Nicotine-Dependence-Varying Effects of Smoking Events on Momentary Mood Changes among Adolescents

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The roles of reinforcement in addiction

- **Positive reinforcement**
  - Hedonic effects of nicotine
  - Thought to be important in early stages of nicotine addiction

- **Negative reinforcement**
  - Smoking to relieve withdrawal symptoms
  - Thought to maintain addiction after early stages

- Russell, 1971; Baker et al., 2004; Tiffany et al., 2004
A time-varying effect (TVE) interpretation

• Positive reinforcement initially has a strong association with smoking regularity, but this decreases over time

• Negative reinforcement initially has a weak relationship with smoking regularity, but this grows over time

• Using a TVE model, these theories are supported among adolescent smokers (Selya et al., 2012)
What about “momentary” reinforcement?

- Previous study used longitudinal data (past-week or past-month reports)
- Positive affect (PA) and negative affect (NA) can more directly measure +/- reinforcement

-> Do smoking-related mood changes vary over the course of smoking development?
Varying Effect Model (VEM)

- SAS macro publicly available from http://methodology.psu.edu
- Developed for intensive longitudinal data
- Unlike traditional VEM’s, empirically estimates shape of trend
- Commonly used as “time-varying effect models”
  - Can be thought of as moderation by time
- Here, a new application of the VEM to examine moderation by Nicotine Dependence (ND)
SECASP Study

- Robin Mermelstein at UIC
- ~1200 9th and 10th graders at baseline in full longitudinal component
- Oversampled novice (<100 cigarettes/life) and light (≤5 cigarettes/day) smokers
- Followed over 4+ years
  - Baseline; 6-, 15-, 24-, 33-, 48-month follow-ups
• 451 adolescent smokers also participated in EMA
• 7-day EMA collection intervals at baseline, 6-, 15, and 24-month waves
• Asked about PA, NA, amount smoked, location, environment, social factors
• Random prompts up to 5x daily
• Self-initiated smoking prompts for every “smoking event”
  ○ Smoking events included before/after smoking PA/NA reports
“ND-VEM” model

- **DV’s:**
  - Change in PA = after-smoking PA – before-smoking PA
  - Change in NA = after-smoking NA – before-smoking NA
- **Time-varying IV:** amount smoked per prompt
  - “a puff” (0.2) to “more than one cigarette” (2)
- **Other covariates:** past-month smoking frequency & quantity; past-month NDSS; weekday; gender; white ethnicity
- **24-month assessment wave**
  - Assess effects *across* subjects at different levels of ND
Nicotine-Dependence-Varying Effects

Selya et al., revised & resubmitted to EMA special issue of NTR
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Conclusions

- Smoking-related mood changes significantly vary over levels of ND
- Theory of positive reinforcement is supported
- Role of negative reinforcement does not match theory
  - Participants may be preemptively smoking to prevent withdrawal
    - DiFranza et al., 2011
  - May reflect mood stabilization at higher levels of smoking
    - Hedeker et al., 2009; Hedeker & Mermelstein, 2012
Strengths & Limitations

• **Strengths:**
  - Informative sample
  - EMA data
  - VEM macro
  - Extension of VEM to dimensions other than time

• **Limitations:**
  - Across-subject, not within-subject
  - Using PA/NA change scores excluded using random prompts; this required dose, rather than binary, effects of smoking
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