0.040	-0.205– -0.005	-0.070	0.096	-0.153– 0.013
Utilities	0.053	0.122	-0.014- 0.121	0.110	0.036	0.007–0.212	0.061	0.060	-0.002–0.123
Additional insurance	-0.052	0.049	-0.103- -0.001	0.054	0.118	-0.0137–0.121	0.041	0.132	-0.012–0.095
Family income (in €1,000)	0.046	0.036	0.003- 0.089	0.070	0.010	0.017–0.123	0.004	0.792	-0.028–0.036
Current smoker	0.037	0.058	-0.001- 0.075	0.042	0.177	-0.019–0.103	0.059	0.036	0.004–0.114
Excessive alcohol consumption	0.002	0.970	-0.124- 0.129	-0.156	0.011	-0.276– -0.035	-0.071	0.165	-0.172–0.030
Other drug consumption	-0.017	0.895	-0.275- 0.241	0.151	0.059	-0.006– 0.308	0.102	0.242	-0.068–0.272
Self-perception of risk-inclination	-	-	-	0.241	<0.001	0.159–0.323	0.121	<0.001	0.074–0.168
Constant	0.526		0.435- 0.618	0.392	<0.001	0.241–0.543	0.290	<0.001	0.178–0.401
	n= 659 Wald $\chi^2(9)$= 40.96 Prob > χ^2< 0.0001			n= 655 Wald $\chi^2(10)$ = 223.83 Prob > χ^2 <0.0001			n= 651 Wald $\chi^2(10)$ =301.12 Prob > χ^2< 0.0001		

was associated with an increased risk inclination, every thousand euros than income increased, scores on self-reported scale increased 0.046 points on average (95% CI: 0.003–0.089) and L1 0.070 points (95% CI: 0.017–0.123).

In terms of risky behaviours, being a smoker was associated with higher inclination to risk in L2, increasing the average score in this lottery in 0.059 points (95% CI: 0.004–0.114). Alcohol abuse showed an inverse association with risk appetite in L1, decreasing the average score 0.156 points (95% CI: - 0.276– -0.035). Higher education was closely correlated with income and behaved in the same way, but cannot be included in the same model since they show co-linearity. Self-evaluated inclination to risk was associated with the responses of the lottery games once the rest of the individual variables were adjusted, increasing the average score in L1 by 0.241 points (95% CI: 0.159–0.323) and by 0.121 in L2 (95% CI: 0.074–0.168) when the highest and the lowest scores in the self-reported scale were compared.

Risk-taking attitude was evaluated in 127 subjects after 15 days. The intraclass correlation coefficient for the self-evaluated risk-taking scale was 0.510 (95%CI: 0.372–0.629). 0.571 (95%CI: 0.441–0.678) for L1, and 0.349 (95%CI: 0.186–0.493) for L2.

DISCUSSION

People who seek health care in primary care express certain inclination to risk when self-evaluation scales are used. But this feature is attenuated when methodologies involving losses are tested. Self-reported risk-taking attitude is different depending on specific personal characteristics. Those who perceived a higher quality of life, who have greater economic resources, and those who have risky health behaviours, as smoking habits, are more inclined to risk.

This paper addresses two research questions. First, population that seeks health care should address a certain amount of risks not much different from the ones shown in general population[1,8,12,13,21-23]. Second, according to the most accepted theoretical models, risk attitudes based on self-evaluation and lottery games might be used as a simple approach to study individual risk.

Our results about the characteristics associated with higher inclination to risk in the lottery games are consistent with the literature review. Women and older people have been consistently risk averse[21-23]. The lower average inclination to risk of women has been extensively studied in the field of financial risks, and it has been concluded that it is independent from financial knowledge, the proposed settings, and even from the degree of knowledge of the assessed risk[8]. Age has been shown to be related to a lower inclination to take any kind of risk, but with a lower impact in the case of financial risks[21]. Low education level has been also related to a higher aversion to risk[22].

The association between immigration and inclination to risk is consistent with the most of theories on risk-taking which have related it to some aspect of social isolation or acculturation[24,25]. The fact of emigrating implies an attitude toward risk. Besides, some authors had observed higher prevalence of risky behaviours[26] and of accepting jobs with unfavourable health conditions among immigrants[27].

Self-perceived state of health was strongly associated with risk propensity but chronic illness was not related to risk-taking attitudes. Thus, people who feel better are more inclined to assume risks in lottery games[21]. There are several explanations for higher risk-taking among people with better states of health[28]. When the nature of the risk is financial (lotteries), the marginal utility of the potential loss can be lower since future gains and purchases will be able to compensate for the current loss. Good health also guarantees productivity and prevents from the expense of maintaining it, which releases economic resources for other goods and services.

Purchasing a private insurance was related to a lower self-perception of risk inclination[29], but not so for the lottery games. It must be pointed out that health care coverage was universal at the time the study was conducted, thus the acquisition of a private health insurance could be related to higher socioeconomic level rather than suffering from a worse state of health[30].

Our results provide new empirical evidence of the positive association between smoking and risk taking, but it is not possible to infer the same generalization for the alcohol consumption or other toxic habits. Smoking behaviours are correlated to self-perceived risk, but inversely correlated with risk attitude in lottery games[31]. In other studies it appears to be clearly associated with general inclination to risk and particularly for health related issues[21]. Smokers show a higher preference for the present, which characterizes people who are prone to risk[32]. Following this argumentation line, smokers display higher inclination to risk in L2, that is, the experiment which implies potential losses. In addition, smokers' higher inclination to take risks has been described in settings such as the work environment[33], which reinforces our findings.

These results are not validated for the case of alcohol consumption. People who abuse from alcoholic beverages seem to avoid risks, at least in L1, which is an unexpected association[34]. Measurement of excessive alcohol consumption was performed using clinical records, which may imply an information bias since excessive alcohol consumption has a negative social perception. According to literature review, subjects who consume excessively alcoholic beverages at advanced ages show higher price elasticity than younger drinkers. Our results confirm this hypothesis about price elasticity thus a higher marginal utility of money might be related to the addictive behaviour (money is required to satisfy addictive behaviours)[31], and consequently it might lead to rejection of risk in the lottery games.

Looking at validity tests, it must be pointed out that risk taking decreases along risk assessments, which constitutes an indicator of apparent validity of the proposed evaluation system[1]. Additionally, risk taking measures allow classifying subjects according to common characteristics (except for the case of alcohol abuse), which would endorse the tool with certain degree of convergent validity.

In terms of consistency, the reliability of proposed assessment tools is moderate for the measurements of risk derived from self-perception and L1; and weak for L2. The reliability values found (ICC between 0.35–0.57) are no different from the reported by other authors. Beauchamp et al. found reliability values from 0.59 to 0.67 for different risk measures[23], but lower rates of correlation (by the order of 0.27)[35] had been reported, and even lower for games under laboratory conditions[36].

Other attributes of the assessment tool, such as its applicability, make it quite convenient, since it achieves high response rate.

This study has several limitations. Lottery games have been criticized in the literature review for not having real gains or losses. However, observed attitudes in more realistic scenarios (with the loss or gain constrained by the experimental framework) do not provide different information from hypothetical games like the ones employed here [37].

The amount of potential losses or gains should be also considered when defining attitude towards risk through this type of games, since it is possible that responses vary with proportional changes of losses and gains, even with the same expected value for each choice. Future research should focus on the best rank to evaluate attitude toward risk, as it is still unknown. The relationships among attitudes towards financial risks studied using lottery games and health-related risks are not definitively established. It is known that there is a direct relationship[7], even though it is possible that risk attitudes in the case of health matters is weaker than for other life domains[21].

The present study confirms a positive correlation among risk measures based on self-perception and lottery games. However both spheres might not summarize the same attitudes to study health issues. Self-perception of risk refers to a transversal attitude towards risk, whereas lotteries games explore risk attitudes only in the economic field.

Another potential limitation of this work has to do with the ability to extrapolate the outcomes. The studied population is not representative of the general population, but of those seeking health care, even though 66% of the general population attended a health care center within the previous year.There is no doubt that the presented and discussed results have a direct transfer to society. The study of risk-taking attitudes is a matter of interest when designing health interventions. The individual degree of risk taking informs us about the individual risk perception, which is relevant for policy makers to determine public interventions to promote healthy behaviours and discourage risky ones. Lottery games, like the described ones in this paper, are simple tools to approach the study of subjects' risk attitudes.

Future lines of research should determine if there are more valid and precise designs of experimental tools that allow identifying those subjects who are risk takers, and figuring out the correct relationship between hypothetical financial risks and health-related attitudes.

In conclusion, risk-taking attitudes differ depending on specific personal characteristics, for example, women and older people are less prone to risk, In contrast, immigrants, those who are better off and those who perceive better states of health, are more predisposed to risk. A strong association is found between smoking and risk taking.

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See Annex 1 >

Annex 1
Characterization of individuals' levels of risk

Self-evaluated attitude towards risk	
Would you say you are a person who tries to avoid risks or you are able to behave riskier when there is a possible benefit? Please indicate how risky you consider yourself in the scale of 1 to 10.	Total risk averse =1 Total risk inclination = 10
Self-Perception Risk: To calculate the index, we divide the answer by 10, thus we convert the scale (1 to 10) to (0.1-1) If subject expressed a score ≥0.8 points on the transformed self-evaluated risk-taking scale, he was classified as prone to risk.	
Lottery games	
L1. Now imagine that you can take part in a contest in which you are offering the choice between two boxes (in a box there are 200 € and the other one is empty) or stay with a fixed amount of money. If you choose to compete, your prize will be the contents of the box you choose. Point out your preferences in each case.	1. Contest or 40 €, and you choose 40 € 2. Contest or 70 €, and you choose 70 € 3. Contest or 100 €, and you choose 100 € 4. Contest or 130 €, and you choose 130 € 5. If you choose to compete in option 4
L2. Imagine that now contest rules change. Again, we offer money or a contest, but before the contest you must pay 40 €. The prize if competing is the same as in the previous case, in one box there are 200 € and in the other nothing. Point out your preferences in each case.	1. Contest or 0 €, and you choose 0 € 2. Contest or 30 €, and you choose 30 € 3. Contest or 60 €, and you choose 60 € 4. Contest or 90 €, and you choose 90 € 5. If you choose to compete in option 4
It was multiplied by 0.2 the average of options 1, by 0.4 the average of option 2, by 0.6 the average options 3, by 0.8 the average of options 4 and by 1 the average of options 5. This index was codified from 0.2: the most risk averse to 1: the most prone to risk. If the expected value of the contest is equal or smaller than the fixed amount of money and the contest is chosen, the individual is classified as "prone to risk".	