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Psychometric Properties of Plutchik's Impulsivity Scale in Juvenile Spanish-speaking population

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The objective of the present study was to validate and score the Plutchik's Impulsivity Scale (IS) in adolescent offenders in Spanish-speaking population. 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. The forensic population included 450 adolescents (those who committed an offense) and the normal population (no offense committed) 585 adolescents. The internal consistency of the IS was estimated by Cronbach's alpha coefficient, whose value was 0.713. Regarding validity, the factorial structures found showed the construct's robustness because they explained a large proportion of the variance and extract factors that are stable for each subsample. The scales developed for the first time in a transcultural sample, differentiating gender and crime, are presented. Consequently, the results obtained suggest that the IS is a valid and reliable instrument within an adolescent Spanish-speaking population. It is a rapid to use and easy to apply scale, which is very valuable in forensic evaluation.

Keywords: Antisocial behavior, Evaluation, Juvenile offenders, Impulsivity

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Propiedades psicométricas de la escala de impulsividad de Plutchik en una muestra de jóvenes hispanohablantes

El objetivo del presente estudio ha sido la validación y baremación de la Escala de Impulsividad de Plutchik (EI) en población adolescente hispanohablante. 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 de la población forense (han cometido delito) han sido 450 y los de población normalizada (no han cometido delito) han sido 585. La consistencia interna de la EI se ha calculado mediante el coeficiente de fiabilidad alfa de Cronbach, cuyo valor ha sido 0,713. Con respecto a la validez, las estructuras factoriales halladas muestran la solidez del constructo porque explican un porcentaje elevado de varianza y extraen factores que son estables para cada submuestra. Se presentan los baremos elaborados, por primera vez en una muestra transcultural, diferenciando con respecto al género y al delito. En consecuencia, los resultados obtenidos sugieren que la EI 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: Conducta antisocial, Evaluación, Delincentes juveniles, Impulsividad

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INTRODUCTION

In recent times, there has been renewed interest to incorporate personality variables into criminology theories to construct models that integrate personality variables and biological factors with psychosocial and sociocultural factors. Specifically, special attention has been given to the variables that have been related with "temperament," a group of characteristics assumed to depend on the individual biological substrate and that show a relative grade of stability over lifetime. In criminal psychology, the three dimensions of the Eysenck model (extraversion, neuroticism and psychoticism) together with impulsivity and sensation seeking, have deserved special attention.¹⁻⁸

Although the complex mechanisms underlying aggressive and antisocial behavior are not totally understood at present, scientific findings and a growing body of literature show that violence is associated with genetic, neurobiological and psychophysiological factors, which is boosting the reemergence of biological criminology. To understand the etiology of this phenomenon as exactly and accurately as possible, the interactions of biological variables with psychosocial and learning aspects must be considered. In the prevention of these acts and the treatment of impulsive subjects, it is crucial to consider that individuals with high biological risk may be especially vulnerable to the negative effects of the exposition to adverse environments during their lifetime.^{2,9-13}

The core traits of antisocial personality disorder (APD) are impulsive behaviors, without stopping to consider the negative consequences of the behaviors, absence of personal and social responsibilities, with deficits in problem solving and flattening of effect, without feelings of love or guilt. Because of all this, these persons lack the minimum cognitive and affective equipment necessary to assume socially accepted values, which generally means constant transgressing of established norms and a general pattern of disregard of the rights of others.

Plutchik and Van Praag¹⁴ developed some scales with the ambitious objective of measuring impulsivity and risk of violence as accurately as biochemical changes in the brain could be measured. They suggested that from an evolutionary etiological perspective, it can be considered that an aggressive impulse underlies suicidal behaviors and risk of violence that would be activated under certain environmental conditions. In this way, they distinguish between aggressive impulse and aggressive behavior. Consequently, the fact that aggressive impulse is expressed in aggressive behavior depends on the presence of environmental stimulation. Some environmental stimuli can activate and amplify the aggressive impulse while others may lessen or inhibit it. According to the authors, the neuropsychological evidence suggests that the lateral hypothalamus and basal ganglia

are fundamental for the activation of the behaviors, while the middle hypothalamus and amygdala would be the structures involved in the inhibition processes. The results of this interrelation between both systems (inhibitory and excitatory) will determine the likelihood of the behavior.

The accumulated findings up to date seem to indicate that the existence of a neuroanatomical correlate that helps to explain aggressive and impulsive behaviors is likely. The most recent investigations have manifested that neurologically healthy individuals diagnosed of APD have subtle prefrontal deficits.^{1,14-17}

From a perspective of the current neurosciences, the impulsivity construct has been considered to be involved in the deficiencies for control of behavior in the presence of salient reinforcers.¹⁸⁻²⁰ Consequently, impulsivity would be linked with alterations in the regulation of emotion, behavior and cognition, which are related with antisocial behavior and vulnerability and maintenance in drug abuse.^{2,17,21-23}

This article presents the validation and scoring of Plutchik's Impulsivity Questionnaire in a sample of Spanish American adolescents. This questionnaire has already been translated and validated using a sample of Spanish adults.²⁴

METHOD

Participants

The total number of participants was 1059, 24 of whom were ruled out due to mere material errors: lack of a page in the questionnaire or identification data (country, gender), which accounts for approximately 2% of the total sample.

The final sample was made up of a total of 1035 subjects, corresponding to: 285 to Mexico, 309 to El Salvador and 441 to Spain. The adolescents who belong to a forensic population (they had committed some offense or crime) accounted for 450 and the standardized population (they had not committed any offense or crime) accounted for 585 (Table 1).

Control groups were obtained for both groups with a similar number of sampled subjects from standardized teaching sites of Guadalajara (Mexico), San Salvador (El Salvador) and Toledo (Spain) similar in age and gender. Ages ranged from 12 to 22 years, with a mean of 16.2 and standard deviation of 1.53

Materials

- Eysenck Personality Questionnaire (EPQ),²⁵ Spanish version.²⁶
- Sensation Seeking Scale, ZKPQ-II.^{7,27} Sensation Seeking

Table 1	Sample description									
	Gender					Education level				
	Male		Female		Primary ¹		Middle School		High school and University Students ²	
	Normal	Crime	N	C	N	C	N	C	N	C
Mexico	95	107	78	5	0	49	49	46	124	1
El Salvador	113	78	95	23	0	37	128	41	80	3
Spain	110	203	94	34	0	18	141	184	26	14
Total	318	388	267	62	0	104	318	271	230	18

¹Without studies and Primary Studies. ²High School and University students.
N: NORMAL; C: CRIME

Scale (SSS). Own translation made for the current research.¹ The SSS is made up of 34 items with two sentences of forced choice, scored as 0 or 1. The final score is the sum of the scores of all the items, so that it will range from 0 to 34.

- Plutchik's Impulsivity Scale (IS),¹⁴ Spanish adaptation.²⁴ Questionnaire having 15 Likert type items with 4 possible answers (never, sometimes, often, almost always), scored respectively from 0 to 3. The final value of the IS is obtained adding the score of each item, so that it will be between 0 and 45.
- Plutchik's Violence Risk Scale (VS),¹⁴ Spanish adaptation.²⁸ Questionnaire having 12 items, 11 of which are Likert type with 4 possible answers (never, sometimes, often, almost always), scored respectively from 0 to 3, and one is a true-false type, scored as 1 or 0, respectively. Thus, the VS adopts values between 0 and 34.

VALIDATION

The validation of the questionnaire was performed comparing the scores obtained by the forensic group with the standardized group and correlating the impulsiveness scores with those obtained in the EPQ and with the Plutchik's violence risk questionnaire to estimate convergent validity. The study of the construct validity was performed using the exploratory factor analysis of principal components extracting the factors with self-value greater than one.²⁹ In the factor analysis, goodness of fit of the model was studied using Chi-square greater than 0.01, by the least squares estimation procedure, so that the number of factors extracted is decided according to the goodness of fit of the model and the extraction of the lower number of factors that are capable of explaining a greater percentage of variance.³⁰

Construct validity

The measurement of the sampling appropriateness of Kaiser-Meyer-Olkin (0.814) and Bartlett's sphericity test with

the Chi-square value=1883.862; (g.l.=105; $p<0.000$) suggests the adequacy of the factor analysis. Thus, a factorial structure underlying the items making up the impulsivity scale could be isolated. The analysis of principal components with varimax rotation extracts four factors explaining 47.313% of the total variance (Table 2).

As is seen in Table 2, considering the items that are most saturated in each factor, the first one could correspond with *impulsive self-concept*; the second would be related with the impulses linked to the primary emotions and physical needs (sex and food), which we have called *primary emotions and impulses*; the third would be a *planning* factor and the last *concentration*.

On its part, other factorial solutions have been tested with oblique rotation without increasing the total variance explained or clarifying the nature of the factors.

Convergent and discriminant validity

Correlations of the four IS factors with age, EPQ questionnaire dimensions, sensation seeking and risk of violence are presented in Table 3.

The impulsivity scale had high positive correlations with the violence risk scale, sensation seeking and with the EPQ questionnaire personality dimensions: antisocial, psychotism, sincerity and neuroticism.

As seen in Table 3, the concentration factor was orthogonal to the extraversion dimension of the EPQ questionnaire and factor I (self-concept) had very similar correlations to the general impulsivity scale (IS) due to the fact that it is the factor corresponding to the most variance. Sequentially, factor II (primary emotions and impulses) showed very similar correlations to the previous, but with much smaller absolute values.

Table 2	Factorial solution of principal components and varimax rotation				
	Impulsivity Scale Items	Factors			
		I	II	III	IV
1. Is it hard for you to stand in line ?	0.334	0.286	-0.142	0.421	
2. Do you do things impulsively?	0.806	0.030	0.063	0.002	
3. Do you spend money impulsively?	0.571	0.213	0.030	0.088	
4. Do you plan things in advance?	-0.083	-0.063	0.622	0.031	
5. Do you often lose patience?	0.563	0.175	-0.061	0.222	
6. Do you find it easy to concentrate?	-0.117	-0.176	0.311	0.647	
7. Do you have problems to control your sexual impulses?	0.034	0.704	-0.117	0.090	
8. Do you say the first thing that comes into your mind?	0.364	0.339	0.119	0.090	
9. Do you eat even if you are not hungry.	0.249	0.496	0.226	-0.281	
10. Are you impulsive?	0.829	0.055	0.009	-0.021	
11. Do you finish things that you have started.	0.112	0.040	0.686	0.129	
12. Do you have problems controlling your feelings?	0.114	0.661	0.028	0.095	
13. Are you easily distracted?	0.281	0.243	0.041	0.628	
14. Do you find it hard to sit still?	0.351	0.364	0.105	0.321	
15. Are you careful or caution?	0.064	0.096	0.714	0.004	
Own value	3.411	1.606	1.063	1.017	
% of total explained variance	16.98	11.27	10.57	8.48	

Those having the greatest factorial weights are shown in bold

Table 3	IS Correlations with age and personality values				
	Factor I	Factor II	Factor III	Factor IV	IS
Age	0.031	-0.016	0.005	-0.040	-0.003
Neuroticism (EPQ)	0.294**	0.179**	0.073*	0.153**	0.343**
Extraversion (EPQ)	0.041	0.005	-0.084*	0.000	-0.022
Psychoticism (EPQ)	0.307**	0.162**	0.144**	0.105**	0.379**
Sincerity (EPQ)	0.314**	0.188**	0.273**	0.172**	0.463**
Antisocial (EPQ)	0.357**	0.212**	0.092	0.215**	0.434**
SSS	0.303**	0.102**	0.111**	0.044	0.323**
VS	0.284**	0.177**	0.019	0.140**	0.426**
IS	0.646**	0.515**	0.403**	0.384**	1

SSS: Sensation Seeking Scale; VS: violence scale; IS: Impulsivity Scale
 * p<0.05; ** p<0.01.
 Factor I= Self-concept, Factor II= Primary emotions and impulses, Factor III= Planning, Factor IV= Concentration.

RELIABILITY

The internal consistency of the impulsivity scale was calculated with Cronbach's alpha reliability coefficient, with the resulting value of 0.713. This value did not improve by eliminating any item from those making up the scale.

The same Cronbach alpha index was calculated for each one of the subsamples in which differentiated scales (gender, crime and criminal nature) were calculated. As a whole, the indexes found were similar, except in the subsamples differentiated by criminal nature: against persons (0.556) against things (0.667). In these subsamples, it must be

considered that the sample size was considerably reduced: against persons ($n=181$) and against things ($n=170$). The indexes are very similar to those found in other subsamples in the total sample (Table 4).

Table 4 shows the statistics of the scale items, verifying how the indexes of asymmetry and kurtosis close to zero of the IS suggest that the distribution is symmetric and similar to the normal curve. Globally, we observed in each item that indicators close to zero are also reproduced.

The correlations between each item and total value of the scale are shown in Table 5, where high correlations between all the elements and the total value of the scale are observed (Table 5).

SCALES FOR GENDER, CRIME AND CRIMINAL NATURE

In order to study the existence of differences between different groups of the sample that would justify the development of different scales for these groups, ANOVAS were performed in regards to the variables of gender, age (cutoff 16 years), country, continent (grouping the two American countries against Spain) and crime. The ANOVAS were only significant for the variables gender, crime and criminal nature (Table 6). Consequently, differentiated scales are presented for these three variables (Table 7).

The effect size was calculated for the three contrasts according to Cohen's index (d), finding mean values for crime and criminal nature, which favors the goodness of fit of the contrasts made.³⁰⁻³³ However, in the case of gender, the value found was somewhat less than average, which could result in the recommendation to not consider the significance of the difference of means. In this sense, in the original sample, differences were also not found regarding the gender variable.¹⁴ However, the large sample size and the fact contrasted in the literature on the difference in gender for the criminological variables leads to the recommendation to obtain differentiated scales for the gender variable.^{1,4,5}

The scales developed for gender, crime and criminal nature are shown in Table 7.

CONCLUSIONS

The results obtained suggest that the Impulsivity Scale (IS) is a valid instrument for use in the Spanish-speaking adolescent population. On the other hand, this is a scale that is easy to apply and that requires very little time (about five minutes). This is very valuable in the forensic content where little time is usually available for the evaluation.³⁴

The reliability obtained coincides with that obtained by the authors in the original sample.¹⁴ It is similar to that obtained recently in a sample of adolescents using another much longer impulsivity scale (45 items).³⁵ However, it is noticeably inferior to that obtained by Rubio et al. (1998) in the only known validation in Spanish that was performed with a sample of 672 adults who had come to the emergency service in the Madrid "Hospital de La Paz" (Spain), due to suicide attempt (35%) and diagnosed of antisocial personality disorder or borderline personality disorder (17%). The control group used was their escorts. The authors per se consider that this is because the psychiatric diagnoses used are more related with impulsivity than those of the original sample, which was made up of 200 participants from different groups: high school students, epilepsy patients, psychiatric patients, those from the pain unit, patients with self-reported violence and prisoners. Thus, the same considerations can be extended to the participants of the present sample that would have conditions of lower diagnostic specificity. In this sense, they are similar to those who participated in the original sample. Consequently, the reliability coefficient obtained with our data is considered satisfactory, the same as that of the original sample and in agreement with that which is generally accepted for instruments belonging to the health sciences setting (0.75).^{14,36} The similar indexes of reliability reached in the different subsamples indicate that the IS is reliable to measure impulsivity in both the general sample as well as in the subsamples differentiated by gender and crime.

Regarding validity, the factor structure found explains the construct robustness since the factors obtained coincide with the constitutive characteristics of the impulsivity: cognitive and motor. It also remains basically the same, although oblique rotations are established or solutions are forced to obtain different numbers of factors. In addition, the high positive correlations with the violence risk scale, sensation seeking and with the EPQ personality questionnaire dimensions (antisocial, psychoticism, sincerity and neuroticism) are consistent with a large number of previous investigations, showing adequate convergent validity.^{8,14,35,37-39}

Impulsivity is one of the most important explanatory factors of violent behavior and other behaviors such as hyperactivity or addictive behavior. From this perspective, the distinction between forensic and normal subsamples is predictable. In coherence with the forensic clinical observation, adolescents who had contact with the legal system generally show greater social desirability in the answers, which would explain the mildly lower scores of the forensic subsample. Analogically, the novel finding of this work in relationship with the differentiation between the subject who have committed an offense against things or against persons could tentatively be explained. Committing a crime against persons entails having to directly confront the victim, which has been reflected in lower scores on impulsivity, indicating

	Mean	Standard deviation	Asymmetry	Kurtosis	N
1. Is it hard for you to stand in line?	1.23	0.928	0.753	-0.239	973
2: Do you do things impulsively?	1.06	0.828	0.763	0.334	973
3. Do you spend money impulsively?	1.03	0.946	0.697	-0.376	965
4. Do you plan things in advance?	1.15	1.001	0.237	-1.180	967
5. Do you often lose patience?	1.07	0.856	0.779	0.222	967
6. Do you find it easy to concentrate?	1.52	1.017	-0.279	-1.089	968
7. Do you have problems to control your sexual impulses?	0.78	0.951	1.148	0.362	967
8. Do you say the first thing that comes into your mind?	1.07	0.913	0.785	-0.041	969
9. Do you eat even if you are not hungry.	0.79	0.903	1.027	0.264	973
10. Are you impulsive?	1.03	0.920	0.760	-0.138	964
11. Do you finish things that you have started.	0.82	0.921	0.572	-1.111	969
12. Do you have problems controlling your feelings?	1.24	0.940	0.517	-0.563	970
13. Are you easily distracted?	1.51	0.993	0.237	-1.046	966
14. Do you find it hard to sit still?	1.29	1.057	0.410	-1.037	971
15. Are you careful or caution?	1.07	0.959	0.167	-1.339	975
Impulsivity Scale (IS)	16.51	6.272	0.497	0.696	970

Item	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	1														
2	0.232**	1													
3	0.242**	0.311**	1												
4	-0.074*	-0.028	-0.011	1											
5	0.289**	0.354**	0.283**	-0.067*	1										
6	0.004	0.004	0.040	0.169**	0.009	1									
7	0.218**	0.176**	0.220**	-0.067*	0.120**	-0.023	1								
8	0.155**	0.256**	0.228**	0.003	0.148**	0.029	0.179**	1							
9	0.150**	0.191**	0.184**	-0.013	0.160**	-0.030	0.144**	0.171**	1						
10	0.232**	0.565**	0.391**	-0.008	0.313**	-0.028	0.165**	0.303**	0.184**	1					
11	0.043	0.093**	0.063	0.193**	0.121**	0.163**	0.000	0.065*	0.107**	0.058	1				
12	0.163**	0.175**	0.188**	0.012	0.268**	-0.024	0.253**	0.178**	0.192**	0.205*	0.062	1			
13	0.272**	0.222**	0.194**	0.017	0.244**	0.110**	0.143**	0.216**	0.120**	0.216**	0.144**	0.213**	1		
14	0.223**	0.289**	0.212**	0.024	0.225**	0.042	0.184**	0.254**	0.195**	0.282**	0.084**	0.234**	0.329**	1	
15	0.058	0.114**	0.070*	0.195**	0.032	0.125**	0.017	0.096**	0.093**	0.044	0.314**	0.055	0.089	0.103**	1
IS	0.471**	0.569**	0.530**	0.217**	0.503**	0.254**	0.405**	0.485**	0.417**	0.570**	0.378**	0.471**	0.531**	0.560**	0.366**

* p<0.05; ** p<0.01 (bilateral)

that the subjects show some greater control and planning to carry out such offenses than those who choose offenses

against things that do not require this confrontation with the victim.^{1,5,21,23}

Table 6		Analysis of variance for gender, crime and criminal nature					
		n	mean	Standard Deviation	F	p	d
Gender	female	317			d	0.003	0.049
	male	653		6.21			
Crime	normal	560	17.37	6.51	25.592***	0.000	0.33
	crime	410	15.34	5.74			
Criminal N.	against/ things	191	15.94	6.04	7.114**	0.008	0.27
	against/ persons	193	14.44	4.94			

** p<0.01; *** p<0.001

Table 7		Scales for gender, crime and criminal nature (IS)					
Centile	Gender		Crime		Criminal nature		
	Female n=317	Male n=653	Normal n=560	Forensic n=410	Against things n=191	Against persons n=193	
99	34-40	35-42	36-42	30-35	30-35	29-31	
98	32	31-34	34-35	29	---	27	
97	31	30	32-33	27-28	29	25-26	
96	29-30	28-29	30-31	---	27-28	24	
95	28	27	28-29	26	26	23	
93	27	25	27	24-25	25	22	
92	26	24	26	---	---	---	
90	25	---	25	23	24	21	
85	24	22-23	23-24	21-22	23	19-20	
80	22-23	21	22	20	21-22	18	
75	21	20	21	19	20	17	
70	20	19	20	18	19	---	
65	19	18	---	17	18	16	
60	---	17	19	16	17	15	
50	17	16	17	15	16	14	
45	---	15	16	14	15	13	
40	16	14	15	---	---	---	
30	15	13	14	12	13-14	12	
25	14	12	13	11	12	11	
20	12-13	11	12	10	11	10	
10	9-11	9	9-10	9	9-10	9	
5	8	7-8	7-8	7	7-8	8	
3	5-7	6	6	5-6	4-6	7	
1	3	4	4	3-4	2-3	4-6	

Regarding the differentiation by gender in a study with Spanish adolescents (435 males and 529 females) both in standardized school centers and 95 institutionalized delin-

quent males, the authors found that girls show significantly higher means in neuroticism and lower ones in psychoticism. There are no significant differences in extraversion. Girls

show significantly lower score in all the sensation seeking components, except seeking experiences while impulsivity does not differ significantly between boys and girls.⁵ This finding would go along the same line as that obtained in this work with significant gender differences but with a lower size effect of the average. This would lead to the recommendation to not take such differences into consideration. On another hand, differences by gender were also not found in the original sample.¹⁴

In conclusion, the IS has been shown to be valid and reliable to measure impulsivity of Spanish-speaking adolescents. Specifically, its use is recommended in the forensic setting, using the scales provided in this article for the first time in the scientific literature. In the evaluation, the IS has been shown to be very useful as a screening instrument and, when appropriate, combining it with other questionnaires to help establish the adolescent personality patterns.^{1,4,5,21,23,38}

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