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Short communication

The Fagerström Test for Nicotine Dependence in a Dutch sample of daily smokers and ex-smokers

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Abstract

We explored the performance of the Fagerström Test for Nicotine Dependence (FTND) in a sample of 1378 daily smokers and 1058 ex-smokers who participated in a survey study of the Netherlands Twin Register. FTND scores were higher for smokers than for ex-smokers. Nicotine dependence level was not associated with age. FTND score was highly correlated with the maximum number of cigarettes smoked (even after excluding the item 'number of cigarettes per day' from FTND), but the FTND score showed a low correlation with age of first cigarette and total number of years smoked. In a subsample of smokers ($n = 143$) and ex-smokers ($n = 181$) the test–retest correlations for the FTND were high. In general, the performance of the FTND in ex-smokers was comparable with that in smokers. These findings suggest the FTND to be a valuable tool for studies of nicotine dependence in large epidemiological samples.

Keywords: FTND; Daily smokers; Ex-smokers; Internal consistency; Test–retest correlation

1. Introduction

For both clinical practice and for research on smoking, it is useful to have a measure of the degree of nicotine dependence, which can be used in large epidemiological samples. To assess nicotine dependence, structured interviews like the *DSM-IV* can be used or, alternatively, self-report measures of nicotine dependence, such as the Fagerström Tolerance

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Questionnaire (FTQ). The FTQ was developed in 1978 (Fagerstrom, 1978), and a revised version was published in 1991: the Fagerström Test for Nicotine Dependence (FTND), (Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991). The FTND consists of six items, which all loaded on a single factor. The internal consistency was 0.61. Fagerstrom et al. (1996) compared the FTND data of treatment and population studies. FTND scores ranged from 5.15 to 6.55 in treatment samples, and lower FTND scores, ranging from 3.07 to 4.30, were found in population samples of current smokers. More recent studies have found comparable, or even lower, scores in population-based samples, ranging from 1.84 to 3.2 (Etter, Vu Duc, & Perneger, 1999; John et al., 2003).

There are few longitudinal studies that collected FTND data, but the test–retest correlations in those studies were high, ranging from .85 in a French sample to .88 in an American sample (Etter et al., 1999; Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994). As far as we know, there are no publications on the performance of the FTND in ex-smokers. It might be useful to have a measure of the degree of nicotine dependence for all participants who ever smoked (independent of their current smoking status). For example, genetic studies assume that there is an underlying liability for nicotine dependence. If there is an underlying (genetic) liability for nicotine dependence, then, the exclusion of the ex-smokers can cause bias and can decrease the sample size unnecessary in, for example, family studies of (genetic) influences on nicotine dependence.

We assessed the performance of the FTND in a sample of daily smokers ($n = 1378$) and a sample of ex-smokers ($n = 1058$) aged 16 years and older. Retest data were available for 324 participants.

2. Methods

As part of a longitudinal survey study of the Netherlands Twin Register, smoking data were collected in 6792 participants in 2000 (Boomsma et al., 2002). There were 3939 (58.5%) nonsmokers, 1732 (25.7%) current smokers, and 1058 (15.7%) ex-smokers. FTND data were available for 1378 daily smokers (584 men, mean age = 30.3, S.D. = 9.0, and 794 women, mean age = 30.6, S.D. = 10.4) and for 1058 ex-smokers who reported on the period they smoked the heaviest (368 men, mean age = 38.6, S.D. = 14.3, and 690 women, mean age = 37.1, S.D. = 11.8). A subsample of 606 participants took part in the survey study of 2000, as well as in a genetic linkage study of ND. The average interval between the two FTND measurements was 1.8 years (S.D. = 0.25). Only participants who reported to be daily smokers at both measurements (FTND available for $n = 143$) or who reported to be ex-smokers at both measurements (FTND available for $n = 181$) were included in the analyses for the test–retest correlations.

We used the Dutch version of the FTND. The same scoring system was employed as described in Heatherton et al. (1991). Other variables considered in the analyses were "At what age did you smoke your first cigarette" and "At what age did you start smoking regularly?," with answer categories 11 years or younger, 12–13, 14–15, 16–17 years, 18 years or older, or never, and "How many years did or do you smoke?" To determine the

maximum number of cigarettes smoked per day, the participants (both current smokers and ex-smokers) were classified as never smokers, never smoked regularly, <1, 1–5, 6–10, 11–20, 21–30, and more than 30 cigarettes/day. The classification for these other variables was constructed by taking the answers to all available surveys (1–5) into account.

All statistical analyses were performed using SPSS 11.5 windows. The internal consistency of the FTND was assessed by Cronbach's alpha. To investigate the test–retest reliability, correlations between the two measurements were obtained using the Pearson–Lawley correction for selected samples (Lawley, 1943). This correction method is used because the subsample that completed the FTND twice was selected for a gene-finding study of ND on the basis of scores on the first measurement.

3. Results

For smokers, the mean score of the FTND was significantly higher for men than for women, respectively, 3.02 and 2.77 ($t=2.02$, $df=1376$, p=.041). Post hoc analysis showed that men reported significantly higher values on the item 'number of cigarettes per day' (Mann–Whitney test; $P=.006$); scores on the other five items were not different for men and women. For ex-smokers, the FTND scores in men were also higher than the FTND scores in women, but differences were not statistically significant (respectively, 2.22 and 1.97, $t=1.72$, $df=1044$, $P=.085$). FTND scores of ex-smokers were lower than the FTND scores of smokers. The internal consistency of the FTND was reasonably high, with Cronbach's alpha of .65 for male smokers, .69 for female smokers, .66 for male ex-smokers, and .71 for female ex-smokers.

Correlations between FTND score and age were low for female smokers ($r=.09$) and not significant for male smokers and ex-smokers. Correlations with age of first cigarette, age of regular smoking, and total number of years smoked were significant but low. The only exception was the maximum number of cigarettes per day. which correlated highly with FTND score, even when the item 'number of cigarettes per day' was excluded from the FTND score (Table 1).

Table 1
Correlation among FTND scores of daily smokers and ex-smokers and other smoking variables

	Smokers		Ex-smokers	
	Males	Females	Males	Females
Age first cigarette	−.19	−.08	−.11	−.17
Age regular smoking	−.26	−.19	−.20	−.22
Number of years smoked	.10	.17	.19	.35
Maximum number of cigarettes smoked per day	.70	.66	.79	.75
Maximum number of cigarettes smoked per day (with FTND score without number of cigarettes/day)	.51	.50	.60	.59

All correlation are significant at the $P<.05$ level.

In the test–retest sample, the mean FTND score of the first measurement was not significantly different from the mean FTND score at the second measurement occasion. The test–retest correlations (Pearson–Lawly correction) were .70 for male smokers, .83 for female smokers, .91 for male ex-smokers. and .83 for female ex-smokers. These correlations did not differ much from the regular Pearson Product–Moment Correlations (.72 for male smokers, .85 for female smokers, .92 for male ex-smokers, and .86 for female ex-smokers).

4. Discussion

The FTND scores in the sample of daily smokers were comparable with those in other population studies (Fagerstrom et al., 1996; John et al., 2003). Our finding that males scored higher on the FTND than females did was also in line with those studies. Interestingly, post hoc analyses in the present study showed that the gender differences were limited to one of the six items: the number of cigarettes per day. Studies have shown that cigarette nicotine dose may be less important for the reinforcing effects of smoking for women compared with men (Perkins, Jacobs, Sanders, & Caggiula, 2002). Less is known with regard to the performance of the FTND in populations of ex-smokers. Our results showed that the mean FTND scores of ex-smokers who reported on the period they smoked the heaviest were not significantly different for men and women and were lower than the mean scores of smokers. Fagerstrom et al. (1996) quoted a written communication that also showed former daily smokers to have lower dependence levels than current smokers. It is likely that those smokers who succeed in smoking cessation are the ones who are less nicotine dependent.

Our data showed a reasonably high internal consistency for the Dutch version of the FTND in daily smokers, which is in line with other studies (Heatherton et al., 1991). No studies have investigated the internal consistency of the FTND in ex-smokers. Our results showed that the internal consistency of the FTND for ex-smokers was comparable with the internal consistency of the FTND for smokers.

We did not find a correlation between FTND score and age. A study with current smokers aged 20 years and older also concluded that the FTND score was independent of age (John et al., 2003). Results showed that the lower the age of smoking the first cigarette and the age when starting regular smoking, as well as the higher the number of years smoked, the higher the FTND score. This is in line with other studies (Lando et al., 1999; Horn, Fernandes, Dino, Massey, & Kalsekar, 2003; John et al., 2003). Our results showed stronger correlations between FTND score and number of years smoked for ex-smokers than for smokers; this could be due to the age-difference between the smokers and the ex-smokers. For both smokers and ex-smokers, the FTND score was highly correlated with the maximum number of cigarettes smoked per day. Although these correlations were somewhat lower when the item ‘number of cigarettes per day’ was removed from the FTND score, they were still relatively high. Thus, part of the variance in FTND score is explained by the maximum number of cigarettes smoked per day (25–26% for smokers and 34–36% for ex-smokers), but this also indicates that the FTND measures additional aspects of nicotine dependence.

Test–retest correlations of the Dutch FTND were high and are in line with two other studies that have reported test–retest correlations for smokers (Etter et al., 1999; Pomerleau et al., 1994). As far as we know, no reports of test–retest correlations in ex-smokers are published. Our results show that the test–retest correlations for ex-smokers were comparable with the test–retest correlations for smokers.

In conclusion, our data suggest sufficient internal consistencies and test–retest reliabilities for the Dutch version of the FTND in daily smokers and ex-smokers. Together, these findings suggest the FTND is a reliable questionnaire to measure nicotine dependence in smokers as well as ex-smokers.

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