

# Nicotine Use and Cardiovascular Risk: A Review of the Fagerstrom Test as a Predictive Tool

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## ABSTRACT

*The research paper titled "Fagerstrom Test: Evaluating Subclinical Cardiovascular Risk in Nicotine Dependents" delves into the association between nicotine addiction and the likelihood of developing subclinical cardiovascular issues. This investigation utilizes the Fagerstrom Test for Nicotine Dependence (FTND), a widely recognized tool for gauging the severity of nicotine addiction, where higher scores reflect more intense dependency. Given the significant public health issue posed by cardiovascular disease and the known risks associated with smoking, the review critically examines existing studies on how nicotine affects cardiovascular health, the predictive capacity of the Fagerstrom score for cardiovascular events, and the broader consequences for those who use nicotine and their healthcare providers. A pivotal finding of this review is the potential link between nicotine dependency, as determined by the FTND, and an elevated risk of subclinical cardiovascular diseases. However, it's noted that nicotine may not be the only factor contributing to cardiovascular harm, as other elements in traditional cigarettes could also be influential. The study underscores the necessity of considering nicotine dependence in cardiovascular risk assessments for smokers and stresses the urgency for more comprehensive research to fully grasp the connection between nicotine addiction and cardiovascular health.*

*Keywords: fagerstrom test, cardiovascular disease*

## 1. INTRODUCTION

The research paper titled "Fagerstrom Test: Evaluating Subclinical Cardiovascular Risk in Nicotine Dependents" delves into the association between nicotine addiction and the likelihood of developing subclinical cardiovascular issues. This investigation utilizes the Fagerstrom Test for Nicotine Dependence (FTND), a widely recognized tool for gauging the severity of nicotine addiction, where higher scores reflect more intense dependency. Given the significant public health issue posed by cardiovascular disease and the known risks associated with smoking, the review critically examines existing studies on how nicotine affects cardiovascular health, the predictive capacity of the Fagerstrom score for cardiovascular events, and the broader consequences for those who use nicotine and their healthcare providers. A pivotal finding of this review is the potential link between nicotine dependency, as determined by the FTND, and an elevated risk of subclinical cardiovascular diseases. However, it's noted that nicotine may not be the only factor contributing to cardiovascular harm, as other elements in traditional cigarettes could also be influential. The study underscores the necessity of considering nicotine dependence in cardiovascular risk assessments for smokers and stresses the urgency for more comprehensive research to fully grasp the connection between nicotine addiction and cardiovascular health.

## 2. MATERIAL

### 2.1 Fagerstrom Test: An Overview

The Fagerstrom Test for Nicotine Dependence (FTND) stands as a cornerstone in the assessment of physical addiction to nicotine. Conceived by Karl-Olov Fagerström and subsequently refined in 1991 by Todd Heatherton and colleagues, the FTND provides a nuanced approach to evaluating nicotine dependence, specifically within the context of cigarette smoking. This assessment tool is characterized by its structured format, which includes six meticulously crafted questions that probe into the frequency of cigarette use, the urgency of the compulsion to smoke, and the overall magnitude of dependency. These questions are ingeniously designed to capture the essence of nicotine addiction through a blend of binary and multiple-choice queries, culminating in a scoring system that ranges from 0 to 10. The resulting score serves as a gauge of physical dependence on nicotine, with higher scores indicative of more profound addiction levels. It offers a graded assessment of nicotine dependence related to cigarette smoking. The test comprises six questions that evaluate cigarette use frequency, compulsion to smoke, and overall dependency(8)

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#### Fagerstrom Test for Nicotine Dependence

PLEASE TICK (✓) ONE BOX FOR EACH QUESTION		
How soon after waking do you smoke your first cigarette?	Within 5 minutes	<input type="checkbox"/> 3
	5-30 minutes	<input type="checkbox"/> 2
	31-60 minutes	<input type="checkbox"/> 1
Do you find it difficult to refrain from smoking in places where it is forbidden? e.g. Church, Library, etc.	Yes	<input type="checkbox"/> 1
	No	<input type="checkbox"/> 0
Which cigarette would you hate to give up?	The first in the morning	<input type="checkbox"/> 1
	Any other	<input type="checkbox"/> 0
How many cigarettes a day do you smoke?	10 or less	<input type="checkbox"/> 0
	11 – 20	<input type="checkbox"/> 1
	21 – 30	<input type="checkbox"/> 2
	31 or more	<input type="checkbox"/> 3
Do you smoke more frequently in the morning?	Yes	<input type="checkbox"/> 1
	No	<input type="checkbox"/> 0
Do you smoke even if you are sick in bed most of the day?	Yes	<input type="checkbox"/> 1
	No	<input type="checkbox"/> 0
<b>Total Score</b>		
<b>SCORE</b>	1- 2 = low dependence 3-4 = low to mod dependence	5 - 7= moderate dependence 8 + = high dependence

Images1. Scoring the Fagerstrom Test For Nicotine Dependence(<https://www.aarc.org>)

The reliability and validity of the FTND have been the subject of extensive evaluation. Research findings suggest that the test demonstrates moderate test-retest reliability, with variability in scores reflecting a range from moderate to high consistency over

time. Specifically, reliability scores have been reported to span from 0.56 to 0.92, highlighting a generally reliable measure of nicotine dependence across different time points. Moreover, the FTND has shown commendable construct validity, further cementing its utility and accuracy in measuring the construct it intends to assess. Despite its broad application and the value it adds to both clinical practice and research, the FTND is not without its criticisms. Some critiques have been raised regarding its psychometric properties, suggesting that there may be aspects of nicotine dependence that the test does not fully capture or quantify accurately. These limitations notwithstanding, the FTND remains a widely used instrument across various contexts, from clinical assessments to research studies delving into the intricate relationship between nicotine dependence and its health implications, such as Chronic Obstructive Pulmonary Disease (COPD).(10)

In clinical and research settings alike, the FTND is pivotal for screening purposes, facilitating the identification of individuals with varying levels of nicotine dependence. It also plays a crucial role in the planning of treatment interventions and in predicting treatment outcomes, offering a standardized measure that can be used universally. The FTND's contribution to understanding the link between nicotine dependence and an array of health conditions underscores its significance, paving the way for targeted research and intervention strategies aimed at mitigating the health risks associated with nicotine addiction.(11).

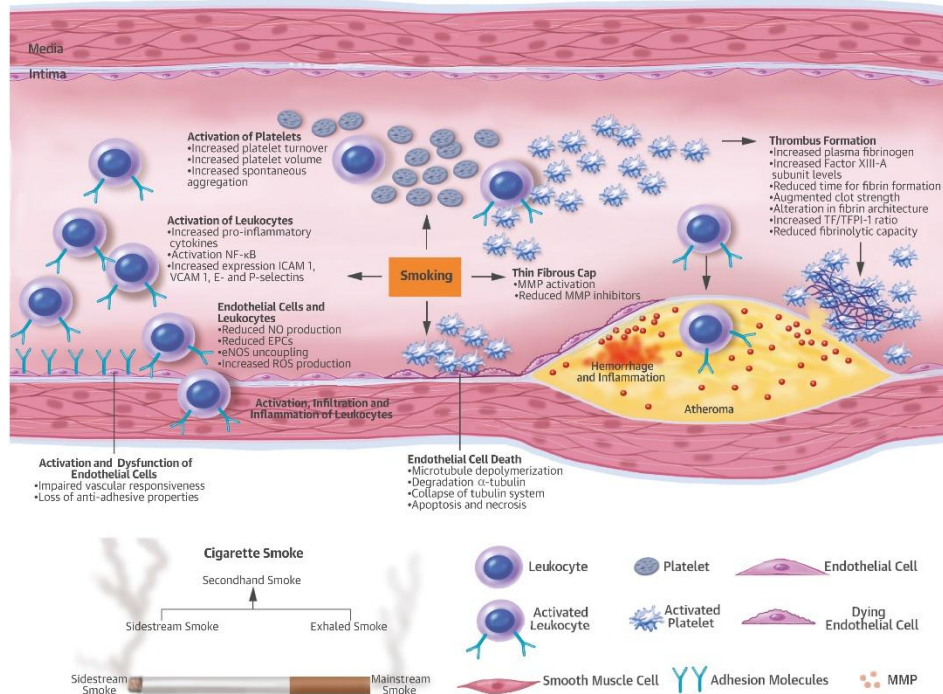
## **2.2 Nicotine Use and Cardiovascular Risk**

Nicotine, mainly through smoking, is closely linked to an elevated risk of CVDs. According to the World Health Organization, tobacco-induced heart disease is responsible for one-fifth of all heart disease deaths, with smokers facing a higher risk of acute cardiovascular events at an earlier age than non-smokers (12).

Nicotine impacts cardiovascular health in multiple ways: it increases cardiac output by raising heart rate and myocardial contractility (3). prompts acute spikes in blood pressure and heart rate, and can lead to inflammation, altered lipid metabolism, and a hypercoagulable state, all contributing to atherosclerosis (13). Furthermore, nicotine use can result in a hypercoagulable state, inflammation, and changes in lipid metabolism, all of which contribute to the development of atherosclerosis.

Epidemiological studies highlight the cardiovascular dangers of nicotine use. For instance, cigarette smoking in the U.S. is linked to about 140,000 premature CVD-related deaths annually(14). Even short-term smoking can increase heart rate, blood pressure, and aortic stiffness(13).

Subclinical cardiovascular alterations are also observed in nicotine users. Research indicates a dose-dependent association between smoking intensity and inflammation, with biomarkers like hsCRP, IL-6, and fibrinogen showing significant correlations(15). Additionally, chronic e-cigarette users have shown marked impairments in coronary microvascular endothelial function, surpassing those in traditional cigarette users (16).



Morris, P.B. et al. J Am Coll Cardiol. 2015; 66(12):1378-91.

**Images 2.** Exposure to cigarette smoke and secondhand smoke leads to harmful effects (Morris, P.B. et al. J Am Coll Cardiol. 2015; 66(12):1378–91)

In essence, nicotine use, primarily via smoking, significantly escalates cardiovascular disease risk. This risk stems from various physiological changes, including increased heart rate, blood pressure, inflammation, changes in lipid metabolism, and blood coagulation, potentially leading to subclinical cardiovascular changes and eventually manifesting as overt CVD

### 2.3 Application of the Fagerstrom Test in Cardiovascular Risk Assessment

The Fagerstrom Test for Nicotine Dependence (FTND) emerges as a cornerstone in the landscape of nicotine addiction assessment, with profound implications for cardiovascular risk evaluation. In both clinical and research milieus, the FTND serves a critical screening function, enabling the identification of individuals across the spectrum of nicotine dependence. This nuanced differentiation is paramount, as it informs the subsequent steps in clinical care, from the customization of treatment interventions to the anticipation of patient outcomes. Through its provision of a standardized metric, the FTND facilitates a uniform approach to addiction assessment, thereby ensuring consistency and comparability across diverse settings and populations.(7).

However, the integration of the FTND into cardiovascular risk assessment poses an intriguing challenge, particularly when juxtaposed with other established cardiovascular risk evaluation tools. The direct comparison between the FTND's predictive accuracy for cardiovascular events and that of other tools, such as the Framingham Risk Score (FRS), the Systematic Coronary Risk Evaluation (SCORE), and the Progetto CUORE model, has yet to be thoroughly explored. While existing studies have primarily focused on the correlation between FTND scores and specific cardiovascular risk factors or markers, the tool's efficacy in predicting cardiovascular incidents remains a relatively uncharted territory.

This gap in research underscores the need for comprehensive studies aimed at elucidating the FTND's comparative value in cardiovascular risk assessment.(18).

The potential of the FTND as an indicator of subclinical cardiovascular disease among nicotine-dependent individuals has begun to emerge from the research. Studies have demonstrated a correlation between nicotine dependence, as quantified by the FTND, and an elevated risk of atherosclerosis in long-term smokers, as well as an association with the development of carotid artery stenosis. These findings hint at the FTND's capacity to serve as a valuable marker for early cardiovascular disease manifestations in populations at risk due to nicotine use (19).

Despite its utility, the application of the FTND in cardiovascular risk assessment is not without limitations. The test's focus on physical nicotine dependence may not fully capture the multifaceted nature of smoking addiction, which encompasses behavioral, cognitive, and social dimensions. Furthermore, the test's relevance to individuals who use both traditional cigarettes and emerging nicotine delivery systems, such as electronic cigarettes, remains uncertain.(20)

### **3. Conclusion**

In conclusion, the application of the Fagerstrom Test for Nicotine Dependence (FTND) within the field of cardiovascular health provides invaluable insights into the nexus between nicotine dependency and cardiovascular disease (CVD). The FTND's capacity to discern subclinical cardiovascular conditions in individuals with nicotine dependency underscores its utility as a predictive tool. However, it is crucial to recognize the limitations of the FTND, notably its emphasis on physical dependency and its constrained applicability to individuals who concurrently use traditional and electronic cigarettes.

The potential benefits of integrating the FTND with established cardiovascular risk assessment tools are significant, suggesting a promising avenue for research. Such integrative approaches could enhance our understanding of the FTND's predictive power for cardiovascular outcomes, offering a more comprehensive assessment of cardiovascular risk among nicotine users. This endeavor could uncover nuanced insights into how nicotine dependency influences cardiovascular health, thereby informing targeted intervention strategies.

The broader implications of these insights extend into clinical practice and public health policy formulation. By leveraging a deeper understanding of nicotine's role in CVD risk, healthcare professionals can tailor interventions more effectively, and policymakers can develop strategies that more accurately target the reduction of CVD risks among nicotine users. Ultimately, the continued exploration and refinement of tools like the FTND, in concert with other cardiovascular risk assessment methodologies, hold the promise of advancing our efforts to mitigate the impact of nicotine dependency on cardiovascular health. This progression is essential for crafting comprehensive, evidence-based approaches to reduce the burden of cardiovascular diseases in populations worldwide, marking a critical step forward in the ongoing battle against CVD.

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