Assessing Nicotine Dependence

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Due to the many health risks associated with smoking, the topic of smoking cessation – assessment, prediction, and successful abstinence – is important. Primary care physicians play a pivotal role in helping patients quit smoking. Standardized tools for the assessment of nicotine dependence are imperative for clinical research and subsequent use with patients. Such tools provide more precise diagnostics as well as targeted treatment interventions. Thus, the psychometrics of nicotine dependence assessments used by clinicians is clinically useful. This brief report details some of the major assessment instruments used to aid in facilitating more successful smoking cessation.

Background of the Fagerstrom measures

For decades, it has been known that nicotine dependence is a major reason that many smokers are unable to quit smoking. Several typologies with scales to measure them were developed in the 1960s and 1970s that relied on smokers' self-understanding and self-reporting of their specific reliance on nicotine. However, a more behaviorally-based 8-item measure, the Fagerstrom Tolerance Questionnaire (FTQ), was developed, used widely, and examined empirically. The FTQ included specific questions about the number of cigarettes smoked per day, how soon after waking the first cigarette was smoked, and so on. Research found positive correlations between participants' FTQ scores and nicotine or cotinine blood levels as well as more severe nicotine withdrawal symptoms. [1]

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Although the original FTQ was subjected to considerable research and proved promising, issues with particular items were noted. Thus, Heatherton and colleagues examined systematically each FTQ item in their research, comparing FTQ results for subsets of smokers (e.g., those who had their first cigarette earlier vs later in the day, nicotine yield of cigarettes used) with results for a measure composed of just two key FTQ items, entitled the Heaviness of Smoking Index (HSI), which compared favorably with the FTQ. A revision of the FTQ dropped two weak items and revised the scoring for two other items. The revised measure, renamed the Fagerstrom Test for Nicotine Dependence (FTND) displayed stronger psychometric and conceptual properties than the parent measure. There was also solid support for the HSI, which could be used as a quick screen to identify level of dependence in daily smokers in settings such as pulmonary or general internal medicine clinics. [2]

The FTND has been used widely, e.g., comparing smoking data from 15 countries. Although smoking has decreased overall in recent decades, remaining smokers may be more smoking-dependent. A strong negative correlation ($-r$=-0.73, p=0.001) between countries' smoking prevalence and current smokers' FTND scores prompted the suggestion that as societies succeed in lowering the smoking rates, those people who continue to smoke may be more recalcitrant. [3] This has been referred to by various scholars as the "hardening hypothesis." If that hypothesis is correct, then today's smokers may need more intensive treatment to quit smoking.

It has been noted that nicotine replacement might serve as a confounding variable when assessing FTND scores and successful smoking cessation. Recent research reframed the question to assess varenicline's possible role in the FTND and HSI relationships with smoking abstinence. [4] Although a detailed discussion can be found in the original paper,

Table 1. Fagerstrom Test of Nicotine Dependence (FTND)

Items	Responses	Scoring
1. How soon after you wake up do you smoke your first cigarette? *	Within 5 minutes	3
	6-30 minutes	2
	31-60 minutes	1
	After 60 minutes	0
2. Do you find it difficult to refrain from smoking in places where it is forbidden or not allowed?	Yes	1
	No	0
3. Which cigarette would you hate most to give up?	The first one in the AM	1
	All others	0
4. How many cigarettes per day do you smoke? *	10 or less	0
	11-20	1
	21-30	2
	31 or more	3
5. Do you smoke more frequently during the first hours after waking than during the rest of the day?	Yes	1
	No	0
6. Do you smoke if you are so ill that you are in bed most of the day?	Yes	1
	No	0

***Note:** the HSI consists of items 1 and 4 from the FTND and uses the same response and scoring items. Also, if the FTND is to be used for non-research purposes, please request permission from K.O. Fagerstrom.

essentially 10 studies by Pfizer were included in a pooled analysis of cigarette smokers motivated to quit smoking. Patients in Phase 2-4 clinical trials received either varenicline or placebo. All patients reportedly received brief (up to 10 min.) smoking cessation counseling at weekly or biweekly clinic visits. A number of interesting findings emerged, but two stand out. First, there was no interaction between initial FTND and HSI scores and treatment modality (varenicline, placebo). Thus, nicotine replacement with varenicline was not a confounding variable and did not affect the validity of either the HSI or the FTND. Second, as expected, the FTND and HSI performed similarly, with the authors emphasizing the utility of the HSI, at least for predicting abstinence outcome.

Critiques of the Fagerstrom Measures

Both reliability and validity are essential in a measure, and both internal consistency reliability and test-retest reliability have varied across studies of the FTND. [5] Regarding content validity, the FTND is missing components of substance dependence defined by both the ICD-10 and DSM-IV. In addition, higher ratings of dependence on FTND at baseline significantly predicted increased ratings of cravings at one-month follow up, but not other important withdrawal symptoms. [6]

Although the FTND has been considered unidimensional, more recent research has suggested two smoking factors rather than one factor: (1) morning smoking and (2) daytime smoking. For example, individuals may score high on one factor (e.g., heavier morning smoking) and lower on the other factor (e.g., lighter daytime smoking). Thus, if a total scale score is calculated, the most severe dependence problems may be masked. This could limit clinicians' potential for tailoring treatment interventions that will be effective in facilitating smoking cessation. [7] It has even been suggested that the FTND name be changed to the Fagerstrom Test of Cigarette Dependence (FTC) to reflect both its focus on only cigarettes and to communicate the understanding that dependence is driven by multiple factors (e.g., having a spouse/partner who smokes). Although it is beyond the scope of this review, it is also important to be aware of nicotine dependence due to smokeless tobacco, cigar smoking, and pipe smoking. [8]

An alternative to the FTND, the Cigarette Dependence Scale was developed. [9] This 12-item measure (CDS-12) covers the ICD-10 and DSM-IV criteria for dependence and has been shown in some research to have better reliability figures than the FTND, better prediction of smoking cessation at six-week follow up, and better prediction of withdrawal across more domains. [6, 9] In addition, a shorter version, the CDS-5, is similar to the FTND in reliability and validity. [6] Although these scales are promising, the CDS-12 is twice as long as the FTND, and neither the CDS-12 nor its shortened version has been subjected to the breadth and depth of research that characterizes the FTND.

Conclusions

Helping patients to quit smoking is a primary care priority, and any mechanism that moves that priority ahead is a positive one. The FTND is a six-item, well established measure. The HSI is a two-item measure suitable for brief screening. The CDS-12 and CS-5 are newer measures with good psychometric properties but less research yet available. The best choice for each provider may depend on existing clinic procedure, access to measures, and time allotted to appointments. What need not vary, however, is the provider's insistence that smoking cessation is important to the patient's health and longevity and is a high priority for a provider who cares. Please see table 1 to view the FTND and HSI measures.

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References

1. Fagerstrom K-O, Schneider NG. Measuring nicotine dependence: A review of the Fagerstrom Tolerance Questionnaire. Journal of Behavioral Medicine 1989; 12: 159-182.
2. Heatherton, LT, Kozlowski RC, Frecker RC, Fagerstrom K-O. The Fagerstrom Test for Nicotine Dependence: A revision of the Fagerstrom Tolerance Questionnaire. British Journal of Addiction 1991; 86: 1119-1127.
3. Fagerstrom K, Furberg H. A comparison of the Fagerstrom Test for Nicotine Dependence and smoking prevalence across countries. Addiction 2008; 103: 841-845.
4. Fagerstrom K, Russ C, Yu C-R, Yunis C, Foulds J. The Fagerstrom Test for Nicotine Dependence: A pooled analysis of varenicline clinical trial data. Nicotine & Tobacco Research 2012; 14: 1467-1473.
5. Weinberger AH, Reutenauer EL, Allen TM, Termine A, Vessicchio JC, Sacco KA, Easton CJ, McKee SA, George TP. Reliability of the Fagerstrom Test for Nicotine Dependence, Minnesota Nicotine Withdrawal Scale, and Tiffany Questionnaire for smoking urges in smokers with and without schizophrenia. Drug and Alcohol Dependence 2007; 86: 278-282.
6. Etter JF. A comparison of the content-. Construct -, and predictive validity of the cigarette dependence scale and the Fagerstrom test for nicotine dependence. Drug and Alcohol Dependence 2005; 77: 259-268.
7. Richardson CG, Ratner PA. A confirmatory factor analysis of the Fagerstrom Test for Nicotine Dependence. Addictive Behaviors 2005; 30: 697-709.
8. Fagerstrom K, Eissenberg T. Dependence on nicotine and nicotine products: A case for product-specific assessment. Nicotine & Tobacco Research 2012; 14: 1390.
9. Stavem K, Rogeberg OJ, Olsen JA, Boe J. Properties of the Cigarette Dependence Scale and the Fagerstrom Test of Nicotine Dependence in a representative sample of smokers in Norway. Addiction 2008; 103: 1441-1449.