Clinimetric and Psychometric Evidences of an Instrument to Assess Craving for Inhalants in a Sample of Users

Lizeth Alonso-Matías[1], Francisco Paz-Rodríguez[2]

[1]Subdirección de Investigaciones Clínicas, Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz.

[2]Departamento de Neuropsicología, Instituto Nacional de Neurología y Neurocirugía Manuel Velasco Suárez.

RESUMEN

Introducción: el craving es un criterio importante en el diagnóstico del trastorno por uso de inhalables; detectar esta condición en el ciclo adictivo de los inhalables puede ayudar a predecir abstinencias prolongadas o recaídas. **Objetivo:** describir la evidencia psicométrica y clinimétrica de la escala de craving en una muestra de usuarios. **Método:** estudio transversal con muestra no probabilística de 76 participantes adultos. La muestra se dividió en dos grupos para el análisis: un grupo de usuarios con trastorno por uso de inhalables (*n* = 60) y un grupo de usuarios experimentales (*n* = 16). Se aplicó una escala de craving a inhalables. Se realizó un análisis descriptivo, factorial y un análisis de la curva característica operativa del receptor (ROC). **Resultados:** el análisis ROC para discriminar entre consumidores de inhalables y el grupo de usuarios experimentales mostró un punto de corte de 36 mm, con una sensibilidad de .983 y una especificidad de .813 (1= especificidad de .187). El análisis general mostró que las puntuaciones de craving de los usuarios con trastorno por uso de inhalables eran considerablemente más altas (M = 417.15, SD = 215) que en los usuarios experimentales (M = 185, SD = 136.25). **Discusión y conclusiones:** la evidencia clínica mostró un punto de corte válido para detectar la presencia de craving en usuarios de inhalables, y este puntaje puede ser utilizado como referencia objetiva en la práctica clínica; la escala de craving tiene evidencia adecuada de confiabilidad y validez.

Palabras clave: inhalables, craving, adicción, screening, diagnóstico.

ABSTRACT

Introduction: craving is an important criterion in the diagnosis of inhalant use disorder; detecting this condition in the inhalant addictive cycle can help in predicting prolonged abstinence or relapses. **Objective:** to describe the psychometric and clinimetric evidence of the craving scale in a sample of users. **Method:** a cross-sectional study with a non-probability sample of 76 adult participants. For the analysis, the sample was divided into two groups: inhalant use disorder group (n = 60) an experimental user group (n = 16). A craving scale for inhalants was applied. A descriptive, factorial analysis and a receiver operating characteristic curve (ROC) analysis were performed. **Results:** the ROC analysis to differentiate between users with inhalant users disorder and experimental users showed a cut-off point of 36 mm, with a sensitivity of .983 and a specificity of .813 (1= specificity of .187). The overall analysis showed that the craving scores of users with inhalant use disorder were considerably higher (M = 417.15, SD = 215) than experimental users (M = 185, SD = 136.25). **Discussion and conclusions:** clinical evidence showed a valid cut-off point to detect the presence of craving in inhalant users and this score can be used as an objective reference in clinical practice; the craving scale has adequate reliability and validity evidence.

Keywords: inhalants, craving, addiction, screening, diagnosis.

Corresponding author:
Lizeth Alonso-Matías. Subdirección de Investigaciones Clínicas, Instituto Nacional de Psiquiatría Ramón de la Fuente Muñiz, Calzada México-Xochimilco 101, col. San Lorenzo Huipulco, C.P. 14370, Ciudad de México. E-mail: neuropsic.liz@gmail.com
Received on: December 27th, 2023
Accepted on: April 25th, 2024
doi: 10.28931/riiad.2024.1.06

INTRODUCTION

Inhalants are volatile substances that are self-administered for intoxication purposes. They are found in various household products that are both legal and affordable. Paint thinners, markers, spray paints and glues are the most frequently used inhalants (National Institute on Drug Abuse [NIDA], 2022). The onset of consumption usually occurs at an early age between 12 and 14 years old (Villatoro et al., 2011). Prolonged use of these substances is associated with numerous medical consequences, including addiction.

Similar to other addictions, craving inhalants is considered one the most important diagnostic criteria, because it is a predictor of remissions or relapses within the addictive cycle (Sayette, 2016). Craving is the subjective experience of desire or compulsion to take a psychoactive substance. Immediately after withdrawal, craving has three distinct elements: craving is conscious, craving is best captured by an expression of desire, and that desire is directed toward the use of a specific substance (Drummond, 2001; Tiffany & Wray, 2011). Recent studies indicate that the clinical measurement of inhalant craving is possible (Kalayasiri et al., 2018), that there is a validated scale in asymptomatic population (Alonso-Matías et al., 2015), and that preliminary data from young users show presence of craving (Alonso-Matías et al., 2019). The data from these investigations indicate that the young asymptomatic and non-consuming population has scores ranging between zero and 18.5 millimeters (mm) on the ICQ.

It would be important to know the score from which the craving severity measure could be considered as clinically important in healthcare settings, since this could prove very useful in the diagnosis and treatment of inhalant use disorder. With this type of information, it would be possible to know the level of craving that users have during the rehabilitation process, allowing to identify if the treatment requires adjustments to better promote the prolongation of abstinence. The objective of this study was to describe the psychometric and clinimetric evidence of the craving scale in a sample of users.

METHODS

Participants

The non-probabilistic sample was made up of a total of 76 adults, divided into two groups according to the diagnostic of each subject. The first group consisted of 60 adults diagnosed with inhalant use disorder (IUD), and the second group consisted of 16 experimental users (EU), meaning subjects with clinical suspicion of use but without a diagnosis of dependence. Participants in the IUD group were selected according to the following criteria: diagnosed with an inhalant use disorder following the fifth edition of the Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013) criteria; absence of a comorbid mood or personality disorder; absence of documented head injury or neurological disorders; between 18 to 45 years old; admitted to and currently in detoxification treatment, and a minimum of 48 hours without using drugs before the test in order to exclude possible interference of substance use or withdrawal symptoms. The criteria for the EU group were: reporting the first-time use of inhalants; not having an inhalant use disorder according to the diagnostic criteria of the DSM-5; not having personality disorders, a neurological disorder or head trauma, and being between 18 and 45 years old.

Instrument

The Inhalant Craving Questionnaire (ICQ; Alonso-Matías et al., 2015) is a self-administered instrument of 10 items, with a Cronbach's alpha = .947 and with a craving limit starting at 18.5 mm in Mexican population. It has two sections: the first asks for information about consumption history, and the second part has ten statements that indicate different conditions, both must be answered on a visual analogous scale consisting of a 100 mm line, without divisions, in which the participant marks the point on the line that best describes the intensity of their desire to use inhalants. The distance from the start of the line to the point marked by the users is then measured and millimeters are recorded. An individual response to each item, as well as a global measurement, can be obtained through this. This instrument has been validated only in an asymptomatic population.

Procedure

Participants were recruited from a specialized center for the prevention and detoxification of psychoactive substances. In the first phase of the study, both outpatient users of the center who attended prevention courses, and users who were hospitalized for detoxification, were invited. Participation was voluntary and the confidentiality and anonymity of the users was assured. In the second phase of the study, the evaluation was carried out individually, and it was administered in a quiet room, during a session that lasted approximately 30 minutes. The first part of the session was the explanation and signing of the in-

formed consent, and then the semi-structured interview was administered to obtain sociodemographic and consumption history information. Finally, we applied the ICQ. The test was administered on paper and in a fixed order.

Ethical Considerations

This research was carried out in accordance to the Declaration of Helsinki and was approved ethics committee, register id: 206-17 and CEI/C/006/2018.

Statistical Analysis

In this cross-sectional study, a descriptive analysis of sociodemographic data was used for the variables of interest. To differentiate the IUD group from the EU group, non-parametric statistics (Chi-square test) were used for categorical variables and the Mann-Whitney U test was used to compare continuous data in two groups. Student's T analysis was applied when there was statistical normality.

The validation was carried out according to the good practice recommendations of Goretzko et al. (2021). The data processing and analysis were performed using the Jeffrey's Amazing Statistics Program (JASP), version .14.1 (Goss-Sampson, 2020), and the Statistical Package for the Social Sciences (SPSS), version 20 (IBM, 2011) software. Receiver Operating Characteristic (ROC) analysis was used to

Table 1
Sociodemographic characteristics and history use

	Total	EU	IUD	Test statistics		
Variables	*N = 76 (mean ± SD) or n (%)*	*n = 16 (mean ± SD) or n (%)*	*n = 60 (mean ± SD) or n (%)*	*U-MW*	*Z*	*X2*
Age	22.71 ± 5.51	18.50 ± .516	23.83 ± 5.69	120	- 4.63	
Education (years)	9.24 ± 2.51	10.81 ± .834	8.82 ± 2.64	202	- 3.63	
Onset age of consumption	15.78 ± 3.29	14.44 ± 2.25	16.13 ± 3.44	354	- 1.61	
Withdrawal time (days)	20.12 ± 16.46		20.12 ± 16.4			
Time of drug use						5.57
Less than 6 months	22 (29)	16 (100)	6 (10)			
6 months to 1 year	9 (12)		9 (15)			
1 to 2 years	13 (17)		13 (22)			
2 to 5 years	10 (13)		10 (17)			
5 years or more	22 (29)		22 (37)			
Number of volatile substance, n (%)						.842
one	42 (55)	10 (62)	32 (57)			
two or more	34 (45)	6 (38)	28 (47)			
Frequency of consumption, n (%)						18**
Once a month	13 (17)	11 (69)	2 (3)			
Two days a week	19 (25)	1 (6)	18 (30)			
Every 14 days	10 (13)	4 (25)	6 (10)			
Daily	34 (45)		34 (57)			
Attempts to stop using drug, n (%)						12.10*
None	16 (21)	16 (100)				
1 to 3 times	32 (42)		32 (53)			
4 to 6 times	15 (20)		15 (25)			
7 or more times	13 (17)		13 (22)			

Notes: U-MW = Mann-Whitney U Test; EU = experimental user group; IUD = inhalant use disorder group. Detailed only for contrasts that have proved significant; *$p < .05$; **$p < .001$.

Table 2
Descriptive data of the groups

Item of ICQ	Normal score	Total *N = 76* *(mean ± SD)*	Test statistics *T*	EU *n = 16* *(mean ± SD)*	IUD *n = 60* *(mean ± SD)*	Test statistics	
						U-MW	*Z*
Total craving	18.5	368 ± 221.72	13.75**	185 ± 136.25	417.15 ± 215	168**	-3.97
1		29.88 ± 27.57		15.5 ± 14.28	33.72 ± 29	307.5*	-2.20
2		34.75 ± 30.12		11.69 ± 13	40.90 ± 30.46	207.5*	-3.47
3		34.59 ± 30.32		14 ±19.27	40 ± 30.48	238.5*	-3.07
4		44.26 ± 32.78		16.87 ± 17.17	51.57 ± 32.15	186**	-3.74
5		45.45 ± 30.57		35 ± 32	48.22 ± 29.83	351	-1.64
6		27.55 ± 26.91		21.25 ± 23.49	29.23 ± 27.68	379	-1.28
7		40.66 ± 32.98		15.44 ± 19.83	47.38 ± 32.62	200.5**	-3.56
8		45.20 ± 33.1		23.5 ± 26.8	50.98 ± 32.38	246*	-2.98
9		36.66 ± 31.86		15.19 ± 15.22	42.38 ± 32.76	237*	-3.09
10		29.28 ± 30.48		16.5 ± 18.94	32.68 ± 32.15	343.5	-1.74

Notes. U-MW = Mann-Whitney U Test; ICQ = inhalant craving questionnaire; EU = experimental user group; IUD = inhalant use disorder group. Detailed only for contrasts that have proved significant; *$p < .05$; **$p < .001$.

determine ICQ sensitivity and specificity, as well as the ideal cutoff point to differentiate the groups.

The JASP software explored the structure of its components with an exploratory factor analysis to identify the underlying variables that explained the pattern of correlations observed between the items. Maximum likelihood estimation was used as the extraction method and oblimin was used as the oblique rotation method. The reliability of the item scores was obtained with Cronbach´s alpha and McDonald's omega coefficients, respectively.

RESULTS

Descriptive Analysis of the Sample

The total sample was 76 participants with an age of *M* = 22.71 (*SD* = 5.51). There were 19 women with an age of *M* = 25.47 (*SD* = 6.22) and 41 men with an age of *M* = 23.07(*SD* = 5.34) in the IUD group, and7 women with an age of *M* = 18.57, (*SD* = .527) and 9 men with an age of *M* = 18.44 (*SD* = .527) in the EU group. The IUD group had a lower educational level than the EU group with a mean 8.82 (± 2.64); the age of initiation of inhalant consumption was 16.13 (± 3.44); 47% consumed more than two substances; 37% of the participants had been using inhalants for 5 or more years (Table 1).

The absence of significant differences between the EU and IUD groups was confirmed, both in sex (women: 26.9% *vs.* 73.1% $p = .387$), in consumption of more than two substances (38 *vs.* 47; $p = .842$) and age of initiation of consumption (14.4 years, *SD* = 2.25, *vs.* 16.13, *SD* = 3.44; $p = .106$), the relationship between EU and IUD was 1/3.75. The predictive power of the sample was calculated, obtaining a value of .80 (.70 – .92). It was considered that both groups showed the necessary equivalence.

Total craving score of the ICQ for the IUD group was *M* = 417.15, *SD* = 215, and for the EU group was *M* = 185, *SD* = 136.25. The Student's T test result indicates a statistically significant score. In particular, when comparing the total score of users and the ICQ cut-off point of non-users. According to the U Mann-Whitney test, the total scores of each ICQ item reflected statistically significant differences when comparing the groups, mainly in items 1, 2, 3, 4, 7, 8 and 9 (Table 2).

ICQ Descriptive Analysis

Internal consistency of ICQ gave a Cronbach's alpha = .898, which represents a high internal consistency. In addition, all item-total correlations McDonald's omega were .900, indicating high reliability.

On the other hand, the results of the Kaiser-Meyer-Olkin index (KMO = .821) and Bartlett's sphericity test, (X^2 (45) = 416.087; $p < .001$) showed a good fit and identification of the data for their factorial analysis. The results of the factor analysis indicated a percentage of total explained variation of 47.3%. The 10 items were grouped into one single factor, which

Table 3
Principal component analysis and internal consistency of ICQ

Item of ICQ description	*RC 1*
1. Indicate how strong is your desire to consume ___ at this moment (so strong that you can almost feel its scent).	.761
2. Indicate how intense your desire to inhale ___ in the last month was.	.828
3. Indicate how often you felt the desire to inhale ___ in the last month.	.821
4. During the last month, indicate the urgency you felt to inhale ___ when you were exposed to things that reminded you of inhaling (bag of glue, PVC, odors, etc.).	.827
5. Imagine that you are in a situation that reminds you of consuming ___. If you were in that situation right now, what would be the possibility that you inhaled ___?	.601
6. Would you inhale ___ as soon as you had the opportunity?	.549
7. If I had inhaled ___ in the last month, I would not have been able to stop.	.552
8. If I had had___ in front of me in the last month, it would have been very difficult for me not to inhale it.	.584
9. To inhale ___ in the last month would have made me feel less irritable or restless.	.688
10. To inhale ___ in the last month would have made everything seem better.	.571
Variance cumulative	.473

Notes: ICQ = inhalant craving questionnaire; RC1 = component correlations.

means that all components showed coefficients above .540 (Table 3, Figure 1).

ROC analysis to differentiate both groups showed a cut-off point of 36 mm, with a sensitivity of .983 and specificity of .813 (1 = specificity of .187; Figure 2).

DISCUSSION AND CONCLUSIONS

Craving is an important criterion for diagnosis and treatment in inhalant use disorder. This phenomenon can be measured and in some way contribute to the prediction of the duration of abstinence and possible

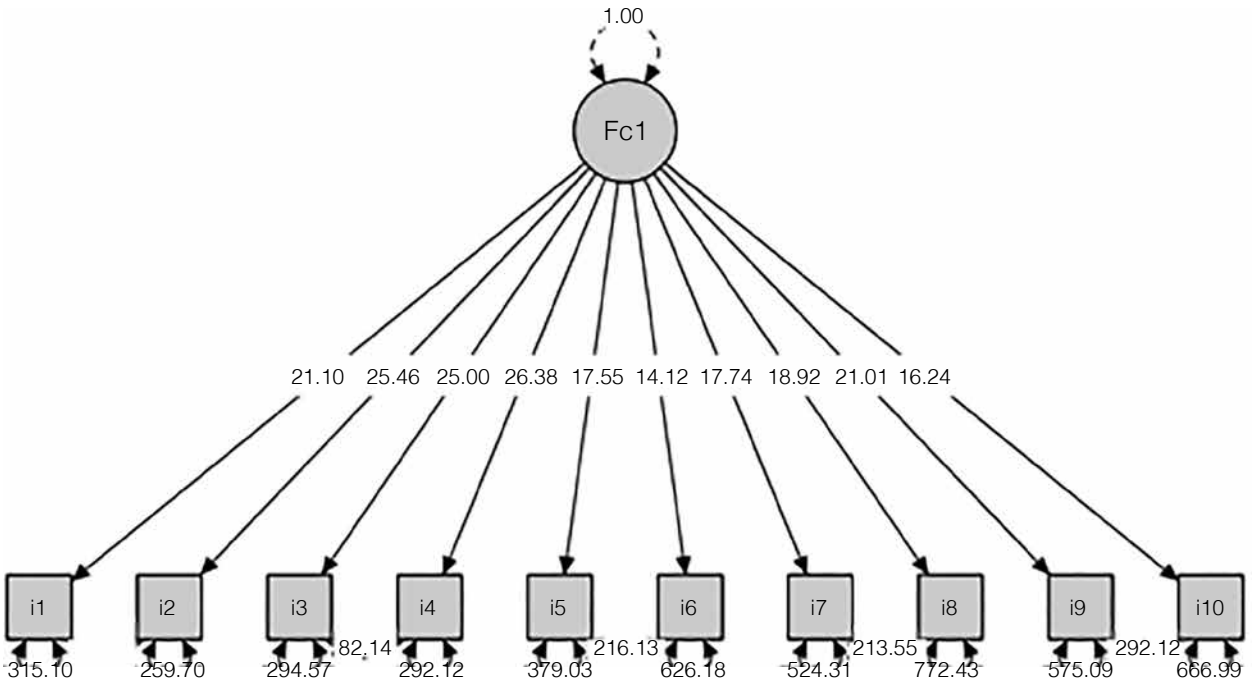

Figure 1. *Path Diagram.*

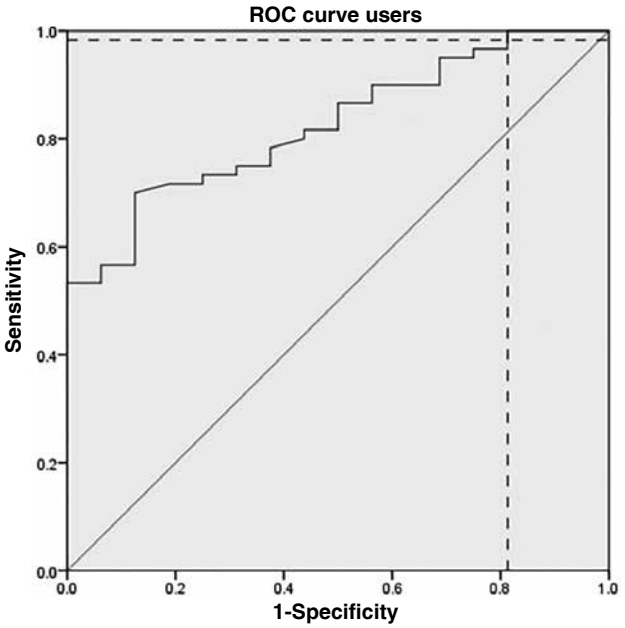

Figure 2. *ROC curve to discriminate between different groups of inhalant users.*

relapses within a detoxification process. According to these results, inhalant users present indicators of craving. Having quantitative clinical measurements allows detoxification processes to have better tangible control of the effectiveness of the treatments. According to the literature, craving considerably influences whether abstinence is prolonged; with this monitoring measurement, health personnel will be able to better understand the benefits of their treatments and help users achieve and authentic cure, defined by the World Health Organization (WHO) as the state of complete physical, mental and social well-being (WHO, 2020).

The initial data from this clinical study was based on a cut-off point of the ICQ scale, which provides a preliminary valid measure that can be used as a reference in the clinical setting. The results of the ROC curve analysis indicated that the questionnaire is suitable for assessment of craving severity in users. This instrument has adequate specificity and sensitivity.

The instrument in a previous validation in a non-consuming population had a craving range of 0 mm to 18.5 mm, a value that means absence of craving (Alonso-Matías et al., 2015). It was observed in this validation study in a sample of users that the cut-off point for craving is marked from 36 mm. When interpreting the results, it is concluded that a normal range of 0 mm to 18 mm is the absence of craving in non-users, 18 mm to 36 mm is the starting range for inhalant users, and 36 mm to 1000 mm is the range in which the intensity of craving is detected.

Finally, this research could benefit from conducting research on populations from different geographic areas to contrast responses, realizing longitudinal studies to determine craving behavior in inhalant users, increasing the sample size or the application in the user population in different stages of abstinence from inhalants, as well as applying the instrument in populations of substance users with analogous psychoactive substances.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding this study.

FUNDING

This research received no external funding.

ACKNOWLEDGEMENTS

Authors thank all volunteers for their participation in this study and CONAHCYT-IxM #1578.

REFERENCES

Alonso-Matías, L., Páez-Martínez, N., Reyes-Zamorano, E., & González-Olvera, J. J. (2015). Evidencias de validez de un cuestionario de craving a inhalables. *Adicciones*, *27*(4), 276-287. https://doi.org/10.20882/adicciones.752

Alonso-Matías, L., Reyes-Zamorano, E., & González-Olvera, J. J. (2019). Clinical and behavioral profile of young inhalant users. *Actas Españolas de Psiquiatría*, *47*(5), 171-178. https://actaspsiquiatria.es/index.php/actas/article/view/310/456

American Psychiatric Association, DSM-5 Task Force. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5™* (5th ed.). American Psychiatric Publishing, Inc.

Drummond, D. C. (2001). Theories of drug craving, ancient and modern. *Addiction*, *96*(1), 33-46. https://doi.org/10.1046/j.1360-0443.2001.961333.x

Goretzko, D., Pham, T. T. H., & Bühner, M. (2021). Exploratory factor analysis: Current use, methodological developments and recommendations for good practice. *Current Psychology*, *40*(7), 3510-3521. https://doi.org/10.1007/s12144-019-00300-2

Goss-Sampson, M. A. (2020). *Statistical Analysis in JASP 0.14: A Guide for Students*. November 2020.

IBM Corp. Released. (2011). *IBM SPSS Statistics for Windows, Version 20.0*. Armonk, NY: IBM Corp.

Kalayasiri, R., Maneesang, W., & Maes, M. (2018). A novel approach of substitution therapy with inhalation of essential oil for the reduction of inhalant craving: A double-blinded randomized

controlled trial. *Psychiatry Research*, *261*, 61-67. https://doi.org/10.1016/j.psychres.2017.12.015

National Institute on Drug Abuse [NIDA]. (2022). *What are inhalants?*, September 29. Retrieved from https://nida.nih.gov/publications/research-reports/inhalants/what-are-inhalants Aceess date May 16, 2024

Sayette, M. A. (2016). The Role of Craving in Substance Use Disorders: Theoretical and Methodological Issues. *Annual Review of Clinical Psychology*, *12*(1), 407-433. https://doi.org/10.1146/annurev-clinpsy-021815-093351

Tiffany, S. T., & Wray, J. M. (2011). The clinical significance of drug craving. *Annals of the New York Academy of Sciences*, *1248*(1), 1-17. https://doi.org/10.1111/j.1749-6632.2011.06298.x

Villatoro, J. A., Cruz, S. L., Ortiz, A., & Medina-Mora, M. E. (2011). Volatile Substance Misuse in Mexico: Correlates and Trends. *Substance Use & Misuse*, *46*(Suppl 1), 40-45. https://doi.org/10.3109/10826084.2011.580205

World Health Organization [WHO]. (2020). *Basic Documents - Constitution of the World Health Organization* (29th Ed.). https://apps.who.int/gb/bd/pdf_files/BD_49th-en.pdf#page=7