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Gambling, games of skill and human ecology: a pilot study by a multidimensional analysis approach

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Abstract
The present pilot study aims at analyzing the human activity of playing in the light of an indicator of human ecology (HE). We highlighted the four essential anthropological dimensions (FEAD), starting from the analysis of questionnaires administered to actual gamers. The coherence between theoretical construct and observational data is a remarkable proof-of-concept of the possibility of establishing an experimentally motivated link between a philosophical construct (coming from Huizinga's *Homo ludens* definition) and actual gamers' motivation pattern. The starting hypothesis is that the activity of playing becomes ecological (and thus not harmful) when it achieves the harmony between the FEAD, thus realizing HE; conversely, it becomes at risk of creating some form of addiction, when destroying FEAD balance. We analyzed the data by means of variable clustering (oblique principal components) so to experimentally verify the existence of the hypothesized dimensions. The subsequent projection of statistical units (gamers) on the orthogonal space spanned by principal components allowed us to generate a meaningful, albeit preliminary, clusterization of gamer profiles.

Key words
- human ecology
- addiction
- pathological gambling
- principal component analysis

INTRODUCTION

Gambling activity in Italy increased significantly in recent years and continues to create dangers to subjects with vulnerability traits: it can develop into a serious form of behavioral dependence and addiction (pathological gambling: PG) [1], causing problems to the persons affected, to their family and the society where they are involved, as reported by the American Psychiatric Association (APA) [2]. In most cases gambling and games of skill represent an entertainment occasionally practiced during spare time, but sometimes they can become a form of addiction, In any case gambling has rapidly evolved from a simple recreational activity to represent 4% of Italian GDP (gross domestic product) in 2010 [3]: according to the Italian Ministry of Health, 54% of Italians would be gamblers.

A research performed by IPSAD-Italia(®)2007-2008 reveals that problem gamblers ranges from 1.3% to 3.8% of the general population, while pathological gamblers ranges from 0.5% to 2.2% [4]. PG represents a major public health issue in Italy (a recent study reveals that gambling disorders affect 0.2%-5.3% of adults worldwide [5]). PG creates psychosocial problems to the subjects involved, it can be a source of financial problems and can lead to disorders of antisocial nature; this is why PG is considered as an issue to be addressed in the light of bioethical and social medicine paradigms [6-8].

Playing. A human activity

The dimension of recreation is essential in the human being and tells us something of his/her freedom and spirituality: this is, in summary, the assumption that sparks this short essay. What we now consider to be a closely childish attitude, in fact, for centuries was considered one of the most distinctive expressions of the human nature, of its irreducibility to mere animal instinct, on the one hand, and to pure logical rationality on the other. We might say playing is an example of rational use of irrationality. The aim of this study is to give a preliminary survey on the basic dimensions of gambling activity, combining theoretical constructs on the

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human propensity to game by the quantitative analysis of questionnaire data. This could be useful in order to prevent PG. Our aim is to obtain a multidimensional model, to be in turn tested by the statistical analysis of a group of persons who have played at least once with pure hazard (slot machines, dices, lotteries) or games of skill, (*e.g.* poker). The virtual lack of any frank PG in the data set forces us to consider the analysed group as a "control, baseline" set for checking the non-pathological game activity. The lack of frank PG individuals is in any case optimal for checking the relevance theoretical models of game behaviour, whereas pathological degeneration is a stressing of normal features. The coherence between philosophical and observational dimensions of the phenomenon can be considered as a proof-of-concept of the reliability of the employed paradigms.

The dimensions of rationality, love for risk, curiosity, pleasure harmonically coexist in human beings and interact fruitfully with each other, constituting an example of a successful ecology. For this reason, from now on we will talk of human ecology (HE) to indicate this flourishing harmony between the different dimensions of the human being present in game activity. As aptly reported in [11]: "… In acknowledging play you acknowledge mind, for whatever else play is, it is not matter. Even in the animal world it bursts the bounds of the physically existent. From the point of view of a world wholly determined by the operation of blind forces, play would be altogether superfluous. Play only becomes possible, thinkable and understandable when an influx of mind breaks down the absolute determinism of the cosmos. The very existence of play continually confirms the supra-logical nature of the human situation" [11].

Having stated that games (and thus even gambling, as an example of a widely practiced game) are an essential part of human experience, we make the hypothesis that gambling can pass from a physiological (and spiritually enriching) activity if (and only if) the harmonic balance of the anthropological dimensions at the basis of a physiological game activity is lost.

The four essential anthropological dimensions

To define the fundamentals of HE we mainly refer to Huizinga's *Homo ludens*. The four essential anthropological dimensions (FEAD) of HE, according to his model, are:

1) Freedom. "There is no doubt that playing must be defined as a free and a voluntary activity" [9, 10]. The dimension of freedom becomes evident in two limitations imposed by the game itself: time and rules. Physiological game must be limited by something that is "non-game". "Play is distinct from *ordinary* life both as to locality and duration. It is *played out* within certain limits of time and place. Play begins, and then at a certain moment it is *over*" [11]. The issue of time is essential in the game: the player cares about not to waste time; without limits (rules and time) there would be no possibility of freedom, and therefore, no possibility of playing. For this reason, any kind of play has its own rules: "They determine what *holds* in the temporary world circumscribed by play. The rules of a game are absolutely binding and allow no doubt" [11].

2) Rationality. "Inside the play-ground an absolute and peculiar order reigns. The play creates order, is order"[11]. Order coincides with the clarity of rules: not-so-clear rules severely impair playing. The beauty of playing lies precisely in finding rational spaces of freedom within the laws: "The profound affinity between play and order is perhaps the reason why play, seems to lie to such a large extent in the field of aesthetics. Play has a tendency to be beautiful" [11].

3) Tension. "The player wants to *succeed* by his own exertions. Though play as such is outside the range of good and evil, the element of tension imparts to it a certain ethical value in so far as it means a testing of the player's prowess" [11]. In the activity of playing a certain tension towards an ideal is implicit: "If a person is playing a game, he is seeking to achieve an end, describable as a certain state of affairs" [13]. An activity, as a movement, tends to quietness, which is the point of arrival of the movement itself: the risk rises in the relation between the movement and the point of arrival: "To dare, to take risks, to bear uncertainty, to endure tension – these are the essence of the play spirit" [11].

4) The relational field. The game creates links and relationships; thereby not only we affirm that, to be such, the game must be multiplayer, but also that it should not break the essential relationships that constitute the human being, first of all, the relation with reality. The risk is that "the completely solitary game is one of the most risky game because involves alienation from reality. The immediacy of access is a key strategic advantage for the machine but not for the person" [12]. An activity, moreover, gives nourishment to relationships: it cannot extinguish the fundamental component of human sociality [13].

Working hypothesis

This is, in summary, our working hypothesis: the activity of playing – and perhaps even playing gambling games! – is ecological when it achieves the harmony between FEAD so realizing HE; conversely, it goes toward pathology when the some of the balance among these dimensions is lost (we chose the example of gambling games because they can significantly develop in a pathology, unlike "safe games"). If this hypothesis is correct, we should find a trace – although fatally weak, given the difficulty of translating these concepts into statistical data – of this balance emerging from the correlation pattern among a questionnaire focused on gambling activity. More precisely, we seek for "ordination principles", shaping the answers to the different items of a questionnaire, administered to a sample of players in terms of observed between items mutual correlations. These data-driven ordination principles, corresponding to groups of correlated items, are expected to resemble the four anthropological dimensions (FEAD) described above.

MATERIALS AND METHODS

The anonymous questionnaire items, more or less explicitly, are related to FEAD. The questionnaire has 21 closed-ended questions (estimated time of completion: 20 minutes). 73 males, aged 18 to 60 years old, who had

played at least once with gambling or games of skill participated in the current study. The 21 initial questions (*variables*) were further decomposed into 55 *atomic items*, as some of these were multiple-choice questions.

The "atomization" consisted in the conversion of an item allowing for *n* different (not mutually exclusive) answers into *n* "atomic items" allowing for a binary yes/no answer.

These 55 questions (*operational variables*), submitted to a sample of 73 persons, were the starting material of the analysis. The choice of turning each multiple choice items into a battery of binary yes/no variables (one for each choice) stems from the fact binary variables can be considered as fully quantitative variables for the application of multidimensional methods [14].

Such data matrix was the input for oblique principal component (OPC), whose purpose is to identify "groups of related questions", *i.e.* to cluster items whose answers are maximally correlated and independent from the answers to the items pertaining to the other clusters. OPC [15-17] generates homogeneous groups of variables through the criterion of maximizing the percentage of variance explained by the first principal component of each group. The procedure progressively divides the set of initial variables into increasingly compact (more internally correlated) clusters, pausing when a subsequent division generates a between clusters correlation higher than 20% of variance explained. This stop condition corresponds to the best compromise of the two opposite goals of generating most compact clusters (maximizing within-cluster correlation) while keeping the clusters the most separate as possible (minimizing between clusters correlation).

The correlation metrics was based on Pearson product moment correlation coefficient: only the variables (items) consistently pertaining to a given cluster and thus showing an elevated distance between the r-square with their own cluster and the r-square with the next closest cluster *(Table 1)* were maintained for the following steps of the analysis. It is worth noting the selection process is a completely data-driven unsupervised procedure.

The selected variables form the basis for principal component analysis (PCA). PCA, projecting statistical units (respondents in this case) on the space spanned by the independent axes (components) allowing for the best (in least square sense) reproduction of the original information generates an Euclidean space in which each dimension correspond to an independent latent variable (ordination parameter) of the data set. This allows for an unbiased correlation between demographic variables and game motivation components.

The last step of the analysis was the computation of the correlations between internal dimensions of the game (principal components) with demographic and personality variables, so to check until which extent specific game dimensions interfere with demographic traits. The selected external variables are: age, scholar level, married with children, number of friends, income, self-judgment, time committed to family, time committed to friends, time committed to work, perception of the future.

RESULTS AND DISCUSSION

Variable clustering

The OPC produced a 14 cluster solution globally explaining the 57% of total variance, given the nominal character of the data set, this corresponds to a relevant portion of explained information. In any case at 14 clusters the divisive algorithm reached a stop condition (any further increase in cluster number producing too high between clusters correlations).

Table 1 reports, for each item, its relevance for the cluster definition. This information is summarized into two variables:

- *own cluster:* the R-square of each variable with its cluster; the higher this value the most representative the corresponding variable for cluster definition.
- *next closest:* the degree of correlation of the selected variable with the next cluster. The highest this value, the most "ambiguous" the corresponding item, being halfway between two competing groups.

For each cluster we selected the maximally correlated variables within their clusters and the minimal correlated ones with the adjacent clusters, in order to underline the coherent part of the total acquired information. The R-squared value (*Table 1*) corresponds to the "assimilation level" of the variable with a cluster, the R-square of each variable (item) with its cluster and with the nearest cluster are reported as:

For the second step of the analysis we selected only central, mostly correlated, variables.

In *Table 2* the descriptive statistics of selected variables is reported.

Principal component analysis

The pivotal variables of each cluster were used as input variables for the second part of the analysis. The selected variables were analyzed by formulating a factorial model in which we extracted new representative variables on the unique quantification of the correlation between the descriptors of our data set. The adopted descriptors correspond to the "internal" variables of the game behaviour. The "external" ones, otherwise, have been correlated later on with the extracted components. The 21 elements (variables) initial structure can be in this way explained by means of 6 factors (*Table 3*):

- *F1* and *F2* are the two most important components, explaining up to 43% of the total information;
- from *F3* to *F6* we gain about the 31% of information reaching the 74% of the total information.

The above six components are the basic dimensions of gamer character. In order to give an interpretation to such dimensions use is made of loading matrix (*Table 3*), reporting the correlation coefficients (loadings) between the original variables and the factors (principal components).

Bolded values correspond to the variables maximally loaded (correlated) on the extracted components (*factors*), which consequently are the most important ones for assigning a meaning to the components.

The *Appendix* reports the variable codes, it is worth noting the sub-division of "internal" game variables into classes:

Table 1
The OPC results. The variables are ordered along their cluster memberships, the bolded value mark variables sufficiently central to their own cluster to be considered as representative. Items devoid of any variance (all identical answers) were not included in the analysis

Cluster	Item	Own Cluster	Next Closest	1-R**2 Ratio
1	V73	0.220	0.146	0.913
1	V8	**0.701**	**0.171**	**0.361**
1	V121	0.252	0.107	0.837
1	V122	**0.682**	**0.262**	**0.430**
1	V15	**0.743**	**0.203**	**0.322**
1	V17	0.408	0.261	0.801
2	V103	0.428	0.192	0.706
2	V106	0.283	0.166	0.859
2	V111	**0.529**	**0.182**	**0.575**
2	V112	**0.771**	**0.246**	**0.303**
2	V115	**0.643**	**0.260**	**0.481**
2	V20	0.141	0.071	0.928
3	V124	0.444	0.164	0.665
3	V125	**0.768**	**0.130**	**0.265**
3	V126	**0.710**	**0.065**	**0.310**
3	V127	**0.629**	**0.131**	**0.426**
3	V128	0.471	0.121	0.601
3	V192	0.335	0.171	0.801
4	V6	0.531	0.128	0.538
4	V72	**0.662**	**0.217**	**0.431**
4	V9	**0.652**	**0.197**	**0.433**
4	V123	0.453	0.127	0.626
4	V13	0.429	0.053	0.602
4	V16	0.361	0.138	0.741
4	V191	**0.780**	**0.083**	**0.239**
5	193	**0.678**	**0.063**	**0.343**
5	194	**0.704**	**0.110**	**0.331**
5	195	**0.634**	**0.052**	**0.385**
6	V1	**0.755**	**0.205**	**0.308**
6	V31	0.358	0.179	0.782
6	V34	**0.773**	**0.102**	**0.252**
7	V32	0.415	0.314	0.852
7	V33	0.345	0.060	0.696
7	V101	**0.816**	**0.163**	**0.219**
7	V102	**0.782**	**0.236**	**0.285**
7	V105	**0.642**	**0.175**	**0.434**
8	V4	**0.474**	**0.045**	**0.551**
8	V5	**0.585**	**0.046**	**0.435**
8	V14	**0.386**	**0.058**	**0.651**
8	V21	**0.426**	**0.124**	**0.654**
9	V36	0.613	0.071	0.416
9	V182	0.613	0.117	0.438
10	V116	**0.428**	**0.136**	**0.662**
10	V181	**0.707**	**0.124**	**0.334**
10	V183	**0.641**	**0.099**	**0.398**
11	V2	**0.658**	**0.116**	**0.386**
11	V114	**0.658**	**0.261**	**0.462**
12	V74	0.706	0.148	0.344
12	V113	0.706	0.172	0.354
13	V104	**0.691**	**0.208**	**0.390**
13	V184	**0.691**	0.094	0.340
14	V71	0.635	0.152	0.430
14	V185	0.635	0.114	0.412

• "risk" variables: items reporting the estimated risk connected to each game (V101-V106);
• "odds" variables: items reporting the estimated winning probabilities of each game (V112-V116);
• "motivation" variables: items reporting the motivation driving the play behaviour (V122-V127).

F1 can be defined as "risk estimation" (risk variables are the most loaded) and is a "size" component [18] assuming positive loading for almost all the variables, thus pointing to a general coherent variation of all the aspects of gamer character. A gamer with high *F1* assigns and high value to the risk associated to game activities.

We can also note:
• the risk variables covary with the odds variables along *F1*;
• the variables with higher loadings on *F1* refer to games in which the stochastic component is more important than the strategy: the possibility to choose an "educated guess", on *a priori* knowledge, is considered less important in this case;
• a high risk evaluation is concordant to the addiction, confirming that a higher risk perception could be the cause of the addiction itself.

F2 can be defined as "professional game" and is characterized by:
• the choice of the game, with a high preference for poker;
• the personal creativity;
• a careful consideration of the gambled money;
• the strategy and the passion.

In *Figure 1* we project our data set on the two main (*F1* and *F2*) components space: each point corresponds to a specific respondent. The factors have by construction zero mean and unit standard deviation; this allows for a simple partition of the plot into four quadrants, correspondent to the four "higher-than mean"/"lower-than mean" combinations of the two factors. In *Figure 1* is evident how risk perception is a general psychological trait independent of the player skillness.

While the two major factors correspond to general at-

Table 2
Descriptive statistics of the variables entering the second phase of the analysis

Variable	Label	Mean	Std Dev	Min	Max
V1	Ext	2.339	1.073	1	4
V2	Ext	1.433	0.635	0	3
V34	Ext	0.301	0.463	0	1
V4	Ext	2.433	0.665	2	4
V5	Ext	2.811	0.680	1	4
V72		0.584	0.818	0	2
V8		0.132	0.312	0	1
V9		1.320	1.369	0	5
V101		2.679	1.868	0	5
V104		2.433	1.792	0	5
V105		3.264	1.777	0	5
V106		2.169	1.477	0	5
V111		2.150	1.610	0	5
V112		2.54	1.659	0	5
V114		2.566	1.813	0	5
V115		1.943	1.536	0	5
V116		2.849	1.405	0	5
V122		1.716	1.668	0	5
V125		0.660	0.516	0	2
V126		0.716	0.631	0	3
V127		1.830	1.740	0	5
V14	Ext	2.886	0.776	1	4
V15		3.094	1.213	1	5
V181:		1.886	1.887	0	5
V183		1.679	1.805	0	5
V191		1.509	1.218	0	5
V192		1.358	1.020	0	5
V193:	Ext	3.622	1.403	0	5
V194	Ext	3.415	1.350	0	5
V195	Ext	3.754	1.426	0	5
V21	Ext	3.754	0.704	2	5

titude with respect to game activity, minor factors (from *F3* to *F6*) highlight peculiarities of the different game kinds.

In the following we will sketch an interpretation for each component that can be checked by the observation of loading pattern (*T3*).

F3 (lotteries and slot-machines are risky). An high perceived risk goes hand-in-hand with lack of friendship and happiness seeking as game motivation.

F4 (online games) is characterized by the limit of the game due to both money and time. The time committed to offline games is inversely correlated with online ones. This factor tells us there are two distinct typologies of "online" and "offline" players.

F5 (fate *vs* strategy") is an external component on the game verdict and is strictly related to the player preferences for his game activity.

Table 3
Factor Pattern matrix reporting the loading (Pearson correlation coefficient between original variables and factors) pattern over the components. Bolded values point to the most relevant variables for the interpretation of the correspondent component, the percentage of explained variance for the six factors are: F1 = 22.3%, F2 = 20.6%, F3 = 11.8%, F4 = 8.9%, F5 = 6.4%, F6 = 5.5%

Variable	F1	F2	F3	F4	F5	F6
V72	-0.190	0.742	-0.112	*0.366*	0.289	0.156
V8	*0.326*	0.666	0.287	-0.111	-0.134	0.064
V9	-0.200	0.813	0.133	0.118	0.145	-0.162
V101	0.556	0.193	0.370	-0.150	0.446	0.046
V104	0.285	0.313	0.605	-0.040	-0.039	0.145
V105	0.568	0.216	0.473	0.151	0.147	-0.092
V106	0.475	-0.178	0.241	*0.353*	-0.173	-0.500
V111	0.526	*-0.431*	0.020	-0.219	*0.375*	0.099
V112	0.617	*-0.470*	0.101	-0.150	0.405	-0.263
V114	0.569	-0.342	0.280	-0.109	0.134	*0.337*
V115	0.634	-0.399	0.007	0.092	-0.030	-0.173
V116	0.565	0.002	0.214	*0.358*	-0.516	*-0.302*
V112	0.541	0.616	-0.115	*-0.390*	-0.169	0.117
V125	0.586	0.166	-0.659	0.093	0.083	-0.091
V126	0.484	0.088	-0.678	0.109	0.136	-0.156
V127	0.582	0.198	-0.517	*-0.339*	-0.144	0.104
V15	*0.397*	0.628	0.262	-0.191	-0.277	0.107
V181	0.465	-0.071	-0.229	0.610	-0.055	0.398
V183	0.457	-0.215	-0.089	*0.373*	-0.197	0.485
V191	-0.048	0.642	-0.041	0.487	0.432	-0.092
V192	0.241	0.575	-0.370	*-0.303*	-0.059	-0.214

F6 (depletion game) is characterized by the concomitant presence as leading variables of running out of money and expected victory both as an end point for the game. *F6* covaries with a low risk perception as for gambling games.

The mainly descriptive, data-driven, character of PCA does not allow to get a one-to-one correspondence between emergent components and semantic categories. The names we assigned to each factor are indicative and stems from the loading pattern (*T3*) by the consideration of the variables mostly loaded on the specific components. This is a largely subjective procedure and we are aware different readers can assign different "names" to the same factors. In any case it is worth noting the resemblance between the major experimentally derived components and the Huizinga's theoretical constructs. Risk estimation and game skill are the main data-driven components: they both include rationality and tension in their making. The rational and irrational parts do not correspond to different components: they are embedded into the two main dimensions of gaming. Two highly rational activities, namely risk estimation, and the acquiring of technical skill, define the meaning of the two axes superimposing rational mind to a basically unpredictable outcome.

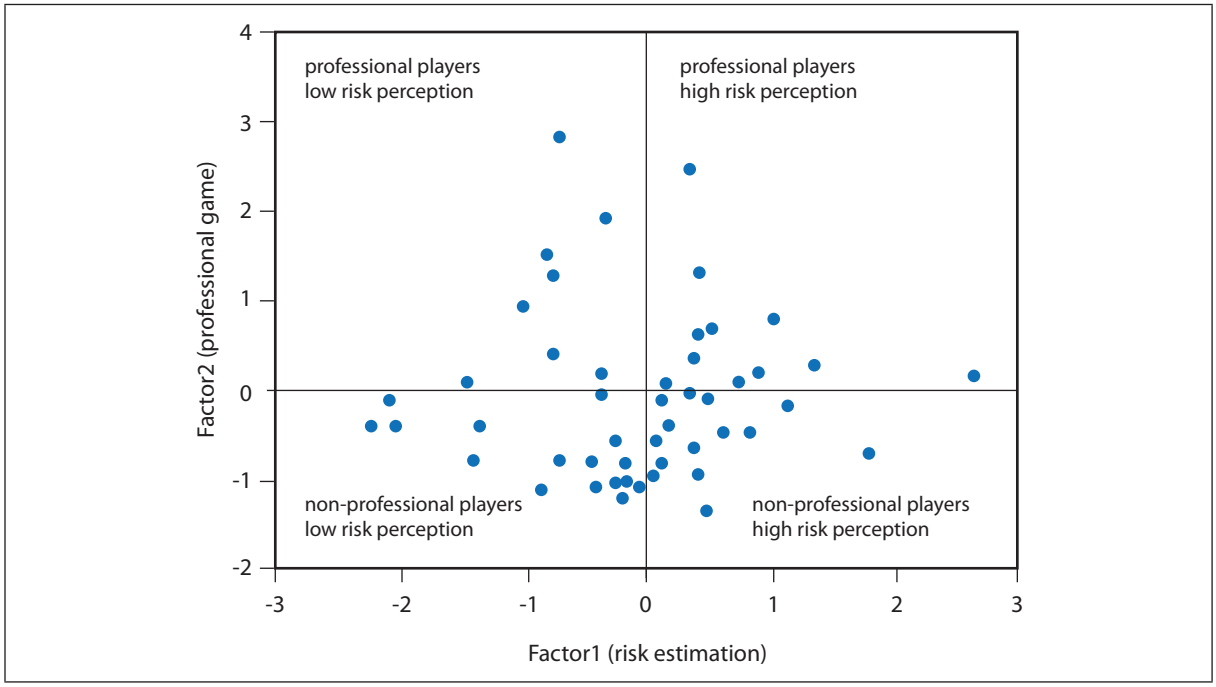

Figure 1
Space spanned by the first two principal components. Each point corresponds to a specific gamer. The subdivision of the space in quadrants (each component is forced to have zero mean) is interpreted according to the meaning of the components themselves.

External variables

How external variables are related to the "internal dimensions" of game ? This point is worth of investigation in order to both delineate gamers profile and to detect eventual "risk factors" for pathologic game. Some statistically significant correlations between game and personality variables do emerge: the correlations are indicated below in terms of Pearson correlation coefficient while in parentheses is reported the statistical significance of the relation:

• Age-*F6* = -0.29 (p = 0.03), Income-*F6* = -0.34 (p = 0.01): the online games are more popular among young people with a limited amount of money.

• Scholar level-*F2* = -0.33 (p = 0.01): the game competence (*F2*) has a negative relation with respect to the scholar level. The correlation disappears when partialled out of the age effect, thus it must be considered as an artifactual relation driven by the age-related scholar level differences.

• Perception of the future-*F3* = 0.37 (p = 0.005); Perception of the future-*F4* = 0.29 (p = 0.03): these are probably the most interesting correlations in terms of possible social consequences of pathological game. An high expectation in the future correlates with an high perceived risk of slot machines (v104) and lotteries (v105) while in the same time preventing going into game activity seeking friendship, happiness (V125 and V126 negatively correlated with *F3*). The correlation with *F4* points to the fact high perception of the future is correlated with the preference for online games and the end-of-money as stop condition.

• Time committed to friends/family-*F6* = -0.37 (p = 0.007): the negative correlation between the time dedicated to the family and friends with respect to the online game could be due to the consideration of the game as a solitary amusement. This is especially true for online games.

It is worth noting that, given the low number of respondents (after all this is a pilot study) the above correlations must be intended only in terms of "work hypotheses" for further investigations.

CONCLUSIONS

This pilot study on a small sample of non-addicted gamers, gave potentially interesting preliminary results prompting us to move toward the validation phase of the questionnaire and to its wider dissemination. In this sense, the approach of the PCA is appropriate to the object of study, as it has allowed us to identify new elements, otherwise difficult to find.

Through this study we appreciated how the FEAD, declined in accordance to the variables identified in the questionnaire, correlate significantly with each other, and would thus be a good starting point to delineate an indicator of HE.

The concept of HE, in addition, in the present study covers a dual role: on the one hand, it provides a useful tool (indicator) for the diagnosis of behaviours of addiction in gambling and games of skill; on the other hand it is configured as an excellent therapeutic tool for the prevention of risk behaviour.

In particular, referring to the FEAD and to the results of the PCA analysis, we can state that:

1. the dimension of rationality is particularly important because it can prevent the emergence of behaviours of addiction, or at least it can help to understand the reasons for such behaviours. The player who undertakes a game with a clear awareness of his actions and a good

knowledge of the variables, the rules and the logic that define the game, is freer.
2. the presence of a sub-set of "virtuous players" in the *F1-F2* space (high values of both professionalism and risk estimation), allows us to go back to the bioethical personalist principle that the necessary condition of freedom would be precisely rationality. A game played with awareness and expertise (that is: with rational control of irrationality), can be a factor of prevention of addiction. The dimension of rationality permeates all the six Factors and, for this reason, it may be considered a fundamental human ecological dimension;
3. freedom is evident in *F1* and *F2*, and also in *F3*, *F5*, *F6*. The ability of respecting limits (of time, money…) is an expression of freedom, of the human possibility to avoid addictions and the ability to "rule the passions politically" [19]. High values of the variables in *F4* means the demonstration of a freedom highly developed, and, so, a possibility of an ecological gambling;
4. tension detects the presence of the final cause. This dimension, strictly dependent by the first two (rationality and freedom), emerges as a strong element of uncertainty in the human act: it reveals the possibility of success or failure. In this context, the emotions have a fundamental function: they help to continue (or to abandon) the activity undertaken. For this reason, the lower the value of *F3*, the more significant is the dimension of tension. Another important element of control is *F5*: the presence of a strategy reveals the subject predisposition to identify the best ways – and also the best means, as recalled by the Aristotelian virtue of prudence [20] – useful to achieve the goal chosen by the subject. On the other hand, however, a total reliance of the player on randomness (on luck, fate, superstition…), reduces the dimension of tension, de-professionalizing the game and introducing the possibility of PG;
5. the element that, better than any other, might identify a protection factor of the relational field from PG is the time variable: the more time dedicated to the game (in particular to the online game), the lowest weight to the relations.

Once the highlighted positive elements of novelty are introduced by the present pilot study, we report some future developments:
• extend the factor of risk to the existential risk, using it as a feedback in a systemic model, and thus introducing new risk variables (relational risks, social risks, etc.);
• process educational plans for the prevention of PG, using the tools identified in this study by recovering the FEAD and identifying new factors of protection.

In this particular context of the spreading of new forms of PG, the tools identified here may be, on one hand, powerful tools for social medicine, and on the other, a new approach to increasingly noteworthy bioethical issues.

Conflict of interest statement

There are no potential conflicts of interest or any financial or personal relationships with other people or organizations that could inappropriately bias conduct and findings of this study.

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Appendix. Variables codes

V1: Age
V2: Scholar level
V34: Relationship status (in this case: married with children)
V4: Estimated number of friends
V5: Income
V72: Games played (in this case: poker online)
V8: Ability to create games
V9: Money gambled per day
V101: Degree of risk for "dice"
V104: Degree of risk for "lotteries"
V105: Degree of risk for "slot-machines"
V106: Degree of risk for "sport bets"
V111: Gambling odds for "dice"
V112: Gambling odds for "roulette"
V114: Gambling odds for "lotteries"
V115: Gambling odds for "slot-machines"
V116: Gambling odds for "sport bets"
V122: Motivation for playing: "passion"
V125: Motivation for playing: "friendship"
V126: Motivation for playing: "addiction"
V127: Motivation for playing: "hobby"
V14: Self judgment
V15: Importance of games strategy
V181: Game limit: end of money
V183: Game limit: winnings
V191: Time committed to online play
V192: Time committed to offline play
V193: Time committed to family
V194: Time committed to friends
V195: Time committed to work
V21: Perception of the future

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