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Validation and Psychometric Properties of the State Impulsivity Scale (SIS)

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Introduction. Impulsivity is a complex phenomenon that can be evaluated from a trait or state perspective. Impulsive trait is a predisposition relatively stable over time, but not always perceptible by behavior. However, the impulsivity state covers transient variations on impulsivity levels that are dependent on environmental or biologic conditions.

Objetive. This study has aimed to validate a scale to assess impulsivity as a state in a Spanish sample.

Method. State Impulsivity Scale (SIS) was designed based on three experimental models: Reward, Automatism and Attentional. All the items in the SIS explore the presence and frequency of impulsive behaviors. Statistical analyses of reliability and validity were done. Convergent validity was examined by means of correlations among SIS and Barratt Impulsiveness Scale (BIS-11), Sensitivity to the punishment and sensitivity to the reward questionnaire (SPSRQ) and Sensations Seeking Scale type V (SSS).

Results. We used a Spanish sample of 70 patients who had at least one diagnosis of Impulse Control Disorder (IP), 73 psychiatric patients without impulsive disorders (NIP) and 150 control subjects (CS). The values obtained reveal the high reliability of the SIS (Cronbach's alpha coefficients 0.884), factor analysis confirmed the theoretical three-dimensional structure and convergent validity was excellent. SIS also demonstrated its capacity for discrimination among IP group and NIP and CS groups.

Conclusions. SIS is a new impulsive behavior assessment instrument validated in Spanish population. The results obtained indicate adequate psychometric properties for its use in the clinical and research fields.

Key Words:
State Impulsivity, Trait, Evaluation, Scale.

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Validación y Propiedades Psicométricas de la Escala de Impulsividad Estado (EIE)

Introducción. La impulsividad puede abordarse desde una perspectiva de rasgo o estado. El rasgo impulsivo es una predisposición -no necesariamente observable conductualmente- que es estable en el tiempo. Por el contrario, la impulsividad estado, engloba las variaciones transitorias en los niveles de impulsividad que son dependientes de cambios ambientales o biológicos.

Objetivo. El objetivo de este trabajo fue validar en población española una escala que evalúe la impulsividad como estado.

Metodología. La EIE (Escala de Impulsividad Estado) se diseñó en base a tres modelos experimentales: Gratificación, Automatismo y Atencional. Todos los ítems detectan aparición y frecuencia de conductas impulsivas. Se realizaron análisis estadísticos de validez y fiabilidad. Para la convergencia la EIE se administró junto con la Escala de Impulsividad de Barratt (BIS-11), el Cuestionario Sensibilidad al Castigo Sensibilidad a la Recompensa (SCSR) y la Escala de Búsqueda de Sensaciones V (SSS).

Resultados. La muestra estuvo formada por 70 pacientes con diagnóstico de Trastornos Impulsivos (PI), 73 pacientes con otros diagnósticos psiquiátricos sin conductas impulsivas (PNI) y 150 sujetos control (GC). La EIE obtuvo una fiabilidad elevada (alfa de Cronbach 0,884), el análisis factorial confirmó la presencia de las 3 dimensiones definidas previamente y la validez convergente fue excelente. Además, la escala discriminó el grupo de PI, del grupo de PNI y del GC de forma adecuada.

Conclusiones. La EIE es una nueva escala clínica, validada en población española, que permite medir la conducta impulsiva como estado pudiendo utilizarse en ámbitos clínicos y de investigación.

Palabras Clave:
Impulsividad Estado, Rasgo, Evaluación, Escala.

INTRODUCTION

Impulsivity is defined as a tendency to respond rapidly, without planning and without considering the consequences of this behavior. [1-2] This tendency to respond impulsively may form a part of the stable personality trait[3-5] or be a transitory state derived, for example, from substance usage, psychiatric disorders, medical conditions or pharmacological treatments such as dopaminergic agonists.[6-9]

Several instruments have been developed for the evaluation of impulsivity. These can be classified based on the dimension to be evaluated, that is trait/state, and on the type of test used, that is, clinical scale/neuropsychological task. Table 1 gives some examples derived from this classification.[10-24] One measure of impulsivity as "state" is justified from the clinical point of view on considering that subjects with low "trait" impulsivity may experience transitory impulsive behaviors derived from biological or specific environmental situations.[25-26] Furthermore, an evaluation of "state" impulsivity is more sensitive to short term change than evaluation of "trait," and is a very important measurement when the efficacy of therapeutic interventions is determined. This study has aimed to validate a new self-applied clinical scale in a Spanish population that can register and quantify impulsivity as "state." In this sense, the total score on the SIS would express the sum of the frequency of appearance of prototypic impulsive behaviors that can be modified in the short term. In this way, the instrument would serve to measure the effectiveness of the pharmacological or psychotherapeutic treatments aimed at decreasing levels of abnormal impulsivity.

METHODOLOGY

Theoretical models used

Three experimental models explaining impulsive behavior were used for the construction of the scale. The first model "Reward" uses incapacity to delay an immediate reward, relinquishing a greater but deferred reward as a measure of impulsivity. [27-30] This model incorporates aspects related with sensitivity to punishment. Impulsive subjects act in spite of the harmful consequences of their behavior (for example, canceling commitments acquired for an immediate reward).

The second experimental model "Automatism" uses repetition of a behavior even though it does not obtain reinforcement or even obtains punishment as measurement of impulsivity.[31-32] The negative consequences are experienced immediately, but the subject maintains the response (or even increases it), behaving in a stereotyped and inflexible way. Automatism is related with deficiencies in inhibitory mechanisms of self-regulation, finding similarities with the behavioral inhibition system (BIS) proposed at the end of the 80's by Gray.[33]

The last experimental model is "Attentional." This is defined by the presence of rapid (premature) responses without counting on all the necessary information to act appropriately to the situation. [34-35] An early response is not

Table 1 Classification of the instruments used frequently in the Spanish population for the evaluation of impulsivity as trait or as state by clinical scales or neuropsychological tasks[10-24]

Dimension	Type of Test	Examples
Trait	Clinical Scale	Barratt Impulsiveness Scale (BIS-11)
		Plutchik Impulsivity Scale (IS)
		Eysenck Personality Inventory (EPI)
		Functional/Dysfunctional Impulsivity Scale
		Sensation Seeking Scale (SSS)
		Sensitivity to Punishment and Sensitivity to Reward (SPSRQ)
		Escala de Control de los Impulsos "Ramón y Cajal" (ECIRyC) (Impulsive Control Scale Ramon y Cajal)
		International Personality Disorder Examination (IPDE)
	Neuropsychological Task	Inference between results of several tasks
State	Clinical Scale	State Impulsivity Scale (SIS)
	Neuropsychological Task	Continuous Performance Test (CPT)
		GO/NO GO Type Test
		STOP Tasks
		Change Tasks
		Delay tasks
		Iowa Gambling Task (IGT)
		Wisconsin Card Sorting Test

necessarily a maladaptive response Therefore, Dickman[36] characterizes impulsivity as "functional" when this impulsive behavior provides benefits. In order to draw up the SIS, those aspects referring to "dysfunctional" or "maladaptive" impulsivity characterized by the negative consequences derived from a deficient extraction of the stimulus information, of a lack of planning and incapacity to omit an inadequate response were obtained from the attentional model.

Writing the Instrument

The items were written in accordance with the following keys: 1. The presence of expressions that orient towards an evaluation of the trait, for example words such as "I am, I prefer, I usually, I tend to, I like" were always avoided. 2. Sentences whose answers could be conditioned by style of life (visits to the doctor, taking trips, etc.) were avoided. 3. Sentences pointing to the detection of an explicit behavior related with each one of the theoretical models previously defined. 4. Short and easy to answer sentences were used. 5. A Likert-type response format that recorded the frequency of appearance of the behavior was taken into account, assigning a score of zero to the value "Almost never" (low impulsivity) and a score of 3 to the value "Almost Always/ Always" (high impulsivity).

Procedure

In a first phase, a pilot study was made, applying the scale to a sample of patients belonging to a Mental Health Center of the Community of Madrid and to subjects of the general population (n=110). A first statistical analysis was made that made it possible to eliminate the problematic and/or non-discriminative items. Thus, the final version of the SIS (Annex 1) was finally made up of 20 items: the first 7 corresponding to the dimension Reward, the next 6 to the dimension Automatism and the last 7 to the dimension Attentional.

In the second phase (validation and standardization of the SIS in Spanish population), a new sample was established that was formed by 3 groups: 1. "Impulsive Patients" (IP): subjects recently diagnosed of at least one impulse control disorder; 2. "Non-Impulsive Patients" (NIP) made up by patients recently diagnosed of other psychiatric disorders without impulsive behaviors; and 3. "Control Group" (CG). The diagnoses were made by an experienced psychiatrist and according to the DSM-IV-TR criteria. The IP and NIP groups were recruited from two Mental Health Centers of the Community of Madrid and two Mental Health Centers of the Community of Castilla y León, and the patients signed their consent for voluntary participation.

Exclusion criteria were defined for the 3 groups as: age under 18 years, cognitive deterioration and for the NIP group hypo/manic episode, paraphilias, dissociative disorders and factitious disorders.

During the interviews, basic demographic data were collected and the SIS was administered together with the Barratt Impulsivity Scale (BIS-11), Sensitivity to Punishment and Sensitivity to Reward (SPSR) Questionnaire and the Sensation Seeking Scale form V (SSS). The latter was applied in an exploratory way to 39 subjects of the IP group randomly selected. The retest measurement for the SIS was obtained after 7 days in 102 randomly selected subjects made up of patients and controls.

Characteristics of the Instruments

1. BIS-11: it evaluates the presence of a pattern of long term maintained impulsive behavior. It is a trait clinical scale. It includes 3 dimensions: cognitive (tendency to make rapid decisions), motor (tendency to act suddenly) and absence of planning (greater interest for the present them for the future). [37-38]
2. SPSR: It is made up of 48 items into subscales. The first, Sensitivity to Punishment (SP) evaluates behavior inhibition when there is the possibility of aversive consequences. It is related with the behavioral inhibition system (BIS) and with the anxiety trait dimension. The second subscale, Sensitivity to Reward (SR), evaluates the possibility of appearance of appetitive stimuli and is related with the behavior activation system (BAS), being a measurement of impulsiveness. [39]
3. SSS: It evaluates search for novel and risky experiences. It is made up of 4 subscales: ESS: Emotion Seeking Subscales, ExSS: Excitement Seeking subscale, DSS: Deinhibition subscale, BSS: Boredom Susceptibility subscale.There is a close relationship between the impulsive behavior and the sensation seeking trait expressed in the total score of the SSS and "fundamentally in the DSS and BSS dimensions."[40]

Sample

For the final validation stage of the questionnaire, a total sample of 310 subjects was used (Group IP n=75; Group NIP n=75; CG n=160). The IP group received the following as principal diagnosis: Intermittent Explosive Disorder (n=46, 61%), Pathological Gambling (n=7, 9%), Kleptomania (n=3, 5%) and Borderline Personality Disorder

with impulsive behaviors (n=19, 25%). The principal psychiatric diagnosis of the NIP group was distributed as follows: Major Depressive Disorder (n=15, 20%), Anxiety Disorders (n=14, 19%), Adaptive Disorder (n=12, 16%), Anorexia Nervosa (n=2, 3%), Schizophrenia (n=4, 5%), Alcohol Dependence (n=16, 21%), Somatomorph Disorder (n=3, 4%), "Non-impulsive" Personality Disorder (n=9, 12%). During the statistical analysis of the data, 17 subjects were eliminated due to serious doubts regarding the rigor used when responding to the questionnaires. The finally analyzed sample (n=293) was made up by: 70 IP (23.9%), 73 NIP (24.9%) and 150 subjects of the CG (51.2%). Age range was 18 to 68 years (mean =35.5; median 34; SD. 12.1 years). Mean age of the subjects of the CG (31.97) was significantly less than that of the IP group (mean 40.27) and that of the NIP group (mean 38.23 years). This difference was looked for intentionally. Arce and Santisteban[41] postulated that age, IQ and socioeconomic level could be possible confounding variables in the impulsivity studies. The investigations made with the Cattell personality model proposed analyzing Factor F of the 16-PF[42] that "...the young are more impulsive than the older persons..."[43] That is why having a CG with slightly younger ages than the group of patients increases the discriminative power of the SIS to differentiate between pathological impulsiveness and usual impulsiveness characteristic of a young population. In regards to the comparison of age between the 2 groups of patients (IP and NIP), there are no statistically significant differences with p>0.05 (ANOVA Post-hoc test: MSD; p=0.574). In regards to gender, there were no significant differences in the total sample (p=0.448) or in the comparison between groups (Chi-square= 4.094; 2 gl; n=293; p=0.129). There were also no significant differences regarding work situation, civil status and educational level between groups, so that these variables do not behave as distorting factors of the results.

Statistical Analysis

The analysis of the data was performed with the SPSS program, version 15. Kolmogorov-Smirnov (K-S) Goodness of Fit and Chi-square of independence to verify normality and relationship between categoric variables were used. The significance of the differences between means of numeric variables was contrasted with the ANOVA Fixed Effects Factor. Analysis of the items was made using the homogeneity index corrected between the item and total score of the scale, using the Pearson coefficient for its statistical significance test. For the reliability test, the following were used: Cronbach's *alpha* coefficient, the method of the balanced two halves and the test-retest correlation. The construct validity of the final version was analyzed with the Principal Component Factor Analysis, stopping the factorization at the extraction of the 3 theoretically expected factors. The factorization conditions were previously verified with the Bartlett and Kaiser-Meyer-Olkin tests, together with the determinant of the correlation matrix. Factor rotation was performed with the Oblimin and Promax methods. Correlations for the convergent validity were performed with the Pearson coefficient, with its significance test. The standardization of the final scale was done by transforming the direct scores into typical standardized Z value (mean 0, SD 1) and into percentiles of the normal standard.

RESULTS

Since a previous debugging of the items of the initial bank had already been performed, a strict item-to-item

Table 2 Individual reliability of the items of the SIS

	R (item-test)	R2	Cronbach's Alpha
item1	0.613	0.534	0.875
item2	0.552	0.435	0.877
item3	0.556	0.422	0.877
item4	0.487	0.364	0.879
item5	0.498	0.341	0.879
item6	0.581	0.512	0.876
item7	0.569	0.449	0.876
item8	0.560	0.376	0.877
item9	0.481	0.423	0.879
item10	0.412	0.337	0.882
item11	0.510	0.454	0.878
item12	0.545	0.459	0.877
item13	0.493	0.391	0.879
item14	0.398	0.364	0.882
item15	0.537	0.402	0.878
item16	0.447	0.333	0.880
item17	0.474	0.335	0.880
item18	0.334	0.193	0.884
item19	0.519	0.372	0.879
item20	0.332	0.241	0.884

analysis of the final version was not necessary. To demonstrate that the items maintained their homogeneity in the validation sample, each one of them was correlated with the total corrected score (Table 2). All of the items maintained elevated reliability (≥ 0.875) and the R^2 determination coefficient shows us that all of them have an elevated percentage of variability shared with the total scale, so that they should form a part of the final version of the SIS.

Total scores of the SIS and Standardization

The total sample (n=293) obtained a mean of 19.85 (SD 9.35). The distribution of these results had a slight deviation from the normal model with p<0.05, however this was tolerable (p=0.033 in the K-S goodness of fit test). The IPs obtained a mean of 28.69 (SD 8.54). This distribution does fit the normal standard model with p>0.05 (p=0.445 on the K-S test) as does that of the CG with a mean of 15.79 (SD 6.79), (p=0.407 in the K-S test). A standardization of the SIS in typical Z scores was performed (mean 0 and SD 1) and another in percentiles, both for the CG as well as for the IP and NIP groups based on gender (Annex II).

Internal Consistency and Reliability

The reliability of the SIS according to Cronbach's *alpha* is 0.884 and it perfectly shows its high significativity with p<0.05 ($F_{19;5548}$ = 7,638; 20 items, n=293; p=0.000), the degree of homogeneity of the 20 items among themselves being very high. Using the *two-halves* procedure, the total scale was randomly divided into 2 equivalent parts of 10 items each. Their internal consistency is very good (0.844 and 0.788, respectively). The correlation between both halves is high and significant (r=0.644; p=0.000). The estimated reliability according to the *Spearman-Brown* coefficient correction is 0.783. In regards to the test-retest reliability, the correlation obtained was elevated and highly significant (r=0.776 with p=0.000). This demonstrates a very good degree of temporal stability at the end of one week. Based on the above, we consider that the reliability of the final version of the SIS has been sufficiently verified in all of its possible forms.

Construct validity

The Factorial Analysis was used with intention to demonstrate that the SIS fits to the 3-factor Reward, Automatism and Attentional theoretical model. The results that we show in the following thus indicate it. At the onset of the analysis, the conditions for their correct usage were verified. A value of 0.982 on the KMO test was obtained, this meaning a "marvelous" sample adequacy according to the Kaiser terminology. The determinant of the correlation matrix between the 20 items (0.001) together with Bartlett's sphericity test (Chi-square: 1913,5129; 190 gl; p=0.000) allows us to reject the hypothesis of identity matrix with p<0.05. It is concluded that the data have a very adequate structure for the factorization. The Principal Component method was used for the factor extraction, stopping the process at 3 factors. After this, it was verified that the 3 components had characteristic roots greater than 1.5. The total of the explained variance was 48.8% that could be considered satisfactory for this solution, given its proximity to 50%. The rotation was verified with the Oblimin and Promax methods (with Kaiser) due to the proven existence of correlations between the expected dimensions, the result

Table 3 Rotated Factor Matrix of the SIS

	Component		
Item	1	2	3
1	0.798		
6	0.788		
3	0.717		
2	0.709		
4	0.677		
7	0.645		
5	0.644		
11		0.767	
12		0.755	
9		0.746	
13		0.703	
10		0.653	
8		0.646	
14			0.744
19			0.687
15			0.680
16			0.607
20			0.605
17			0.590
18			0.555

Extraction method: Analysis of principal components
Rotation method: Promax with Kaiser Normalization
SIS: State Impulsivity Scale

Table 4 Means and significance of the differences between Groups based on each Subscale and based on the Total Score of the SIS

Mean (SD)	IP n=70	NIP n=73	CG n=150	Between groups (Anova)	Post-hoc (MSD)		
					IP *vs* NIP	IP *vs* CG	NIP *vs* CG
Reward	10.89 (4.37)	6.79 (4.47)	5.23 (3.12)	$F_{2;290}$=52.78 p=0.000	p=0.000	p=0.000	p=0.004
Automatism	8.01 (3.72)	5.07 (3.16)	4.35 (2.75)	$F_{2;290}$=33.70 p=0.000	p=0.000	p=0.000	p=0.108
Attentional	9.79 (3.77)	7.85 (3.77)	6.21 (2.90)	$F_{2;290}$=28.18 p=0.000	p=0.000	p=0.000	p=0.001
Total SIS S.	28.69 (8.54)	19.71 (8.87)	15.79 (6.80)	$F_{2;290}$=65.47 p=0.000	p=0.000	p=0.000	p=0.000

SIS: State Impulsivity Scale. IP: Impulsive Patients Group. NOP: Group of Patients with other non-impulsive psychiatric diagnoses. CG: Control Group.

obtained with the Promax procedure being more satisfactory. Therefore, only the latter is presented. Table 3 contains the saturations of the items in the 3 components (only the >0.50 for better explanatory clarity). The values of each item are ordered according to their contribution, from greater to lesser in each one of the factors extracted. The theoretical structure of this scale as well as the inclusion of the items written for each one of the defining components of items 1 to 7, Reward, items 8 to 13 Automatism and items 14 to 20 attentional have been strongly demonstrated. The first dimension, Reward, could be considered the principal factor given that it accounts for 32% of the total variability observed in the process. The other 2 factors account for 8.7% (Automatism) and 8.1% (Attentional) so that the SIS should not be considered, at all, as unifactorial. Finally, the correlations obtained between the 3 dimensions are statistically significant and this demonstrates the adequacy of the use of an oblique rotation method as that which has been used.

Construct validity and reliability of the dimensions

To demonstrate the internal unifactoriality of the 3 dimensions, an independent factorial analysis was performed for each one of them, setting the degree of consistency of their respective items using Cronbach's *alpha*. The Reward factor showed its unidimensional structure, its 7 items, explaining 51.4% of the total variability observed in this component. The internal consistency of these elements is elevated (α=0.840). The dimension, Automatism, also shows its unidimensionality since the 6 items in it account for 51.3% of the total variability, with high reliability (α=0.809). The component, Attentional, is revealed as unifactorial among the 7 items that make it up, the variability explained being 41.5% with a very good internal consistency (α=0.756).

Discriminant validity

To demonstrate the discrimination capacity of the SIS among the IP, NIP and CG groups, the significance of the differences observed between the means obtained by each one of the total scores of the SIS and their subscales was studied (Table 4). The single-factor ANOVA with post-hoc MSD was used (after verification of normal fit of the data and homocedasticity). The means obtained in all of the variables analyzed indicate to us that the IPs always score higher than the rest of the subjects, regardless of the group (with statistically significant differences $p<0.05$ and even with $p<0.01$). This manifests that the SIS is valid to discriminate between the IPs compared to the NIPs, regardless of whether there is another type of psychiatric disorder. Furthermore, the subjects from the CG obtained significantly lower means ($p<0.05$) than the NIPs. These results very satisfactorily show the discriminative validity of the SIS to detect patients whose principal diagnosis has been Impulse Control Disorder.

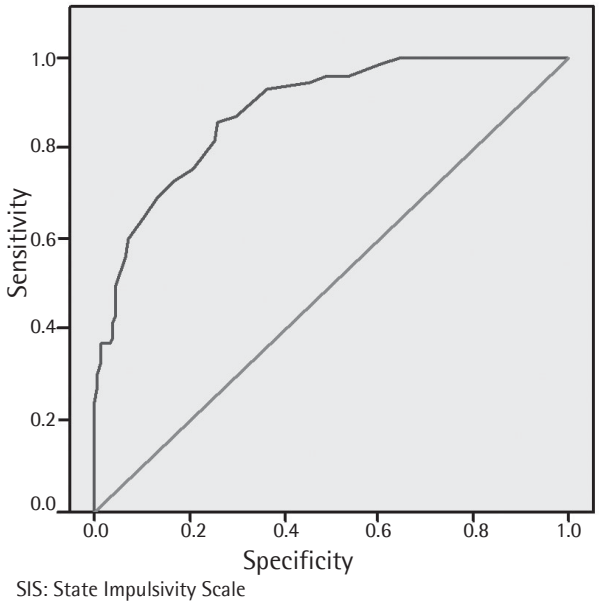
Convergent validity

The convergence analysis was then done, using the following as markers: BIS-11, SPSR and the SSS. The

correlation linearity between the variables was verified with the corresponding dispersion chart and the Pearson coefficient was used. Table 5 shows the correlations obtained. With the BIS-11 (n=293), highly significant coefficients of correlation were obtained ($p<0.05$ and even with $p<0.01$), expressing a moderate or elevated size of effect. The correlations found when validated to the SIS with the Sensitivity to Reward (con $p<0.05$ and $p<0.01$) were obtained with the SPSRQ (n=185). Regarding Sensitivity to Punishment, no significances were found ($p>0.05$) except for that of Total Score of the SIS, which is significant, although with mild intensivity (r=0.129). The SSS was applied to 39 subjects of the IP sample, so that the correlations have been calculated for this sample size. In spite of this, a good number of significant correlations were obtained with $p<0.05$ (between the total score of the SIS and the Excitement Seeking subscale (ExSS) r=0.291 and between the total scores of both tests r=0.550).

Diagnostic validity

The IP groups (n=70) and the CG (n= 150) have been taken into account, tracing the ROC curve of the total scores of the SIS (Fig. 1). The area under the curve is 0.882 (CI 95%, 0.837 - 0.927), this being highly significant ($p<0.01$). This demonstrates the good diagnostic capacity of the SIS. The optimum cutoff according to the curve coordinates was established at score 19 (negative being the subjects with scores less than or equal to 19). The percentage of false positives among the subjects analyzed would be 26% and the rate of false negatives only 14.3%. The sensitivity of the SIS would reach 0.857 and specificity up to 0.740. Correlation between the test diagnosis and belonging to one group or another is highly significant (Chi-square: 68.76; 1 gl; n=220; p=0.000), the study of the residues of the Chi-square test actually indicating that the control subjects have scores up to 19 (negatives in the SIS) while the IPs have scores above that cutoff (positives in the SIS).



SIS: State Impulsivity Scale

Figure 1 ROC curve of the SIS: Total score

CONCLUSIONS

The SIS is presented as the new easy to apply instrument, validated in the Spanish population, with adequate psychometric characteristics, which is useful for the evaluation of impulsive behavior conceptualized as a state. The distinction between trait and state comes from the area of psychology of the intra-individual differences that assimilates the "traits" to dispositional concepts and the "state" to clear concepts.[44] As background of the trait/state evaluation, we have the works of Spielberg[45] on anxiety that motivated the development of the known State-Trait Anxiety Inventory (STAI). [46] In this way, the SIS, as the STAI-State, were designed to evaluate impulsivity as a manifest behavior that may vary in the short term. In this sense, the SIS has the following advantages: 1) it contributes to improvement of the evaluation of impulsive subjects, since there are currently very few "state" instruments (usually computerized tests). 2) It has greater capacity to measure change versus the "trait instruments: a subject with an impulsive trait is not continuously impulsive, but rate the expression of this trait may fluctuate. In turn, a subject without impulsive traits may have this type of behavior. 3) it integrates in an original way, within the same instrument, three experiential models (Reward, Automatism, Attentional), making it possible to decrease the amount of tests necessary to evaluate a subject using each model separately.

In regards to the psychometric properties, the SIS has elevated reliability (*alpha*=0.884) that is adequately maintained when each dimension is analyzed separately. This indicates that the items of each factor are very interrelated. In the construct validation, the factorial analysis confirms that within the SIS, each initially written item is distributed in accordance with the foreseen theoretical model. The subscale, Reward, examines the urgency to satisfy an impulse, preference for immediate rewards, intolerance to frustration and acting in spite of the possible negative consequences. The subscale, Automatism, records the behaviors that are expressed

Table 5 Coefficients of validity and their significance among the SIS, BIS-110, SPSR Scale and SSS Scale. The significant correlations have been indicated in bold

	SIS Reward	SIS Automatism	SIS Attentional	Total SIS
Barratt Cognitive	0.493 (p=0.000)	0.391 (p=0.000)	0.456 (p=0.000)	0.554 (p=0.000)
Barratt Motor	0.523 (p=0.000)	0.470 (p=0.000)	0.567 (p=0.000)	0.640 (p=0.000)
Barratt Planning	0.457 (p=0.000)	0.387 (p=0.000)	0.389 (p=0.000)	0.510 (p=0.000)
Barratt Total	0.612 (p=0.000)	0.525 (p=0.000)	0.593 (p=0.000)	0.712 (p=0.000)
Sensitivity to Reward	0.452 (p=0.000)	0.416 (p=0.000)	0.358 (p=0.005)	0.507 (p=0.000)
Sensitivity to Punishment	0.117 (p=0.072)	0.116 (p=0.072)	0.080 (p=0.141)	0.129 (p=0.040)
SSS: ESS	0.168 (p=0.153)	0.125 (p=0.223)	0.114 (p=0.445)	0.177 (p=0.140)
SSS: ExSS	0.105 (p=0.262)	0.236 (p=0.074)	0.364 (p=0.014)	0.291 (p=0.036)
SSS: DSS	0.469 (p=0.001)	0.549 (p=0.000)	0.368 (p=0.010)	0.593 (p=0.000)
SSS: BSS	0.333 (p=0.019)	0.521 (p=0.000)	0.321 (p=0.023)	0.497 (p=0.000)
SSS: Total	0.382 (p=0.008)	0.506 (p=0.000)	0.407 (p=0.005)	0.550 (p=0.000)

SIS: State Impulsivity Scale. SPSRQ: Sensitivity to Punishment and Sensitivity to Reward Questionnaire. SSS: Sensation Seeking Scale, ESS: Emotion Seeking Subscales, ExSS: Excitement Seeking subscale, DSS: Deinhibition subscale, BSS: Boredom Susceptibility subscale.

rigidly and repeatedly without considering the feedback of the context. The subscale, Attentional, collects the behaviors that are expressed without planning, a product of acting prematurely and without evaluating all the pertinent information. In regards to the convergent validity, the SIS obtains highly significant correlations with scales that are frequently used for the evaluation of impulsivity (Table 5). The emphasis on behavior of the SIS is highlighted by a greater intensity of correlation with the motor subscale of the BIS-11 that collects a large number of sudden reactions related with the impulsive behavior. Sensitivity to Reward of the SPSR is elevated in impulsive subjects. Correlations of this scale with the SIS are significant, especially the Total-SIS and foreseeably, in the Reward dimension. The significant correlation (mild) between the scores on the Total-SIS and the Sensitivity to Punishment scale may be because both instruments record some individual susceptibility for anxiety and the appearance of negative emotional states. The SSS scale was administered to a small group of IP and it stands out that its total scores significantly correlate with the Total-SIS, except for the ESS subscale (Emotion Seeking). This could also be explained because the ESS fundamentally records behaviors related with risk sports whose appearance largely depends on contextual and socioeconomical factors. The analysis of discriminative validity shows that the scores on the SIS significantly differentiate when compared with a CG and even when compared with the group having other NIP psychiatric conditions that theoretically could generate greater interference in the results. Furthermore, the SIS shows an excellent diagnostic capacity when differentiating between patients who have been diagnosed of at least one impulse control disorder from the control subjects.

Among the limitations of the SIS, we can mention, in the first place, that the construct that it evaluates, impulsivity, is a complex phenomenon that may be defined from very diverse theoretical frameworks.[47-49] In the second place, the SIS has its limitations characteristic of self-report scales. That is, it requires a minimum of introspective capacity by the patient and there is the risk of intentional distortion of information.[50-51] Finally, it is necessary to compare the scale and other clinical populations and to perform longitudinal studies that test the sensitivity to changes in expression of impulsivity over time. To do so, reliable indicators that really demonstrate that this variation has been produced are needed. Given the characteristics of the SIS, we consider that it has wide applicability, covering both clinical and research settings and that it is an appropriate instrument to evaluate the efficacy of pharmacological treatments aimed at decreasing the levels of impulsiveness.

The authors of this work declare that they have no conflict of interests.

Annex 1 **State Impulsivity Scale (SIS)**

	BEFORE YOU BEGIN, READ THE FOLLOWING INSTRUCTIONS In the following, there are sentences related with how you have behaved in different situations in the last month. Check the corresponding box with an X to indicate how often they have occurred in your case. Answer quickly and honestly.	Almost never	Sometimes	Quite often	Almost always/Always
1	I seek activities where I obtain rapid pleasure, even if they are harmful				
2	I generally fall into temptations that make it hard for me to fulfill a commitment				
3	I seek immediate benefits instead of waiting for something better later on				
4	I continue doing certain pleasurable activities even if the others warn me that they are harmful for me				
5	When I have a craving for something, I go for it immediately, without being able to wait				
6	I obtain more pleasure transgressing than controlling my actions				
7	It is hard for me to control my reactions even if I do not get what I want				
8	It is hard for me to stop doing something when I see that I am making a mistake				
9	I have automatic reactions that I cannot avoid				
10	If I do something and do not obtain the results I expects, it is hard for me to do something else				
11	I usually react in the same way, even if it is not the appropriate time or place				
12	I do not restrain my reactions no matter how much others tell me to stop				
13	I repeat the same way of acting many times even if it does not achieve what I am seeking				
14	I generally make mistakes because I react so quickly that I do not pay sufficient attention to important details				
15	When something unexpectedly occurs, I act without considering the consequences				
16	I draw erroneous conclusions because I do not wait for the appropriate time				
17	Sometimes I do not pay attention to the immediate consequences of my actions				
18	I respond before someone has finished asking me a question				
19	In some situations, I do not wait long enough and act prematurely				
20	I act without thinking that others may get angry because of what I do.				

Annex 2 **Scales by Gender of the total Score on the SIS**

	Direct Scores						
	Control Group		IP Group		NIP Group		
Percentile	M	W	M	W	M	W	Z of N(0;1)
99	34	36	44	45	41	39	2.33
95	29	29	43	44	37	38	1.64
90	25	25	39	43	33	31	1.28
85	23	23	38	42	31	28	1.04
80	22	22	37	39	28	27	0.84
75	21	19	36	37	26	26	0.67
70	20	18	34	35	25	25	0.52
65	19	17	31	34	23	24	0.39
60	18	17	28	33	22	24	0.25
55	17	15	27	30	20	22	0.13
50	17	14	26	28	19	21	0.00
45	16	13	25	28	18	18	-0.13
40	15	12	24	27	17	16	-0.25
35	14	12	22	26	14	15	-0.39
30	13	11	21	25	13	14	-0.52
25	12	11	21	24	11	12	-0.67
20	10	10	20	23	10	11	-0.84
15	8	9	19	20	9	10	-1.04
10	7	7	16	18	7	9	-1.28
5	5	5	14	18	5	8	-1.64
1	4	4	13	17	4	7	-2.33
Mean (D.T.)	16.4 (6.7)	15.4 (6.9)	27.5 (8.5)	29.2 (8.4)	19.5 (9.3)	19.9 (8.4)	

M: Man. W: Women. IP: Impulsive Patients. NIP: Non-impulsive patients

REFERENCES

1. Moeller FG, Barratt ES, Dougherty DM, Schmitz JM, Swann AC. Psychiatric aspects of impulsivity. Am J Psychiatry 2001;158(11):1783-93.
2. Evenden JL. Varieties of impulsivity. Psychopharmacology 1999;146(4):348-61.
3. Eysenck HJ. Crime and personality. Boston: Houghton Mifflin, 1964.
4. Cloninger RC. A systematic method for clinical description and classification of personality variants: a proposal. Arch Gen Psychiatry 1987;44:573-88.
5. Dickman SJ. Functional and dysfunctional impulsivity: personality and cognitive correlates. J Pers Soc Psychol 1990;58(1):95-102.
6. Rubio G, Jiménez M, Rodríguez-Jiménez R, Martínez I, Iribarren MM, Jiménez-Arriero MA, et al. Varieties of impulsivity in males with alcohol dependence: the role of Cluster-B personality disorder. Alcohol Clin Exp Res 2007;31(11):1826-32.
7. Benazzi F. Impulsivity in bipolar-II disorder: trait, state or both? Eur Psychiatry 2007;22(7):472-8.
8. Doménech-Bisén JR, García-Lacort MJ, Hernández-Vidal P. Impulsividad y Medicina. En: Ros-Montalbán S, Peris-Días MD, Gracia-Marco R. Impulsividad. Barcelona: Ars Medica, 2004; p. 175-94.
9. Rossi M, Merello M. Trastornos del control de los impulsos en la Enfermedad de Parkinson. Arch Neurol Neuroc Neuropsiquiatr 2008;15(1):6-16.
10. Oquendo MA, Baca-García E, Graver R, Morales M, Montalvan V, Mann JJ. Spanish adaptation of the Barratt Impulsiveness Scale (BIS-11). Eur J Psychiatry 2001;15(3):147-55.
11. Rubio G, Montero I, Jáuregui J, Martínez ML, Álvarez S, Marín JJ, et al. Validación de la escala de impulsividad de Plutchik en población española. Arch Neurobiol (Madr) 1998;61(3):223-32.
12. Sánchez-Turet M, Cuadras-Avellana C. Adaptación Española del Cuestionario EPI de Eysenck. Barcelona: Anuario de Psicología. Universidad de Barcelona, 1972.
13. Chico E, Tous JM, Lorenzo-Seva U, Vigil-Colet A. Spanish adaptation of Dickman's impulsivity inventory, its relationship to Eysenck's personality questionnaire. Personality and individual differences 2003;35:1883-92.
14. Pérez J, Torrubia R. Fiabilidad y validez de la versión española de la escala de búsqueda de sensaciones (forma V). Revista Latinoamericana de Psicología 1986;18(1):7-22.
15. Torrubia, R., Avila, C., Moltó, J., Caseras, X. The Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) as a measure of Gray´s anxiety and impulsivity dimensions. Personality an individual differences 2001;31:837-62.
16. Ramos-Brieva JA, Gutiérrez-Zotes A, Sáiz-Ruiz J. Escala de Control de los Impulsos "Ramón y Cajal" (ECIRyC). Desarrollo, validación y baremación. Actas Esp Psiquiatr 2002;30(3):160-74.
17. Lopez-Ibor Aliño JJ, Pérez-Urdániz A, Rubio-Larrosa V. IPDE. Examen Internacional de los Trastornos de la Personalidad. Madrid: Meditor; 1996.
18. Rodriguez-Jiménez R, Cubillo A, Jiménez-Arriero MA, Ponce G, Aragüés-Figuero M, Palomo T. Executive dysfunctions in adults with attention deficit hyperactivity disorder. Rev Neurol 2006;43(11):678-84.
19. Walderhaug E, Landrø NI, Magnusson A. A synergic effect between lowered serotonin and novel situations on impulsivity measured by CPT. J Clin Exp Neuropsychol 2008;30(2):204-11.
20. Dougherty DM, Marsh DM, Mathias CW. Immediate and delayed memory tasks: a computerized behavioral measure of memory, attention, and impulsivity. Behav Res Methods Instrum Comput 2002;34(3):391-8.
21. Rubio G, Jiménez M, Rodríguez-Jiménez R, Martínez I, Avila C, Ferre F, Jiménez-Arriero MA, Ponce G, Palomo T. The role of behavioral impulsivity in the development of alcohol dependence: a 4-year follow-up study. Alcohol Clin Exp Res 2008;32(9):1681-7.
22. Verbruggen F, Logan GD. Models of response inhibition in the stop-signal and stop-change paradigms. Neurosci Biobehav Rev 2009;33(5):647-61.
23. Bechara A, Damasio H, Damasio AR. Emotion, decision making and the orbitofrontal cortex. Cereb Cortex 2000;10(3):295-307.
24. Dougherty DM, Mathias CW, Marsh DM, Jagar AA. Laboratory behavioral measures of impulsivity. Behav Res Methods 2005;37(1):82-90.
25. Téllez-Vargas J. Impulsividad y Suicidio. In: Téllez-Vargas J, Forero-Vargas J, editores. Suicidio: neurobiología, factores de riesgo y prevención. Bogotá: Nuevo Milenio, 2006; p. 62-80.
26. Tirapu-Ustárroz J. La evaluación neuropsicológica. Intervención Psicosocial 2007;16(2)189-211.
27. Monterosso J, Ainslie G. Beyond discounting: possible experimental models of impulse control. Psychopharmacology 1999;146(4):339-47.
28. Logue AW, Tobin H, Chelonis JJ, Wang RY, Geary N, Schachter S. Cocaine decreases self-control in rats: a preliminary report. Psychopharmacology 1992;109(1-2):245-7.
29. Reynolds B, Schiffbauer R. Delay of gratification and delay discounting: a unifying feedback model of delay-related impulsive behavior. The Psychological Record 2005;55:439-60.
30. Mischel W, Shoda Y, Rodriguez MI. Delay of gratification in children. Science 1989;244(4907):933-8.
31. Markou A, Weiss F, Gold LH, Caine SB, Schulteis G, Koob GF. Animal models of drug craving. Psychopharmacology 1993;112:163-82.
32. Evenden JL. The pharmacology of impulsive behaviour in rats III: the effects of amphetamine, haloperidol, imipramine, chlordiazepoxide and ethanol on a paced fixed consecutive number schedule. Psychopharmacology 1998;138:295-304.
33. Gray JA. Perspectives on anxiety and impulsivity: A commentary. Journal of Research in Personality 1987;21:493-509.
34. Swann AC, Bjork JM, Moeller FG, Dougherty DM. Two models of impulsivity: relationship to personality traits and psychopathology. Biol Psychiatry 2002;51(12):988-94.
35. Evenden J. Impulsivity: a discussion of clinical and experimental findings. J Psychopharmacol 1999;13(2):180-92.
36. Dickman S. Functional and dysfunctional impulsivity: Personality and cognitive correlates. Journal of Personality and Social Psychology 1990;58(1):95-102.
37. Patton JH, Stanford MS, Barratt ES. Factor structure of the Barratt Impulsiveness Scale. Journal of Clinical Psychology 1995;51(6):768-74.
38. Barratt ES. Impulsiveness and aggression. Violence and mental disorder. Development in risk assessment. En: Monahan J, Steadman HJ, editors. Chicago: The University of Chicago Press, 1995; p. 61-79.
39. Avila C, Parcet MA. Individual differences in reward sensitivity and attentional focus. Personality and Individual Differences 2002;33(6):979-96.
40. Estallo-Martí JA, Pedrido-Peteiro I. Evaluación de la impulsividad. En: Ros-Montalbán S, Peris-Días MD, Gracia-Marco R. Impulsividad. Barcelona: Ars Medica, 2004; p. 241.
41. Arce E, Santisteban C. Impulsivity: a review. Psicothema 2006;18(2):213-20.

42. Karson M, Karson S, O´Dell JW. 16PF-5. Una guía para su interpretación en la práctica clínica. Madrid: TEA, 1998.
43. Zabalegui L. La medida de la personalidad por cuestionarios. Madrid: UPCN, 1990.
44. Arce E, Santisteban C. Impulsivity: a review. Psicothema 2006;18(2):213-20.
45. Sánchez-Cano, J, Sánchez-Cánovas J, Sánchez-López MP. Psicología Diferencial. Diversidad e Individualidad Humanas. Madrid: Editorial Universitaria Ramón Areces, 1994; p.99-100.
46. Spielberg CD. Theory and research on anxiety. In Spielberg, Ed. Anxiety and Behavior. NY: Academic Press, 1966: p. 3-20.
47. Spielberg CD, Gorsuch RL, Lushene RE. Cuestionario de Ansiedad Estado/Rasgo (STAI). Madrid: TEA, 2002.
48. Pinal-Fernández B, Pérez-Bravo A. Impulsivity: historical and conceptual review. Actas Esp Psiquiatr 2003;31(4):220-30.
49. Chamberlain SR, Sahakian BJ. The neuropsychiatry of impulsivity. Curr Opin Psychiatry 2007;20(3):255-61.
50. Carrasco-Perera JL. La relación entre los trastornos del control de los impulsos, la personalidad y los trastornos de la personalidad. Aula Médica Psiquiatría 2002;6(5):323-40.
51. De las Cuevas-Catresana C, González de Rivera-Revuelta JL. Autoinformes y Respuestas Sesgadas. Anales de Psiquiatría 1992;8(9):362-6.