

Which Comes First in a Quit Attempt?

Temporal Relations Between Smoking and Non-Adherence to Nicotine Replacement Therapy

Tanya R. Schlam, PhD^{1,2}; Timothy B. Baker, PhD^{1,3}; Daniel M. Bolt, PhD⁴; Stevens S. Smith, PhD^{1,3}; Danielle E. McCarthy, PhD^{1,3}; Jessica W. Cook, PhD^{1,3,5}; Todd Hayes-Birchler, BA¹; Michael C. Fiore, MD, MPH, MBA^{1,3}; Megan E. Piper, PhD^{1,3}

¹Center for Tobacco Research and Intervention, University of Wisconsin School of Medicine and Public Health; ²Department of Medicine, University of Wisconsin School of Medicine and Public Health; ³Division of General Internal Medicine, Department of Medicine, University of Wisconsin School of Medicine and Public Health; ⁴Department of Educational Psychology, University of Wisconsin-Madison; ⁵William S. Middleton Memorial Veterans Hospital, Madison, Wisconsin

BACKGROUND

- Adherent nicotine replacement therapy (NRT) use is strongly associated with cessation success.
- Despite research devoted to this topic, it remains unclear whether NRT non-adherence precedes smoking lapses or whether lapses precede NRT non-adherence, or whether both are the case.
- This research examined nicotine gum use patterns pre- and post-lapse and explored whether these patterns were associated with latency to relapse.

METHOD

Participants

- Participants were adult smokers attending an outpatient primary care visit who, when asked, expressed interest in quitting as part of a study conducted at their clinic.
- N = 416; 57.0% female; 85.1% White; 9.9% African American; 3.7% Hispanic; 14.0% had a college degree; mean age = 46.0 years (SD = 12.8); mean cigarettes per day = 17.8 (SD = 8.1).
- All participants received at least 8 weeks of nicotine patch + nicotine gum.
- To be included in these analyses, participants needed to have quit for at least 1 day in the first 2 weeks post-target quit day.

Study Procedure

- Primary care patients took part in a factorial experiment evaluating two factors to boost smoking cessation rates and three factors to boost cessation medication adherence (Schlam et al., 2016).
- All participants carried an electronic medication dispenser that time-stamped each use of nicotine gum (Figure 1).

Figure 1. The electronic medication dispenser.



RESULTS

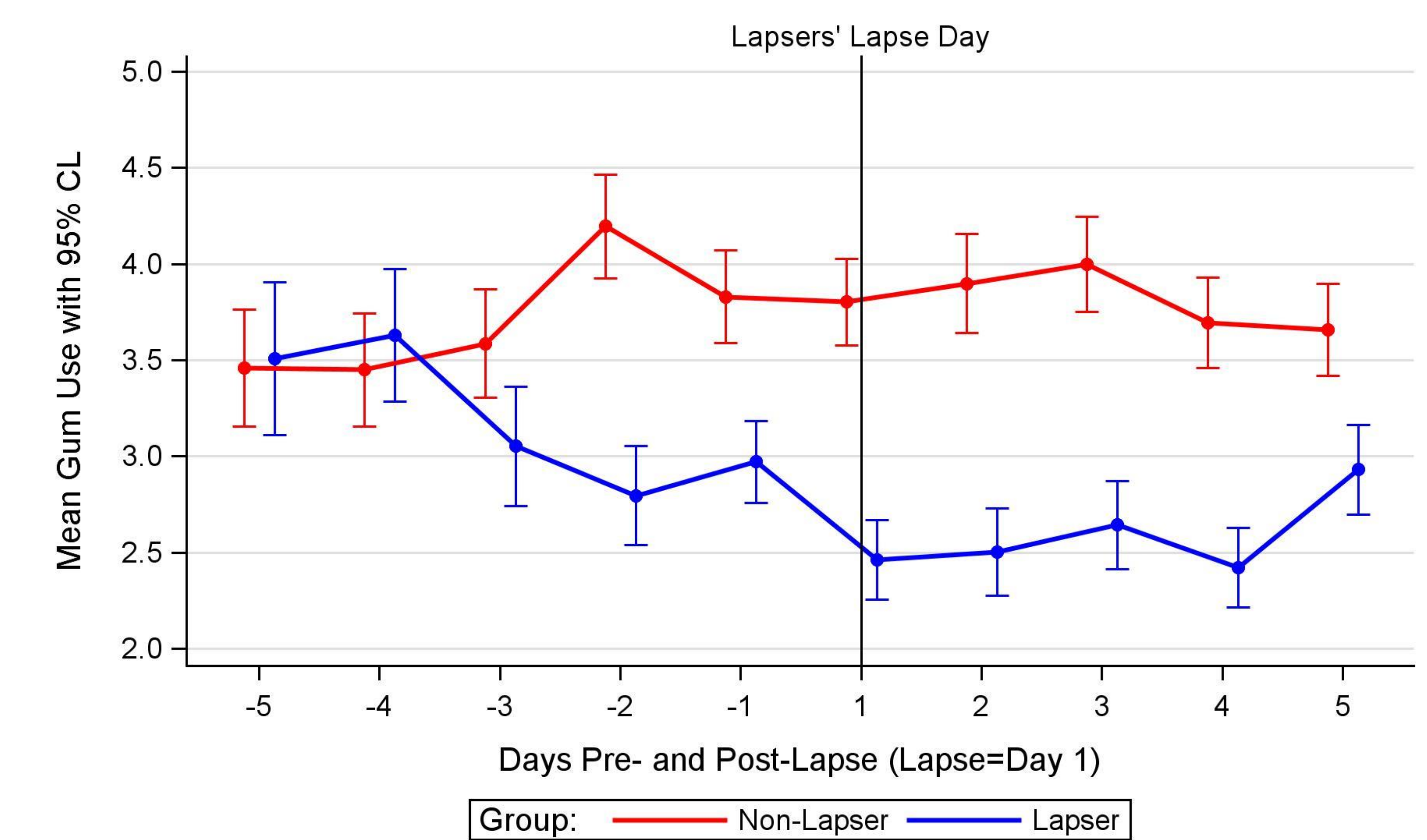
- 261 participants (62.7%) lapsed in the first 6 weeks, a mean of 8 days (SD=9.3) after their first 24 hours of abstinence.
- 119 (28.6%) relapsed in the first 6 weeks (smoked on the first of 7 consecutive days of smoking). The first day of the relapse occurred a mean of 5.3 days (SD=9.2) after they lapsed.
- In matched samples analyses, we compared dynamic profiles of gum use pre- and post-lapse in “lapsers” with the gum use profiles of temporally matched controls who did not lapse.
- 146 lapsers were matched with 146 non-lapsers on treatment assignment, gender, age, and tobacco dependence.
- In gum use analyses, time for each pair was anchored around the lapsers’ lapse date (Figure 2). So, for example, if a lapser lapsed 8 days after establishing abstinence, we assigned their matched non-lapsers a “lapse” day of 8 days after establishing abstinence.
- Compared to the non-lapsers, lapsers:
 - Used similar amounts of gum 4 and 5 days prior to the “lapse” day
 - Used fewer pieces of gum 1 and 2 days before the “lapse” day
 - Used fewer pieces of gum on the “lapse” day and on each of the four following days.
- Lapsers’ and non-lapsers’ gum use slopes differed from each other significantly both pre-lapse and post-lapse.
 - Lapsers’ pre-lapse gum use showed a decreasing trajectory (slope = -.15) from day -5 to day -1 prior to the lapse day, while the non-lapsers’ pre-lapse gum use showed a variable but non-decreasing trajectory (slope = .00).
 - Lapsers’ post-lapse gum use slope was mostly flat but a small uptick in mean gum use on day 5 post-lapse resulted in a positive slope of .08. Non-lapsers’ post-lapse slope was similar to their pre-lapse slope (slope = -.05), although the post-lapse slope showed a slight decreasing trajectory from days 3 to 5 post-lapse.
- In a separate set of analyses using the full sample (N = 416), a dynamic structural equation model (SEM) allowed us to consider individual differences in the cross-lagged effects (for consecutive days across the first 6 weeks) of both prior smoking on subsequent gum use and of prior gum use on subsequent smoking. We found that, on average across smokers, gum use decreased the day after smoking.
- On average, while gum use gradually decreased prior to lapsing, there was a modest increase 1 day before the first lapse day.
- Survival analyses showed that the greater this increase in gum use, the faster the transition to relapse ($p < .05$).

CONCLUSIONS

- The data suggest that overall nicotine gum use is highly associated with smoking cessation outcomes because those who lapse both decrease their gum use prior to lapsing and further decrease their gum use after lapsing.
- These data suggest that declines in gum use may signal heightened lapse risk that is manifest in 1-3 days and underscore the importance of adherent medication use.
- Smokers tended to increase gum use modestly the day before a lapse and then decrease gum use following a lapse. Steeper acceleration in use on the day before a lapse was associated with a more rapid progression to relapse.
- Smokers may increase their gum use in response to sensing their heightened lapse risk; the greater their compensatory self-dosing, the faster they relapse.

Figure 2.

Pre- and Post-Lapse Mean Gum Use with 95% Confidence Limits by Group (N=146 Pairs)



REFERENCES

Schlam, T. R., Fiore, M. C., Smith, S. S., Fraser, D., Bolt, D. M., Collins, L. M., Mermelstein, R., Piper, M. E., Cook, J. W., Jorenby, D. E., Loh, W.-Y., & Baker, T. B. (2016). Comparative effectiveness of intervention components for producing long-term abstinence from smoking: A factorial screening experiment. *Addiction*, 111, 142-155. PMID: PMC4692280

FUNDING

Funding: This research was supported by grants 9P50CA143188 and 1P01CA180945 from the National Cancer Institute to the University of Wisconsin Center for Tobacco Research and Intervention, and by the Wisconsin Partnership Program.



UW Center for Tobacco Research and Intervention
UNIVERSITY OF WISCONSIN
SCHOOL OF MEDICINE AND PUBLIC HEALTH