

Weight Concern as a Predictor of Smoking Cessation in Smokers Participating in a Community-based Cessation Program

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Abstract

This study examined whether weight concerns predicted smoking cessation among adults participating in a community-based cessation trial. Using data from 392 adult smokers in a randomized control trial (2004–2007), we assessed two validated measures of weight concern, 1) smoking to control weight, and 2) intolerance to weight gain, as predictors of biochemically verified abstinence at 7 weeks, 6 months, and 12 months. Logistic mixed repeated measure analyses were stratified by sex and adjusted for age, BMI, race, and nicotine dependence. Neither dimension of weight concern predicted cessation for men or women. Greater nicotine dependence predicted lower odds of abstinence, while older age predicted higher odds. Although these data precede widespread e-cigarette use, CDC surveillance shows most adult cigarette smokers remain exclusive users rather than dual users, supporting the relevance of these findings. Weight concern may not need to be routinely targeted in cessation interventions.

Keywords: smoking cessation, weight concern, weight gain, community-based program

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Introduction

Cigarette smoking continues to be a leading cause of preventable death, with half of smokers attempting to quit each year (Centers for Disease Control and Prevention [CDC], 2023a). Concerns about post-cessation weight gain have been cited as barriers to quitting and predictors of relapse, though findings have been inconsistent. Some studies link higher weight concerns to reduced quit success (Clark et al., 2006; Schauer et al., 2013), while others find no association (Spring et al., 2004). For example, Tuovinen et al. (2018) found that weight concerns predicted lower quit rates only among smokers with low nicotine

dependence, whereas Krotter et al. (2023) reported that actual post-cessation weight gain, rather than concern, predicted relapse among smokers with depression.

Discrepancies in the literature are likely due to differences in how weight concerns are defined and measured, variations in sample characteristics, inconsistencies in covariates included in models, and differing cessation outcomes examined (Germeroth & Levine, 2018). Therefore, examining the relationship between baseline weight concerns and abstinence from tobacco over several time points in a community-based sample of smokers will be useful in understanding if weight concern is predictive of cessation outcomes for individuals who are motivated

to quit and amenable to treatment, which substantially boosts quit rates (Fiore et al., 2008). To comprehensively and accurately assess smoking-related weight concern, this analysis prospectively examined its predictive value using two validated measures widely reported in the literature – the Smoking Situations Questionnaire (SSQ) and the Weight Concerns Scale (WCS) – in both male and female smokers over a 12-month follow-up period.

Methods

This secondary analysis used data from the Lifestyle Enhancement for Activity and Prevention (LEAP) randomized trial (Vander Weg, et al., 2018). A full description of LEAP'S design and trial procedures can be found in that original publication. Participants (N = 392; 62% female, 67% White; aged 18–65) smoked at least five cigarettes daily, were sedentary, and wished to quit. All participants received behavioral counseling plus nicotine patch and were randomized to adjunctive physical activity or wellness counseling. Data were collected at baseline, 7 weeks (end of treatment), and 6 months post-cessation.

Measures

The dependent variable was quit status (yes/no) based on 7-day point prevalence, defined as self-reported abstinence (“not even a puff”) during the past 7 days and biochemically verified with an expired carbon monoxide level <10 ppm and assessed at each follow-up.

Independent variables included two validated measures of smoking-related weight concern administered at baseline: (1) Smoking to control weight (Control) and (2) Intolerance to amount of weight gain before relapse (Intolerance). Control was measured using the Smoking Situations Questionnaire (SSQ; Weekley et al., 1992), consisting of six

items assessing reasons for smoking to control weight. Each item is rated on a 6-point scale from strongly disagree (0) to strongly agree (5). Psychometric evaluation of the SSQ in this study showed that the items load on one factor (unidimensional) and has good internal consistency (Cronbach's $\alpha = .87$). In prior research, the SSQ predicted smoking status (Weekley et al., 1992). Intolerance was measured using the Weight Concerns Scale (WCS; Meyers et al., 1997), a six-item scale assessing the level of weight gain (in 5-pound increments up to 30 pounds) at which respondents believe they would likely return to smoking. Scores were dichotomized as “weight concerned” or “not weight concerned”. This scale has been validated as a predictor of smoking cessation, with participants categorized as weight concerned being less likely to remain abstinent at 1-, 6-, and 12-month follow-ups (Meyers et al., 1997). Both instruments continue to be widely used in recent research on smoking and weight perceptions (He et al., 2025; Stockton et al., 2023).

Covariables included age, body mass index (BMI; kg/m²), race (White/non-White), and nicotine dependence measured by the Fagerström Test for Nicotine Dependence (Heatherton et al., 1991).

Analysis

Covariables were first modeled as main effects and an interaction term with both measures of weight-concern to test for potential effect modification. If the variable did not moderate the association, the interaction term was removed but the covariable was left in the model to control for confounding. Models were stratified by sex due to known differences in weight concern between males and females (Kilmurray et al., 2023). For the dependent variable (smoking status), mixed effects logistic regression was used to determine the effect of weight-concern on quit status over 3 time points.

Separate analyses were used to examine weight concern “control” and “intolerance.” To account for random effects within individuals’ repeated measures, unstructured covariance structure was specified. A p -value of $<.05$ was used to determine statistical significance for these analyses.

Results

Participants averaged 44.6 years of age ($SD = 10.1$), with a mean BMI 28.0 ($SD = 5.8$), and FTND score of 4.9 ($SD = 2.3$). At baseline, the mean SSQ weight concern score on a scale from 0-5 was 1.8 ($SD = 1.3$). Based on the WCS measure, 56% of participants (38% male and 66% female) were classified as weight concerned. Verified abstinence rates were 30% at 7 weeks, 21% at 6 months, and 23% at 12 months.

Attrition was highest during early follow-ups (36% at 7 weeks and 47% at 6 months) but improved by the 12-month assessment, when only 18% of participants were lost to follow-up. Most attrition was due to loss of contact, and no significant sex differences were observed.

Neither SSQ nor WCS scores predicted smoking cessation among women ($p = .18$ and $p = .97$) or men ($p = .67$ and $p = .97$). Across both sexes, greater nicotine dependence predicted lower odds of abstinence ($p = .01-.03$), whereas older age predicted higher odds of abstinence ($p = .01-.05$). Time predicted lower odds of abstinence at follow-up ($p < .05$), consistent with expected relapse patterns. Race and BMI were nonsignificant predictors.

Discussion

Contrary to prior findings (Clark et al., 2006; Shauer et al., 2013), neither dimension of weight concern predicted smoking cessation outcomes in this community-based trial. Variations across studies may reflect

differences in study duration, measurement tools, or covariable control. Our results align with investigations reporting no predictive effect of weight concern on quitting success (Copeland et al., 2015; Pisinger & Jorgeson, 2007; Spring et al., 2004).

Nicotine dependence and age were consistent predictors: higher dependence reduced, and older age increased, the odds of abstinence. These findings reaffirm studies that physiological dependence (Transdisciplinary Tobacco Use Research Center [TTURC] Tobacco Dependence et al., 2007; Ussher et al., 2016) and life stage (Kaleta et al., 2012; Yang et al., 2015) remain important cessation determinants.

Strengths of this study include its prospective design, large community-based sample of smokers attempting to quit, use of validated instruments, objective BMI measures, and biochemically verified smoking status at each follow-up. Limitations include attrition, treatment-seeking bias, and the dated dataset. Although data were collected before e-cigarettes were widely available, national surveillance indicates that most adult cigarette smokers remain exclusive users rather than dual users (CDC, 2023b). Thus, the behavioral mechanisms identified here continue to apply to the majority of smokers. Because the sample comprised relatively healthy, treatment-seeking smokers, it is possible that individuals most concerned about weight self-selected out of participation, reducing our ability to detect associations. Additionally, the analysis did not include other dimensions of weight concern, such as dieting behaviors or perceptions of overweight. Nonetheless, these findings provide valuable behavioral insight and suggest that addressing weight concern during cessation treatment may not be essential for most smokers.

Table 1.
Descriptive Statistics

Variable	Men (n = 149)	Women (n = 243)	Total (n = 392)
Age (years), mean (SD)	45.1 (10.0)	44.3 (10.1)	44.6 (10.1)
BMI (mean (SD))	27.7 (5.1)	28.2 (6.3)	28.0 (5.8)
Nicotine dependence (mean (SD))	5.2 (2.3)	4.7 (2.3)	4.9 (2.3)
Weight concerned control (SSQ)	1.3 (.98)	2.05 (1.13)	1.78 (1.13)
Weight concerned intolerance (WCS) (%)	38	66	56
White (%)	67	66	67
Biochemically verified abstinence (quit), 7-day point prevalence, Intent to treat (%)			
7 weeks	36	26	30
6 months	21	21	21
12 months	23	23	23

Note: non-White: 31% (n=121) Black, 2.5% (n=10) other (American Indian, n=6; Asian, n=1; “Other”, n=3). Values are means (SD) or percentages. Abstinence was verified by expired carbon monoxide < 10 ppm.

Table 2.
Predictors of Smoking Cessation in Mixed-Effects Models

Variable	Control (SSQ) OR (95% CI)	Intolerance (WCS) OR (95% CI)	p-value range
Weight concern	M: 0.98 (0.92–1.06)	M: 1.00 (0.85–1.18)	ns
	F: 1.03 (0.99–1.08)	F: 1.00 (0.89–1.12)	
Nicotine dependence	M: 0.96 (0.93–0.99)	M: 0.96 (0.93–0.99)	.01–.03
	F: 0.97 (0.95–1.00)	F: 0.97 (0.95–1.00)	
Age	M/F: 1.01 (1.00–1.01)	M/F: 1.01 (1.00–1.01)	.01–.05
Time (6 mo vs 7 wk)	M: 0.85 (0.77–0.94)	M: 0.85 (0.77–0.94)	.002–.29
	F: 0.96 (0.90–1.03)	F: 0.96 (0.89–1.03)	
Time (1 yr vs 7 wk)	M: 0.82 (0.75–0.89)	M: 0.81 (0.75–0.89)	< .05
	F: 0.91 (0.85–0.99)	F: 0.91 (0.85–0.99)	

Note: M = male; F = female. SSQ = Smoking Situations Questionnaire; WCS = Weight Concerns Scale. ns = not significant. Models were also adjusted for race and BMI.

Implications for Health Behavior Theory

Within the Health Belief Model (Rosenstock, 1990), weight concern has often been considered a perceived barrier to quitting. These results challenge that assumption within treatment-seeking populations. For the Transtheoretical Model (Prochaska & DiClemente, 1983), weight concerns may be more relevant during precontemplation or contemplation than

during action or maintenance. Practitioners may consider addressing weight issues only when raised by the smoker, prioritizing stronger predictors such as nicotine dependence and relapse prevention.

Discussion Questions

How can weight concern be more accurately conceptualized to reflect behavioral barriers across different stages of cessation?

At what point in the cessation continuum—before, during, or after quitting—are weight-related concerns most likely to influence outcomes?

References

- Centers for Disease Control and Prevention. (2023a). Adult smoking cessation — United States, 2022. *MMWR. Morbidity and Mortality Weekly Report*, 73(29), 969–974.
<https://doi.org/10.15585/mmwr.mm7329a1>
- Centers for Disease Control and Prevention. (2023b). QuickStats: Percentage distribution of cigarette smoking status among current adult e-cigarette users, by age group—National Health Interview Survey, United States, 2021. *MMWR. Morbidity and Mortality Weekly Report*, 72(10), 270.
<https://doi.org/10.15585/mmwr.mm7210a6>
- Clark, M. M., Hurt, R. D., Croghan, I. T., Patten, C. A., Novotny, P., Sloan, J. A., Dakhil, S. R., Croghan, G. A., Wos, E. J., Rowland, K. M., Bernath, A., Morton, R. F., Thomas, S. P., Tschetter, L. K., Garneau, S., Stella, P. J., Ebbert, L. P., Wender, D. B., & Loprinzi, C. L. (2006). The prevalence of weight concerns in a smoking abstinence clinical trial. *Addictive Behaviors*, 31(7), 1144–1152.
<https://doi.org/10.1016/j.addbeh.2005.08.011>
- Copeland, A. L., McVay, M. A., Martin, P. D., Rash, C. J., Kendzor, D. E., Baillie, L. E., Spears, C. A., & Geiselman, P. J. (2015). Smoking relapse and weight gain prevention program for postmenopausal weight concerned women: A pilot study. *Eating Behaviors*, 18, 107–114.
<https://doi.org/10.1016/j.eatbeh.2015.05.006>
- Fiore, M. C., Jaén, C. R., Baker, T. B., Bailey, W. C., Benowitz, N. L., Curry, S. J., Dorfman, S. F., Froelicher, E. S., Goldstein, M. G., Healton, C. G., Henderson, P. N., Heyman, R. B., Koh, H. K., Lando, H. A., Mecklenburg, R. E., Mermelstein, R. J., Mullen, P. D., Orleans, C. T., Robinson, L., ... Wewers, M. E. (2008, May). *Treating tobacco use and dependence: 2008 update. Clinical practice guideline*. U.S. Department of Health and Human Services, Public Health Service.
<https://www.ncbi.nlm.nih.gov/books/NBK63952/>
- Germeroth, L. J., & Levine, M. D. (2018). Postcessation weight gain concern as a barrier to smoking cessation: Assessment considerations and future directions. *Addictive Behaviors*, 76, 250–257.
<https://doi.org/10.1016/j.addbeh.2017.08.022>
- He, Y., Diao, C., Wen, L., Zhou, Q., Pang, L., Song, L., Yang, Y., & Chen, T. (2025). Positive correlation between post-cessation weight concerns and intentions to quit smoking in Chinese male smokers: A cross-sectional study. *Tobacco Induced Diseases*, 23, Article 20.
<https://doi.org/10.18332/tid/200340>
- Heatherton, T. F., Kozlowski, L. T., Frecker, R. C., & Fagerström, K.-O. (1991). The Fagerström Test for Nicotine Dependence: A revision of the Fagerström Tolerance Questionnaire. *British Journal of Addiction*, 86(9), 1119–1127.
<https://doi.org/10.1111/j.1360-0443.1991.tb01879.x>
- Kaleta, D., Korytkowski, P., Makowiec-Dąbrowska, T., Usidame, B., Bąk-Romaniszyn, L., & Fronczak, A. (2012). Predictors of long-term smoking cessation: results from the global adult

- tobacco survey in Poland (2009-2010). *BMC Public Health*, 12, 1020. <https://doi.org/10.1186/1471-2458-12-1020>
- Kilmurray, C., Vander Weg, M., Wilson, N., Relyea, G., McClanahan, B., Stockton, M. B., & Ward, K. D. (2023). Determinants of smoking related weight-concern in smokers participating in a community-based cessation program. *Eating Behaviors*, 51, 101809. <https://doi.org/10.1016/j.eatbeh.2023.101809>
- Krotter, A., Aonso-Diego, G., García-Pérez, Á., García-Fernández, G., & Secades-Villa, R. (2023). Post-cessation weight gain among smokers with depression predicts smoking relapse. *Journal of Dual Diagnosis*, 19(2-3), 62–70. <https://doi.org/10.1080/15504263.2023.2192683>
- Meyers, A. W., Klesges, R. C., Winders, S. E., Ward, K. D., Peterson, B. A., & Eck, L. H. (1997). Are weight concerns predictive of smoking cessation? A prospective analysis. *Journal of Consulting and Clinical Psychology*, 65(3), 448–452. <https://doi.org/10.1037/0022-006X.72.5.785>
- Pisinger, C., & Jorgensen, T. (2007). Weight concerns and smoking in a general population: The Inter99 study. *Preventive Medicine*, 44(4), 283–289. <https://doi.org/10.1016/j.ypmed.2006.11.014>
- Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal of Consulting and Clinical Psychology*, 51(3), 390–395. <https://doi.org/10.1037/0022-006X.51.3.390>
- Rosenstock, I. M. (1990). The health belief model: Explaining health behavior through expectancies. In K. Glanz, F. M. Lewis, & B. K. Rimer (Eds.), *Health behavior and health education: Theory, research, and practice* (pp. 39–62). Jossey-Bass/Wiley.
- Schauer, G. L., Bush, T., Cerutti, B., Mahoney, L., Thompson, J. R., & Zbikowski, S. M. (2013). Use and effectiveness of quitlines for smokers with diabetes: Cessation and weight outcomes, Washington State Tobacco Quit Line, 2008. *Preventing Chronic Disease*, 10, E105. <https://doi.org/10.5888/pcd10.120324>
- Spring, B., Pagoto, S., Pingitore, R., Doran, N., Schneider, K., & Hedeker, D. (2004). Randomized controlled trial for behavioral smoking and weight control treatment: Effect of concurrent versus sequential intervention. *Journal of Consulting and Clinical Psychology*, 72(5), 785–796. <https://doi.org/10.1037/0022-006X.72.5.785>
- Stockton, M.B., Ward K.D., McClanahan B.S., Vander Weg, M.W., Coday, M., Wilson, N., Relyea, G., Read, M.C., Connelly, S., Johnson, K.C. (2023). The efficacy of individualized, community-based physical activity to aid smoking cessation: A randomized controlled trial, *Journal of Smoking Cessation*, 2023. <https://doi.org/10.1155/2023/5535832>
- Tuovinen, E.-L., Saarni, S. E., Kinnunen, T. H., Korhonen, T., Partonen, T., Haukkala, A., & Kaprio, J. (2018). Weight concerns as a predictor of smoking cessation according to nicotine dependence: A population-based study. *Nordic Studies on Alcohol and Drugs*, 35(5), 344–356. <https://doi.org/10.1177/1455072518800217>
- Transdisciplinary Tobacco Use Research Center (TTURC) Tobacco Dependence, Baker, T. B., Piper, M. E., McCarthy, D. E., Bolt, D. M., Smith, S. S., Kim, S. Y.,

- Colby, S., Conti, D., Giovino, G. A., Hatsukami, D., Hyland, A., Krishnan-Sarin, S., Niaura, R., Perkins, K. A., & Toll, B. A. (2007). Time to first cigarette in the morning as an index of ability to quit smoking: implications for nicotine dependence. *Nicotine & Tobacco Research : Official Journal of the Society for Research on Nicotine and Tobacco*, 9 Suppl 4(Suppl 4), S555–S570. <https://doi.org/10.1080/14622200701673480>
- Ussher, M., Kakar, G., Hajek, P., & West, R. (2016). Dependence and motivation to stop smoking as predictors of success of a quit attempt among smokers seeking help to quit. *Addictive Behaviors*, 53, 175–180. <https://doi.org/10.1016/j.addbeh.2015.10.020>
- Vander Weg, M. W., Coday, M., Stockton, M. B., McClanahan, B., Relyea, G., Read, M. C., Wilson, N., Connelly, S., Richey, P., Johnson, K. C., & Ward, K. D. (2018). Community-based physical activity as adjunctive smoking cessation treatment: Rationale, design, and baseline data for the Lifestyle Enhancement Program (LEAP) randomized controlled trial. *Contemporary Clinical Trials Communications*, 9, 50–59. <https://doi.org/10.1016/j.conctc.2017.11.013>
- Weekley, C. K., 3rd, Klesges, R. C., & Reylea, G. (1992). Smoking as a weight-control strategy and its relationship to smoking status. *Addictive Behaviors*, 17(3), 259–271. [https://doi.org/10.1016/0306-4603\(92\)90031-p](https://doi.org/10.1016/0306-4603(92)90031-p)
- Yang, J. J., Song, M., Yoon, H. S., Lee, H. W., Lee, Y., Lee, S. A., Choi, J. Y., Lee, J. K., & Kang, D. (2015). What are the major determinants in the success of smoking cessation: Results from the health examinees study. *PloS one*, 10(12), e0143303. <https://doi.org/10.1371/journal.pone.0143303>