

Relations Between Individual Differences in Nicotine-Dependence Severity, Nicotine Consumption, and Relative Reinforcing Value of Cigarettes in Vulnerable Populations of Smokers

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Background

Correlation Results

Regression Results (cont.)

- Cigarette smoking is disproportionately prevalent in individuals with psychiatric conditions or socioeconomic disadvantage
- Nicotine-dependence (ND) severity is among the strongest predictors of smoking cessation
- The Brief Wisconsin Inventory of Smoking Dependence Motives (WISDM) is a 36-item measure of ND comprised of Primary and Secondary Dependence Motive Scales
 - The Primary Dependence Motives scale (but not Secondary) predicts smoking relapse
- The Fagerström Test for Nicotine Dependence (FTND) is a 6-item measure of ND
 - FTND scores also significantly predict smoking relapse
- FTND scores are also associated with nicotine biomarkers and the relative reinforcing value of cigarettes, but these relations are less clear for WISDM scores
- The NIH's Research Domain Criteria initiative recommends that psychiatric disorders be characterized by *underpinning psychological/biological processes* rather than symptoms

- WISDM Primary Dependence Motive score, but not Secondary, was correlated with COT+3HC (i.e., consumption)
- FTND total scores were correlated with consumption
- Thus, we included the 16 individual items from the WISDM Primary subscale and all 6 items of the FTND in the following analyses
- All three ND measures were correlated with Amplitude and Persistence

Table 1. Correlations of WISDM Primary and Secondary Dependence total scores and FTND total scores with combined COT and 3-HC levels and CPT latent factors Amplitude and Persistence

	COT + 3HC	Amplitude	Persistence
WISDM Primary	.27*	.36*	.23*
WISDM Secondary	.03 ^{ns}	.16*	.18*
FTND Total	.47*	.54*	.26*

* $p < .0001$

Table 4. Individual predictor results from the final models determining the WISDM Primary Dependence Motives and FTND items that independently predict COT+3HC, Amplitude, and Persistence

Predictor	A. COT+3HC			B. Amplitude			C. Persistence		
	F	p	η^2	F	p	η^2	F	p	η^2
WISDM 2	10.03	.002	.011	-	-	-	-	-	-
WISDM 16	5.07	.025	.006	4.75	.038	.003	-	-	-
WISDM 36	13.42	< .001	.015	4.75	.029	.004	12.29	< .001	.015
FTND 1	41.66	< .0001	.045	7.84	.005	.006	-	-	-
FTND 4	19.57	< .0001	.022	269.85	< .0001	.200	5.23	.023	.007
	R ² = .32			R ² = .47			R ² = .10		

Regression Analyses & Results

Multiple regression was used to determine (see Figure 1):

- The WISDM Primary and FTND items that independently predict COT+3HC
- The COT+3HC predictors that independently predict Amplitude and Persistence

Table 2. Sixteen items comprising the WISDM Primary Dependence Motives scale

- I often smoke without thinking about it.
- Cigarettes control me.
- I usually want to smoke right after I wake up.
- It's hard to ignore an urge to smoke.
- I smoke without deciding to.
- I frequently light cigarettes without thinking about it.
- Sometimes I feel like cigarettes rule my life.
- I frequently crave cigarettes.
- I'm really hooked on cigarettes.
- My urges to smoke keep getting stronger if I don't smoke.
- I find myself reaching for cigarettes without thinking about it.
- Other smokers would consider me a heavy smoker.
- When I haven't been able to smoke for a few hours, the craving gets intolerable.
- I smoke within the first 30 min of awakening in the morning.
- My smoking is out of control.
- I consider myself a heavy smoker.

Table 3. Six items comprising the FTND

- How soon after you wake do you smoke your first cigarette?
- Do you find it difficult to refrain from smoking in places where it is forbidden?
- Which cigarette would you hate most to give up?
- How many cigarettes per day do you smoke?
- Do you smoke more frequently during the first hours after waking than during the rest of the day?
- Do you smoke when you are so ill that you are in bed most of the day?

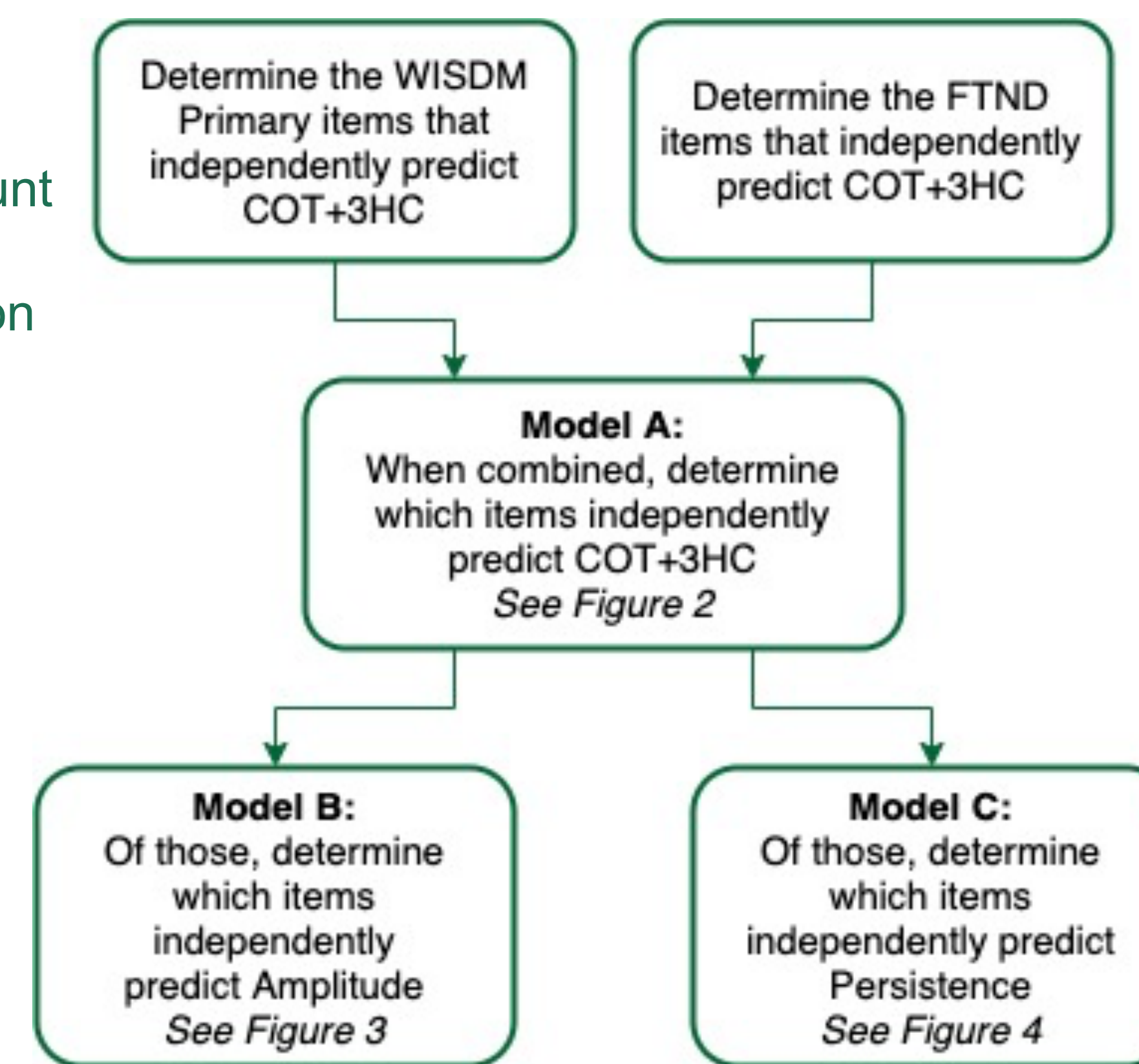


Figure 1. Schematic depicting each step in the sequence of regression analyses

- Five of 16 WISDM Primary Dependence items independently predicted COT+3HC (i.e., nicotine consumption)
 - Items: 2, 3, 4, 16 and 36
- Two of six FTND items independently predicted COT+3HC
 - Items 1, 4 (i.e., the two items of the Heaviness of Smoking Index)
- Model A: When these items were evaluated in a single model
 - WISDM 2, 16, and 36 and FTND 1 and 4 remained, and the strength of the association was strongest for FTND 1
- Model B: When these predictors were tested for Amplitude
 - All predictors remained in the model except for WISDM 2
- Model C: When these predictors were tested for Persistence
 - Only WISDM 36 and FTND 4 remained

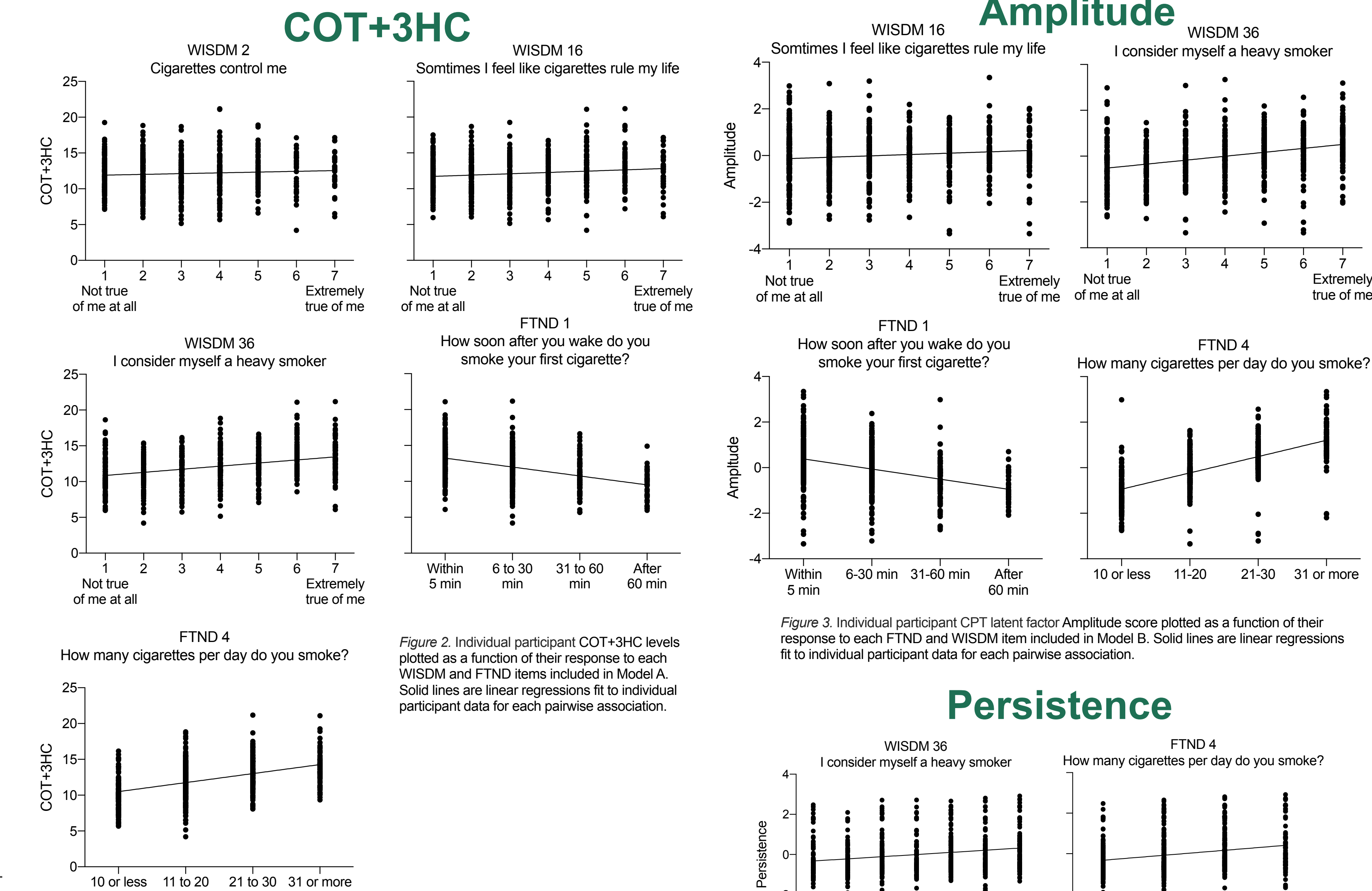


Figure 2. Individual participant COT+3HC levels plotted as a function of their response to each WISDM and FTND item included in Model A. Solid lines are linear regressions fit to individual participant data for each pairwise association.

Figure 3. Individual participant CPT latent factor Amplitude score plotted as a function of their response to each FTND and WISDM item included in Model B. Solid lines are linear regressions fit to individual participant data for each pairwise association.

Figure 3. Individual participant CPT latent factor Persistence score plotted as a function of their response to each FTND and WISDM item included in Model C. Solid lines are linear regressions fit to individual participant data for each pairwise association.

Purpose

- Inspired by this initiative, the purpose of the present study:
 - Determine the WISDM and FTND assessment items that independently predict nicotine consumption
 - Determine how those items are related to measures of the relative reinforcing value of cigarettes
- By identifying specific assessment items that significantly account for individual differences in nicotine consumption and relative valuation, the results of the present study will provide information on efficiently measuring crucial dimensions of nicotine dependence

Method

- Data obtained from intake assessments of 745 adult smokers with psychiatric conditions or socioeconomic disadvantage enrolled in a clinical trial on reduced-nicotine-content cigarettes

Discussion

- Of the 22 WISDM Primary Dependence Motives + FTND items, five independently predicted COT+3HC (i.e., consumption). Together, these items accounted for 32% of the variance in individual differences in nicotine consumption
 - These items assess heavy smoking (FTND 1,4; WISDM 36) and loss of control over smoking (WISDM 2,16)
- Thus, the heaviness of one's smoking and a feeling of loss of control over one's smoking is significantly associated with nicotine consumption
- Further, these same constructs are significantly associated with Amplitude
- Consistent with previous findings, ND severity was more strongly associated with Amplitude, than with Persistence (Models B & C, Table 4)
- These results suggest that the intensity of demand for cigarettes when unconstrained by price, more so than persistence of demand under escalating price, is an important dimension in dependence severity

Measures

- WISDM (see Table 2)
- FTND (see Table 3)
- Combined cotinine and 3'-hydroxycotinine (COT+3HC): represents total nicotine intake (i.e., consumption).
- Cigarette Purchase Task (CPT): models relative reinforcing value of cigarettes by assessing demand for cigarettes under escalating price. Expressed as two latent factors:
 - Amplitude: Intensity of demand when unconstrained by price
 - Persistence: Sensitivity of demand to escalating price

Analyses

- Predictor variables: WISDM and FTND item scores
 - Outcome variables: COT+3HC[†], Amplitude, Persistence
 - Pearson correlation for bivariate analyses
 - Multiple regression for independent predictor analyses
- [†]Box-Cox transformation with $\lambda = 0.25$