

# Empirical validation of the CRAFFT Abuse Screening Test in a Spanish sample

## *Validación empírica del CRAFFT Abuse Screening Test en una muestra de adolescentes españoles*

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### Abstract

The CRAFFT Substance Abuse Screening Instrument, developed by the *Center for Adolescents Substance Abuse Research* (CeASAR) (Knight et al., 1999), is a screening tool for high-risk alcohol and drug risk consumption designed for use with adolescents. Since its publication it has been the subject of translations and validations in different countries, populations and contexts that have demonstrated its enormous potential. However, there is still no empirical validation study that would ensure its good psychometric performance in Spain. The aim of this paper is to develop an adapted version of the CRAFFT in Spanish and to analyze its psychometric properties in a sample of Spanish adolescents. For this purpose an individual interview was conducted on 312 adolescents aged between 12 and 18 years of age ( $M = 15.01$ ;  $SD = 1.83$ ) from the Galician community. The interview included a part of the Adolescent Diagnostic Interview (ADI) and the Problem Oriented Screening Instrument for Teenagers (POSIT). The results obtained, similar to those found in other countries, allow us to report that the Spanish version of the CRAFFT has a good psychometric behavior properties. It was found to have a satisfactory internal consistency with a Cronbach's alpha value of .74. In terms of sensitivity and specificity, values of 74.4% and 96.4% respectively, were obtained and the area under the ROC curve was .946. The Spanish version of the CRAFFT is made available to researchers and professionals in the field of addictive behaviors, so that it can be used with the necessary psychometric guarantees.

*Key words:* Adolescents; Alcohol; CRAFFT; Screening; Drugs.

### Resumen

El *CRAFFT Abuse Screening Test*, desarrollado por el *Center for Adolescents Substance Abuse Research* (CeASAR) (Knight et al., 1999), es una herramienta de cribado del consumo de riesgo de alcohol y otras sustancias diseñada para su uso con adolescentes. Desde su publicación ha sido objeto de numerosas traducciones y validaciones en diferentes países, poblaciones y contextos que han dado cuenta de su enorme potencial. No obstante, seguimos sin disponer de estudios de validación empírica que garanticen su adecuado comportamiento psicométrico en España. El objetivo del presente trabajo consiste en desarrollar una versión adaptada del CRAFFT en castellano y analizar sus propiedades psicométricas en una muestra de adolescentes españoles. Para ello, se realizó una entrevista individual a 312 adolescentes de entre 12 y 18 años ( $M = 15,01$ ;  $DT = 1,83$ ) de la comunidad gallega, que incluyó una parte de la *Adolescent Diagnostic Interview* (ADI) y del *Problem Oriented Screening Instrument for Teenagers* (POSIT). Los resultados obtenidos, similares a los encontrados en otros países, permiten informar que la versión española del CRAFFT presenta un buen comportamiento psicométrico. A nivel de consistencia interna se obtuvo un  $\alpha$  de Cronbach satisfactorio de ,74. En cuanto a la sensibilidad y especificidad se obtuvieron unos valores del 74,4% y el 96,4% respectivamente, con un área bajo la curva COR de ,946. Por lo tanto, queda a disposición de investigadores y profesionales del ámbito de las conductas adictivas la versión española del CRAFFT, para que pueda ser utilizada en adelante con las garantías psicométricas necesarias.

*Palabras clave:* Adolescentes; Alcohol; CRAFFT; Cribado; Drogas.

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The *CRAFFT Substance Abuse Screening Test* (Knight et al., 1999) is one of the most widely used tools to screen for high-risk use of alcohol and other drugs among adolescents (Mitchell et al., 2014). So much so that its use is recommended in Alcohol Screening and Brief Intervention for Youth: Practitioner's Guide (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2011) and by the American Academy of Pediatrics in its Policy Statement: "Substance use screening, brief intervention, and referral to treatment for pediatricians" (Committee on Substance Abuse, 2011).

This quick and easy-to-use instrument was developed in Boston by the Center for Adolescent Substance Abuse Research (CeASAR) (Knight et al., 1999) to aid early identification of children and young people under 21 at high risk of developing an alcohol or drug use disorder. It consists of 6 dichotomous response (yes/no) items, preceded by 3 additional items acting as filters, scored 1 or 0 depending on whether the adolescent responds affirmatively or not. The scoring range of the scale is from 0 to 12, with 2 being the cut-off point established by its original authors (Knight, et al., 1999) to identify high-risk consumption.

The data revealed in the latest National Survey of Drug Use in Secondary Education [ESTUDES 2014-2015] (Plan Nacional sobre Drogas, 2016) highlights the need for detection instruments for use with adolescents. Despite a decline in levels of drug use over recent years, prevalence figures remain high. Of students between 14 and 18, 76.8% drank alcohol in the last year (68.2% in the last month), while 31.4% reported smoking tobacco in the last year (25.9% in the last month) and 25.4% admitted using cannabis (18.6% in the last month). The other substances recorded in the study, such as cocaine, ecstasy, amphetamines or hallucinogens have much lower prevalence figures of below 3%.

These levels of consumption still remain high today, and two other issues that concern both professionals and researchers must be added. The first has to do with the early age at which adolescents start drug use. For example, according to ESTUDES data for 2012-2013, the onset age for alcohol was 13.9 years of age, for tobacco 13.6 and cannabis 14.9. At the European level, the latest report by the *European School Survey Project on Alcohol and Other Drugs* (ESPAD) (ESPAD Group, 2016) states that of students aged 16-18, 47% started drinking, 23% smoking tobacco and 3% using cannabis before the age of 14. The available empirical evidence shows that the age at which adolescents begin to use different substances is not a trivial issue (Cadaveira, 2009; Fontes et al., 2011). In addition, a change in the pattern of alcohol use among the youngest has been observed for some years now (Calafat & Juan, 2003; Sánchez, Moreno, Rivera & Ramos, 2015). The drinking of large quantities of alcohol in short periods of time, known as binge drinking, is a serious social health problem with clearly negative con-

sequences (DeCamp, Gealt, Martin, O'Connell & Visher, 2015; López-Caneda et al., 2014; Moure et al., 2014; Parada et al., 2011).

The fact that prevalence figures for the use of different substances, as well as for binge drinking, are still high, coupled with earlier onset ages (Cortés, Espejo & Giménez, 2007; Golpe, Isorna, Barreiro, Braña & Rial, 2017) only reinforces the need for the early detection of the use of alcohol and other drug. This makes it essential to have screening tools which, in addition to being adapted to Spain and having proven psychometric properties, are quick, simple and easy to use with an increasingly younger population. The CRAFFT has certain advantages that make it a particularly useful tool in this context. Firstly, it is a very easy instrument to apply given the small number of items it comprises. Secondly, its widespread international implementation and the rich tradition of validation studies in different countries, contexts and populations account for its good psychometric properties. Finally, it is an instrument that has formed an integral part of existing prevention plans and strategies, having been implemented in programs for early detection and brief intervention (SBIRT, *Screening, Brief Intervention and Referral to Treatment*) (Committee on Substance Abuse, 2011; Harris, Louis-Jacques & Knight, 2014; Pilowsky & Wu, 2013).

Since its publication, the CRAFFT has been widely translated and validated in different countries, populations and contexts. With regard to internal consistency, a review of numerous papers reveals somewhat modest values, with Cronbach's  $\alpha$  coefficients which in some cases do not reach .70 (Bertini et al., 2015; Knight, Sherritt, Shrier, Harris & Chang, 2002; Skogen, BØe, Knudsen & Hysing, 2013; Wartberg, Kriston, Diestelkamp, Arnaud & Thomasius, 2016). In terms of its screening capacity, the CRAFFT can be seen as having adequate psychometric properties (Dhalla, Zumbo & Poole, 2011), with generally high sensitivity and specificity indices (Gryczynski et al., 2015; Kandemir et al., 2015; Knight, Sherritt, Harris, Gates & Chang, 2003; Pereira, Schram & Azevedo, 2016). However, in studies that also include predictive values, one of the four indicators usually has a poorer result (Cook, Chung, Kelly & Clark, 2005; Kelly, Donovan, Chung, Cook & Delbridge, 2004; Knight et al., 1999), and it is important to note that methodological differences between the studies, such as the use of different standard criteria, produce some uncertainty in the interpretation of these properties. Regarding the factor structure of the CRAFFT, the unidimensionality of the scale has been shown in different studies (Subramaniam, Cheok, Verma, Wong & Chong, 2010; Wartberg et al., 2016).

Regarding the existence of versions of the scale in Spanish, up to three different versions can be found. The CRAFFT website offers a translation into Spanish by the authors of the scale themselves, and there are two different ver-

sions adapted for Columbia (Cote-Menendez, Uribe-Isaza & Prieto-Suárez, 2013; Perez & Scoppetta, 2011). In all three cases the wording of the items is adapted to the use of Spanish in Latin America, which makes them unsuitable for use in Spain. Thus, today we still do not have a version of the CRAFFT duly adapted and validated in Spain which would allow professionals and researchers to implement it with confidence.

Thus, the aim of the present study is precisely to create an adaptation of the *CRAFFT Abuse Screening Test* for Spain and to analyze its psychometric behavior in a sample of Spanish adolescents. More specifically, the hypothesis to be tested in the empirical study is that the Spanish version of the CRAFFT represents a psychometrically adequate instrument for detecting early problems of alcohol use and/or the use of other substances among Spanish adolescents.

## Method

### Participants

In order to achieve the research aim, a selective methodology was chosen, consisting of individual interviews with students in compulsory secondary education (ESO), baccalaureate and intermediate vocational training courses of the Autonomous Community of Galicia (Spain). Two-stage sampling was used to select the sample: by clusters for the selection of the first level units (schools) and by quotas for the second level units (individuals).

Although a total of 343 adolescents were initially interviewed, the final sample consisted of 312 individuals after 31 were rejected mainly because they were unable to complete the interview in its entirety or because of obvious inconsistencies in their responses. To ensure that there was no bias in the distribution of missing cases and that the distribution of these was random, the percentage of missing cases was checked for similarity in the different sample segments according to gender, age group, school attended and residential setting, with  $\chi^2$  contrast statistics calculated for the purpose.

With respect to the composition of the sample, males made up 56.4% and females 43.6% of the sample, with ages ranging from 12 to 18 ( $M = 15.01$ ,  $SD = 1.83$ ). Participants were randomly selected from a total of 33 educational centers (22 public and 11 private), where 64.9% were attending ESO (32.6% in the first cycle and 32.3% in the second), 21.3% in studying for the baccalaureate and 13.9% were on basic vocational training or an intermediate cycle of the same. Finally, 42.4% lived in an urban environment and 57.6% were from a rural or semi-rural background.

### Instrument

Data were collected through a structured interview with the support of a questionnaire that included the *CRAFFT Abuse Screening Test* (Knight et al., 1999), the *Adolescent Diag-*

*nostic Interview* (ADI) (Winters & Henly, 1993) and the substance use and abuse subscale of the *Problem Oriented Screening Instrument for Teenagers* (POSIT<sub>UAS</sub>) (Rahdert, 1991). To avoid possible bias in the order in which the three instruments were completed, this was duly counterbalanced.

The CRAFFT (Knight, et al., 1999) is a tool composed of only 6 dichotomous items (yes/no), designed specifically for the screening of high-risk use of alcohol and other substance among adolescents. The administration of CRAFFT begins with 3 initial questions. If the young person's answer to these questions is "no", the interviewer will only need to ask the first question of the CRAFFT itself. If the adolescent answers "yes" to one or more of the 3 initial questions, the interviewer will ask all 6 of the questions that make up the CRAFFT. For the purposes of the present study the CRAFFT was carefully translated and back-translated under the supervision of its original authors. Once adapted to Spanish, a pilot study was carried out with the aim of evaluating the ease of understanding and clarity of the questions. The sample consisted of 51 adolescents between 12 and 17 years old ( $M = 14.36$ ,  $SD = 1.47$ ). Accidental sampling was used for the selection of the sample, although an attempt was made to ensure that participants covered the age range of the target group. Data were collected in 5 different locations in an attempt to have participants from the three different environments (urban, rural and semi-rural). For data collection, a questionnaire was designed and administered through a personal interview with three different blocks. The first block featured the CRAFFT; in the second, four questions from a cognitive interview (*Probing Based Paradigm - Delayed Retrospective Probing Procedure*) were included in order to establish how easy they were to understand, and finally there was a brief socio-demographic section (gender, age and school year). The results of the pilot study indicated that the CRAFFT really is a brief, clear and easily understood tool.

The *Adolescent Diagnostic Interview* (ADI) (Winters & Henly, 1993) was used as a criterion to calculate the CRAFFT's sensitivity, specificity, and positive and negative predictive value (PPV and NPV respectively). This consists of a diagnostic interview of 213 items adapted to the DSM-5 criteria (American Psychiatric Association [APA], 2013) for the identification of substance use disorders in adolescents. Its items were translated and back-translated under the supervision of its original authors for application in this research. The reliability of the different diagnostic scales was high, yielding Cronbach's  $\alpha$  values of .88 for the diagnosis of alcohol use disorder, .89 for the diagnosis of cannabis use disorder and .92 for the diagnosis of substance use disorder. These values are very similar to those obtained in the study by Araujo, Golpe, Braña and Varela (2017).

Finally, as a complementary indicator of criterion validity, the substance use and abuse subscale of the *Problem Oriented Screening Instrument for Teenagers* (POSIT<sub>UAS</sub>) (Ra-

hdert, 1991) was included, consisting of 17 dichotomous items (yes/no) and validated in the research of Araujo et al. (2017), where good reliability (Cronbach's  $\alpha$  of .82), as well as high values for sensitivity (94.3%) and specificity (83.9%) were recorded.

### Procedure

Data were collected through a personal interview conducted in the schools, in rooms prepared for the purpose, by a team of psychologists with experience of this type of work. Each interview took between 45 and 60 minutes. Participants were informed of the purpose of the study, and were told that it was anonymous and their responses confidential. The study had the approval and collaboration of both the management of the schools and the respective parents' associations. Participation was completely voluntary and unpaid. The study was approved by the bioethics committee of the University of Santiago de Compostela.

### Data analysis

First, a descriptive analysis was carried out by calculating percentages as well as the statistics of central tendency and dispersion. Comparisons of means by gender (through the application of Student's *t* test) and age group (using a single factor Anova and a Tukey post-hoc contrast) were also performed. Given the non-normality of the data, the Mann-Whitney U test for 2 groups and the Kruskal-Wallis test for more than 2 groups were applied. For an assessment of internal consistency, the KR-20 index, suitable for dichotomous variables (Kuder & Richardson, 1937) and the Omega Coefficient ( $\Omega$ ), were calculated. Sensitivity, specificity, PPV and NPV were determined in order to analyze the psychometric properties of the scale. In addition, the area under the ROC curve (Receiver's Operating Characteristics) was calculated with the aim of establishing the optimal cut-off point. Finally, to assess criterion validity, the degree of agreement of the CRAFFT with the POSIT<sub>UAS</sub>

was analyzed. The analyses were performed with the IBM SPSS Statistics 20 statistical package.

## Results

### Descriptive statistics

Table 1 shows the direct responses of the 312 adolescents to each of the 9 items comprising the CRAFFT, along with the percentage of subjects who answered affirmatively to each. As can be seen, almost 50% of adolescents reported having drunk alcohol in the previous year, with 18.3% using marijuana or hashish and 4.2% some other substance. If we look at the items that make up the CRAFFT itself (items 4 to 9), the highest percentage corresponds to item 7 ("Have you ever forgotten things you did while drinking alcohol or taking any kind of drug?"), to which 45.2% answered affirmatively. Item 9 ("Have you ever got into trouble while drinking alcohol or taking any kind of drug?") is the one with the lowest percentage of affirmative answers (22.7%).

Descriptive statistics for the total score are shown in Table 2. The overall CRAFFT mean is 1.05 and the standard deviation is 1.60, with a score range of 0-6. Standardized skew and kurtosis statistics reveal the existence of positive skew and a leptokurtic distribution, which shows that the scores are not normally distributed. Non-normality was verified using the Kolmogorov-Smirnov test, with the corresponding Lilliefors correction ( $K-S = 0.302$ ;  $p < .001$ ).

The distribution of frequencies and the accumulated percentages for the different scores are presented next. Taking the scale's original cut-off point ( $\geq 2$ ) indicates that 22.9% of the sample tests positive on the CRAFFT.

Comparing mean scores by sex reveals that although females score lower than males (0.94 vs. 1.13), this difference is not statistically significant ( $t = 1.07$ ;  $p = .29$ ,  $Z = -0.9$ ,  $p = .93$ ). The differences regarding age, however, between the three groups (12-14 years of age, 15-16 and 17-18) were statistically significant ( $F = 50.567$ ,  $p < .001$ ;  $\chi^2 = 84.87$ ;  $p$

Table 1. Percentage of affirmative responses to each CRAFFT item

Item	% yes
Have you consumed alcoholic drinks (more than a few sips) in the past 12 months?	47.8
Have you smoked marijuana or hashish in the last 12 months?	18.3
Have you taken any other substance to "get high" (illegal drugs, pills, medication or any snorted or inhaled substance)?	4.2
Have you ever been in/on a car/motorcycle driven by someone (including yourself) who previously drank alcohol or consumed any kind of drug?	25.7
Have you ever used alcohol or any kind of drug to relax, feel better about yourself, or fit into a group?	29.7
Have you ever used alcohol or any kind of drug when you were alone, without company?	32.9
Have you ever forgotten things you did while drinking alcohol or taking any kind of drug?	45.2
Have your family or friends ever told you that you should reduce your alcohol or drug use?	27.7
Have you ever got into trouble while drinking alcohol or using any kind of drug?	22.7

Table 2. Descriptive statistics for CRAFFT total score

		Value	
Mean		1.05	
95% confidence interval for the mean	Upper limit	0.87	
	Lower limit	1.23	
5% trimmed mean		0.86	
Variance		2.57	
Standard Deviation		1.60	
Total CRAFFT score	Minimum	0	
	Maximum	6	
	Range	6	
	Skew	11.58	
	Kurtosis	5.76	
	Percentiles	25	0
		50	0
		75	1
		95	5

<.001), with the 17-18 group presenting the highest average (2.20), followed by 15-16 (1.04) and 12-14 (0.23).

**Score reliability**

As evidence of the CRAFFT’s reliability, its internal consistency was analyzed. This was assessed by calculating the KR-20 index, with the resulting a value of .74 considered acceptable. In addition, the Omega coefficient was calculated, yielding an  $\Omega$  value of .82.

Each item was also tested individually for consistency by calculating of the Corrected Homogeneity Index (CHI), and values between .38 and .61 were obtained. Items 2 and 4 were those found to be less consistent with regard to the scale as a whole. However, eliminating any of them did not lead to any improvement in the scale’s overall consistency (Table 4).

**Sensitivity, specificity, PPV, NPV and ROC**

Table 5 shows the values for sensitivity, specificity, PPV and NPV for different cut-off points. The results obtained

indicate that the CRAFFT offers good psychometric properties at cut-off points 1 and 2, but with a better balance between the four indicators when 2 is adopted.

When this original cut-off point ( $\geq 2$ ) is used, the CRAFFT’s sensitivity reaches 74.4% and specificity 96.4%. This means that it is able to detect true positives in 74.4% of cases and to reject true negatives in 96.4% of the time, both of which are very acceptable results. Looking at the predictive values obtained for this cut-off point we can see that the positive predictive value is 88.4%, while the negative predictive value is 91.1%, which means that the probability of an adolescent with a positive CRAFFT score actually having a substance use disorder is 88.4% and, conversely, that the likelihood of an adolescent scoring negatively does not present a disorder is 91.1%. In contrast, when the cut-off point is lowered to 1, the sensitivity index (97.6%) and the negative predictive value (98.8%) are enhanced, to the detriment of specificity and positive predictive value, which sink to 76.6% and 60.6%, respectively. To complement this, a ROC (Receiver Operating Characteristic) curve analysis was performed, yielding an area under the curve of .946 (Figure 1).

Using the original cut-off point and analyzing the psychometric properties of CRAFFT according to gender, the CRAFFT behaves better when applied to males. As for age, the results are acceptable in all three groups, especially in the 12-14 year group (sensitivity = 75%, specificity = 100%, PPV = 100% and NPV = 99.1%), with all indices diminishing slightly with increasing age.

Table 4. Consistency of CRAFFT items

Item	KR-20 if item eliminated	CHI
1	.714	.431
2	.726	.385
3	.697	.487
4	.729	.384
5	.671	.583
6	.668	.605
GLOBAL	.738	

Table 3. Frequency distribution for CRAFFT total score

Total score	Frequency	Valid percentage	Cumulative percentage
0	173	55.8%	55.8%
1	65	21.3%	77.1%
2	17	5.5%	82.6%
3	19	6.1%	88.7%
4	14	4.5%	93.2%
5	14	4.5%	97.7%
6	7	2.3%	100%

Tabla 5. *Propiedades psicométricas del CRAFFT*

		Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	ROC curve
Cut-off point $\geq 1$		97.6	76.6	60.6	98.8	.946
Cut-off point $\geq 2$		74.4	96.4	88.4	91.1	
Cut-off point $\geq 3$		61	98.2	92.6	87.2	
		Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	ROC curve
Cut-off $\geq 2$						
Sex	Males	76.9	97.5	93	90.8	.958
	Females	70	95	80.8	91.4	.926
Years of age	12-14	75	100	100	99.1	.984
	15-16	74.1	97.2	90.9	90.9	.913
	17-18	74.5	82.9	86.4	69	.892

### Validity evidence in relation to external variables

In order to assess criterion validity, the percentage of adolescents who tested positive with CRAFFT and ADI (22.9% and 26.8%, respectively) was compared, yielding a Kappa concordance index of .75 ( $p < .001$ ). Additionally, the same comparison was made between CRAFFT and POSIT<sub>UAS</sub> (with a percentage of positives in the latter instrument of 39.4%), producing a Kappa concordance index of .67 ( $p < 0.001$ ). Finally, the Pearson correlation coefficient between the CRAFFT and POSIT<sub>UAS</sub> scores was also calculated and returned a very high and statistically significant value of  $r_{xy} = .86$  ( $p < .001$ ).

### Internal structure validity evidence

The sample was randomly divided into two halves. Exploratory factor analysis (AFE) was performed on the first, and confirmatory factor analysis (CFA) on the second. To carry out the AFE, the factor extraction method used was the method of main components. The KMO index was .77, and the Bartlett sphericity test value was 184.61 ( $p < 0.001$ ). The analysis provided 1 factor, which explained 44.30% of data variance. The second half of the sample was submitted to CFA in order to confirm this one-dimensional structure. The standardized factor loadings were higher than .45 and the goodness of fit index (GFI), adjusted goodness of fit index (AGFI), normed fit index (NFI) and the root mean square residual (RMSR) yielded highly acceptable values (GFI = .995, AGFI = .989 and NFI = .990) in accordance with the criteria established by Byrne (2009) and Kline (2005).

## Discussion

One of the most frequently used screening instruments worldwide for high-risk drug use is without doubt the CRAFFT. Its use in different countries and in different contexts bears witness to its enormous potential (Agle, Gassman, Jun, Nowicke & Samuel, 2015; Bernard et al., 2005; Co-

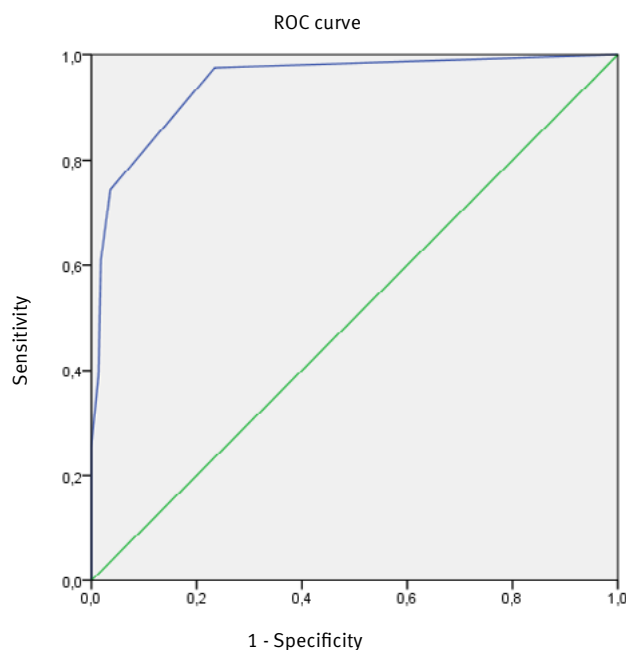


Figure 1. ROC curve for CRAFFT

te-Menendez et al., 2013; Cummins et al. 2003; Dieppe, Stanhope & Rakhra, 2009; Harris et al., 2016; 2014, Karila et al., 2007; Van Weelden et al., 2016). In Spain, however, there are still no psychometric studies that guarantee the proper functioning of this instrument in our country, although some professionals and researchers have occasionally used the CRAFFT.

The results obtained from a sample of 312 students from the Autonomous Community of Galicia show that the CRAFFT possesses good psychometric properties. Firstly, as regards internal consistency, a satisfactory  $\alpha$  value of .74 was obtained, which is higher than that obtained in the original validation study by Knight et al. (2002) ( $\alpha = .68$ )

and other studies (Bertini et al., 2015; Kelly et al., 2004; Subramaniam et al., 2010; Wartberg et al., 2016). Secondly, in terms of screening, it is the original cut-off point ( $\geq 2$ ) that results in the best balance between the four indicators used, with a sensitivity of 74.4%, a specificity of 96.4%, a PPV of 88.4% and an NPV of 91.1%. However, if we follow Latimer, Winters and Stinchfield (1997), who argue that since the most important function of a screening tool is to prevent an adolescent with drug abuse being omitted in screening, and consequently urge that sensitivity should be to maximized, we should rethink the possibility of lowering the cut-off point to 1, as Subramaniam et al. (2010) or Skogen et al. (2013) have already done. The section-by-section results using the original cut-off point show that CRAFFT presents good psychometric properties with both males and females, as well as with the different age groups. However, it should be noted that with females the values in the four indicators are slightly lower than with males, and this difference remains with increasing age.

Regarding the CRAFFT's construct validity, the analyses carried out have confirmed the one-dimensional structure of the scale, as already noted by Subramaniam et al. (2010) and Wartberg et al. (2016).

Finally, the CRAFFT's criterion validity is borne out by its high concordance indices with ADI and POSIT<sub>UAS</sub>, as well as the high and significant correlation found between the CRAFFT and POSIT<sub>UAS</sub>.

In short, the present study makes an adapted and empirically validated version of the CRAFFT *Abuse Screening Test* available to researchers and professionals in the field of addictive behavior. The results obtained show that the CRAFFT enjoys good psychometric properties and represents an appropriate tool to be used within a school context. Furthermore, it has been found that when administered by non-health personnel there is no loss in any of its properties, which increases its potential and the possibilities of being used. Our research also opens up the possibility of using the CRAFFT as the screening tool within the framework of possible early detection and brief intervention programs (SBIRT) to be developed in our country.

Notwithstanding the above, it is important to note that this study has some limitations. From a sampling perspective, although the sample size of 312 adolescents is similar or even higher than that of other validation studies (Bernard et al., 2005; Bertini et al., 2006; Cummins et al. 2003; Kelly et al., 2004) it is not sufficient for assessing the instrument in relation to different sociodemographic sectors. In addition, the fact that only adolescents from the Autonomous Community of Galicia were involved can in itself be seen as conditioning external validity. In an attempt to mitigate this limitation, the sample included students from public, private and 'concertado' (state funded private) schools, living in urban, rural or semi-rural environments. However, it is clear that future research needs to aim at analyzing the

psychometric properties of the scale in other autonomous communities.

It would also have been interesting to have had some clinical information about participants, such as the presence of a comorbid diagnosis, the existence of a family history of the disorder, etc. However, it is worth noting that this is a first validation study in a school setting, where it is intended that the instrument be put to use immediately.

Finally, the fact that the data were gathered in schools themselves, and not in primary care services through a clinical interview as such, means that the variables analyzed were self-reported, which makes it impossible to know objectively to what extent adolescents may actually have underestimated or overestimated their levels of substance use. However, as has previously been pointed out by different experts in the field of addictive behavior, such as Babor, De La Fuente, Saunders and Grant (1989) or Winters, Stinchfield, Henly and Schwartz (1990) themselves, self-report measures have been shown to be reliable and even more accurate than other methods when assessing levels of alcohol and other drug use. Furthermore, the validation of the CRAFFT in a school setting makes it a tool of enormous potential, given that it is precisely in this area where a good part of the preventive work in our country is being carried out.

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## Conflict of interests

The authors of this article declare that they have no conflict of interest

## References

- Agley, J., Gassman, R. A., Jun, M., Nowicke, C. & Samuel, S. (2015). Statewide administration of the CRAFFT screening tool: Highlighting the spectrum of substance use. *Substance Use & Misuse*, 50, 1668–1677. doi:10.3109/10826084.2015.1027930.
- American Psychiatric Association [APA]. (2013). *Diagnostic and statistical manual of mental disorders (fifth edition) (DSM-5)*. Washington, DC: American Psychiatric Publishing.
- Araujo, M., Golpe, S., Braña, T., Varela, J. & Rial, A. (2017). Validación psicométrica del POSIT para el cribado del consumo de riesgo de alcohol y otras drogas en adolescentes. *Adicciones*. Avance de publicación on-line. doi: 10.20882/adicciones.958.
- Babor, T.F., De La Fuente, J.R., Saunders, J. & Grant, M. (1989). *AUDIT: The Alcohol Use Disorders Identification Test*.

- Guidelines for use in primary health care.* Geneva, Switzerland: World Health Organization.
- Bernard, M., Bolognini, M., Plancherel, B., Chinet, L., Laget, J., Stephan, P. & Halfon, O. (2005). French validity of two substance-use screening test among adolescents: A comparison of the CRAFFT and DEP-ADO. *Journal of Substance Use, 10*, 385–395. doi:10.1080/14659890412331333050.
- Bertini, M.C., Busaniche, J., Baquero, F., Eymann, A., Krauss, M., Paz, M. & Catsicaris, C. (2015). Adaptación transcultural y validación del test CRAFFT como prueba de pesquisa para consumo problemático, abuso y dependencia de alcohol y otras sustancias en un grupo de adolescentes argentinos. *Archivos Argentinos de Pediatría, 113*, 114–118. doi:10.5546/aap.2015.114.
- Byrne, B.M. (2009). *Structural equation modeling with AMOS: Basic concepts, applications, and programming* (2nd ed.). London: Psychology Press.
- Cadaveira, F. (2009). Alcohol y cerebro adolescente. *Adicciones, 21*, 9–14.
- Calafat, A. & Juan, M. (2003). De la etiología a la prevención del uso y abuso de drogas recreativas. *Adicciones, 15*, 261–287.
- Committee on Substance Abuse. (2011). Substance use screening, brief intervention, and referral to treatment for pediatricians. *Pediatrics, 128*, e1330–1340.
- Cook, R.L., Chung, T., Kelly, T.M. & Clark, D.B. (2005). Alcohol screening in young persons attending a sexually transmitted disease clinic. Comparison of AUDIT, CRAFFT, and CAGE instruments. *Journal of General Internal Medicine, 20*, 1–6. doi:10.1111/j.1525-1497.2005.40052.x
- Cortés, M.T., Espejo, B. & Giménez, J.A. (2007). Características que definen el fenómeno del botellón en universitarios y adolescentes. *Adicciones, 19*, 357–372.
- Cote-Menendez, M., Uribe-Isaza, M.M. & Prieto-Suárez, E. (2013). Validación para Colombia de la escala CRAFFT para tamización de consumo de sustancias psicoactivas en adolescentes. *Revista de Salud Pública, 15*, 220–232.
- Cummins, L.H., Chan, K.K., Burns, K.M., Blume, A.W., Larimer, M. & Marlatt, G.A. (2003). Validity of the CRAFFT in American-Indian and Alaska-Native adolescents: Screening for drug and alcohol risk. *Journal of Studies on Alcohol, 64*, 727–732. doi:10.15288/jsa.2003.64.727.
- DeCamp, W., Gealt, R., Martin, S., O'Connell, D. & Visher, C. (2015). *Binge drinking and other risk behaviors among college students.* Newark, DE. Recuperado de <https://www.cdhs.udel.edu/content-sub-site/Documents/DDA-TA/2015 CRBS Report.pdf>.
- Dhalla, S., Zumbo, B.D. & Poole, G. (2011). A review of the psychometric properties of the CRAFFT instrument: 1999–2010. *Current Drug Abuse Reviews, 4*, 57–64. doi:10.2174/1874473711104010057.
- Dieppe, C., Stanhope, B. & Rakhra, K. (2009). Children who harm themselves: Development of a paediatric emergency department triage tool. *Emergency Medicine Journal, 26*, 418–420. doi:10.1136/emj.2008.062463.
- ESPAD Group. (2016). *ESPAD Report 2015: Results from the European School Survey Project on Alcohol and Other Drugs.* Luxembourg. Recuperado de [http://www.espad.org/sites/espad.org/files/ESPAD\\_report\\_2015.pdf](http://www.espad.org/sites/espad.org/files/ESPAD_report_2015.pdf).
- Fontes, M.A., Bolla, K.I., Cunha, P.J., Almeida, P.P., Jungerman, F., Laranjeira, R.R., ... Lacerda, A.L. (2011). Cannabis use before age 15 and subsequent executive functioning. *The British Journal of Psychiatry, 198*, 442–447. doi:10.1192/bjp.bp.110.077479.
- Golpe, S., Isorna, M., Barreiro, C., Braña, T. & Rial, A. (2017). Consumo intensivo de alcohol en adolescentes: prevalencia, conductas de riesgo y variables asociadas. *Adicciones.* Avance de publicación on-line. doi: 10.20882/adicciones.932.
- Gryczynski, J., Kelly, S.M., Mitchell, S.G., Kirk, A., O'Grady, K.E. & Schwartz, R.P. (2015). Validation and performance of the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) among adolescent primary care patients. *Addiction, 110*, 240–247. doi:10.1111/add.12767.
- Harris, S.K., Knight, J.R., Van Hook, S., Sherritt, L., Brooks, T.L., Kulig, J.W., ... Saitz, R. (2016). Adolescent substance use screening in primary care: Validity of computer self-administered versus clinician-administered screening. *Substance Abuse, 37*, 197–203. doi:10.1080/08897077.2015.1014615.
- Harris, S.K., Louis-Jacques, J. & Knight, J.R. (2014). Screening and brief intervention for alcohol and other abuse. *Adolescent Medicine: State of the Art Reviews, 25*, 126–156.
- Kandemir, H., Aydemir, Ö., Ekinci, S., Selek, S., Kandemir, S.B. & Bayazit, H. (2015). Validity and reliability of the Turkish version of the CRAFFT Substance Abuse Screening Test among adolescents. *Neuropsychiatric Disease and Treatment, 11*, 1505–1509. doi:10.2147/NDT.S82232.
- Karila, L., Legleye, S., Beck, F., Corruble, E., Falissard, B. & Reynaud, M. (2007). Validation d'un questionnaire de repérage de l'usage nocif d'alcool et de cannabis dans la population générale: le CRAFFT-ADOSPA. *La Presse Médicale, 36*, 582–590. doi:10.1016/j.lpm.2007.01.005.
- Kelly, T.M., Donovan, J.E., Chung, T., Cook, R.L. & Delbridge, T.R. (2004). Alcohol use disorders among emergency department-treated older adolescents: A new brief screen (RUFT-Cut) using the AUDIT, CAGE, CRAFFT, and RAPS-QF. *Alcoholism: Clinical & Experimental Research, 28*, 746–753. doi:10.1097/01.ALC.0000125346.37075.85.
- Kline, R.B. (2005). *Principles and Practice of Structural Equation Modeling* (2nd ed.). New York: The Guilford Press.
- Knight, J.R., Sherritt, L., Harris, S.K., Gates, E.C. & Chang, G. (2003). Validity of brief alcohol screening test among adolescents: A comparison of the AUDIT, POSIT, CAGE, and CRAFFT. *Alcoholism: Clinical & Experimental Research, 27*, 67–73. doi:10.1111/j.1530-0277.2003.tb02723.x.

- Knight, J.R., Sherritt, L., Shrier, L.A., Harris, S.K. & Chang, G. (2002). Validity of the CRAFFT Substance Abuse Screening Test among adolescent clinical patients. *Archives of Pediatrics & Adolescent Medicine*, *156*, 607–614. doi:10.1001/archpedi.156.6.607.
- Knight, J.R., Shrier, L.A., Bravender, T.D., Farrell, M., Vander Bilt, J. & Shaffer, H.J. (1999). A new brief screen for adolescent substance abuse. *Archives of Pediatrics & Adolescent Medicine*, *153*, 591–596. doi:10.1001/archpedi.153.6.591.
- Kuder, G.F. & Richardson, M.W. (1937). The theory of the estimation of test reliability. *Psychometrika*, *2*, 151–160.
- Latimer, W., Winters, K.C. & Stinchfield, R.D. (1997). Screening for drug abuse among adolescents in clinical and correctional settings using the Problem Oriented Screening Instrument for Teenagers. *The American Journal of Drug and Alcohol Abuse*, *23*, 79–98. doi:10.3109/00952999709001689.
- López-Caneda, E., Mota, N., Crego, A., Velasquez, T., Corral, M., Rodríguez, S. & Cadaveira, F. (2014). Anomalías neurocognitivas asociadas al consumo intensivo de alcohol (binge drinking) en jóvenes y adolescentes: una revisión. *Adicciones*, *26*, 334–359.
- Mitchell, S.G., Kelly, S.M., Gryczynski, J., Myers, C.P., O'Grady, K.E., Kirk, A.S. & Schwartz, R.P. (2014). The CRAFFT cut-points and DSM-5 criteria for alcohol and other drugs: A reevaluation and reexamination. *Substance Abuse*, *35*, 376–380. doi:10.1080/08897077.2014.936992.
- Moure, L., Caamaño, F., Doallo, S., Juan, P., Corral, M., Rodríguez, S. & Cadaveira, F. (2014). Heavy drinking and alcohol related injuries in college students. *Gaceta Sanitaria*, *28*, 376–380. doi:10.1016/j.gaceta.2014.02.017.
- National Institute on Alcohol Abuse and Alcoholism [NIAAA]. (2011). *Alcohol screening and brief intervention for youth: A practitioner's guide*. Rockville, MD. Recuperado de [https://pubs.niaaa.nih.gov/OrderForm/EncForm/Youth\\_Guide\\_Order\\_Form](https://pubs.niaaa.nih.gov/OrderForm/EncForm/Youth_Guide_Order_Form)
- Parada, M., Corral, M., Caamaño, F., Mota, N., Crego, A., Rodríguez, S. & Cadaveira, F. (2011). Definición del concepto de consumo intensivo de alcohol adolescente (binge drinking). *Adicciones*, *23*, 53–63.
- Pereira, B. A., Schram, P.F. & Azevedo, R.C. (2016). Evaluation of the Brazilian version of the CRAFFT/CE-SARE scale for screening drug use by adolescents. *Ciência & Saúde Coletiva*, *21*, 91–99. doi:10.1590/1413-81232015211.05192015.
- Pérez, A. & Scopetta, O. (2011). El CRAFFT/CARLOS como instrumento para la identificación temprana de consumo de alcohol y otras SPA: una adaptación al español. *Revista Colombiana de Psicología*, *20*, 265–274.
- Pilowsky, J. & Wu, L.T. (2013). Screening instruments for substance use and brief interventions targeting adolescents in primary care: A literature review. *Addictive Behaviors*, *38*, 2146–2153. doi:10.1016/j.addbeh.2013.01.015.
- Plan Nacional sobre Drogas. (2016). *Encuesta sobre el uso de drogas en enseñanzas secundarias en España (ESTUDES) 2014-2015*. Madrid, España: Delegación del Gobierno para el Plan Nacional sobre Drogas, Ministerio de Sanidad, Servicios Sociales e Igualdad.
- Rahdert, E. R. (1991). *The Adolescent Assessment/Referral System*. Rockville, MD: National Institute on Drug Abuse.
- Sánchez, I., Moreno, C., Rivera, F. & Ramos, P. (2015). Tendencias en el consumo de alcohol en los adolescentes escolarizados españoles a lo largo de la primera década del siglo XXI. *Gaceta Sanitaria*, *29*, 184–189. doi:10.1016/j.gaceta.2015.01.004.
- Skogen, J. C., Bøe, T., Knudsen, A.K. & Hysing, M. (2013). Psychometric properties and concurrent validity of the CRAFFT among Norwegian adolescents. Ung@hordaland, a population-based study. *Addictive Behaviors*, *38*, 2500–2505. doi:10.1016/j.addbeh.2013.05.002.
- Subramaniam, M., Cheok, C., Verma, S., Wong, J. & Chong, S.A. (2010). Validity of a brief screening instrument-CRAFFT in a multiethnic Asian population. *Addictive Behaviors*, *35*, 1102–1104. doi:10.1016/j.addbeh.2010.08.004.
- Van Weelden, M., Lourenço, B., Viola, G.R., Aikawa, N.E., Queiroz, L.B. & Silva, C.A. (2016). Substance use and sexual function in juvenile idiopathic arthritis. *Revista Brasileira de Reumatologia*, *56*, 323–329. doi:10.1016/j.rbre.2016.02.007.
- Wartberg, L., Kriston, L., Diestelkamp, S., Arnaud, N. & Thomasius, R. (2016). Psychometric properties of the German version of the CRAFFT. *Addictive Behaviors*, *59*, 42–47. doi:10.1016/j.addbeh.2016.03.020.
- Winters, K.C. & Henly, G. (1993). *Adolescent Diagnostic Interview (ADI)*. Los Ángeles, CA: Western Psychological Services.
- Winters, K.C., Stinchfield, R.D., Henly, G.A. & Schwartz, R.H. (1990). Validity of adolescent self-report of alcohol and other drug involvement. *International Journal of the Addictions*, *25*, 1379–1395. doi:10.3109/10826089009068469.

