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Psychometric properties of the Plutchik´s Violence Risk Scale on adolescent sample of Spanish-speaking population

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Objetive. The objective of the present study was the validation and scaling of the Plutchik´s Violence Risk Scale (EV) in adolescent Spanish-speaking population.

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 forensic population (those who committed crime) and 585 adolescents from normal population (no crime committed).

Results. The internal consistency of the EV was estimated by Cronbach's alpha coefficient and with a value of 0.782. As for validity, the factorial structures found explain a large proportion of the variance (53.385%); the convergent validity was estimated by the correlation between the dimensions found, the EV and sociodemographic, criminological and personality variables. The developed scales are presented, for the first time in a cross-cultural sample, differentiating between gender and continent.

Conclusions. Consequently, the obtained results suggest that the EV is a valid and reliable instrument within adolescent Spanish-speaking population. Furthermore, it is a quick scale, easy to apply, which is something valuable in forensic assessment.

Keywords: Adolescents, Scaling, Impulsivity, Psychometric features, test, Violence risk, Validation

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Propiedades psicométricas de la Escala de Riesgo de Violencia de Plutchik en una muestra de jóvenes hispanohablantes

Objetivo. El objetivo del presente estudio ha sido la validación y baremación de la Escala de Riesgo de Violencia de Plutchik (EV) en población adolescente hispanohablante.

Material y métodos. 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.

Resultados. La consistencia interna de la EV se ha calculado mediante el coeficiente de fiabilidad alfa de Cronbach, cuyo valor ha sido 0,782. Con respecto a la validez, la estructura factorial hallada explica un porcentaje elevado de varianza (53,385%) y se estudia la validez convergente mediante la correlación de los factores hallados y la EV con variables sociodemográficas, criminológicas y de personalidad. Se presentan los baremos elaborados, por primera vez en una muestra transcultural, diferenciando con respecto al género y al continente.

Conclusiones. En consecuencia, los resultados obtenidos sugieren que la EV es un instrumento válido y fiable en población adolescente hispanohablante. Es una escala rápida y fácil de aplicar lo cual es muy valioso en la evaluación forense.

Palabras Clave: Adolescentes, Escala, Impulsividad, Propiedades Psicométricas, Riesgo de violencia, Validación

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INTRODUCTION

There is currently a renovated interest in incorporating personality variables to criminology theories in order to build more comprehensive models of violent and antisocial behavior, which are able to integrate dispositional traits and biological factors with psychosocial and sociocultural factors. Particularly, special attention has been paid to variables related to "temperament", a group of characteristics which are assumed to depend on individual biological substrate and show a relative stability over the life span. In criminal psychology, the three dimensions from Eysenck's model: extraversion (E), neuroticism (N) and psychoticism (P) along with impulsivity, violence risk and sensation seeking, have deserved special attention[1-10].

Despite the fact that in the present there is not a complete understanding of the complex mechanisms which underlie aggressive and antisocial behavior, scientific evidence and a growing body of literature show that violence is associated with genetic, neurobiological and psychophysiological factors. This is promoting biological criminology development. To understand the etiology of this phenomenon in a precise and accurate way, we must take into account the interaction between biological variables with psychosocial and learning aspects. In the prevention of antisocial behavioral problems and treatment of violent individuals, it is crucial to consider that subjects with high biological risk may be particularly vulnerable to the negative effects of exposure to adverse environments along their lives[4,5,11-14].

Plutchik and Van Praag[15] developed some scales aiming to measure the risk of violence and impulsivity with the same accuracy as brain biochemical changes. From an evolutionary ethological perspective, authors suggest that there is an aggressive impulse underlying suicidal and violent behaviors. This impulse would be triggered under certain environmental conditions. This way, they distinguish between aggressive impulse and aggressive behavior. Thus, the expression of an aggressive impulse in an aggressive behavior would depend on the presence of environmental stimulation. Some environmental stimuli may activate and increase an aggressive impulse, while others may attenuate or inhibit it. According to the authors, the neuropsychological evidence suggests that lateral hypothalamus and basal ganglia are critical for behavioral activation, while medial hypothalamus and amygdala may be the structures involved in inhibition processes. The result of the interrelation between both excitation and inhibition systems may determine the likelihood of behavior.

Findings gathered at the present time, seem to point out that a neuroanatomic correlation is likely to help explain aggressive and impulsive behaviors. Recent researches reveal that neurollogically healthy subjects with Antisocial Personality Disorder (ASP) diagnosis show subtle prefrontal deficit[1,15-19].

Neurological research has established the brain regions involved in aggression pattern organization are the lateral hypothalamus, the ventral tegmental area, the gray area of the brain stem and the septum[20,21]. There are current research results using neuroimaging techniques which report on abnormalities in the brain structures of subjects with violent disorders. Therefore, Raine et al.[22] using magnetic resonance imaging (MRI) find that subjects with ASP show reduced gray matter volume in the prefrontal cortex. In addition, Damasio[23] considers that abnormalities in the frontal cortex may be the neural basis of psychopathy and that ASP may involve, prefrontal cortex abnormalities and functional deficits of the subcortical circuits (for example, an amygdala dysfunction) causing the alteration of emotions commonly displayed by these type of disorders. Consistent with this evidence and according to the modern theories of affect regulation, a recent review of 17 studies with neuroimaging techniques concluded that a reduced ratio of prefrontal *versus* subcortical activity may predispose aggressive and violent behaviour[16,24-26].

This article presents the validation and scaling of Plutchik's Violence Risk Scale in a sample of Spanish American adolescents, already translated into Spanish and validated using a sample of Spanish adults in the past[27].

METHOD

Participants

The total number of participants was 1059, 24 of whom were rejected due to material errors: lack of pages in the questionnaires or lack of personal data (country, gender) which stands for approximately 2% of the total sample.

The final sample consisted of 1035 participants: 285 from Mexico, 309 from El Salvador and 441 from Spain. The adolescents belonging to forensic population (those who committed crime) were 450 and the ones belonging to normal population (no crime committed) were 585.

Both control groups with similar number of participants were obtained from standard education centers in Guadalajara (Mexico), San Salvador (El Salvador) and Toledo (Spain) on a par in terms of age and gender. Ages range from 12 to 22 years of age, with a mean of 16.2 and standard deviation of 1.53.

All the questionnaires were applied by the same person. The first author of this article was helped by other personnel in different centers. The applications were applied in group environments. These groups were selected by the first author with the requirements that the minors knew how to read and write correctly. The groups consisted of 10 & 30 participants. The design of the sample was different in each country; In El Salvador permission was granted to visit the

centers in the country. In Mexico the same permission was also granted only for the centers in Jalisco. In Spain the participants were recruited by the first author in his job as a psychologist in the persecution for minors of Toledo. The participants in the control groups were recruited from private schools in San Salvador the capital of El Salvador. In Mexico the participants of the control group were recruited from two private schools in Zapotlan el Grande (Jalisco) and in Spain from a private school in Toledo (Spain).

For more description of this sample you can read a recent paper about the Plutchik`s impulsivity scale[28].

Materials

EPQ[29], Spanish adaptation[30]. Personality scale with three major dimensions: Neuroticism (N), Extraversion (E), and Psychoticism (P), the PEN model and two additional dimensions: antisocial behavior and sincerity.

Sensation Seeking Scale (EBS), ZKPQ-II[9,31]. The Spanish adaptation was conducted for the fullfilment of the present investigation[1]. The EBS is formed by 34 items. Each item consists of two forced-choice options and it is scored as 0 or 1. The final score is the addition of all the items' scores and, it can consequently be between 0 and 34.

Plutchik Impulsivity Scale (EI)[15], Spanish adaptation[28,32]. It is formed by 15 Likert-type items, with 4 possible responses (never, sometimes, often, almost always), respectively graded from 0 to 3. The final score is obtained by the addition of the scores of each item; scores range from a minimum of 0 and a maximum of 45. It is a self-administered scale.

Plutchik Violence Risk Scale (EV)[15], Spanish adaptation[27]. It is formed by 12 items. 11 Likert-type items, with 4 possible options (never, sometimes, often, almost always), respectively scored from 0 to 3. One is true-false and it is respectively scored as 1 or 0. Therefore, the EV adopts values from 0 to 34. It is a self-administered scale.

VALIDATION

The scale validation was accomplished by comparing scores obtained by the forensic group and the normal group and correlating impulsivity scores (EI) with the ones obtained in the EPQ and Plutchik's Risk of Violence Scale (EV), in order to estimate convergent validity. The study of construct validity was conducted by principal component factorial analysis, drawing factors with own value above one. In factorial analysis, model goodness-of-fit was studied by Chi-square above 0.01, by the estimation method of least squares. This way, the number of factors drawn are decided according to the model goodness-of-fit and the extraction of the least number of dimensions which are able to explain a larger proportion of the variance[33,34].

Construct validity

The measure of sampling adequacy Kaiser-Meyer-Olkin (0.830) and the test of sphericity of Bartlett with value *Chi-square*=2492.200; (*d.f.*=66; $p<0.000$) indicate the suitability of the factorial analysis, so that an underlying factorial structure might be isolated from the items forming the violence risk scale (EV). The principal component analysis with Varimax rotation draws 3 dimensions that explain 53.385% of the total variance (Table 1).

According to the items that saturate the most in each factor, the first one may correspond with *detentions and use of firearms*, the second may be called *fights* and the third is a factor which may be named *annoyment*.

However, other factorial solutions with oblique rotation were tested without increasing the total variance explained or clarifying the nature of the factors (reproducing factors I and III of the total sample). Thus, the factorial solution shown in Table 1 is preferred.

Convergent and discriminant validity

In Table 2, the correlations between the three dimensions of the EV and the age, gender, dimensions of EPQ, sensation seeking (EBS) and impulsivity scale (EI) are presented.

Violence Risk Scale (EV) reveals high positive correlations with Impulsivity Scale (EI) and with the psychopathy dimension (psychoticism, P) of the personality questionnaire EPQ. High correlations, but lower than the previous, are shown with antisocial, sincerity and neuroticism dimensions of the EPQ, and with sensation seeking.

The most important finding concerning the correlation of the obtained factors is that the three of them show high correlations with the total scores of the scale (EV). If we pay attention to the correlation of the factors with the considered variables, it must be mentioned that factor I repeats, to a certain extent, the correlations of the whole scale (EV).

Factor II (*fights*) obtains the highest correlations with sensation seeking and psychopathy, sincerity and antisocial of the EPQ. Finally, factor III (*anger*) is the one of the three factors and within the own scale EV, which most correlates with neuroticism. This factor is, as well, the one which obtains the highest correlations with impulsivity.

RELIABILITY

The internal consistency of the Violence Risk Scale was calculated by Cronbach's alpha coefficient, whose value was 0.782. This value does not improve if any items in the scale are eliminated.

Table 1 Principal components analysis and varimax rotation factor solution

Items Plutchik´s Violence Risk Scale (EV)	Factors		
	I	II	III
1. Do you find that you get angry very easily?	0.034	0.013	**0.798**
2. How often do you feel very angry at people?	0.087	0.133	**0.798**
3. Do you find that you get angry for no reason at all?	0.078	0.188	**0.698**
4. When angry, do you get a weapon?	**0.606**	0.285	0.177
5. Have you ever caused injury in a fight (for example, bruises, bleeding or broken bones)?	0.328	**0.715**	0.086
6. Have you ever hit or attacked a member of your family?	0.043	**0.602**	0.174
7. Have you ever hit or attacked someone who is not a member of your family?	0.222	**0.810**	0.048
8. Have you ever used a weapon to try to harm someone?	**0.512**	0.491	0.184
9. Are weapons easily accessible to you?	**0.662**	0.205	0.049
10. How often have you been arrested for a nonviolent crime such as shoplifting or forgery?	**0.575**	0.181	0.021
11. Have you ever been arrested for a violent crime such as armed robbery or assault?	**0.611**	0.206	0.027
12. Do you keep weapons in your home that you know how to use?	**0.747**	-0.092	0.023
Eigenvalue	3.781	1.614	1.011
% variance	20.86	16.94	15.58

The highest factorial values are highlighted

Table 2 Correlations with age, EPQ, EBS, EI and EV

	Factor I	Factor II	Factor III	EV
Age	**0.056**	**-0.038**	**-0.054**	**-0.010**
Neuroticism (N)	0.012	0.061	0.435**	0.269**
Extraversion (E)	-0.053	0.014	-0.159**	-0.099**
Psychoticism (P)	0.321**	0.348**	0.258**	0.545**
Sincerity	0.129**	0.287**	0.149**	0.342**
Antisocial	0.181**	0.253**	0.218**	0.381**
EBS	0.188**	0.191**	-0.030	0.229**
EI	0.161**	0.221**	0.366**	0.426**
EV	0.625**	0.587**	0.507**	1

* p<0.05; ** p<0.01.
Factor I = Detentions and use of firearms, Factor II = Fights, Factor III = Anger

The alpha coefficients for each of the subsamples were calculated and, defined by the variables that were required differentiated scales, resulting in liability coefficients very similar to the general sample (feminine sub sample 0.764; masculine 0.791; America 0.787 and Spain 0.741). Theses table of contents do not improve when any item of the violence scale is canceled.

The correlations between each item and the total value of the scale (EV) are high, from item 5 (0.679) to item 1 (0.448).

SCALES FOR GENDER AND CONTINENT

With the goal of studying the differences that exist between sample groups, which may justify the creation of different scales for these groups, ANOVAs were carried out concerning the variables of gender, age (cut-off point=16 years of age), country, continent (bringing together the two American countries *vs* Spain) and crime (normal *vs* crime)[1,6,7]. The only ANOVAs which were significant are those for variables gender and continent. Therefore, we present the differentiated scales for these two variables (Table 3). For the two contrasts, the size effect was calculated using the Cohen rate *(d)*. Middle values were obtained, which supports the goodness-of-fit of the contrasts carried out[34-37].

The developed scales for gender and continent America (adding up the participants from Mexico and El Salvador) and Spain are shown in Table 3.

CONCLUSIONS

The results obtained suggest that the Violence Risk Scale (EV) is a valid instrument for its use among adolescent

Spanish-speaking population. In addition, this scale is easy to apply and requires only a few minutes, which is very useful in forensic contexts (Juvenile Courts and Police Stations) where, usually, not much time for assessment is available[21,38].

Reliability obtained is slightly higher than the one obtained by the authors in the original sample[15]. Nevertheless, it is considerably lower to the one obtained by Rubio et al.[27] in the only validation in Spanish language ever known, carried out with a sample of 672 adults who attended emergency room at "Hospital de la Paz", in Madrid (Spain) due to suicide attempts (35%) and with diagnosis of antisocial personality disorder or borderline personality disorder (17%). Their companions were taken as control group. The authors themselves consider that this result may be due to the fact that they selected groups with a very high rate of violent behaviours, compared to the original's sample (consisting of 200 participants of different groups: secondary education students, epileptic patients, psychiatric patients, patients from pain unit, patients with self informed violence and inmates). The same considerations may be made for the respondents of the present sample, who had characteristics of lower diagnosis specificity, in this sense, similar to those who participated in the original sample. As a result, the coefficient of reliability obtained with our data is considered satisfactory, as well as the original sample and consistent to what is generally accepted for instruments belonging to the field of health sciences (0.75)[15,39]. The similar coefficients of reliability reached in the different subsamples reveal that the EV is reliable to measure risk of violence in the general sample and the differentiated subsamples for gender and continent.

As far as validity is concerned, the factorial structure found supports the construct's strength since it explains a high proportion of the total variance (over 50%). The fact that significant differences are obtained for gender and continent also supports the strength of the scale as gender differences regarding violence and aggressive behavior are well known in the scientific literature[1,3,18,21,40]. In Spain, the use of firearms and other weapons is much more controlled by more restrictive laws than those of the American countries considered. It is as well known the more violent atmosphere of El Salvador and Mexico compared to Spain and the existence of youth gangs (*maras*) who commit violent criminal offenses using firearms[41-44]. Therefore, the significant variations concerning country are indicative of the validity of the EV, being necessary the development of different scales for Latin American and Spanish populations. Regarding convergent validity, it must be highlighted that the obtained correlations are consistent with the nature of the found factors.

Consequently, the EV was proved valid and reliable to measure violence risk in Spanish-speaking adolescents. In particular, it is advised to be used in forensic contexts using the scales provided in this article for the first time in scientific literature. In forensic assessment, the EV turns out to be a successful screening instrument and, in combination with other questionnaires, a helpful instrument to establish adolescent personality patterns[1,6,7,11,21,28,38,40,45,46].

Although some limitations affect this study, therefor new investigations should explore the consistency of the data obtained through it. In this case, the answers could be contaminated by the social desirability due to the scale being self-administered. The risk of violence could be specially contaminated due to the tendency of not

Table 3 Scales for gender and continent (EV)

Centile	Gender		Continent	
	Female	Male	America n = 536	Spain n = 364
99	19-32	21-30	22-32	18-26
98	14-18	19-20	20-21	14-15
97	13	18	19	---
96	12	17	17-18	12-13
95	11	16	16	---
93	10	15	15	11
92	9	14	14	9-10
90	---	13	13	---
85	8	11-12	11-12	8
80	7	9-10	10	7
75	6	8	8-9	6
70	---	7	7	---
65	5	6	---	5
60	---	---	6	---
50	4	5	5	4
45	3	4	---	3
40	---	---	4	---
25	2	3	3	2
20	---	2	2	---
10	1	1	---	1
5	0	---	1	0
3	---	0	---	---
1	---	---	0	---

communicating violent behavior, what may have slanted the results; therefor the conclusion in this study should be cautiously taken into consideration. The design of the sample has been a fair and opportunist way for the author to take advantage of the scholarships to travel to the American countries in this study. Future studies should research the generalization of the results to other countries and design the sample to have such effect.

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