Antisocial personality disorder evaluation with the prisoner's dilemma

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Evaluación del trastorno antisocial de personalidad con el dilema del prisionero

Summary

Introduction. *The aim of this study is to evaluate cooperation problems in antisocial disorder with the prisoner's dilemma game, which, in mathematical game theory, is the paradigm of the «non-zero» games (mutual benefit from cooperation).*

Methods. *We have designed a computer version of the prisoner's dilemma (CDT-BD) that confronts the patient to a simulation of a reciprocal exchange situation. IPDE provided us a categorical and dimensional evaluation of 26 controls from the community and 40 methadone patients. Only methadone patients obtained an antisocial diagnosis: 20 in the category of positive antisocial and 10 in the probable antisocial category. Patients also fullfilled TCI and MACH-IV.*

Results. *CDT-BD is, according to the parent's opinion (mothers), a good correlation of real life behavior. CDT-BD shows a statistically significant poorer cooperation of antisocial patients this is categorical evaluation (versus in controls) and in dimensional evaluation true both for variables that measure non-cooperation due to the patient's initiative and those as a response to the computer provocation. This may be due to a tendency of antisocials to use interchange situations «zero game» strategies (you win what the other player loses) instead of non-zero games strategies. Non-cooperative responses are correlated to high scores on the MACH-IV scale (manipulative behavior and cognition) and revengeful in Treatment and Character Inventory (TCI).*

Conclusions. *CDT-BD allows us to generate and test new hypotheses on the causes of the cooperation problems in antisocial patients using game theory paradigms.*

Key words: *Game theory. Antisocial. Prisoner's dilemma. IPDE. MACH-IV. TCI.*

Resumen

Introducción. *El objetivo de este estudio es investigar los problemas de cooperación de los pacientes antisociales, usando el «dilema del prisionero», paradigma en la teoría matemática de juegos del grupo de juegos llamados «no suma cero» (mutuo beneficio en la cooperación).*

Métodos. *Para ello diseñamos una versión del test del dilema por ordenador para la evaluación de los trastornos de conducta (TDO-TC) que pusiera al paciente en una simulación del prisionero por ordenador para un intercambio recíproco. Se valoró la presencia de trastornos de personalidad dimensional y categorialmente con la entrevista* International Parmality Disorders Examination *(IPDE) en 26 controles de la comunidad y en 40 pacientes de un programa de metadona. Sólo en el grupo de metadona se obtuvieron diagnósticos de trastorno de personalidad antisocial: 20 pacientes en grado de diagnóstico positivo y 10 en grado de diagnóstico probable. Los pacientes también rellenaron el* Temperament and Character Inventory *(TCI) y el MACH-IV. Se correlacionaron resultados con conducta en la vida real.*

Resultados. *El TDO-TC es según familiares (madres) de los pacientes un reflejo fiel de la conducta real. A nivel estadisticamente significativo el TDO-TC muestra menor cooperación en la valoración categorial (*versus *controles) y dimensional del trastorno antisocial, ya sea para variables que miden no cooperación por iniciativa del paciente o como respuesta a una provocación del ordenador. Esto se debe probablemente al uso en esta situación de estrategias propias de juegos tipo «suma cero» (el beneficio de un jugador es a costa de las pérdidas del otro). Las respuestas no cooperadoras se asocian a altas puntuaciones en las escalas MACH-IV (conducta y actitudes manipulativas o maquiavélicas) y ser vengativo en el TCI.*

Conclusiones. *El TDO-TC nos permite generar y verificar nuevas hipótesis sobre el origen de los problemas de cooperación en los pacientes antisociales a partir de la teoría de juegos.*

Palabras clave: *Teoría de juegos. Antisocial. Dilema del prisionero. MACH-I. TCI. IPDE.*

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INTRODUCTION

The antisocial personality disorder is defined by a persistent pattern of contempt and violation of the rights

of others that begins in childhood or adolescence and continues in the adult age.

Given the poor response to treatment of the antisocial personality disorder, the only thing effective at present is prevention, detecting and treating that which authors such as Vitiello and Jensen consider to be ontogenic or evolutive manifestations of the continuum of predisposition to antisocial disorder. These disorders are, following the ontogeny: the child having a difficult temperament, the aggressive child, the negative defiant disorder and the dissocial disorder. The closer to the adult age, the clear the relationship[1]. This task has two disadvantages: lack of reliability of the interviews and self-administered questionnaires in this group of disorders and[2] the need for the evaluation to be possible for the same nuclear aspects from childhood to adult age.

One of the aspects that we consider nuclear is the presence of problems in the social exchange manifested in the lack of altruism, the tendency to obtain benefit at the expense of others, and even, which may be less evident, lack of cooperation in situations of reciprocal exchange, which are situations of mutual benefit even between persons who only seek to obtain an advantage for themselves.

The mathematical theory of games developed by economy novel David Nash[3] provides us with models to evaluate these social interactions. One of those used most extensively in sociology, political sciences, economy, biology, etc., is the prisoner's dilemma. It main usefulness in these fields is to development theoretical modeis or computer simulations of the conditions for the development and evolutionist persistence of cooperative behaviors and even altruistic ones in hypothetical populations[4-10]. Application of this dilemma to this psychopathology has essentially consisted, up to now, in evolutionist theoretical models of mental diseases[11-22].

To assess cooperation in antisocial disorder with the prisoner's dilemma paradigm, solving the already explained evaluation problems, we have designed a computer test in form of a simple and attractive game that simulates a reciprocal exchange of goods between two persons: our patient (or control) and another person, which in this case is simulated by a computer program (which avoids the bias of playing against the evaluator as authority figure). We will call this test the computer dilemma test for the evaluation of behavior disorders (CDT-BD).

Our hypothesis is that this test can help us to show how the antisocial disorder, in regards to the non-antisocial ones, uses a different behavior strategy in cooperation situations with reciprocal exchange.

METHODS

A total of 46 patients out of 104 in a methadone maintenance program were selected randomly. The patients had completed 3 months with negative urine controls and had no comorbidity with an acute psychiatric picture at the time of the interview, so that these variables could not affect the evaluation, especially that of personality.

Then the control group from the community was selected from tho se accompanying 100 patients who came consecutively to the imaging diagnosis service. Considering the strong impact that gender and age can have on the variables to be studied, those individuals whose age range was that of the methadone program 18-38 years were included first. Thus, 23 men and 10 women were in this age range. A total of 21 men and 5 women were randomly chosen so that 80% of the control group were men as in the methadone program sample.

In order to increase reliability, the patients were dimensionally and categorically interviewed with the IPDE (International Personality Disorders Examination) interview by the clinician in charge of the methadone maintenance program (MAMR), in order to increase the reliability of this interview. After, and in the presence of another investigator in order to resolve doubts (FMR); the computer dilemma test (CDT-BD) was perforrned. Furthermore, with the help of another investigator (MTLT), the Temperament and Character Inventory (TCJ)[23,24] was filled out by computer. Regarding the latter, we are especially interested in the cooperation subscales (table 3). The machiavellian intelligence scale (MACH IV) (25) was also filled out. This gives us there subscales: tactics (tactics to deceive or manipulate), views (clinical views of human nature) and morality (abstract morality or on general subjects).

Given that only the mothers come regularly to our requests for interviews, the mothers of those interviewed were shown the responses of the different test in order to evaluate their agreement in regards to real life behavior (from 1 to 7). The patients were not told that this assessment was going to be done until they had filled out the last test. All the patients gave their authorization for this to be done.

Our computer version of the dilemma test (CDT-BD) is a computer program made by one of us (FMR) from the Filemaker database (it requires a version 2 or higher). In the CDT-BD, the patients had to exchange material goods (money in our investigation) by mail over 25 weeks with five different persons, each one of them simulated by a computer program. The patients had to imagine that the person with whom they exchanged money was in another country and that both had reached an agreement to send a fixed amount of money in local currency (foreign exchange) on Monday of each week. That sent by mail on Monday by each one of them crossed the border by mail and reached them both on Wednesday. Thus, each Wednesday, the patient received that which he/she had sent the other person and visa versa. When each envelope is opened, both the patient as well as the other person may or may not find the currency that the other person promised to send them. Based on whether the other had sent them the money or not, both decide if they will continue to send the currency or not on the following Monday. It should remain clear that both obtain a benefit equivalent to 6 euros (or its equivalence in kind: seven cokes) in each exchange.

This is the essence of that simulated by the computer program and the situation that the patients have to ima-

gine. Facing the computer, the decisions that the patient has to make are made by pressing the NO button (do not send currency) or YES one (send currency). The responses in form of YES or NO of the patient and the corresponding computer program appear simultaneously on the screen in rows (weeks) and columns (that of the patient and that of the computer). The patient should also know that the computer response has been made before his or hers, but that it will not be shown on the screen until the patient gives his or her answer. The patients also see the weeks that remain (increasing the temptation to not cooperate as the end nears) on the screen and the answers that have been given by him/her as well as by the computer. Given the game form of the test and the fact that it is based on the game theory, the term «player» can also be used to refer to the computer, patient or control and «game» to refer to the decision that is made each week.

Thus the patients play according to their own rules with the first four programs of the computer, but they play with the fifth game knowing that it will give them points according to the traditional payment matrix of the prisoner's dilemma. This matrix gives points to each player every week according to the responses of both (fig. 1). With this fifth prograin, the computer screen changes, tbere being two counters in the upper part, beside the respective columns, in which new points to those already existing according to what the response had been are added automatically each week (fig. 2). To facilitate memorization of the payment matrix, this appears in the lower right comer of the screen in form of a two by two table.

The persons simulated by the computer are, according to the order with which they are presented to the patient, and according to the descriptive name that we have given them by the strategy they use:

— ALWAYS YES. They always give a yes answer for exchange (in the response box of the computer a YES appears every week).
— ALWAYS NO. They always give a no answer for exchange (in the response box of the computer, a NO appears every week).

Cooperates?		Patient	
		Yes	No
Computer	Yes	3.3	0.5
	No	5.0	1.1

Figure 1. Matrix of traditional payments of the prisoner's dilemma. Mutual cooperation gives there points to each «player». If one does not cooperate, he/she can get five points and leaves the other with nothing (the sixth point is not given to eliminate a slight remorse). The mutual NO cooperation is paid with one point for each one since it could have been worse to have cooperated in one turn in which the other was not going to cooperate.

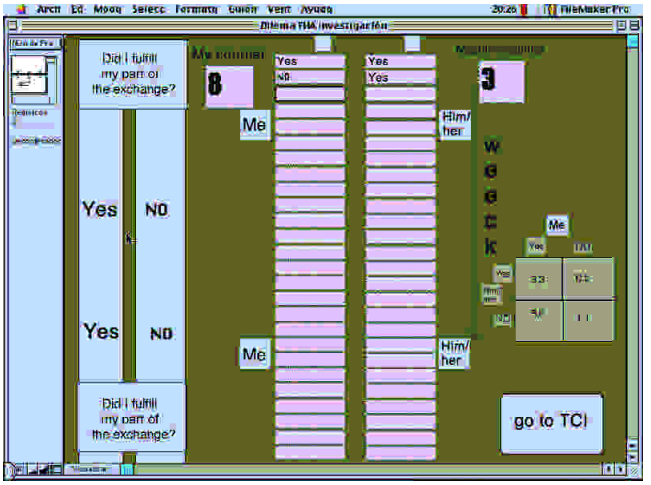

Figure 2. Computer screen of prisoner's dilemma when playing with the fifth computer program (called MATRIX). As is seen in the example, the computer gave 3 points to each player in the first week (both cooperated marking YES) and five points in the second week to the patient and zero to the computer (a NO and a YES response respectively).

— RANDOM. They randomly give an answer for exchange or not. To do so, a list of 25 random responses are created first and the same one is always used with each one of the patients or controls.
— AN TIT FOR TAT. This program gives the same response as that made by the patient (or the community control) the previous week.
— MATRIX. This program is the same as ALWAYS YES, however, here, points are given according to the already mentioned payment matrix.

Many variables can be drawn froin this test according to how they are classified. Taking the definition of provocation by the computer as tho se answers of non-cooperation given the previous week by the computer without there having been a non-cooperation answer by the patient until that week, we have decided to essentially define two groups of variables. On the one hand, those that measure answers of non-cooperation of the interviewed subject performed with previous provocation by the computer and on the other, those that are answers to a provocation of the prograin.

All those derived from playing against ALWAYS YES, AN TIT FOR TAT and MATRIX and those non-cooperation games in the first week with any program belong to the group of variables that assess answers of non-cooperation with provocation of the computer. Those derived from playing against ALWAYS NO (except playying NO in the first game) and all those played who after the third week exclusively with RANDOM (in the fourth week the first non-cooperation of RANDOM appears) are clearly of the second group. Specifically, we have defined two variables for the programs of ALWAYS NO and

TABLE 1. Comparison of percentages and means for dichotomic variables according to categorical and dimensional assessment of the IPDE

	Percentages controls (n = 26) vs antisocials (n = 20)	*Means for the antisocial dimension for the YES vs NO response (n = 66)*
QUICK NO (play NO after the first NO, whether ALWAYS NO OR RANDOMLY)	12.5 vs 55*	26.1 vs 22.7††
FAST & PERSISTENT (after the first NO with ALWAYS NO does not play even one YES)	31.3 vs 100**	20 vs 24†
Played NO in the first week sometime	12.5 vs 50*	23.7 vs 24.4
With ALWAYS YES, TIT FOR TAT and MATRIX, he/she played YES the last week (FAREWELL PRESENT)	93.8 vs 20**	23.3 vs 28†

Chi squared for controls versus antisocials * $p < 0,05$; ** $p < 0,001$. Mann Whitney for antisocial decrease versus dichotomic variables † $p < 0,05$; †† $p < 0,001$.

RANDOM called FAST AND PERSISTENT arid QUICK-NO (table 1). There is a third category of variables that evaluate responses of both provocation as well as non-provocation, these being variables that assess the result of the five computer programs. Finally, the existence of a fourth category of variables can be defended. This evaluates altruistic behavior, specifically cooperation in the last week, which we have also called FAREWELL PRESENT.

RESULTS

A total of 26 controls were obtained from the community. None of them fullfilled antisocial personality disorder criteria. Six patients were excluded froin the sample due to non-collaboration in the methadone maintenance program; for the rest, the IPDE interview categorically classified 20 as positive antisocial diagnosis, 10 as probable and 10 as absent, giving, together with the community controls, a total of four study groups.

According to the IPDE, positive diagnosis of borderline disorder was obtained in six patients, narcissistic disorder in two, histrionic disorder in one, paranoid disorder in two and schizoid in two in the methadone program sample. Ah the positive diagnoses of cluster B and half of those of cluster A were comorbid with the presence of positive or probable antisocial personality disorder. There were no diagnoses of cluster C in the methadone program patients, and this only occurred in two of the community controls (two obsessive personality disorders).

No statistically significant differences were obtained between the four study groups for either gender or age (27.3 years of mean for controls group; 25.2 for non-antisocial methadone group, 26.4 for probable antisocial methadone group and 28.6 for positive antisocial methadone group). The methadone program groups have an educational, socioeconomic and work level that is significantly worse than the community controis, since they lack studies afier the obligatory ones and the professions and economic level associated to them. Ah the methadone patients had been arrested on some occasion at least for pilfering or robbe-ry or aggressions, none had been arrested for consumed manslaughter but seven had been arrested due to attempted manslaughter.

Mean duration in performing the tests was 12 minutes for CDT-BD, 9 for the MACH IV, 15 for the TCI and 75 minutes for the IPDE. Assessments of agreement of the results of the test with real life were obtained for 100% of the patients. Agreement with the performance in real life during the lifetime was 5.9 for the dilemma test, 5.1 for the MACH IV and 4.3 for the TCI for a Likert scale from 1 to 7.

The categorical classification of IPDE fragments the methadone prograin sample into three groups, of which only that of positive antisocials has an acceptable size for comparisons. Thus table 1 (dichotomic variables), table 2 (nominal variables) and table 3 (quantitative variables) only show the comparison of the community controls versus the antisocials with positive grade according to the IPDE. In these tables, the associations of the study variables with the dimensional score of antisocial disorder according to the IPDE are also shown.

There are statistically significant differences (although their small sample size and the large number of comparisons make them unreliable) when we compare the positive antisocial group against the non-antisocial ones of the methadone program or against the sum of the non-antisocials plus probable antisocials. There is a coincidence in both comparisons in some variables for which statistically significance differences are obtained: «Quick NO», «Number of NO answers between week 1 and 25 with MATRIX», points with MATRIX and four related variables: «From what week is always NO played» and «Number of YES afier first NO with ALWAYS NO» and «FAST & PERSISTENT». The comparison between community controls and patients with absence of antisocial diagnosis of the methadone group only shows small significant differences in some variables, essentially those that assess the non-cooperative response to non-cooperation provocations by the computer.

When we add the dimensional scores by personality clusters, we obtain statistically significant correlations

TABLE 2. Comparison of percentages and means for nominal variables (response pattern) according to categorical and dimensional assessment of the IPDE

	Percentages controls (n = 26) vs antisocials (n = 20)	*Means for the antisocial dimension for the YES vs NO response (n = 66)*
The answer pattern with ALWAYS YES is:	*	†
ALWAYS YES	85 vs 45	23.1
In 90 % of the times ALWAYS NO	0 vs 5	11
Give NO type answer sporadically	6.3 vs 15	30.5
The answer patterns with ALWAYS NO is:	*	†
ALWAYS YES	93 vs 85	25
In 90% of the times ALWAYS NO	6.3 vs 10	19
Give NO type answer sporadically	0 vs 0	20
The answer pattern with RANDOM is:	**	†
ALWAYS YES	87 vs 0	15.3
In 90% of the times ALWAYS NO	0 vs 5	26.3
Give NO type answer sporadically	12.5 vs 70	23
The answer pattern with EYE FOR EYE is:		†
ALWAYS YES	87 vs 75	24.1
In 90% of the times ALWAYS NO	6.3 vs 5	11
Give NO type answer sporadically	6.3 vs 20	27.7
The answer pattern with MATRIX is:	*	
ALWAYS YES	81.3 vs 30	22.5
In 90% of the times ALWAYS NO	0 vs 5	16
Give NO type answer sporadically	18.8 vs 35	25.4
The general answer pattern with the 5 programs answer:	**	†
ALWAYS YES with ALWAYS YES, MATRIX and TIT FOR TAT	81.3 vs 25	21
In 90% of the times ALWAYS NO	6.3 vs 5	11
Give NO type answer sporadically	12.5 vs 45	26

Chi squared for controls versus antisocials * $p < 0.05$; ** $p < 0.001$. Cruskall Wallis for dimensional assessment † $p < 0.05$; †† $p < 0.01$.

between high scores of cluster A and the C3 subscale (availability for help) of TCI (0.43, $p < 0.05$), and between high scores of cluster B and the variables: «Number of NO prior to week 25 with ALWAYS YES» (0.45, $p < 0.001$), «From what week is ALWAYS NO played with ALWAYS YES» (–0.45; $p < 0.05$), the tactics subscale of MACH IV (0.39; $p < 0.05$) and the total score of the MACH IV scale (0.36; $p < 0.05$).

Categorically belonging to cluster B is significantly associated to fewer answers in the variables: «How many YES are played after the first NO of ALWAYS NO» (8.5 vs 17.4; $p < 0.05$) and in the variable «From what week is ALWAYS NO played with ALWAYS YES» (8.9 vs 17.3; $p < 0.05$).

Regarding the sensitivity and specificity data, it must be considered that the sample is small and that more than a single test, the simulation is a combined test. In table 4, we have summarized the data for the variables that summarize others and those which showed more discriminatory power in the comparisons of several samples.

DISCUSSION

Many variables of the study statistically significant show that the antisocial patients according to the IPDE categorization are worse cooperators than the controls in the situations of reciprocal exchange proposed by our version of the prisoner's dilemma test (CDT-BD). In the same way, there are statistically significant correlations between the antisocial dimensional score of the IPDE and many variables of the study that assess non-cooperation.

This lack of cooperation occurs both for variables that assess responses to provocations (non-cooperation) by the computer as well as for variables that measure the lack of cooperation due to the patient's own initiative without previous provocation. The variables for which statistically significant differences are obtained show that, in these patients, there is a general strategy prior to any provocation that leads to obtaining the maximum benefit possible at the expense of the other. The antisocial subject detects excessively cooperating subjects by

TABLE 3. Comparison of means for categorical diagnosis of IPDE and correlation coefficients for the dimensional assessment of IPDE

	Means controls (n = 26) vs antisocials (n = 20)	*Correlation coefficient antisocial dimension (n = 66)*
Number of NO answers with:		
ALWAYS YES	0.18 vs 3.45**	–0.1812
ALWAYS NO	19.8 vs 23.6**	–0.2249
RANDOM	9.75 vs 15**	–0.2611
EYE FOR EYE	1.75 vs 5.10	–0.1392
MATRIX	0.75 vs 8.9**	–0.1622
Total (all the above)	32.2 vs 55.15**	–0.1837
Number of NO prior to week 25 with:		
MATRIX (2)	0.0 vs 7.3**	0,4677††
With ALWAYS YES (2)	1.4 vs 1.6	0,0947
From what week is ALWAYS NO played until week 25 with:		
ALWAYS YES	24 vs 23	0.2733
ALWAYS NO	10.2 vs 2.5**	–0.4682††
RANDOM	21.1 vs 17.1	0.3399
EYE FOR EYE	24.2 vs 23.2	0.2822
MATRIX	24.3 vs 19.5*	0.1622
Number of NO answer between week 1-25 (excluding) with:		
ALWAYS YES	0.60 vs 0.68	0.4622†
MATRIX	0.62 vs 0.63	0.0199
Points obtained with MATRIX	79.5 vs 97.3**	0.0130
Number of YES after first NO:		
With ALWAYS NO	0.60 vs 1.75**	0.2667
MACH IV test scales:		
Mach IV Tactics	18.6 vs 28.4*	0.4475††
Mach IV Views	15.5 vs 32.8**	0.6205††
Mach IV Moral	21.1 vs 25.3	
Mach IV Total	16.3 vs 31.3**	0.6063††
Subscales of cooperation of TCI		
C1 social acceptance (vs intolerance)	15.3 vs 15.5	–0.2911
C2 empathy (vs social disinterest	13.7 vs 16.4	0.0841
C3 availability to help others (vs not available)	14.9 vs 15.8	0.0679
C4 compassionate (vs revengeful)*	19.4 vs 13.5	–0.3859†
C5 altruism vs egoism	16.7 vs 14.9	–0.0747

Mann Whitney for controls versus antisocials, * $p < 0.05$; ** $p < 0.001$. Pearson's correlation coefficients for antisocial decrease † $p < 0.05$; †† $p < 0.001$.

sizing them up and then abuses them (aggressive part of the strategy). Furthermore, this strategy has a defensive expression in the quick and persistent form of answering the non-cooperations of others (revenge in extreme), without giving second opportunities, preferring to stop the relationship forever if the other obtains an advantage at any time, although this deprives him/her of future benefits. Of course, a good relationship of reciprocal exchange does not exist (which could be established as ALWAYS YES, MATRIX AND AN TIT FOR TAT) with farewell presents that would be altruistic behavior and that is done by 93% of the controls when they interact with these tbree programs.

To sum up, the antisocial subject cannot avoid competing in this reciprocal exchange situation instead of cooperating. Extrapolating the mathematical theory of games, we would say that the antisocials cannot avoid converting a «non-zero sum» game into a «zero sum» game.

TABLE 4. Sensitivity and specificity of certain values of the prisoner's dilemma variables by computer ( ) for the positive antisocial diagnosis with the IPDE

	Sensitivity	*Specificity*
QUICK-NO (plays NO after the first NO, whether ALWAYS NO or RANDOM)	0.55	0.87
FAST & PERSISTENT (after the first NO with ALWAYS NO, not even one YES is played)	100	0.68
Played NO some time in the first week	0.50	0.85
Never plays YES the last week (DOES NOT make FAREWELL PRESENT) with ALWAYS YES, TIT FOR TAT and MATRIX	0.80	0.93
The general response pattern with the 5 test programs is answer: always yes with ALWAYS YES, MATRIX and TIT FOR TAT	0.75	0.81
More then 36 answers NO with the five test programs	0.90	0.93
From week three plays ALWAYS NO until week 25 with: ALWAYS NO	0.90	0.81
More than 82 points with MATRIX	0.65	0.81

«Zero sum» games are those in which the scores (benefits) obtained by a player are taken away from the other and thus the sum of each interaction is zero (for example +1 plus –1, as occurs in chess, poker, soccer, basketball, etc.).

Our dilemma game is, however, a «non-zero sum» game, as shown by the payment matrix of figure 1. In a «non-zero sum» game, dep ending on how both players interact, both can be benefited, harmed or one is harmed and the other benefited. When the latter circumstance occurs, the antisocial patient reacts very affectively, «without thinking,» simplifying the interaction, trying to convert it into a «zero sum» game, although this means losing benefits in the long run.

Furthermore, according to the comments of the patients, this type of «zero sum» relationship seems less complicated and more sincere and they also state that they are more accustomed to it (the patients speak of the «law of the street» or of «life»), thus they recur to this strategy when the situation seems to be confusing or complicated to them.

In fact, in a «non-zero sum» game, the situation is more complex than in a «zero sum game,» since it has four solutions with different payments as shown in figure 1, while in the zero sum games, there are only two solutions: win or lose, with two payments: ah or nothing. In the «non-zero sum» games, it is also necessary to make decisions instead of always winning, they require patience and tolerance with the faults of the other, it is necessary to adopt strategies and to put oneself in the place of the other, etc. The patients, when faced with these requirements, become suspicious, lose concentration, tolerance and flexibility, above ah with some programs, and pass to simple strategies of the «zero sum» game that they positively connote as the frankest strategy when obtaining a benefit.

Being antisocial or the antisocial dimensional assessment of the IPDE is associated, according to the MACH IV scale, to having more manipulation tactics or having a more cynical view of life. In regards to the cooperation subscales of the TCI, we see a clear association with being revengeful.

The problem of the small sample size should be added as a final criticism to the results and we hope to correct this in future retorts to the study. Furthermore, many comparisons have been made, which as is hnown, generate (for a $p < 0.05$) a statistically significant false result for every twenty comparisons. This should be especially taken into account when interpreting the data of the dimensional assessment of table 3. For the rest of the data, between 50% (table 1 and 3) and 70% (table 2) of the comparisons were statistically significant.

Finally, the test acceptably fulfills the initial objectives. It manages to be a reflection of the non-cooperative behavior of the patient in real life situations, it is comfortable, attractive and fast to perforin for the patient, it can be used in the childyouth population due to its easiness and it shows the strategical problems in cooperation situations of the antisocial disorder. The test opens a road to formulate and verify hypotheses by the application of the paradigms of the mathematical theory of games to the psychopathology of these disorders, especially the interpretation of personality traits as evolutionally stable strategies for social interaction and personality disorders as extreme situations in this continuum. In depth validation of the test deserves an effort by investigators in the future.

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