



FAGERSTRÖM TEST APPLICATION: INTEGRATIVE REVIEW
APLICAÇÃO DO TESTE DE FAGERSTRÖM: REVISÃO INTEGRATIVA
APLICACIÓN DE LA PRUEBA DE FAGERSTRÖM: REVISIÓN INTEGRADORA

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ABSTRACT

Objective: to systematize the knowledge on the Fagerström test application to the smoking population. **Method:** integrative review guided by the question “how has the ‘Fagerström Test for Nicotine Dependence’ been applied to the smoking population in scientific studies?”. Searches were conducted in the databases Latin American and Caribbean Literature on Health Sciences (LILACS), Medical Literature Analysis and Retrieval System Online (MedLine), by using the descriptors “application”, “validation”, “test”, and “Fagerström”. A total of 22 articles were selected in February and March 2014. **Results:** there was a predominance of international publications by healthcare professionals that aimed to classify nicotine dependence as mild, moderate, or severe. **Conclusion:** the articles selected for this review described the Fagerström test as a measurer of the nicotine dependence level that is easy to handle and self-applicable in various groups of people and age groups. **Descriptors:** Smoking; Fagerström Test; Review.

RESUMO

Objetivo: sistematizar o conhecimento sobre a aplicação do teste de Fagerström à população tabagista. **Método:** revisão integrativa norteada pela questão “como tem sido aplicado o ‘Fagerström Test for Nicotine Dependence’ à população tabagista em estudos científicos?”. As buscas foram realizadas nas bases de dados Literatura Latino-Americana e do Caribe em Ciências da Saúde (Lilacs) e Medical Literature Analysis and Retrieval System On-Line (MedLine), empregando os descritores “aplicação”, “validação”, “teste” e “Fagerström”. Foram selecionados 22 artigos, em fevereiro e março de 2014. **Resultados:** houve predomínio de publicações internacionais de profissionais da saúde que objetivaram classificar a dependência nicotínica como leve, moderada ou grave. **Conclusão:** os artigos selecionados para esta revisão descreveram o teste de Fagerström como um mensurador do nível de dependência de nicotina de fácil manejo e autoaplicável em diversos grupos e faixas etárias. **Descritores:** Tabagismo; Teste de Fagerström; Revisão.

RESUMEN

Objetivo: sistematizar el conocimiento acerca de la aplicación de la prueba de Fagerström a la población tabaquista. **Método:** revisión integradora norteada por la pregunta “¿Cómo se ha aplicado el ‘Fagerström Test for Nicotine Dependence’ a la población tabaquista en estudios científicos?”. Las búsquedas se realizaron en las bases de datos Literatura Latinoamericana y del Caribe en Ciencias de la Salud (LILACS) y Medical Literature Analysis and Retrieval System On-Line (MedLine), utilizando los descriptores “aplicación”, “validación”, “prueba” y “Fagerström”. Se seleccionaron 22 artículos en febrero y marzo de 2014. **Resultados:** hubo un predominio de publicaciones internacionales de profesionales de la salud que tuvieron como objetivo clasificar a la dependencia de la nicotina como leve, moderada o grave. **Conclusión:** los artículos seleccionados para esta revisión describieron la prueba de Fagerström como un medidor del nivel de dependencia a la nicotina que es fácil de manejar y auto-aplicable en diferentes grupos de personas y de edad. **Descritores:** Tabaquismo; Prueba de Fagerström; Revisión.

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INTRODUCTION

Smoking is regarded as a major public health problem for many reasons, among them the large number of smokers and the high risk of developing diseases related to continued use of nicotine.^{1,2} At the same time, nicotine addiction can generate more than 50 morbidities, such as lung diseases (emphysema and bronchitis), neoplasms (lung, mouth, larynx), coronary heart diseases (acute myocardial infarction), brain disorders (stroke), and hypertension.³

According to this premise, several studies have sought to reveal the progress of smoking as a habit. And a large majority identified variables that affect the onset, maintenance, and abandonment of smoking, as well as its consequences.^{1,3-12}

To assess the degree of physical dependence on nicotine, questionnaires and measuring instruments were developed. Stand out, for its wide use and validity, the “Fagerström Tolerance Questionnaire” and its revised version, the “Fagerström Test for Nicotine Dependence” (FTND), both designed by por Karl-Olov Fagerström, the first in 1978, and due to ease of use, this questionnaire has been the clinical standard in this field of work. The adaptation and validation of FNTD to Portuguese, with its psychometric properties, occurred in 2002.¹³

The instrument enables measuring the nicotine addiction degree through 6 questions, where the sum of scores ranges from 0 to 10, and determines the individual’s dependence degree on the substance, besides being self-administered. At low nicotine dependence, the score is less than 4; at moderate dependence, the score goes from 5 to 7; and at high dependence, the score is equal or higher than 8.³

Given the results pointed out by applying the Fagerström test, it is regarded as extremely significant that the researchers and/or professionals who use it have a greater mastery of this research and work tool, that is, go further with the results obtained by means of it.

OBJECTIVE

- Systematize knowledge on the Fagerström test application to the smoking population.

METHOD

To conduct the study, the integrative review was adopted, which is a research method consisting in analysis of scientific research, enabling the synthesis of knowledge on a particular subject. It involves 6 steps: theme identification, selection of the hypothesis or research question; establishment of criteria for including and excluding studies/sampling; definition of information to be extracted from the selected studies; assessment of included studies; interpretation of results and presentation of the review/knowledge synthesis.¹⁴ Also guided the study the “Preferred Reporting Items For Systematic Reviews And Meta-Analysis” (PRISMA), since, in their 27 items, there is indication of the flow to be followed by reviewers, focusing on the quality of results, with optimization and accuracy regarding the production of knowledge.¹⁵

Whereas FTND is a tool used to assess the nicotine addiction degree, the following question was prepared: “How has the ‘Fagerström Test for Nicotine Dependence’ been applied to the smoking population in scientific studies?”

The research took place in February and March 2014, by selecting the following descriptors to search the databases: “application”, “test”, “validation”, and “Fagerström”. To carry out the integrative review, we selected the databases Latin American and Caribbean Literature on Health Sciences (LILACS), Medical Literature Analysis and Retrieval System Online (MedLine), and PubMed. For this procedure, 3 independent researchers conducted the collection in each database.

The criteria for inclusion in the integrative review were: full and original scientific articles, published between 2003 and 2013, available online in English, Spanish, or Portuguese. All texts should address the application and/or validation of the Fagerström test. We excluded the studies that were repeated in databases and those that did not meet the inclusion criteria, as Figure 1 shows.

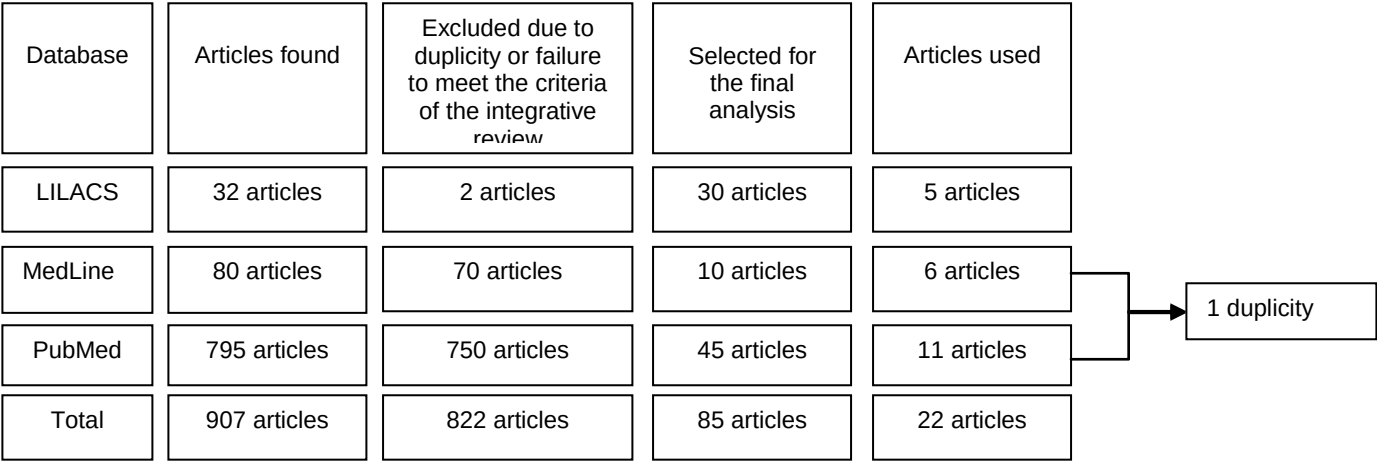


Figure 1. Flowchart of data collection for the integrative review. Goiás, 2014.

Data analysis was performed by means of translation and subsequent reading of articles. The information extracted was transcribed for the instrument validated by Ursi, which enabled the organization of each study into tables prepared in the software *Microsoft Word*, version 2007.

RESULTS

The sample of this integrative review resulted in 22 scientific articles for the final analysis. Out of these, 11 articles (50%) in the database PubMed, 5 (22.7%) in Lilacs, 5 (22.7%) in MedLine, and 1 (4.6%) in duplicate in PubMed/MedLine. For the final analysis, we selected 22 articles.

Box 1 displays a brief description of the articles selected for this integrative review.

In turn, Box 2 displays a synthesis of results from the articles.

Reference number	Identification/title	Authorship	Year	Country	Study type/evidence level	Population	Objective(s)
9	Brazilian validation of the Questionnaire of Smoking Urges	Araújo RB; Oliveira MS; Mansur MA.	2006	Brazil	Experimental design/level IV	201 subjects	Validate the Brazilian version of the Questionnaire of Smoking Urges.
5	Quality of life and severity of tobacco dependence	Castro MG; Oliveira MS; Moraes JFD; Miguel AC; Araújo RB.	2007	Brazil	Cross-sectional study/level IV	276 subjects	Evaluate the association between quality of life and tobacco dependence severity.
17	Level of physical activity and smoking in undergraduate students	Rodrigues ESR; Cheik NC; Mayer AF.	2008	Brazil	Cross-sectional study/level IV	871 university students	Evaluate the physical activity among university students and its association with smoking.
20	An assessment of the association between smoking status, pain intensity, and functional interference in patients with chronic pain	Weingarten TN; Moeschler SM; Ptaszynski AE; Hooten WM; Beebe TJ; Warner DO.	2008	USA	Randomized study/level II	500 patients	Characterize the smoking rate among patients provided with care in a tertiary outpatient pain unit and determine whether smoking is associated with the differences in pain intensity.
25	Smoking among hospitalized patients in a general hospital	Oliveira MVC, Oliveira TR, PereiraCAC, Bonfim AV, Filho FSL, Voss LR.	2008	Brazil	Cross-sectional study/level IV	110 patients	Determine the frequency of smoking among patients admitted to a general hospital and characterize the profile of hospitalized smokers.
6	Coping strategies for craving management in nicotine dependent patients	Araújo RB; Oliveira MS; Pedroso RS; Castro MGT.	2009	Brazil	Experimental study/level II	201 subjects	Investigate the association between craving intensity (according to the duration of nicotine withdrawal) and the types of coping skills used by nicotine-addicted patients.
21	Variants in nicotinic acetylcholine receptors alpha5 and alpha3 increase risks to nicotine dependence	Chen X; Chen J; Williamson VS; An SS; Hettema JM; Aggen SH; Neale MC;	2009	USA	Randomized study/level II	1121 subjects	Study the association of $\alpha 5$ and $\alpha 3$ subunits with nicotine dependence and symptoms of alcohol and <i>cannabis</i> abuse and dependence in two independent epidemiological samples.

Kendler KS.								
4	Tobacco dependence, assertiveness and alexithymia in cardiac patients	Rocha V; Guerra MP; Maciel MJ.	2010	Portugal	Descriptive quantitative study/level VI	30 men		Characterize the two types of nicotine dependence (physiological and behavioral), assertiveness and alexithymia, and evaluate the relation of variables together, in 30 men admitted with heart attack.
10	Assessment of nicotine dependence among adolescent and young adult smokers: a comparison of measures	Carpenter MJ; Baker NL; Gray KM; Upadhyaya HP.	2010	USA	Randomized clinical trial/level II	73 people	young	Examine the concurrent validity of two common dependence measures: the Fagerström Test for Nicotine Dependence (FTND) and the Checklist for nicotine-addicted people.
11	Factors that motivate smokers to seek outpatient smoking cessation treatment at a university general hospital	Russo AC; Azevedo RCS.	2010	Brazil	Descriptive and cross-sectional study/level IV	53 smokers		Describe the motivational factors pointed out by smokers to seek treatment for smoking cessation and relate them to sociodemographic and clinical data, stage of readiness to change, and nicotine dependence severity.
1	Tobacco cessation on patients assisted in an ambulatory of tobacco dependence treatment	Rossaneis MA; Machado RCB.	2011	Brazil	Descriptive study/level VI	12 people		Identify the socioeconomic and clinical profile of patients provided with care in the Tobacco Control Center.
3	Prevalence smokers students, a study to nicotine dependence	Calasans DA; Araújo GAS; Araujo DS; Alexandre AS; Sampaio LMM; Angelini AB.	2011	Brazil	Cross-sectional research/level IV	2030 university students		Evaluate the prevalence of smoking, analyze the nicotine dependence level among undergraduate students in Nursing, Physiotherapy, and Nutrition.
7	Epidemiology, radiology, and genetics of nicotine dependence in COPD	Kim DK; Hersh CP; Washko GR; Hokanson JE; Lynch DA; Newell JD; Murphy JR; Crapo JD;	2011	USA	Observational study/level IV	2500 subjects		Elucidate the relation between nicotine addiction, genetic susceptibility to nicotine addiction, and the results of volumetric cotinine among smokers.

Silverman KE.								
18	Degree of dependence influences the effect of smoking on cognitive flexibility.	Nesic J; Rusted J; Duka T; Jackson A.	2011	England	Cross-sectional study/level IV	48 volunteers	Investigate the acute effects of smoking on cognitive flexibility among smokers with low and high-dependency, defined by the FNTD score.	
2	Smoking and nicotine dependence in Singapore: findings from a cross-sectional epidemiological study	Pajusco B; Chiamulera C; Quaglio G; Moro L; Casari R; Amen G; Faccini M; Lugoboni F.	2012	Italy	Cross-sectional multicenter study/level IV	6616 subjects	Evaluate the prevalence of smoking among a large number of heroin addicted people attending substitution treatment with opioids; evaluate the relation between type (methadone, buprenorphine) and dosage of opioid substitution therapy and nicotine dependence.	
16	Prevalence of tobacco smoking among military policemen in Brazil	Rezende AAB; Rodrigues ESR; Herrera SDSC; Silveira JM; Barreto KKS; Carmo PHF.	2012	Brazil	Cross-sectional, descriptive, and exploratory study/level IV	165 military police men	Identify the prevalence of smoking among military police men in Gurupi, Tocantins, Brazil.	
19	An examination of the Fagerström Test for Nicotine Dependence among concurrent tobacco and khat users	Nakajima M; Al'Absi M; Dokam A; Alsoofi M; Khalil NS.	2012	Africa/Ara bian Peninsula	Cross-sectional study/level IV	103 users	Examine the psychometric properties of the Fagerström test among smokers who use khat.	
22	Assessment of nicotine dependence among smokers in a selected rural population in Kerala, India	Jayakrishnan R; Mathew A; Lekshmi K; Sebastian P; Finne P; Uutela A.	2012	India	Randomized study/level II	928 smokers	Understanding nicotine addiction of smokers selected for an intervention program of smoking cessation in Kerala, in rural India.	
23	Smoking and nicotine dependence in Singapore: findings from a cross-sectional epidemiological study	Picco L; Subramaniam M; Abdin E; Vaingankar JÁ; Chong SA.	2012	India	Epidemiological study/level IV	6616 participants	Describe the prevalence of smoking and nicotine dependence among adults living in Singapore; identify sociodemographic risk factors for smoking and investigate the association between nicotine dependence and physical and psychiatric disorders.	

8	Electronic cigarettes for smoking cessation: a randomised controlled trial	Bullen C; Howe c; Laugesen M; McRobbie H; Parag V; Williman J; Walker N.	2013	New Zealand	Randomized-controlled study/level II	657 people	Investigate whether electronic cigarettes are more effective than nicotine patches to help smokers quit.
12	Female sexual dysfunction in patients with substance-related disorders	Diehl A; Silva RL; Laranjeira R.	2013	Brazil	Cross-sectional study/level IV	105 women	Estimate the prevalence of female sexual dysfunction symptoms and associated risk factors in a sample of patients with substance-related disorders admitted to a specialized unit.
24	Tobacco use and nicotine dependence among conflict-affected men in Georgia	Roberts B; Chikovani I; Makhashvili N; Patel V; McKee M.	2013	USA	Cross-sectional study at home/level IV	1248 men	Describe consumption patterns and nicotine dependence among civil men affected by the conflict in Georgia and associations with mental disorders.

Box 1. Synthesis of selected articles with FTND application. Goiás, 2014.

Reference number	How has the Fagerström test been applied?	Professionals responsible for the application	Application purpose	Dependence level	Intervention
9	Individually, as data collection.	Psychologists	Classify nicotine addiction as mild, moderate, or severe.	Mild dependence level.	No type of intervention was performed.
5	Individually, as data collection.	Psychiatrist and psychologist	Assess the nicotine dependence severity.	139 mildly dependent individuals; 93 moderate and 43 high tobacco dependence level.	No type of intervention was performed.
17	Individually, as data collection.	Physiotherapists	Evaluate the nicotine dependence degree.	The degrees of very low and low nicotine dependence were the most prevalent among smokers.	It suggests preventive measures for providing the student with the possibility to modify the community where she/he operates.
20	Individually, in electronic medical records.	Nurses	Evaluate the score of nicotine dependence.	Severe (FTND $\geq$ 6) and moderate nicotine dependence (FTND < 6).	No type of intervention was performed.

25	Individually, data collection.	as	Physician	Evaluate the nicotine dependence degree.	Moderate dependence (average - 5).	No type of intervention was performed.
6	Individually, data collection.	as	Psychiatrist	Classify nicotine addiction.	258 dependent subjects with a moderate dependence degree.	Coping strategies and behavioral therapy.
21	Individually, data collection.	as	Geneticist physician	Assess tobacco dependence.	Moderate dependence.	No type of intervention was performed.
4	Individually, data collection.	as	Psychologists	Associate the results of various instruments applied.	Most respondents with moderate dependence (3-6).	No type of intervention was performed.
10	Individually, data collection.	as	Psychiatrist	Evaluate the nicotine dependence degree.	Moderate dependence (4-6).	No type of intervention was performed.
11	Individually, data collection.	as	Psychologists and psychiatrists	Classify the nicotine dependence degree.	High nicotine dependence degree.	No type of intervention was performed.
1	Individually, data collection.	as	Multidisciplinary team, consisting of: physicians, nurses, psychologists, social workers, and physiotherapists.	Assess the tobacco dependence severity.	High and very high nicotine dependence degree.	It uses behavioral therapy as a method, individual medical care and, if needed, medication.
3	Individually, data collection.	as	Physiotherapists	Analyze the nicotine dependence degree.	149 students with a mild level; 55 students with moderate and only 7 with high degree.	Proposed intervention: medical counseling, behavioral therapy.
7	Individually, data collection.	as	Geneticist physician	Assess nicotine dependence among current smokers.	Most respondents were classified as moderately addiction to nicotine.	It is recommended to consider the relations between nicotine dependence and COPD in epidemiological, radiological, and genetic studies.
18	Individually, data collection.	as	Pharmacists	Assess the nicotine dependence score.	Cases were classified as low and high dependence.	No type of intervention was performed.
2	Individually, data collection.	as	Physician	Evaluate the nicotine dependence degree.	High dependence (> 6).	There was intervention before the research, but it has not led to new actions.
16	Individually, in self-applicable way.	a	Physiotherapists	Assess the nicotine dependence degree.	There are high prevalence of very low and very high degree.	It is suggested to create anti-smoking awareness campaigns which are strong indications to

						minimize the prevalence of smoking, despite the deficiency in local actions against it.
19	Individually, data collection.	as Physician	Assess the nicotine dependence score.	Total scores were higher for men.		No type of intervention was performed.
22	Individually, data collection.	as Health professionals	Evaluate the dependence on nicotine among participants.	moderate dependence.		It is proposed that interventions are created, either individually or in the community, with guidance and group intervention programs.
23	Individually, data collection.	as Psychiatrist	Assess the nicotine dependence degree.	It does not describe.		No type of intervention was performed.
8	Individually, data collection.	as Physician	Obtain information about nicotine dependence.	Nicotine dependence level (> 5 or ≤ 5).		Low-intensity behavioral support through voluntary counseling by phone.
12	Individually, data collection.	as Psychiatrist	Assess the nicotine dependence degree.	47.6% had high or very high scores, i.e. high or very high nicotine dependence.		No type of intervention was performed.
24	Individually, data collection.	as Physician	Assess the nicotine dependence degree.	High nicotine dependence (≥ 6).		No type of intervention was performed.

Box 2. Synthesis of the application and results of selected studies. Goiás, 2014.

When analyzing the selected articles, we found out the use of FTND in heterogeneous groups regarding sex and age group, where adults stood out, with 16 individuals (72.7%), young adults, with 5 (22.7%), and teenagers, with 1 (4.6%).

As for the analysis of evidence level, the findings show a predominance of level IV studies, which refer to studies with non-experimental methodology or case studies.

Regarding the journals' origin, it was observed that 10 (45.4%) are from Brazil; 5 (22.7%) from the USA; 2 (9.1%) from India; and 5 (22.8%) from Portugal, England, Africa, New Zealand, and Italy, 1 for each location. As for the journal's scope, there was a predominance of international publication, with 12 articles (54.5%), and 10 national articles (45.5%).

The instrument use was multiprofessional, with a prevalence of publications in the areas of medicine, with 7 (31.8%), followed by psychology, with 6 (27.3%), physiotherapy, with 4 (18.2%), and biology and genetics, with 2 (9.1%). In the area of nursing, the publications were more restrained, with 1 (4.6%), as well as 1 (4.6%) in the areas of public health and mental health.

Regarding the publication years, 2012 stand out, with 5 (22.7%), followed by 2011, with 4 (18.2%), followed by 2008, 2010, and 2013, with 3 (13.6%). There were no publications in the period within 2003-2005, according to the inclusion criteria established for this integrative review.

The articles under analysis described FTND as an instrument restricted to measure the nicotine dependence level, complementary to its use in comparison and validation of other instruments that assess the same phenomenon.^{4,9}

DISCUSSION

The investigation pointed out a higher publication in 2012. This finding may indicate the increased number of researchers who are interested in studying

the application of FTND as an instrument to provide answers to guide the classification and the nicotine dependence degree.^{4,3,8,16}

In the descriptors used and the combination to each other, "test" and "Fagerström" revealed a greater number of articles, highlighting the fact that Fagerström is a non-controlled descriptor^{5-12,16-25}, followed by the combination of the descriptors "application" and "test" and "Fagerström"^{1,3,4} and "validation" and "test" and "Fagerström".

The scientific papers found have applied the test to characterize the smoking population.^{4,5,18,21} At the same time, they allowed measuring the physical dependence on smoking among the individuals surveyed, classifying it as mild, moderate, or severe.^{4,5} Analogously, this study corroborated the information that FTND is an effective instrument for tracking the nicotine dependence level, both for work or research purposes.

Another confirmation was that the self-applicable questionnaire may be aimed at various age groups, thus demonstrating the ease of application.¹⁶ The questionnaire efficiency is due to the fact it measures nicotine dependence in a given population, with a view to establish parameters to evaluate tobacco use cessation.¹

Complementing, FTND corroborates the planning of interventions, as it helps describing the condition that the person shows regarding her/his dependence and acceptance of the treatment to quit tobacco.¹¹ This distinction leads to coping actions for cessation or decrease in the consumption of tobacco and other drugs.^{1,6}

FTND also proves to be a good tool for validating and comparing other tests^{4,9}, in addition to its application in researches to determine the dependence levels that can generate comorbidities.⁴ Among the tools used, concomitantly with FTND, stand out: sociodemographic tools to identify people, depression rating and other drug use scales.^{1,5,9,24}

Assertive actions discussed in this integrative review suggest knowing the sociodemographic, psychological, and coping skills profile for tobacco cessation.¹ The development of smoking groups and population knowledge on it, through physicians and nurses, should also be appreciated.²⁶

It is also worth highlighting that there were several professionals from different health areas who used FTND in their studies. However, especially the physicians are not immune to using and consuming tobacco.²⁷ That is, test application pointed out a high nicotine dependence level among undergraduate students attending courses in the health field, i.e. it is observed that even knowing the consequences and the damage that smoking can cause, the individuals do not stop consuming tobacco products.^{3,17}

CONCLUSION

The synthesis of knowledge about the Fagerström test application has revealed an effective instrument for classifying nicotine dependence in different groups of people and age groups.

The analysis of articles showed that the instrument of multiprofessional use may be adopted in the selection of subjects for group studies, something which enables the health professional to assess the user's nicotine dependence level.

These findings also demonstrate that assessing nicotine dependence is indispensable in epidemiological studies and investigations on the effects of this psychoactive substance, as well as in studies related to the treatment for smoking and the various tobacco-related diseases.

The use of FTND enables a better standardized record of information, besides allowing the comparison of similar results and reducing subjectivity during data collection and record. However, limitations emerged from the study, consisting in the fact that the term "Fagerström" is not a controlled descriptor, something which

reinforces the need for this integrative review and the difficulty to find scientific articles describing the test application.

From this perspective, further research must focus on the application and assessment of results of the Fagerström test, in addition to the work of multiprofessional teams for smoking cessation or even to increase community knowledge, according to the rationale of health education. In short, it is suggested that studies with appropriate methodological design are more robust, because the study objective is comprehensive and complex, since smoking is a worldwide public health problem and it requires a consistent production of knowledge.

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