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Validación de la adaptación española de la Apathy Evaluation Scale-self-rated (AES-S) en pacientes con esquizofrenia

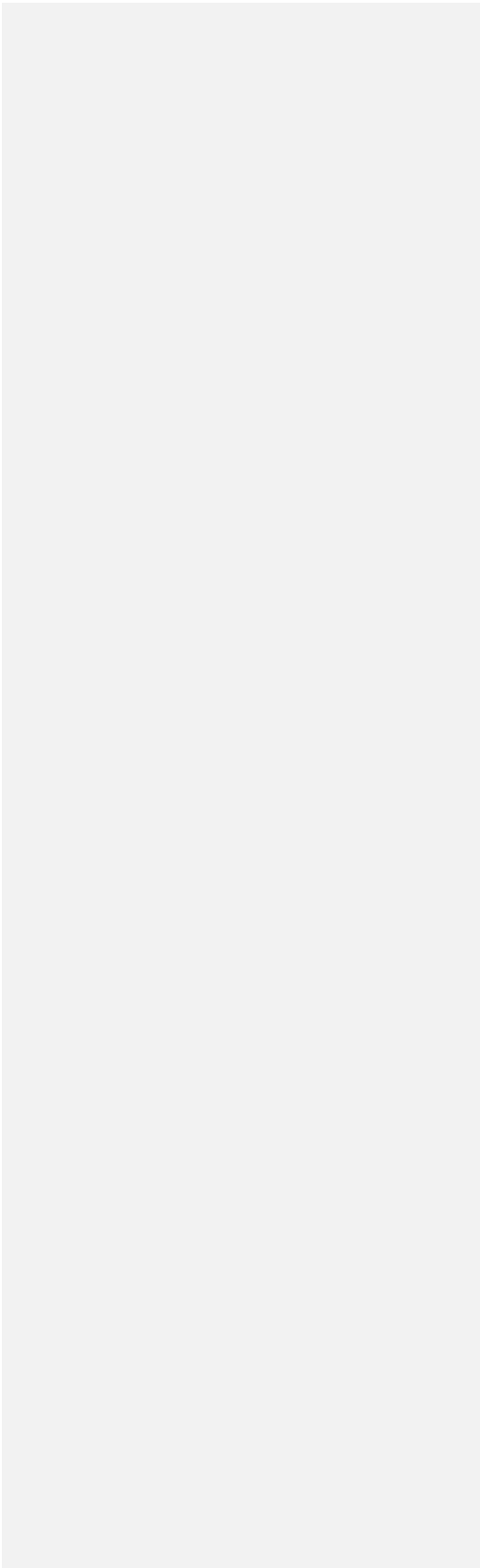
Validation of a European Spanish adaptation of the Apathy Evaluation Scale-self-rated version (AES-S) in patients with schizophrenia

--Borrador del manuscrito--

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Resumen:	<p>Introduction: Apathy is a negative symptom of schizophrenia and is associated with poor real world functioning. Therefore, it is important to have validated psychometric instruments to assess this symptom. This is the first study to validate the Spanish adaptation of the self-rated version of the Apathy Assessment Scale (AES-S) in patients with schizophrenia.</p> <p>Material and methods: Naturalistic, cross-sectional, validation study in 104 patients with schizophrenia evaluated using the following scales: Clinical Global Impression-Severity (CGI-S), Personal and Social Performance (PSP), Clinical Assessment Interview for Negative Symptoms (CAINS), Self-report of Negative Symptoms (SNS), Motivation and Pleasure Scale—Self-Report (MAP-SR), Calgary Depression Scale for Schizophrenia (CDSS), and Apathy Evaluation Scale-self-rated version (AES-S).</p> <p>Results: Reliability: Internal consistency (Cronbach's α) was 0.908. Convergent validity: The Pearson correlation coefficient between AES-S and CAINS-MAP total scores was -0.483 ($p < 0.001$). For SNS, total and avolition subscale scores were -0.803 and -0.639 ($p < 0.001$), respectively. With the MAP-SR, the correlation coefficient was -0.727 ($p < 0.001$). Divergent validity: The Pearson correlation coefficient between AES-S and PSP total scores was 0.504 ($p < 0.001$). Furthermore, with the CDSS, the correlation coefficient was -0.431 ($p < 0.001$).</p> <p>Discriminant validity: The AES-S discriminated between different levels of illness severity according to CGI-S scores. Factor analysis: A three-component solution explained 57.32% of the variance. Pearson correlations between coefficients were 1-2=0.265, 1-3=0.464, and 2-3=0.060.</p> <p>Conclusion: The Spanish AES-S is a reliable and valid instrument for assessing apathy</p>

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**Validation of a European Spanish adaptation of the Apathy Evaluation
Scale-self-rated version(AES-S) in patients with schizophrenia**



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7 **Abstract**
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9 *Introduction:* Apathy is a negative symptom of schizophrenia and is associated with
10 poor real world functioning. Therefore, it is important to have validated psychometric
11 instruments to assess this symptom. This is the first study to validate the Spanish
12 adaptation of the self-rated version of the Apathy Assessment Scale (AES-S) in
13 patients with schizophrenia.
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15 *Material and methods:* Naturalistic, cross-sectional, validation study in 104 patients with
16 schizophrenia evaluated using the following scales: Clinical Global Impression-
17 Severity (CGI-S), Personal and Social Performance (PSP), Clinical Assessment
18 Interview for Negative Symptoms (CAINS), Self-report of Negative Symptoms (SNS),
19 Motivation and Pleasure Scale—Self-Report (MAP-SR), Calgary Depression Scale for
20 Schizophrenia (CDSS), and Apathy Evaluation Scale-self-rated version (AES-S).
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22 *Results:* Reliability: Internal consistency (Cronbach's *alpha*) was 0.908. Convergent
23 validity: The Pearson correlation coefficient between AES-S and CAINS-MAP total
24 scores was -0.483 ($p < 0.001$). For SNS, total and avolition subscale scores were -
25 0.803 and -0.639 ($p < 0.001$), respectively. With the MAP-SR, the correlation coefficient
26 was -0.727 ($p < 0.001$). Divergent validity: The Pearson correlation coefficient between
27 AES-S and PSP total scores was 0.504 ($p < 0.001$). Furthermore, with the CDSS, the
28 correlation coefficient was -0.431 ($p < 0.001$). Discriminant validity: The AES-S
29 discriminated between different levels of illness severity according to CGI-S scores.
30 Factor analysis: A three-component solution explained 57.32% of the variance.
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32 Pearson correlations between coefficients were 1-2=0.265, 1-3=0.464, and 2-3=0.060.
33 *Conclusion:* The Spanish AES-S is a reliable and valid instrument for assessing apathy
34 in Spanish patients with schizophrenia. It seems to be appropriate for use in everyday
35 clinical practice as a means of monitoring apathy in these patients.
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43 **Keywords**
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45 AES-S, apathy, psychometric properties, schizophrenia
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7 **Introduction**
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11 Schizophrenia is a severe, complex, multidimensional disorder characterised by
12 negative, positive, affective, and cognitive symptoms. Negative symptoms are
13 heterogeneous. The Diagnostic and Statistical Manual of Mental Disorders, Fifth
14 Edition (DSM-5)¹ groups it into five subdomains: apathy/avolition, anhedonia, asociality,
15 alogia, and affective flattening. However, there is a consensus that it can be grouped
16 into two domains: avolition/apathy and diminished emotional expression²⁻³.

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18 These symptoms affect around 60% of patients with schizophrenia⁴. This seems to
19 be associated with different biomarkers (IL-2, IL1 β , and LPO)^{5,6}, but no treatments
20 have yet emerged as reliably and robustly effective⁷. Furthermore, these negative
21 symptoms (including apathy) are not specific to schizophrenia and can be confused
22 with an antipsychotic adverse event; thus, they may be difficult to evaluate. In
23 particular, apathy has been described as one of the most determining symptoms of the
24 residual and chronic stages of schizophrenia⁸⁻⁹. However, as previously mentioned,
25 this symptom is not specific to schizophrenia; apathy can occur independently¹⁰ or in
26 combination with symptoms of depression or dementia¹¹. Due to the similarity of
27 symptoms, it can be very complex to differentiate apathy as a symptom of
28 schizophrenia from a symptom of depression. Although both apathy and anhedonia
29 indicate lack/decrease of interest, the latter presents a state of decreased experienced
30 pleasure in activities whilst apathy is characterized by a lack of primary motivation and
31 affective dullness¹².

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33 Depending on the repercussions on patients' lives, apathy was strongly associated with
34 higher levels of psychopathology and poorer functioning and quality of life in patients
35 10 years after the first psychotic episode¹³. Thus, it is very important to assess the level
36 of apathy to prevent repercussions on patients' lives. However, there are few validated
37 instruments that specifically assess apathy, the Apathy Evaluation Scale (AES)¹⁴ is one
38 of them. The AES was developed by Marin et al.¹⁴ to characterize apathy in adult
39 patients, regardless of their nature; the main symptom versus a symptom belonging to
40 a major syndrome such as dementia, stroke or major depression. The authors
41 simultaneously developed versions to be used by three different sources: patients
42 (AES-S), clinicians (AES-C) and informants or proxies (AES-I). The AES-S showed
43 good reliability (internal consistency 0.86; test-retest reliability 0.76) as well as a fairly
44 good convergent validity with the scores of the clinicians (AES-C, $r = 0.72$) but not of
45 the informants (AES- I, $r = 0.43$)¹⁴. The scarce literature on the AES-S factorial
46 structure is controversial. On the one hand, Marin et al.¹⁴ found a common structure for
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7 the three versions consisting of 3 factors; a general apathy factor that explained 32-
8 53% of the variance (information is not provided for each of the versions separately),
9 curiosity or novelty seeking accounting for 5-10%, and, the third factor, structuring daily
10 activities, that accounted for 7-8% of the variance. On the other, Clarke et al.¹⁵ in
11 patients with dementia identified two factors for the AES-S version, apathy accounting
12 for 36.4% of the variance, and "other" that explained a further 6.9%. The factorial
13 structure of the AES-C was also analyzed in patients with Parkinson disease¹⁶,
14 Alzheimer disease¹⁷, and with a first episode of psychosis (FEP)¹⁸⁻¹⁹. However, to the
15 best of our knowledge, no study has validated this scale in either the Spanish
16 population or patients with established schizophrenia.

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18 Therefore, the aim of this study was to validate the self-reported version of the AES
19 (AES-S) in European Spanish and assess its psychometrics properties (including floor
20 and ceiling effects, reliability, and construct and discriminant validity) in patients with
21 schizophrenia. We decided to validate the self-report version, since self-assessment is
22 a time-efficient method that provides the patient's point of view on the experience of
23 their negative symptoms, and facilitates shared decision-making in daily clinical
24 practice.

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31 Materials and methods

32 Study Design

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36 This is a secondary analysis of a cross-sectional, naturalistic study carried out in three
37 outpatient centers in Spain with the aim of validating two self-assessment instruments
38 for the negative symptoms of schizophrenia (the Self-Evaluation of Negative Symptoms
39 –SNS- and the Motivation and Pleasure Self-Report –MAP-SR-). It was approved by
40 the Clinical Research Ethics Committee of one of the centres, Hospital Universitario
41 Central de Asturias, Oviedo, Spain (ref. no. 140/150) and was conducted in
42 accordance with the ethical principles of the Declaration of Helsinki and Good Clinical
43 Practice guidelines. All subjects gave their written informed consent prior to enrolment.
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47 Subjects

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50 A total of 104 patients who had completed the AES-S in the SNS and MAP-SR
51 validation study were included in this secondary analysis. Inclusion criteria were (1)
52 schizophrenia diagnosis according to ICD-10²⁰ criteria; (2) patients with stable
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7 schizophrenia (stability was defined as those patients who were clinically stable and
8 had not required any change in their current pharmacological treatment during the past
9 3 months) (3) older than 17 years of age; (4) receiving outpatient treatment at one of
10 the three centres; and (5) written informed consent to participate in the study. Exclusion
11 criteria were designed to be minimal, and only those with intellectual developmental
12 disorder or acquired brain injury or who refused to participate in the study were
13 excluded.
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16 17 **Psychometric measures**

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19 Participants were assessed by trained psychologists. The assessment included an ad
20 hoc questionnaire for collecting demographic and clinical information. The Spanish
21 versions of the following instruments were also used. We used the Clinical Global
22 Impression-Schizophrenia scale (CGI-SCH)²¹ to assess severity of illness. The level of
23 functioning was assessed using the Personal and Social Performance scale (PSP)²².
24 Negative symptoms were assessed using the Clinical Assessment Interview for
25 Negative Symptoms (CAINS)²³, the Self-report of Negative Symptoms (SNS)²⁴, and
26 the Motivation and Pleasure Scale—Self-Report (MAP-SR)²⁵. In addition, depressive
27 symptoms were assessed with the Calgary Depression Scale for Schizophrenia
28 (CDSS)²⁶. Information was collected from the patients themselves and, when possible,
29 from the main caregiver.
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33 Finally, we employed the Spanish adaptation of the *Apathy Evaluation Scale—self-*
34 *rated version (AES-S)*¹⁴. The AES-S is a self-reported 18-item scale that assesses
35 apathy in the past 4 weeks. Each item is rated on a 4-point Likert-type scale from 1 (not
36 at all true) to 4 (very true). Additionally, there are three inverse items (6,10, and 11) that
37 have to be recoded. The total AES-S score range is 18-72 with lower scores indicating
38 greater apathy.
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41 In the review of Weiser and Garibaldi²⁷ the AES has been validated in individuals
42 with Alzheimer's disease, Parkinson's disease, other types of dementia, stroke and
43 subarachnoid haemorrhage, first episode of psychosis (FEP), major depressive
44 disorder, and the general population.
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47 Two Spanish clinical psychologists who are fluent in the English language (LGA,
48 TBB) first translated the original instrument into Spanish. Then, a Spanish psychiatrist
49 (EFE) fluent in English back-translated the Spanish version, and finally the original
50 authors approved it.
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53 **Statistical analysis**

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8 The statistical analysis was done using SPSS 17.0. The two-tailed level of significance
9 used was 0.05.

10 Skewness and kurtosis were calculated to measure the shape of the distributions
11 (values of skewness and kurtosis ± 1 were considered good). The coefficient of
12 variation (standard deviation / mean) and ceiling and floor effects were also determined
13 (number of patients with scores greater than 95% and less than 5%, respectively).
14 The internal consistency of the AES-S was calculated using the Cronbach's alpha
15 coefficient at the item level.

16 To calculate divergent validity, we used the Pearson correlation coefficient between the
17 total AES-S score and total scores on the PSP and CDSS using the hypothesis that a
18 moderate coefficient would be found, as they are related but different constructs.

19 Convergent validity was calculated using the Pearson correlation coefficient between
20 the total AES-S score and total scores on the CAINS, SNS, and MAP-SR and the SNS
21 avolition subscale score using the hypothesis that higher coefficients would be found
22 with self-rated measures (SNS and MAP-SR).

23 For analysing the discriminant validity, patients were classified into three groups based
24 on their CGI-S negative subscale scores: mildly ill (CGI-S = 2-3), moderately (CGI-S =
25 4), and severely ill (CGI-S = 5-7). An ANOVA test (Duncan post hoc) was used to
26 identify statistically significant differences in the AES-S scores according to severity
27 groups. An exploratory factor analysis (EFA) using the principal component analysis
28 (PCA) method with oblimin rotation was used to explore the structure of the 18 AES-S
29 items.
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39 Results

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42 A total of 104 patients with schizophrenia were included. The mean age was 40.11
43 (sd=14.08), 63.4% were men, and the mean number of years of disease progression
44 was 12.02 years (sd=12.23). Most of the subjects were on antipsychotic monotherapy
45 (54.7%), the 25.6% received antidepressants, and 50.6% had prescribed at least one
46 benzodiazepine. Table 1 shows patient demographic and clinical characteristics.
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49 Psychometric properties of the AES-S

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52 Distribution characteristics of AES-S scores
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7 The distribution characteristics of the total AES-S score are shown in Table 2. Total
8 AES-S scores exhibited symmetrical and mesokurtic distributions. The AES-S did not
9 show ceiling or floor effects.
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11 Reliability

12 The AES-S scale had good internal consistency for patients with
13 schizophrenia (Cronbach's α of 0.908), and with the exception of items 6 and 11, all
14 the Corrected Item-Total Correlation Values were >0.3 (they ranged between 0.411 for
15 item 10 and 0.775 for item 18) (Table 2).
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19 Convergent validity

20 The Pearson correlation coefficient between the AES-S total score and the total score
21 of the CAINS-MAP was -0.483 ($p < 0.001$). The correlation coefficients were greater
22 with the self-reported measures. Thus, Pearson correlation coefficients were -0.803 ($p <$
23 0.001) and -0.639 ($p < 0.001$) with the SNS total and avolition subscale scores and $-$
24 0.727 ($p < 0.001$) with the MAP-SR. When controlling for scores on the CDSS, all the
25 coefficients slightly decreased, ranging from -0.414 (with the CAINS-MAP) to -0.748
26 (with the total SNS).
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31 Divergent validity

32 The Pearson correlation coefficient between the AES-S total score and the total score
33 of the PSP was 0.504 ($p < 0.001$). Again, when controlling for scores on the CDSS, the
34 correlation coefficient decreased to 0.426 ($p < 0.001$). The correlation between AES-S
35 and CDSS was -0.431 ($p < 0.001$).
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39 Discriminant validity

40 The AES-S was able to discriminate among the different levels of illness severity
41 according to CGI-S negative symptom scale scores. AES-S scores decrease as the
42 severity of negative symptoms increases: mildly ill: 55.62 ($sd=8.21$), moderate ill: 43.38
43 ($sd=6.46$), and severely ill: 38.25 ($sd=6.01$) ($F=42.644$, $p < 0.001$). The Duncan post hoc
44 analysis demonstrated that each group was significantly different from the other two
45 groups.
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49 Exploratory factor analysis and principal component analysis

50 The 18 items of the AES-S were subjected to principal components analysis (PCA).
51 The Kaiser-Meyer-Olkin value was 0.87 , exceeding the recommended value of 0.60 ,
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7 and Bartlett's Test of Sphericity ($\text{Chi}^2 = 9333.07, p < 0.001$) reached statistical
8 significance, supporting the factorability of the correlation matrix.

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10 Principal component analysis revealed the presence of four components with
11 eigenvalues exceeding 1, explaining 42.41%, 8.49%, 6.42%, and 6.27% of the
12 variance, respectively. An inspection of the scree plot revealed a clear break after the
13 third component; therefore, it was decided to retain three components for further
14 investigation.

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16 The three-component solution explained a total of 57.32% of the variance, with
17 component 1 contributing 42.41%, component 2 contributing 8.49%, and component 3
18 contributing 6.42% (Table 3). To aid in the interpretation of these three components, an
19 oblimin rotation was performed. The interpretation of the three components was
20 consistent with previous research, with motivation-, purpose-, and emotion-related
21 items loading strongly on component 1, indifference items loading strongly on
22 component 2, and social and personal experience items loading strongly on component
23 3. There was a weak correlation among the three factors (they ranged between 0.060
24 and 0.464). Therefore, the results of this analysis support an underlying three-factor
25 structure.
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31 Discussion

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34 This is the first study to investigate an apathy self-report scale in Spanish patients
35 with stable schizophrenia. The aim was to adapt and validate the AES-S instrument into
36 European Spanish and assess its psychometrics properties in Spanish patients with
37 stable schizophrenia. Our results confirm that the Spanish version of the AES-S has
38 appropriate psychometric properties and may therefore be used by Spanish clinicians
39 when evaluating patients with schizophrenia in order to obtain the patients' perspective
40 on their level of apathy.
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43 The internal consistency of the overall scale was adequate and similar to previous
44 studies¹⁹, although items 6 and 11 could be removed since they showed corrected
45 item-total correlation values < 0.3 . With respect to convergent validity, we found a highly
46 significant correlation between AES-S and the other self-reported scales used in this
47 study, SNS and MAP-SR, indicating strong convergent validity. However, a moderate
48 correlation was found with the CAINS-MAP, which is a clinician-administered scale.
49 The awareness of apathy may vary more among lay people in general, including
50 patients, than among research clinicians who are trained to provide high inter-rater
51 agreement¹⁹. However, apathy is an internal experience and therefore more accessible
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7 and suitable for self-reporting than observation-based expressive deficits²⁸. Thus, we
8 think that obtaining information from patients themselves is of great value and should
9 be considered complementary to the clinician's point of view.

10 Concerning divergent validity, moderate correlation coefficients were obtained with
11 total PSP and CDSS scores, demonstrating that these instruments measure related but
12 not identical constructs. The moderate correlation found among scores for apathy and
13 functioning and depression is in keeping with the results of Faerden et al.¹⁹. This may
14 be related to the negative influence of apathy on real world functioning, as the negative
15 symptom is more highly associated with poor functional outcome²⁹.

16 As hypothesised, AES scores discriminate between different levels of negative
17 symptom severity according to CGI-S negative symptom scores. Our results show that
18 the AES-S total score decreases by more than five points for each level increase in the
19 CGI-S.
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21 **We obtained a three-component solution as in the original validation study¹⁴.**

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22 Following the definition of apathy proposed by other authors^{30,31}, the interpretation of
23 these factors is as follows: the first component, Motivation, Purpose, and Emotion, is
24 associated with a reduction in initiation and persistence in motivation and goal-directed
25 activities. The second factor, Indifference, can be associated with affective dullness,
26 which characterizes apathy. Finally, the two previous factors would result in increased
27 associability, which reflects our third factor, Personal and Social Experiences. Since
28 other studies have identified two or three factors with similar components to ours,
29 including interest, cognitive behaviour, social indifference, insight, and social
30 contacts¹⁴⁻¹⁸, in their validation study of the original AES, Marin et al.¹⁴ conclude that
31 this scale was predominantly a single-factor structure.
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33 One of the limitations of this study is the generalizability of our results, since all
34 patients were outpatients from the same region of Spain (Asturias), and there was a
35 lack of patients with extremely severe negative symptoms, such as institutionalised or
36 acutely hospitalized individuals. Another limitation is the cross-sectional design of the
37 study that does not allow us to obtain information about the ability of the AES-S to
38 detect changes in apathy over time. The main strength of this study consists of the
39 non-restrictive inclusion and exclusion criteria, so our patients are very similar to those
40 seen in routine outpatient clinical practice.
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42 In conclusion, the Spanish version of the AES-S is an instrument that is reliable
43 and valid for measuring apathy in patients with stable schizophrenia. As a self-reported
44 instrument, it seems to be appropriate for use in routine clinical practice as a means of
45 identifying apathy in this population. Furthermore, it is feasible to use since it is not
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7 time-consuming, and the information obtained should be considered complementary to
8 the clinician's point of view.
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10 11 **Funding source**

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14 This work has been financially supported by BICIBERSAM, the Government of the
15 Principality of Asturias PCTI-2018-2022 IDI/2018/235, and Fondos Feder.
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18 19 **Conflict of interest**

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22 The authors declare that there is no conflict of interest. The funding sources had no
23 participation in the development of this study.
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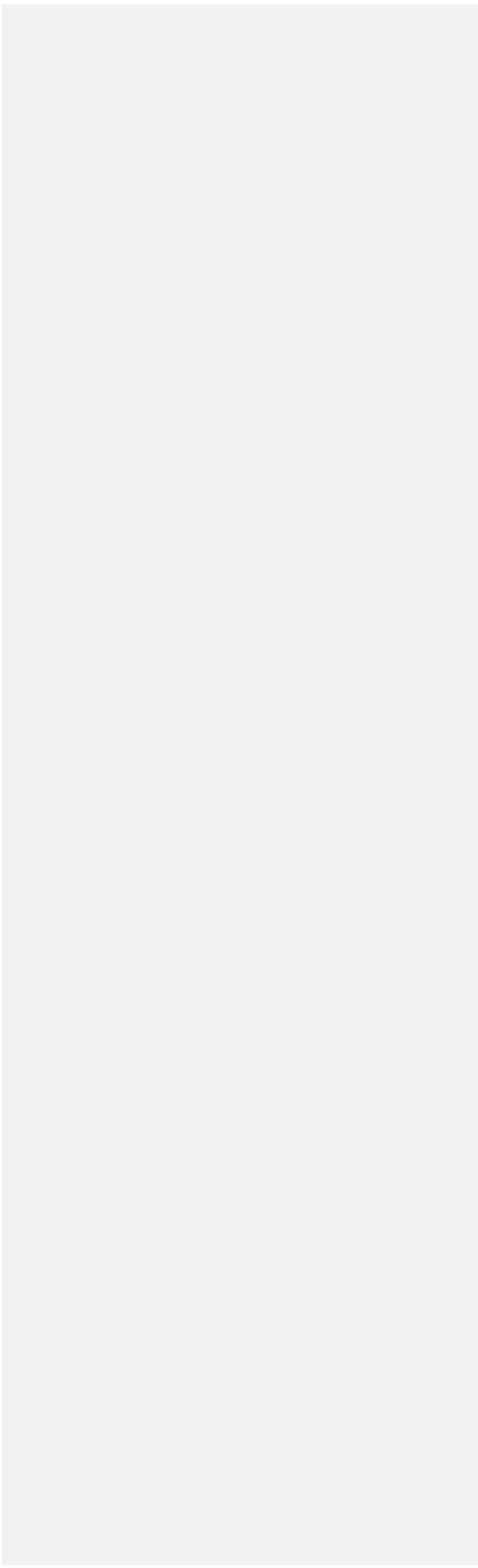


Table 1. Clinical and demographic characteristics of the patients included in the study.

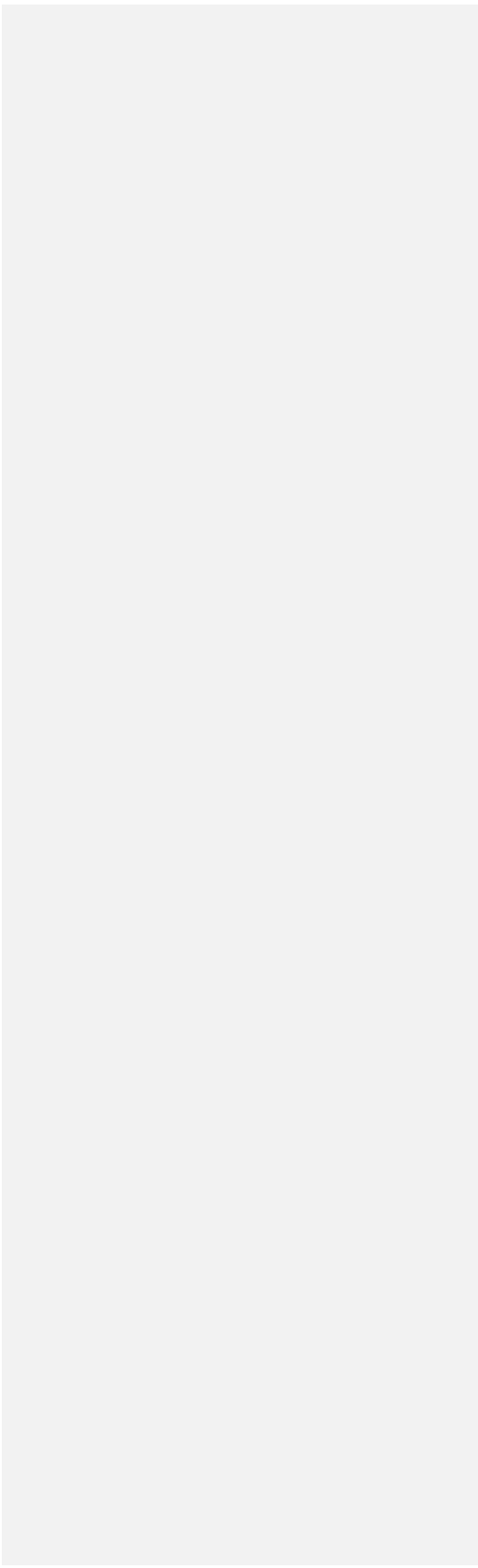
Mean age (sd)	40.14 (14.0)
Sex, men [n (%)]	64 (63.4)
Civil status [n (%)]	
Never married	67 (71.3)
Married/domestic partner	19 (20.2)
Divorced	8 (8.5)
Educative level [n (%)]	
Primary	26 (27.7)
Secondary	58 (61.7)
University	10 (10.6)
Employment situation [n (%)]	
Working	10 (9.6)
Permanent disability, mental disorder	31 (29.8)
Not working ^a	44 (42.3)
Student	14 (13.5)
Homemaker	5 (4.8)
Length of illness (years) [mean(sd)]	12.02 (12.2)
Antipsychot treatment [n (%)]	
No	3 (3.5)
1	47 (54.7)
2	32 (37.2)
3	4 (4.7)
Mood-stabilizing treatment [n (%)]	
No	75 (96.2)
Yes	3 (3.9)
Antidepressant treatment [n (%)]	
No	64 (74.4)
Yes	22 (25.6)
Benzodiazepine treatment [n (%)]	
No	43 (49.4)
Yes	44 (50.6)
CGI-S [mean(sd)]	
Positive symptoms	2.99 (1.5)
Negative symptoms	3.92 (1.0)
Depressive symptoms	2.05 (1.1)
Cognitive symptoms	3.26 (1.3)
Total	4.26 (0.8)
CAINS MAP [mean(sd)]	21.93 (8.9)
CDSS [mean(sd)]	3.03 (3.5)
SNS [mean(sd)]	
Social	2.81(2.2)
Emotional	2.99(2.2)
Alogia	3.81(2.6)
Avolition	3.81(2.3)
Anhedonia	2.65(2.3)
Total	16.07 (9.2)
MAP-SR [mean(sd)]	29.67 (11.1)
Total PSP [mean(sd)]	51.53(17.7)

sd: standard deviation; CGI-S: Clinical Global Impression Severity scale; CAINS: The Clinical Assessment Interview for Negative Symptoms; PSP: Personal and Social

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Performance; CDSS: Calgary Depression Scale for Schizophrenia; MAP-SR:
Motivation and Pleasure Scale-Self-Report; SNS: Self-report of Negative Symptoms.
^aNot working includes temporary incapacity, temporary incapacity for schizophrenia
and somatic diseases, retirement, and unemployment.



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Table 2. Descriptive analysis of the Apathy Evaluation Scale- Self report (AES-S).

	Mean	sd	Skewness	se	Kurtosis	Se	Normality test ¹	p	Floor effect		Ceiling effect		Cronbach's α
									n	%	n	%	
AES-S Total*	46.610	9.608	0.237	0.237	-0.229	0.469	0.098	0.015	0	0	0	0	0.908

*n=104 patients; sd: standard deviation; se: standard error; 1. Kolmogorov-Smirnov test.

Table 3. AES rotated three-component structure and component loadings.

AES items	Component loadings		
	Component 1 Motivation, Purpose and Emotion	Component 2 Indifference	Component 3 Social and Personal Experience
1. There are things that interest me	0.666	0.328	0.561
2. I do things during the day	0.725	0.313	0.498
3. Starting things is important to me	0.734	0.196	0.276
4. I am interested in having new experiences	0.446	0.327	0.774
5. I am interested in learning new things	0.680	0.238	0.643
6. I put little effort into anything	0.110	0.498	-0.259
7. I approach life with intensity	0.614	0.314	0.531
8. Seeing a job through to the end is important to me	0.765	0.323	0.199
9. I spend time doing things that interest me	0.712	0.216	0.418
10. Someone has to tell me what to do each day	0.311	0.721	0.292
11. I am less worried about my problems than I should be	0.133	0.756	0.010
12. I have friends	0.428	-0.045	0.747
13. Meeting friends is important to me	0.464	-0.007	0.769
14. When something good happens, I get excited	0.634	-0.043	0.350
15. I have an accurate understanding of my problems	0.688	0.042	0.467
16. Doing things during the day is important to me	0.824	0.162	0.314
17. I have initiative	0.736	0.397	0.579
18. I have motivation	0.801	0.414	0.441
Eigenvalues	7.635	1.529	1.156
Percentage of total variance	42.415	8.942	6.420

The numbers represent the load of each item in each of the three factors, and the items belonging to each factor are highlighted in bold.

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**Validation of a European Spanish adaptation of the Apathy Evaluation
Scale-self-rated version(AES-S) in patients with schizophrenia**

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Abstract

Introduction: Apathy is a negative symptom of schizophrenia and is associated with poor real world functioning. Therefore, it is important to have validated psychometric instruments to assess this symptom. This is the first study to validate the Spanish adaptation of the self-rated version of the Apathy Assessment Scale (AES-S) in patients with schizophrenia.

Material and methods: Naturalistic, cross-sectional, validation study in 104 patients with schizophrenia evaluated using the following scales: Clinical Global Impression-Severity (CGI-S), Personal and Social Performance (PSP), Clinical Assessment Interview for Negative Symptoms (CAINS), Self-report of Negative Symptoms (SNS), Motivation and Pleasure Scale—Self-Report (MAP-SR), Calgary Depression Scale for Schizophrenia (CDSS), and Apathy Evaluation Scale-self-rated version (AES-S).

Results: Reliability: Internal consistency (Cronbach's *alpha*) was 0.908. Convergent validity: The Pearson correlation coefficient between AES-S and CAINS-MAP total scores was -0.483 ($p < 0.001$). For SNS, total and avolition subscale scores were -0.803 and -0.639 ($p < 0.001$), respectively. With the MAP-SR, the correlation coefficient was -0.727 ($p < 0.001$). Divergent validity: The Pearson correlation coefficient between AES-S and PSP total scores was 0.504 ($p < 0.001$). Furthermore, with the CDSS, the correlation coefficient was -0.431 ($p < 0.001$). Discriminant validity: The AES-S discriminated between different levels of illness severity according to CGI-S scores.

Factor analysis: A three-component solution explained 57.32% of the variance. Pearson correlations between coefficients were 1-2=0.265, 1-3=0.464, and 2-3=0.060.

Conclusion: The Spanish AES-S is a reliable and valid instrument for assessing apathy in Spanish patients with schizophrenia. It seems to be appropriate for use in everyday clinical practice as a means of monitoring apathy in these patients.

Keywords

AES-S, apathy, psychometric properties, schizophrenia

Introduction

Schizophrenia is a severe, complex, multidimensional disorder characterised by negative, positive, affective, and cognitive symptoms. Negative symptoms are heterogeneous. The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)¹ groups it into five subdomains: apathy/avolition, anhedonia, asociality, alogia, and affective flattening. However, there is a consensus that it can be grouped into two domains: avolition/apathy and diminished emotional expression²⁻³.

These symptoms affect around 60% of patients with schizophrenia⁴. This seems to be associated with different biomarkers (IL-2, IL1 β , and LPO)^{5,6}, but no treatments have yet emerged as reliably and robustly effective⁷. Furthermore, these negative symptoms (including apathy) are not specific to schizophrenia and can be confused with an antipsychotic adverse event; thus, they may be difficult to evaluate. In particular, apathy has been described as one of the most determining symptoms of the residual and chronic stages of schizophrenia⁸⁻⁹. However, as previously mentioned, this symptom is not specific to schizophrenia; apathy can occur independently¹⁰ or in combination with symptoms of depression or dementia¹¹. Due to the similarity of symptoms, it can be very complex to differentiate apathy as a symptom of schizophrenia from a symptom of depression. Although both apathy and anhedonia indicate lack/decrease of interest, the latter presents a state of decreased experienced pleasure in activities whilst apathy is characterized by a lack of primary motivation and affective dullness¹².

Depending on the repercussions on patients' lives, apathy was strongly associated with higher levels of psychopathology and poorer functioning and quality of life in patients 10 years after the first psychotic episode¹³. Thus, it is very important to assess the level of apathy to prevent repercussions on patients' lives. However, there are few validated instruments that specifically assess apathy, the Apathy Evaluation Scale (AES)¹⁴ is one of them. The AES was developed by Marin et al.¹⁴ to characterize apathy in adult patients, regardless of their nature; the main symptom versus a symptom belonging to a major syndrome such as dementia, stroke or major depression. The authors simultaneously developed versions to be used by three different sources: patients (AES-S), clinicians (AES-C) and informants or proxies (AES-I). The AES-S showed good reliability (internal consistency 0.86; test-retest reliability 0.76) as well as a fairly good convergent validity with the scores of the clinicians (AES-C, $r = 0.72$) but not of the informants (AES- I, $r = 0.43$)¹⁴. The scarce literature on the AES-S factorial structure is controversial. On the one hand, Marin et al.¹⁴ found a common structure for

1 the three versions consisting of 3 factors; a general apathy factor that explained 32-
2 53% of the variance (information is not provided for each of the versions separately),
3 curiosity or novelty seeking accounting for 5-10%, and, the third factor, structuring daily
4 activities, that accounted for 7-8% of the variance. On the other, Clarke et al.¹⁵ in
5 patients with dementia identified two factors for the AES-S version, apathy accounting
6 for 36.4% of the variance, and “other” that explained a further 6.9%. The factorial
7 structure of the AES-C was also analyzed in patients with Parkinson disease¹⁶,
8 Alzheimer disease¹⁷, and with a first episode of psychosis (FEP)¹⁸⁻¹⁹. However, to the
9 best of our knowledge, no study has validated this scale in either the Spanish
10 population or patients with established schizophrenia.

11 Therefore, the aim of this study was to validate the self-reported version of the AES
12 (AES-S) in European Spanish and assess its psychometrics properties (including floor
13 and ceiling effects, reliability, and construct and discriminant validity) in patients with
14 schizophrenia. We decided to validate the self-report version, since self-assessment is
15 a time-efficient method that provides the patient's point of view on the experience of
16 their negative symptoms, and facilitates shared decision-making in daily clinical
17 practice.

18 **Materials and methods**

19 **Study Design**

20 This is a secondary analysis of a cross-sectional, naturalistic study carried out in three
21 outpatient centers in Spain with the aim of validating two self-assessment instruments
22 for the negative symptoms of schizophrenia (the Self-Evaluation of Negative Symptoms
23 –SNS- and the Motivation and Pleasure Self-Report –MAP-SR-). It was approved by
24 the Clinical Research Ethics Committee of one of the centres, Hospital Universitario
25 Central de Asturias, Oviedo, Spain (ref. no. 140/150) and was conducted in
26 accordance with the ethical principles of the Declaration of Helsinki and Good Clinical
27 Practice guidelines. All subjects gave their written informed consent prior to enrolment.

28 **Subjects**

29 A total of 104 patients who had completed the AES-S in the SNS and MAP-SR
30 validation study were included in this secondary analysis. Inclusion criteria were (1)
31 schizophrenia diagnosis according to ICD-10²⁰ criteria; (2) patients with stable
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1 schizophrenia (stability was defined as those patients who were clinically stable and
2 had not required any change in their current pharmacological treatment during the past
3 3 months) (3) older than 17 years of age; (4) receiving outpatient treatment at one of
4 the three centres; and (5) written informed consent to participate in the study. Exclusion
5 criteria were designed to be minimal, and only those with intellectual developmental
6 disorder or acquired brain injury or who refused to participate in the study were
7 excluded.
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11 **Psychometric measures**

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16 Participants were assessed by trained psychologists. The assessment included an ad
17 hoc questionnaire for collecting demographic and clinical information. The Spanish
18 versions of the following instruments were also used. We used the Clinical Global
19 Impression-Schizophrenia scale (CGI-SCH)²¹ to assess severity of illness. The level of
20 functioning was assessed using the Personal and Social Performance scale (PSP)²².
21 Negative symptoms were assessed using the Clinical Assessment Interview for
22 Negative Symptoms (CAINS)²³, the Self-report of Negative Symptoms (SNS)²⁴, and
23 the Motivation and Pleasure Scale—Self-Report (MAP-SR)²⁵. In addition, depressive
24 symptoms were assessed with the Calgary Depression Scale for Schizophrenia
25 (CDSS)²⁶. Information was collected from the patients themselves and, when possible,
26 from the main caregiver.
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35 Finally, we employed the Spanish adaptation of the *Apathy Evaluation Scale—self-*
36 *rated version (AES-S)*¹⁴. The AES-S is a self-reported 18-item scale that assesses
37 apathy in the past 4 weeks. Each item is rated on a 4-point Likert-type scale from 1 (not
38 at all true) to 4 (very true). Additionally, there are three inverse items (6,10, and 11) that
39 have to be recoded. The total AES-S score range is 18-72 with lower scores indicating
40 greater apathy.
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45 In the review of Weiser and Garibaldi²⁷ the AES has been validated in individuals
46 with Alzheimer's disease, Parkinson's disease, other types of dementia, stroke and
47 subarachnoid haemorrhage, first episode of psychosis (FEP), major depressive
48 disorder, and the general population.
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51 Two Spanish clinical psychologists who are fluent in the English language (LGA,
52 TBB) first translated the original instrument into Spanish. Then, a Spanish psychiatrist
53 (EFE) fluent in English back-translated the Spanish version, and finally the original
54 authors approved it.
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60 **Statistical analysis**

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1 The statistical analysis was done using SPSS 17.0. The two-tailed level of significance
2 used was 0.05.

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4 Skewness and kurtosis were calculated to measure the shape of the distributions
5 (values of skewness and kurtosis ± 1 were considered good). The coefficient of
6 variation (standard deviation / mean) and ceiling and floor effects were also determined
7 (number of patients with scores greater than 95% and less than 5%, respectively).
8 The internal consistency of the AES-S was calculated using the Cronbach's alpha
9 coefficient at the item level.

10 To calculate divergent validity, we used the Pearson correlation coefficient between the
11 total AES-S score and total scores on the PSP and CDSS using the hypothesis that a
12 moderate coefficient would be found, as they are related but different constructs.

13 Convergent validity was calculated using the Pearson correlation coefficient between
14 the total AES-S score and total scores on the CAINS, SNS, and MAP-SR and the SNS
15 avolition subscale score using the hypothesis that higher coefficients would be found
16 with self-rated measures (SNS and MAP-SR).

17 For analysing the discriminant validity, patients were classified into three groups based
18 on their CGI-S negative subscale scores: mildly ill (CGI-S = 2-3), moderately (CGI-S =
19 4), and severely ill (CGI-S = 5-7). An ANOVA test (Duncan post hoc) was used to
20 identify statistically significant differences in the AES-S scores according to severity
21 groups. An exploratory factor analysis (EFA) using the principal component analysis
22 (PCA) method with oblimin rotation was used to explore the structure of the 18 AES-S
23 items.
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42 **Results**

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45 A total of 104 patients with schizophrenia were included. The mean age was 40.11
46 (sd=14.08), 63.4% were men, and the mean number of years of disease progression
47 was 12.02 years (sd=12.23). Most of the subjects were on antipsychotic monotherapy
48 (54.7%), the 25.6% received antidepressants, and 50.6% had prescribed at least one
49 benzodiazepine. Table 1 shows patient demographic and clinical characteristics.
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54 **Psychometric properties of the AES-S**

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59 Distribution characteristics of AES-S scores
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1 The distribution characteristics of the total AES-S score are shown in Table 2. Total
2 AES-S scores exhibited symmetrical and mesokurtic distributions. The AES-S did not
3 show ceiling or floor effects.
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5 6 Reliability

7 The AES-S scale had good internal consistency for patients with
8 schizophrenia (Cronbach's *alpha* of 0.908), and with the exception of items 6 and 11, all
9 the Corrected Item-Total Correlation Values were >0.3 (they ranged between 0.411 for
10 item 10 and 0.775 for item 18) (Table 2).
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16 Convergent validity

17 The Pearson correlation coefficient between the AES-S total score and the total score
18 of the CAINS-MAP was -0.483 ($p < 0.001$). The correlation coefficients were greater
19 with the self-reported measures. Thus, Pearson correlation coefficients were -0.803 ($p <$
20 0.001) and -0.639 ($p < 0.001$) with the SNS total and avolition subscale scores and -
21 0.727 ($p < 0.001$) with the MAP-SR. When controlling for scores on the CDSS, all the
22 coefficients slightly decreased, ranging from -0.414 (with the CAINS-MAP) to -0.748
23 (with the total SNS).
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31 Divergent validity

32 The Pearson correlation coefficient between the AES-S total score and the total score
33 of the PSP was 0.504 ($p < 0.001$). Again, when controlling for scores on the CDSS, the
34 correlation coefficient decreased to 0.426 ($p < 0.001$). The correlation between AES-S
35 and CDSS was -0.431 ($p < 0.001$).
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41 Discriminant validity

42 The AES-S was able to discriminate among the different levels of illness severity
43 according to CGI-S negative symptom scale scores. AES-S scores decrease as the
44 severity of negative symptoms increases: mildly ill: 55.62 (sd=8.21), moderate ill: 43.38
45 (sd=6.46), and severely ill: 38.25 (sd=6.01) ($F=42.644$, $p < 0.001$). The Duncan post hoc
46 analysis demonstrated that each group was significantly different from the other two
47 groups.
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54 Exploratory factor analysis and principal component analysis

55 The 18 items of the AES-S were subjected to principal components analysis (PCA).
56 The Kaiser-Meyer-Olkin value was 0.87, exceeding the recommended value of 0.60,
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1 and Bartlett's Test of Sphericity ($\text{Chi}^2 = 9333.07, p < 0.001$) reached statistical
2 significance, supporting the factorability of the correlation matrix.

3 Principal component analysis revealed the presence of four components with
4 eigenvalues exceeding 1, explaining 42.41%, 8.49%, 6.42%, and 6.27% of the
5 variance, respectively. An inspection of the scree plot revealed a clear break after the
6 third component; therefore, it was decided to retain three components for further
7 investigation.
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10 The three-component solution explained a total of 57.32% of the variance, with
11 component 1 contributing 42.41%, component 2 contributing 8.49%, and component 3
12 contributing 6.42% (Table 3). To aid in the interpretation of these three components, an
13 oblimin rotation was performed. The interpretation of the three components was
14 consistent with previous research, with motivation-, purpose-, and emotion-related
15 items loading strongly on component 1, indifference items loading strongly on
16 component 2, and social and personal experience items loading strongly on component
17 3. There was a weak correlation among the three factors (they ranged between 0.060
18 and 0.464). Therefore, the results of this analysis support an underlying three-factor
19 structure.
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31 Discussion

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35 This is the first study to investigate an apathy self-report scale in Spanish patients
36 with stable schizophrenia. The aim was to adapt and validate the AES-S instrument into
37 European Spanish and assess its psychometrics properties in Spanish patients with
38 stable schizophrenia. Our results confirm that the Spanish version of the AES-S has
39 appropriate psychometric properties and may therefore be used by Spanish clinicians
40 when evaluating patients with schizophrenia in order to obtain the patients' perspective
41 on their level of apathy.
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46 The internal consistency of the overall scale was adequate and similar to previous
47 studies¹⁹, although items 6 and 11 could be removed since they showed corrected
48 item-total correlation values < 0.3 . With respect to convergent validity, we found a highly
49 significant correlation between AES-S and the other self-reported scales used in this
50 study, SNS and MAP-SR, indicating strong convergent validity. However, a moderate
51 correlation was found with the CAINS-MAP, which is a clinician-administered scale.
52 The awareness of apathy may vary more among lay people in general, including
53 patients, than among research clinicians who are trained to provide high inter-rater
54 agreement¹⁹. However, apathy is an internal experience and therefore more accessible
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1 and suitable for self-reporting than observation-based expressive deficits²⁸. Thus, we
2 think that obtaining information from patients themselves is of great value and should
3 be considered complementary to the clinician's point of view.

4
5 Concerning divergent validity, moderate correlation coefficients were obtained with
6 total PSP and CDSS scores, demonstrating that these instruments measure related but
7 not identical constructs. The moderate correlation found among scores for apathy and
8 functioning and depression is in keeping with the results of Faerden et al.¹⁹. This may
9 be related to the negative influence of apathy on real world functioning, as the negative
10 symptom is more highly associated with poor functional outcome²⁹.

11
12 As hypothesised, AES scores discriminate between different levels of negative
13 symptom severity according to CGI-S negative symptom scores. Our results show that
14 the AES-S total score decreases by more than five points for each level increase in the
15 CGI-S.

16
17 We obtained a three-component solution as in the original validation study¹⁴.
18 Following the definition of apathy proposed by other authors^{30,31}, the interpretation of
19 these factors is as follows: the first component, Motivation, Purpose, and Emotion, is
20 associated with a reduction in initiation and persistence in motivation and goal-directed
21 activities. The second factor, Indifference, can be associated with affective dullness,
22 which characterizes apathy. Finally, the two previous factors would result in increased
23 associability, which reflects our third factor, Personal and Social Experiences. Since
24 other studies have identified two or three factors with similar components to ours,
25 including interest, cognitive behaviour, social indifference, insight, and social
26 contacts¹⁴⁻¹⁸, in their validation study of the original AES, Marin et al.¹⁴ conclude that
27 this scale was predominantly a single-factor structure.

28
29 One of the limitations of this study is the generalizability of our results, since all
30 patients were outpatients from the same region of Spain (Asturias), and there was a
31 lack of patients with extremely severe negative symptoms, such as institutionalised or
32 acutely hospitalized individuals. Another limitation is the cross-sectional design of the
33 study that does not allow us to obtain information about the ability of the AES-S to
34 detect changes in apathy over time. The main strength of this study consists of the
35 non-restrictive inclusion and exclusion criteria, so our patients are very similar to those
36 seen in routine outpatient clinical practice.

37
38 In conclusion, the Spanish version of the AES-S is an instrument that is reliable
39 and valid for measuring apathy in patients with stable schizophrenia. As a self-reported
40 instrument, it seems to be appropriate for use in routine clinical practice as a means of
41 identifying apathy in this population. Furthermore, it is feasible to use since it is not
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time-consuming, and the information obtained should be considered complementary to the clinician's point of view.

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Conflict of interest

The authors declare that there is no conflict of interest. The funding sources had no participation in the development of this study.

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Table 1. Clinical and demographic characteristics of the patients included in the study.

Mean age (sd)	40.14 (14.0)
Sex, men [n (%)]	64 (63.4)
Civil status [n (%)]	
Never married	67 (71.3)
Married/domestic partner	19 (20.2)
Divorced	8 (8.5)
Educative level [n (%)]	
Primary	26 (27.7)
Secondary	58 (61.7)
University	10 (10.6)
Employment situation [n (%)]	
Working	10 (9.6)
Permanent disability, mental disorder	31 (29.8)
Not working ^a	44 (42.3)
Student	14 (13.5)
Homemaker	5 (4.8)
Length of illness (years) [mean(sd)]	12.02 (12.2)
Antipsychot treatment [n (%)]	
No	3 (3.5)
1	47 (54.7)
2	32 (37.2)
3	4 (4.7)
Mood-stabilizing treatment [n (%)]	
No	75 (96.2)
Yes	3 (3.9)
Antidepressant treatment [n (%)]	
No	64 (74.4)
Yes	22 (25.6)
Benzodiazepine treatment [n (%)]	
No	43 (49.4)
Yes	44 (50.6)
CGI-S [mean(sd)]	
Positive symptoms	2.99 (1.5)
Negative symptoms	3.92 (1.0)
Depressive symptoms	2.05 (1.1)
Cognitive symptoms	3.26 (1.3)
Total	4.26 (0.8)
CAINS MAP [mean(sd)]	21.93 (8.9)
CDSS [mean(sd)]	3.03 (3.5)
SNS [mean(sd)]	
Social	2.81(2.2)
Emotional	2.99(2.2)
Alogia	3.81(2.6)
Avolition	3.81(2.3)
Anhedonia	2.65(2.3)
Total	16.07 (9.2)
MAP-SR [mean(sd)]	29.67 (11.1)
Total PSP [mean(sd)]	51.53(17.7)

sd: standard deviation; CGI-S: Clinical Global Impression Severity scale; CAINS: The Clinical Assessment Interview for Negative Symptoms; PSP: Personal and Social

Performance; CDSS: Calgary Depression Scale for Schizophrenia; MAP-SR:
Motivation and Pleasure Scale-Self-Report; SNS: Self-report of Negative Symptoms.
^aNot working includes temporary incapacity, temporary incapacity for schizophrenia
and somatic diseases, retirement, and unemployment.

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Table 2. Descriptive analysis of the Apathy Evaluation Scale- Self report (AES-S).

	Mean	sd	Skewness	se	Kurtosis	Se	Normality test ¹	p	Floor effect		Ceiling effect		Cronbach's α
									n	%	n	%	
AES-S Total*	46.610	9.608	0.237	0.237	-0.229	0.469	0.098	0.015	0	0	0	0	0.908

*n=104 patients; sd: standard deviation; se: standard error; 1. Kolmogorov-Smirnov test.

Table 3. AES rotated three-component structure and component loadings.

AES items	Component loadings		
	Component 1 Motivation, Purpose and Emotion	Component 2 Indifference	Component 3 Social and Personal Experience
1. There are things that interest me	0.666	0.328	0.561
2. I do things during the day	0.725	0.313	0.498
3. Starting things is important to me	0.734	0.196	0.276
4. I am interested in having new experiences	0.446	0.327	0.774
5. I am interested in learning new things	0.680	0.238	0.643
6. I put little effort into anything	0.110	0.498	-0.259
7. I approach life with intensity	0.614	0.314	0.531
8. Seeing a job through to the end is important to me	0.765	0.323	0.199
9. I spend time doing things that interest me	0.712	0.216	0.418
10. Someone has to tell me what to do each day	0.311	0.721	0.292
11. I am less worried about my problems than I should be	0.133	0.756	0.010
12. I have friends	0.428	-0.045	0.747
13. Meeting friends is important to me	0.464	-0.007	0.769
14. When something good happens, I get excited	0.634	-0.043	0.350
15. I have an accurate understanding of my problems	0.688	0.042	0.467
16. Doing things during the day is important to me	0.824	0.162	0.314
17. I have initiative	0.736	0.397	0.579
18. I have motivation	0.801	0.414	0.441
Eigenvalues	7.635	1.529	1.156
Percentage of total variance	42.415	8.942	6.420

The numbers represent the load of each item in each of the three factors, and the items belonging to each factor are highlighted in bold.