Introduction. There is a renewed interest in incorporating personality variables in criminology theories in order to build models able to integrate personality variables and biological factors with psychosocial and sociocultural factors. The aim of this article is the assessment of personality dimensions that contribute to the prediction of antisocial behavior in adolescents.

Methods. For this purpose, a sample of adolescents from El Salvador, Mexico, and Spain was obtained. The sample consisted of 1035 participants with a mean age of 16.2. There were 450 adolescents from a forensic population (those who committed a crime) and 585 adolescents from the normal population (no crime committed). All of participants answered personality tests about neuroticism, extraversion, psychoticism, sensation seeking, impulsivity, and violence risk.

Results. Principal component analysis of the data identified two independent factors: (i) the disinhibited behavior pattern (PDC), formed by the dimensions of neuroticism, psychoticism, impulsivity and risk of violence; and (ii) the extrovert behavior pattern (PEC), formed by the dimensions of sensation risk and extraversion. Both patterns significantly contributed to the prediction of adolescent antisocial behavior in a logistic regression model which properly classifies a global percentage of 81.9%, 86.8% for non-offense and 72.5% for offense behavior.

Conclusions. The classification power of regression equations allows making very satisfactory predictions about adolescent offense commission. Educational level has been classified as a protective factor, while age and gender (male) have been classified as risk factors.

Keywords: Personality, Antisocial behavior, Disinhibited, Extrovert

Los patrones de personalidad predicen el riesgo de la conducta antisocial en adolescentes hispanohablantes

Introducción. En los últimos años existe un renovado interés por incorporar las variables de personalidad en las teorías criminológicas para construir modelos que integren variables de personalidad y factores biológicos con factores psicosociales y socioculturales. Recientes estudios revelan que las relaciones entre dimensiones de personalidad y delincuencia podrían representar un continuo dentro de las conductas antisociales. El objetivo del presente estudio ha sido la evaluación de las dimensiones de personalidad que contribuyan a la predicción de la conducta antisocial de los adolescentes.

Metodología. Para ello se obtuvo una muestra de adolescentes de El Salvador, México y España formada por 1035 participantes con una edad media de 16,2 años. Los adolescentes que han cometido delito han sido 450 y los que no lo han cometido han sido 585. Todos los participantes contaron cuestionarios de personalidad que miden las dimensiones de neuroticismo, extraversion, psicotícosímico, búsqueda de sensaciones, impulsividad y riesgo de violencia.

Resultados. El patrón desinhibido de conducta (PDC) se forma con las dimensiones de neuroticismo, psicotícosímico, impulsividad y riesgo de violencia. El patrón extravertido de conducta (PEC) se forma con las dimensiones de búsqueda de sensaciones y extraversion. Ambos patrones permiten predecir la conducta antisocial de los adolescentes mediante
INTRODUCTION

Personality variables are incorporated in criminological theories to construct models that integrate personality variables and biological factors with psychosocial and cultural factors. In this sense, it is considered that the relations between personality dimensions and delinquency represent a continuum of the antisocial behaviors.[1-14]

On the other hand, there has been a great development of the criminological theories of self-control arising from a sociological perspective.[15-18] Briefly, the Gottfredson and Hirschi model[16] proposes that low self-control would be the key factor that would underlie the different types of antisocial behavior, in association with situational opportunity. In this way, Gottfredson and Hirschi[16] and Farrington[19-21] have proposed similar lists of components of individual differences that would hypothetically relate to antisocial propensity: low intelligence, high levels of daring, impulsivity, activity level, physical strength. Empirical studies have attempted to relate the study of self-control to antisocial behavior, but derived the antisocial propensity of social opportunities and deviant behavior, incurring connotative definitions[22,23]. Consequently, it is necessary to find some alternative definition and independent measure that breaks such circularity, for which it is proposed to focus attention on the individual components of antisocial propensity that are stable dispositions throughout life and that constitute the socio-emotional nucleus of the “personality dimensions”[24,25].

In this integrative line, the fact that impulsiveness is related to other dimensions of personality considered in Plutchik’s theoretical model of emotions, called psycho-evolutionary theory.[26-28] The theory assumes the existence of eight dimensions of basic emotions that are systematically related to eight conglomerates of personality dimensions. The eight basic dimensions of personality would be: controlled, uncontrolled, confident, distrustful, depressive, gregarious, shy, and aggressive. At the base of which would be the emotions of temperance, confidence, sadness and anger, which would be expressed in a continuum with two poles each.[27-30] An important aspect of the theory is that personality dimensions can be conceptualized as derived from the emotions assuming that the extremes of personality dimensions will involve personality disorders. In this way, extreme forms of impulsivity can be part of antisocial behavior or borderline personality disorder.

Eysenck[11,22] and later Eysenck and Gudjonsson[33] elaborated a model of delinquent’s personality with clear biological basis. In accordance with Eysenck’s model (PEN model) the personality has three traits: extraversion (E), neuroticism (N) and psychopathy (P) (Psychoticism of the EPQ, the personality questionnaire derived from this model). In agreement with to this approach, personality traits of the offender would be high extraversion, high neuroticism and high psychopathy (P). However, subsequent studies seem to indicate that predictions are fulfilled only for the psychopathy dimension, termed “psychoticism” in the original Eysenck theory.[11,34-39]

Disinhibition (lack of inhibition) is a key concept in recent research on personality and psychopathology. Some personality dimensions such as impulsivity and extraversion on the one hand and psychopathy, hyperactivity disorder and drug abuse, on the other hand, have been associated with inhibition deficits.[40-45] Disinhibition (or lack of inhibition) identify people with self-regulation problems and difficulties in canceling inappropriate responses and adjusting to the expectations of the situation. The lack of inhibition of the response has been related to the literature with a large number of terms: perseverance, impulsiveness, delayed gratification, sensation seeking, risk taking and exaggerated reaction to frustration. The ability to inhibit inappropriate responses is considered one of the most important executive functions and is directly related to self-control and goal-oriented behavior.[9,50-52] Applying these findings to the field of forensic psychology, what has been called weak resistance to crime has become the central construct of contemporary criminology, calling it weak self-control.[15,53-56]

From the point of view of physiological psychology, it has been suggested that the systems of inhibition and behavioral facilitation interact to determine observable behavior. Thus, it has been considered that antisocial behavior would have to do more with the imbalance between two systems than with too high or diminished functioning of any of them.[46-48]

Along the same lines, in the field of juvenile offending behavior, what has been called the “inhibited pattern of behavior” characterized by impulsive subjects and sensation seekers who have not learned from experience being insensitive to punishment and, consequently, relapse into antisocial behavior.[46,48,51,67-73]

Consequently, the research’s aims were to assess personality dimensions that relate to the uninhibited pattern of behavior (PDC), the subsequent examination of how those...
dimensions are grouped into factors and the possibility that such factors allow predicting the antisocial behavior of adolescents. The hypothesis that is put to the test will be whether the PDC is related to the commission of antisocial behavior.

**METHODOLOGY**

**Participants**

The total number of participants were 1059, which 24 were discarded for mere material errors: lack of a page of questionnaires or identification data (country, gender), which is approximately 2% of the total sample.

The final sample has been composed of a total of 1035 subjects, of which correspond: 285 to Mexico, 309 to El Salvador and 441 to Spain. The adolescents who belong to the forensic population (have committed some crime) have been 450 and those of normalized population (they have committed no crime) have been 585. The crimes have been all types, from theft to murders. At the time of answering the questionnaires minors filled in the form the crime, they had committed.

Control groups were from standardized educational centers in Guadalajara (Mexico), San Salvador (El Salvador) and Toledo (Spain) were compared with respect to age and sex. The ages are between 12 and 22 years, with a mean of 16.21 (mode and median have turned out to be 16) and the standard deviation of 1.521 (Table 1).

All the questionnaires were applied by the same researcher, the first signer of this article who in some cases had the help of auxiliary staff by the application was grouped in the classrooms of the various centers. These groups were formed by the first signer of this article with the requirement that minors could read and write correctly. The groups were conformed between 10 and 30 participants. With respect to design of the sample was different in each country. In El Salvador, administrative permits were obtained to visit all internment centers in the country. In Mexico, this was for all centers of the state of Jalisco and in Spain, they were recruited by the first signer in his work as a psychologist of the prosecutor of minors of Toledo located in the city of Toledo. In Mexico, this was for all centers of the state of Jalisco and in Spain, they were recruited by the first signer in his work as a psychologist of the prosecutor of minors of Toledo located in the city of Toledo. In Mexico, this was for all centers of the state of Jalisco and in Spain, they were recruited by the first signer in his work as a psychologist of the prosecutor of minors of Toledo located in the city of Toledo. Respect to the control group the participants was recruited from two schools in the country’s capital San Salvador (El Salvador). In the Mexican case, the participants of the control group were recruited from two schools in the municipality of Zapotlán el Grande (Jalisco) in the Spain case in a school in the city of Toledo.

For a more detailed description of the sample, the reader is referred to a recent article published in this same journal that analyzes the psychometric properties of Plutchik’s scale of impulsivity⁴ and risk of violence⁵.

**Materials**

- EPQ⁷, Spanish version⁷⁵. Personality questionnaire that measures the dimensions of Neuroticism (N), Extraversion (E) and Psychoticism (P), named PEN model. It also incorporates two additional scales of antisocial behavior and sincerity.

- Sensation Seeking Scale, ZKPQ-II⁷⁶,⁷⁷. Sensation Search Scale (EBS). Own translation made for this research¹. The EBS consists of 34 items of two forced-choice phrases, which are scored as 0 or 1. The final score is the sum of the scores of all items, so it will range from 0 to 34. The EBS is a scale Self-applied.

- Plutchik’s Impulsivity Scale (EI)²⁹, Spanish adaptation⁴,⁰. Questionnaire of 15 items Likert-type with 4 possible answers (never, sometimes, often, almost always), scored respectively 0 to 3. The final value of the (EI) is obtained by adding the score for each item, therefore, it will be between 0 and 45. It is a self-applied scale.

- Plutchik’s Violence Risk Scale of (EV)²⁹, Spanish adaptation⁵,⁰. Questionnaire of 12 items, which 11 are Likert-type with 4 possible answers (never, sometimes, often, almost always), scored respectively 0 to 3, and one is of true or false type, which is scored as 1 0, respectively. Therefore, the EV adopts values between 0 and 34. This is a self-applied scale.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Sample description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Educational level</strong></td>
<td><strong>Primary¹</strong></td>
</tr>
<tr>
<td></td>
<td>Normal</td>
</tr>
<tr>
<td>Mexico</td>
<td>0</td>
</tr>
<tr>
<td>El Salvador</td>
<td>0</td>
</tr>
<tr>
<td>Spain</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>0</td>
</tr>
</tbody>
</table>

1: No studies and Primary. 2: Bachelor and University students.
Statistical analysis

Data were analyzed by factor analysis to find the structures underlying to measure personality dimensions. A logistic regression was performed to study the relationship of the dichotomous variable like crime with age, gender, behavior patterns, and country.

Participants who have not committed a crime (standardized population) all of them have at least secondary education, meanwhile many of the participants who have committed a crime have a primary level of education evidencing that this population, adolescents that commit crime are delayed school what would correspond to them by age. For this reason, it is decided to recode the variable of educational level in order that no null cases are found in these categories (Table 1). This way, the educational level variable shown in the logistic regression equation (Table 3) has two categories: On the one hand, without education, primary and secondary; And on the other, High school and university students.

The country variable has three values (1=Mexico, 2=El Salvador, 3=Spain), two dummy variables have been created to be used as a reference in the comparison to Spain. In this way, the variable Mexico takes the value of 1 when the country variable is Mexico and the value 0 in another case. The variable El-Salvador takes the value of 1 when the country variable corresponds to El Salvador and 0 in another case. Therefore, the variables Mexico and El Salvador take the value 0 to Spaniards.

RESULTS

Factorial analysis

The sample adequacy measure of Kaiser-Meyer-Olkin (0.679) and the Bartlett sphericity test with Chi-square value =684.889; (g.l.=15, p<0.000) suggest the adequacy of the factorial analysis, which could isolate a factorial structure underlying to personality scales. The unconstrained principal component analysis extracts two factors with an eigenvalue greater than one, which together accounts for a total of 58.917% of the total variance of the response of the personality scales (N, E, P EI, EV, and EBS). The Table 2 shows the saturations resulting from the varimax rotation.

Table 2 | Main component factor solution and varimax rotation

<table>
<thead>
<tr>
<th>Scales</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Neuroticism (N)</td>
<td>0.552</td>
</tr>
<tr>
<td>Extraversion (E)</td>
<td>-0.124</td>
</tr>
<tr>
<td>Psychopathy (P)</td>
<td>0.743</td>
</tr>
<tr>
<td>Impulsivity (EI)</td>
<td>0.746</td>
</tr>
<tr>
<td>Risk of violence (EV)</td>
<td>0.777</td>
</tr>
<tr>
<td>Sensation Seeking (EBS)</td>
<td>0.425</td>
</tr>
<tr>
<td>Own value</td>
<td>2.214</td>
</tr>
<tr>
<td>% Of total variance explained</td>
<td>36.902</td>
</tr>
</tbody>
</table>

The higher factor weights are highlighted in bold.

The logistic regression equation shown in Table 3 has been used to predict whether or not each subject has committed a crime from the set of independent variables. The result is that an overall percentage of 81.9% of the subjects is correctly classified. The equation correctly classifies 86.8% of subjects who have not committed a crime, and in the case of crime, the percentage of correct classification reaches 72.5%.

The benefit ratio (OR) is considered a good estimator of the effect size.84,85 With regard to interpretation as protection or risk factors, gender (greater probability of offense for the male gender) and age (a greater crime at an older age) would be risk factors; while the educational level (less crime at high educational level) would be protective factors consistent with the specialized literature.86-94

Considering the reason for advantages, the level of higher education that adolescents have decreased the advantage of committing a crime by 98%. And respect to age, each year old that is the subject implies that the chances of committing a crime increase by 17.26%.

Discussion

Respect reduction of the dimensionality of the measured personality scales, taking into account the saturations of the scales in the factors55,80-83, the first factor can be denominated as Disinhibit Conduct Pattern (PDC) and the second as Extravert Pattern of Conduct (PEC). Thus, subjects who score high on PDC tend to score high on psychopathy, impulsivity, and risk of violence, and to a lesser extent on neuroticism. This way, subjects who score high on PDC tend to be
impulsive, emotionally tough, at risk of violent behaviors and prone to worry and anxiety. Those who rate low on PDC will tend to be carefree, without anxiety, little impulsive and without risk of violent behaviors.

On the other hand, subjects who score high in PEC will tend to score high extraversion and search of feelings and to show a lack of concern and lack of anxiety. However, subjects scoring low on PEC tend to be concerned and anxious, introverted, and lacking interest in emotions or activities that provide intense sensations.

From a criminological perspective, it has been considered that crime or antisocial behavior would have to do more with the imbalance between the two patterns of behavior than with too high or diminished functioning of any of them. From the perspective of linking the evidence with criminological theory, we consider that behavior patterns are indicators of behavioral self-regulation and that can be a contribution from psychology to criminology to break the tautology of the model of self-control where the Antisocial propensity of antisocial behaviors that would indicate a low self-control of the individual. This concept of individual self-control arises in literature as a continuum and a central construct in modern criminology.

Respect to the prediction of the antisocial behavior of adolescents, it is found in the regression equation shown (Table 3) that the PDC has a regression coefficient that is not significant, so we cannot consider that there is a relation between this variable and the probability of committing an offense. In contrast, PEC has a negative and statistically significant coefficient that is associated with a ratio of advantages less than one, indicating that a greater extraversion is associated with a lower probability of committing a crime. Following the logistic regression (Table 3), the estimated coefficient B for the El-Salvador variable can be interpreted as a risk factor for committing offenses by Salvadorans in comparison with the Spaniards; being negative B we can conclude that the probability of crime in El Salvador is lower than in Spain. Similarly, the B of the variable Mexico indicates the change in the probability of crime by the Mexicans in comparison with the Spaniards; As this B is not significant, it can not be concluded that the probability of crime varies between Mexico and Spain.

However, some limitations affect this study and new research will be exploring the consistency of the data obtained in this research. Especially the one of a risk of violence by the tendency to not communicate violent behaviors that could have skewed the results reason why the conclusions of the present study must be taken with caution.

### Table 3: Logistic regression (introduce method) for the crime variable (n = 646)

<table>
<thead>
<tr>
<th>Variables</th>
<th>B</th>
<th>Wald</th>
<th>$R^2$</th>
<th>Nagelkerke</th>
<th>$R^2$</th>
<th>Cox</th>
<th>$R^2$</th>
<th>p</th>
<th>Reason Advantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational level</td>
<td>-3.868</td>
<td>96.067***</td>
<td>0.000</td>
<td>0.021</td>
<td>0.397</td>
<td>0.548</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>0.546</td>
<td>39.186***</td>
<td>0.000</td>
<td>1.726</td>
<td>0.000</td>
<td>8.331</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>2.178</td>
<td>53.531***</td>
<td>0.000</td>
<td>8.831</td>
<td>0.000</td>
<td>0.632</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PDC</td>
<td>-0.193</td>
<td>3.018</td>
<td>0.082</td>
<td>0.825</td>
<td>0.000</td>
<td>0.405</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEC</td>
<td>-0.459</td>
<td>14.239***</td>
<td>0.000</td>
<td>0.632</td>
<td>0.000</td>
<td>0.405</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>-0.183</td>
<td>0.415</td>
<td>0.519</td>
<td>0.832</td>
<td>0.000</td>
<td>0.405</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>El Salvador</td>
<td>-0.904</td>
<td>10.822**</td>
<td>0.000</td>
<td>0.405</td>
<td>0.000</td>
<td>0.405</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-6.042</td>
<td>22.401***</td>
<td>0.000</td>
<td>0.405</td>
<td>0.000</td>
<td>0.405</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<0.05 **p<0.01 ***p<0.001; 1: Without education, primary and secondary; Bachelor and university. The estimated parameters for Mexico and El Salvador indicate the change in the probability of crime in these countries compared to Spain.
Also the design of the sample has been to a great extent opportunistic to take advantage, of the first signer to get scholarships for its displacement to American countries of this study. Therefore, future studies will research generalization of the results to other countries by designing the samples to that effect.\textsuperscript{1,4,5}

CONCLUSIONS

The results of this research show the relationship between personality and delinquency of adolescents, which can be interpreted according to the approach formulated by Eysenck the existence of a continuum, from normal behavior to criminal till psychopathic.\textsuperscript{2,23,74,95,96} Following these authors, there would be a continuum in personality dimensions and a continuum of antisocial behavior ranging from small crimes at one end to serious criminal offenses, and relationships can be established between them. It suggests the existence of a general pattern of antisocial and criminal behavior, opposed at one end of the continuum to a pattern of prosocial and altruistic behavior.\textsuperscript{1,3,33,96} In other words, results would support young offenders not differing substantially from non-offenders in dimensions of their personality, but in concrete profiles of scores in those dimensions.\textsuperscript{73,97,98}

Our results support the uninhibited behavior pattern (PDC) approach as a useful way of articulating personality dimensions to investigate their association with antisocial behavior. The analysis of our data, not only has the uninhibited behavior pattern (PDC) been formed, but a new one emerged that had not previously been established in the scientific literature, which we have called the extroverted behavior pattern (PEC). PDC conforms to EI, EV, P and N, while the PEC with E and EBS. Therefore, PDC is formed around impulsivity and PEC around the search for sensations, which would be compatible with the proposal of Barrat et al.\textsuperscript{506}, from the psychology of the personality they defend that impulsiveness and search of sensations are different dimensions of personality.

Empirical evidence has provided evidence about the effect of uninhibited and extroverted patterns on the likelihood of criminal behavior. In both cases the relationship is negative at the descriptive level, so high values in PDC and PEC are associated with a lower probability of offense. However, the clearer result is obtained with the variable PEC, whose coefficient of regression is highly significant. These findings show the importance of using personality variables as predictors of antisocial behaviors, as well as studying the differences between levels of other variables such as age, gender, country of residence and educational level. In synthesis, the results of our study suggest that patterns of behavior, structure personality traits and facilitate the empirical verification of hypotheses derived from the relationship between personality and antisocial behavior.

On the other hand, this sample has confirmed that the educational level is a factor of protection to commit crimes and that the greater age and the masculine gender are the most important risk factors in a coherent way to the established in this field of study.\textsuperscript{1,2,4-6,10,11,14,15,19-21,23,37,56,63,86,88,89,91-94,105}

ACKNOWLEDGMENT

The first author desires to show his acknowledge to the Spanish International Cooperation Agency (AECI) of Foreign Affairs Ministry. With this scholarship, during 2001 and 2002 it would let him finish the field work in El Salvador and México, making the recruiting of the American sample for this research possible.

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