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Short-Term Weight Gain by Menstrual Phase Following Smoking Cessation in Women

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Abstract

Prevention of early weight gain may be critical to avoid relapse among women with a fear of weight gain. Menstrual phase has physiological fluctuation of fluid resulting in short-term weight gain, suggesting menstrual phase of smoking cessation may impact short-term weight gain. This study examined the effect of smoking abstinence and menstrual cycle on short-term weight gain. Women were randomized to quit smoking during the follicular or luteal phase of their cycle and followed for four weeks. Weight, among other measures, was recorded at five post-quit date visits (days 2, 5, 9, 12 and week 4). Participants (n = 152) were grouped based on randomized quit phase and smoking status after assigned quit date: 1) follicular (F), quit < 24 hours, 2) F, quit ≥ five days, 3) luteal (L), quit < 24 hours, and 4) L, quit ≥ five days. Participants who quit smoking experienced significantly more weight gain than those who quit for less than 24 hours. There were no significant increases in short-term weight gain based on menstrual cycle phase during attempted smoking cessation.

Keywords

Cessation; Menstrual Cycle; Smoking; Weight; Women

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1.0 Introduction

The fear of weight gain is a major barrier to quitting smoking among women (Perkins, Levine, Marcus & Schiffman 1997). Weight gain is a common consequence of quitting (Gritz, Berman, Read, Marcus, & Siau, 1990; Hughes, Higgins, & Bickel, 1994), with an average post-cessation weight gain of 8–10 lbs (Kawachi, Troisi, Rotnitzky, Coakley, & Colditz, 1996; Williamson, Madans, Anda, Kleinman, Giovino, & Byers, 1991). Several studies report no significant differences in short-term weight gain over 4–10 days post-cessation (Hatsukami, LaBounty, Hughes, & Laine, 1993; Hellerstein, Benowitz, Neese, Schwartz, Hoh, Jacob, Hsieh, & Faix, 1994; Perkins, Epstein, & Pastor, 1990) while others show a significant gain among abstaining women compared to women continuing to smoke over two weeks after attempted smoking cessation (Pomerleau, Pomerleau, Namenek, & Mehringer, 2000; Eck, Klesges, Meyers, Slawson, & Winders, 1997).

Identifying factors influencing early weight gain during a smoking cessation attempt, when likelihood of relapse is highest, would be salient to helping women be successful. Measurement of the influence of menstrual cycle phase on short-term weight gain during a smoking cessation attempt is important since the luteal phase is associated with physiological weight gain (Speroff, Glass, & Kase, 1994). This weight gain is related to premenstrual increases in appetite, eating and/or fluid retention (Harlow, 1995). It is important to know if a difference in short-term weight gain by cycle phase represents weight gain due to abstinence per se, and if this is greater in the luteal versus the follicular phase. Since women have reported accepting an average weight gain of 5–7 pounds during smoking cessation (Pomerleau, Zucker, Namenek Brouwer, Pomerleau & Stewart, 2001), keeping weight gain at a minimum is crucial to the success of these quit attempts. Consequently, knowledge regarding whether weight gain associated with menstrual phase and weight gain associated with smoking cessation acts synergistically or not would provide pertinent information about timing of a quit attempt for women and, would potentially improve smoking abstinence rates among those with a fear of weight gain.

This study examined short-term weight gain by menstrual phase following a quit attempt in an intent-to-treat randomized smoking cessation trial. The aim of the study was to assess whether greater weight gain, due to smoking abstinence, occurs during luteal (L) versus follicular (F) phase. We hypothesized that participants who quit for at least five days during the L phase would experience more initial weight gain compared to participants who quit for at least five days during the F phase. This would suggest that early weight gain in smoking cessation is greater as a function of menstrual phase. Further, we expected that women who abstain from smoking for at least five days would experience more weight gain compared to women who were unable to achieve smoking abstinence.

2.0 Methods

2.1. Design and Procedure

This study was approved by the University of Minnesota Institutional Review Board and was part of a large randomized smoking cessation trial for women to examine the effects of menstrual cycle phase on smoking relapse. Subjects had to be between ages 18–40, smoke at least 10 cigarettes/day for at least one year, have regular menstrual cycles and not be on exogenous hormones or psychotropic medications. At the screening visit, participants supplied information regarding demographics, smoking behavior, menstrual cycle. They also completed the Fagerstrom Test of Nicotine Dependence (FTND; Heatherton, Kozlowski, Frecker, & Fagerstrom, 1991) and received a randomly assigned quit date in either the F or L phase. After the screening visit, participants completed daily measures of premenstrual and withdrawal symptomatology, and number of cigarettes smoked. Participants then attended a

baseline visit approximately one week before their quit date. After baseline, the participants attended clinic visits on days 2, 5, 9, 12 and week 4 post assigned quit date. Smoking cessation behavioral counseling, provided by trained counselors, was conducted at each of these clinic visits. No pharmacological intervention was allowed. Participants were followed for up to six months post-quit date; however, this study only assessed weight gain through week 4. Details of the main study are described elsewhere (Allen et al, 2008).

2.2. Study Groups

Participants were classified to one of four groups as defined by randomization of quit date by menstrual cycle phase and verified smoking status post quit date: (1) Quit date assigned during the F phase and relapsed within 24 hours (F-Relapsed; n=52), (2) Quit date assigned during the F phase and quit for five days or more (range: 5 to ≥ 30 days) (F-Quit; n=22), (3) Quit date assigned during the L phase and relapsed within 24 hours (L-Relapsed; n=42), and (4) Quit date assigned during the L phase and quit for five days or more (range: 5 to ≥ 30 days) (L-Quit; n=36). Participants who abstained from smoking between one and four days (F = 29; L = 38) were excluded from the final analysis because we wanted to compare participants who quit long enough to experience significant weight gain (i.e. five days or greater) with those who did not (i.e. relapsed within 24 hours). This allowed us to conduct a stricter analysis of the role of the menstrual cycle phase in short-term weight gain during smoking cessation. Comparison of the analysis sample (n=152) and excluded sample (n=67) revealed no difference on any baseline or outcome measures (data not shown).

2.3. Study Measures

Menstrual phase was determined using menstrual calendars and urine Luteinizing Hormone (LH) peaks as previously validated by the study authors (for further study details see Allen, Hatsukami, Christianson, & Nelson, 1996; Allen, Hatsukami, Christianson & Brown, 2000; Allen, Bade, Center, Finstad, & Hatsukami, 2008). Weight, measured in street clothes without shoes to the nearest 0.10 pounds using an A&D Precision Health Scale (Model UC-300), was measured at the baseline clinic visit (approximately one week prior to assigned quit date) and all clinic visits post-quit by clinic staff. BMI was calculated at baseline (weight in kilograms/height in meter squared). Concerns about weight gain were assessed at the screening visit. Participants were asked to answer the following question 'How concerned are you about weight gain after you quit smoking' on a five-point likert-type scale with 1 = not at all and 5 = very concerned. Participants were also asked 'What is an acceptable weight gain for you when quitting smoking?' The seven categorical responses ranged from '1–3 pounds' to '19 to 21 pounds'. Relapse to smoking was defined as a single puff of a cigarette (Hughes, Keely, Niaura, Ossip-Klein, Richmond, & Swan, 2003). Relapse measures included daily self-reports and at each clinic visit breath CO monitoring (less than 5 ppm indicated abstinence) and saliva cotinine (less than 15 ng/ml indicated abstinence; Jarvis, Tunstall-Pedoe, Feyerabend, Vesey & Saloojee, 1987) were measured.

2.4. Statistical Analysis

Group differences in demographic, smoking behavior, and concerns about weight gain were assessed by conducting analysis of variance (ANOVA) and chi-square tests. Changes in weight were determined by subtracting the participants' baseline weight from the weight measured at subsequent clinic visits. The effect of quit phase and initial smoking cessation success on weight gain were examined using a repeated measures analysis of covariance (ANCOVA) to assess for differences in weight among group assignment at each clinic visit. This model controlled for differences in age, motivation to quit, weight concerns, acceptable weight gain, and FTND scores. We used an ANCOVA, controlling for the same variables listed above, to compare the randomization groups during the same menstrual phases. That is we compared

weight gain from day 2 to day 9 within the F randomized group to day 9 to week 4 among the L randomized group to compare weight change when both groups were in the follicular phase. Similarly, we compared weight gain from day 9 to week 4 within the F randomized group to the weight gain from day 2 to day 9 within the L randomized group to compare weight change with both groups were in the luteal phase. We also conducted a t-test at each follow-up time point to compare weight changes, regardless of menstrual cycle, between those who relapsed to smoking (n=94) and those who maintained their abstinence (n=58). Finally, we assessed the impact of weight concerns and acceptability of weight gain on weight changes by completing a median split on these two items then completing a t-test to assess differences in changes in weight. All analyses were completed using SAS 9.1.3.

3.0. Results

3.1. Participants

A total of 328 women were screened, met eligibility and were randomly assigned to quit smoking during the F (n=163) or L (n=165) phase of their cycle. One-hundred-nine women did not reach their quit date (due to scheduling conflicts, moved, or lost to follow-up) and, consequently, were ineligible for this analysis (pre-quit drop-outs). The remaining 219 (F = 103, L = 116) women reached their quit date and completed at least one follow-up clinic visit (<10% completed only one visit); however, 67 (F = 29; L = 38) quit between one and four days and were excluded from this analysis. As a result, 152 (F = 74; L = 78) women were included in this analysis.

3.2. Demographics & Smoking Behavior

Compared to the participants included in this analysis (n=152), the participants who were pre-quit drop-outs (n=109) were more likely to have a high school education or less (39% vs. 53%, $\chi^2 = 5.26$, p-value = 0.0219; respectively), had higher FTND (4.06 ± 2.04 vs. 4.53 ± 2.24 , df = 259, t-value = 1.76, p-value = 0.0791; respectively), shorter previous quit attempts (172.18 days ± 353.12 vs. 77.18 days ± 165.56 , df = 233, t-value = 2.85, p-value = 0.0047; respectively), began smoking at an earlier age (17.09 years ± 3.87 vs. 16.06 years ± 3.01 , df = 256, t-value = 2.39, p-value = 0.0251; respectively) and had less concerns about weight gain during smoking cessation (4.05 ± 1.23 vs. 3.69 ± 1.36 , t-value = 2.14, p-value = 0.0034; respectively). There were no other significant differences between those included in this analysis and the pre-quit drop-outs. There were also no significant differences between the 67 participants excluded from the analysis and the 152 included in terms of demographics, smoking behavior, and weight concerns.

Participants (n=152) had a mean age of 29.34 (S.D. ± 6.52) years and 38% had a high school education or less. They reported smoking a mean of 16.85 (S.D. ± 5.96) cigarettes/day and had a mean FTND score of 4.00 (S.D. ± 2.01 ; see Table 1). Participants in the F-Relapsed and F-Quit group were significantly younger than participants in the L-Relapsed and L-Quit groups (27.21 ± 6.10 vs. 29.55 ± 5.75 vs. 30.10 ± 6.91 vs. 31.39 ± 6.43 , respectively; F-value = 3.38, p = 0.0199). The participants in the F-Relapsed and L-Relapsed groups had higher FTND scores than the participants in the F-Quit and L-Quit groups (4.40 ± 1.93 vs. 4.24 ± 2.23 vs. 3.91 ± 1.90 vs. 3.19 ± 1.72 , respectively; F-value = 2.96, p-value = 0.0343). There were no other demographic or smoking behavior differences by study group.

3.3. Weight Concerns

On a five-point likert-type scale, with five indicating the most concern, participants reported they were, on average, 4.09 (S.D. ± 1.19) concerned about weight gain during smoking cessation and 85% reported that acceptable weight gain would be six pounds or less. These items did not differ significantly by the four study groups. There were no significant differences

in baseline weight or changes in weight at any time point between those with more acceptability of weight gain (four pounds or more; $n=79$) compared to those with less acceptability of weight gain (three pounds or less; $n=65$; data not shown). Baseline weight was significantly different by weight concerns such that those with greater weight concerns (a '5' on a five-point Likert-type scale; $n=76$) weighed more than those with less weight concerns (a '4' or less on a five-point likert type scale; $n=68$;) at baseline (165.37 ± 43.86 pounds versus 146.73 ± 37.12 pounds; $t\text{-value}=2.89$, $p\text{-value}=0.005$). There were no significant differences in changes in weight post quit date based on weight concerns (data not shown).

3.4. Weight Gain by Menstrual Cycle Phase & Smoking Status

Participants in the F-Relapsed group gained significantly less weight than participants in the F-Quit and L-Quit groups. The participants in the L-Relapsed group gained significantly less weight than women in the L-Quit group. There were no other significant differences in weight gain post smoking cessation attempt based on group assignment (see Table 1). Those who relapsed to smoking gained significantly less than those who achieved smoking abstinence at each time point (in pounds): Day 2 (0.49 ± 2.93 vs. 1.35 ± 2.14 , $p=0.043$), Day 5 (0.47 ± 2.77 vs. 1.65 ± 2.62 , $p=0.016$), Day 9 (0.68 ± 2.74 vs. 2.19 ± 2.48 , $p=0.002$), Day 12 (0.65 ± 3.32 vs. 2.40 ± 2.63 , $p=0.002$), and Week 4 (2.44 ± 3.99 vs. 3.26 ± 3.68 , $p\text{-value}=0.011$).

4.0 Discussion

The results of the present study suggest that if smoking abstinence is achieved, the menstrual phase in which a woman quits does not play a role in short-term weight gain. Further, as expected, women who achieved smoking abstinence gained more weight short-term than those who relapsed to smoking, regardless of phase of quit attempt. These data suggest that menstrual cycle phase does not independently predict weight gain during attempted smoking cessation.

Our work, similar to others (Pomerleau et al 2000; Borelli, Spring, Niaura, Hitsman & Papandonatos, 2001; McBride, French, Pirie & Jeffery, 1996), confirms short-term weight gain in women during a smoking cessation attempt. However, we did not detect a phase effect that Pomerleau et al (2000) showed where women abstaining in luteal phase compared to follicular phase gained more weight while continuing smokers showed no phase-related differences in weight to suggest their effect was not an artifact of premenstrual fluid retention. Eck and colleagues (1997) also saw a marginal ($p\text{-value} = 0.07$) phase effect looking at one time period of 10 days post quit with the luteal group gaining more weight from baseline to cessation compared to the follicular group. However, these studies were small ($n = 20$, $n = 40$, respectively), menstrual phase was not hormonally determined, only one post-cessation time point was measured (7 days in one study, 10 days in the other study) and subjects were not treatment seeking women. Furthermore, oral contraceptive use was included in one (Pomerleau et al, 2000) study for some of the subjects. In addition to differences in study design, differences in study results may be related to the fact that weight-concerned smokers represent a heterogeneous group of women, with diverse factors such as age, race, pre-cessation smoking rate, eating patterns and conventional values on appearance (Pomerleau, Zucker & Stewart, 2001); thus, they may not be equally at risk for poor outcome.

One must keep in mind that our definition of short-term weight gain (4 weeks) is different from other studies assessing short-term weight gain ranging from four days to two weeks. Although this limits direct comparisons, we felt it was important to assess changes in weight over an entire menstrual cycle (typically four weeks in length). In addition, the personally relevant coping strategies suggested during counseling session may have included individualized off-the-cuff advice about weight management, possibly affecting weight outcomes in unpredictable ways. However, addressing weight control was not a formal part of the counseling.

There are some limitations in the present study. A large number of participants prematurely withdrew from the study prior to their assigned quit date. These pre-quit dropouts showed signs of higher dependence to smoking and had lower concerns of weight gain during smoking cessation; thus, it is likely that those who dropped out from the study were different from those who participated. In addition, those who relapsed within 24 hours may still have been attempting to quit smoking or reduce the cigarettes smoked per day in unpredictable ways, which may have been affected the study outcomes. Lastly, we measured baseline weight approximately one week prior to quit date and we measured weight in street clothes, these items may have affected the accuracy of the measurement of changes in weight after quit date.

In summary, findings from this study confirm short-term weight gain post-cessation in female smokers but do not suggest that menstrual phase influences short-term weight gain after a smoking cessation attempt. Further research is needed to assess the role of age, race, baseline smoking rate, eating and physical activity patterns, and importance of appearance in short-term weight gain during smoking cessation.

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References

- Allen SS, Bade T, Center B, Finstad D, Hatsukami D. Menstrual phase effects on smoking relapse. *Addiction* 2008;103:809–821. [PubMed: 18412759]
- Allen SS, Hatsukami D, Christianson D, Nelson D. Symptomatology and energy intake during the menstrual cycle in smoking women. *Journal of Substance Abuse* 1996;8:303–319. [PubMed: 8934436]
- Allen SS, Hatsukami D, Christianson D, Brown S. Effects of transdermal nicotine on craving, withdrawal and premenstrual symptomatology in short-term smoking abstinence during different phases of the menstrual cycle. *Nicotine and Tobacco Research* 2000;2(3):231–241. [PubMed: 11082823]
- Borrelli B, Spring B, Niaura R, Hitsman B, Papandonatos G. Influences of gender and weight gain on short-term relapse to smoking in a cessation trial. *Journal of Consulting & Clinical Psychology* 2001;69(3):511–515. [PubMed: 11495180]
- Eck LH, Klesges RC, Meyers AW, Slawson DL, Winders SA. Changes in food consumption and body weight associated with smoking cessation across the menstrual cycle phase. *Addictive Behaviors* 1997;22:775–782. [PubMed: 9426795]
- Gritz ER, Berman BA, Read LL, Marcus AC, Siau J. Weight change among registered nurses in a self-help smoking cessation program. *American Journal of Health Promotion* 1990;5:115–121.
- Hatsukami D, LaBounty L, Hughes J, Laine D. Effects of tobacco abstinence on food intake among cigarette smokers. *Health Psychology* 1993;12:499–502. [PubMed: 8293734]
- Harlow, SD. What we do and do not know about the menstrual cycle; or, Questions Scientists Could be Asking. *The Robert H. Ebert Program on Critical Issues in Reproductive Health and Population*; New York, NY. 1995.
- Heatherton TF, Kozlowski LT, Frecker RC, Fagerstrom KO. The fagerstrom test for nicotine dependence: A revision of the fagerstrom tolerance questionnaire. *British Journal of Addiction* 1991;86:1119–1127. [PubMed: 1932883]
- Hellerstein MK, Benowitz NL, Neese RA, Schwartz JM, Hoh R, Jacob P, Hsieh J, Faix D. Effects of cigarette smoking and its cessation on lipid metabolism and energy expenditure in heavy smokers. *Journal of Clinical Investigation* 1994;93:265–272. [PubMed: 8282797]
- Hughes JR, Higgins ST, Bickel WK. Nicotine withdrawal versus other drug withdrawal syndromes: Similarities and dissimilarities. *Addiction* 1994;89:1461–1470. [PubMed: 7841857]

- Hughes JR, Keely JP, Niaura RS, Ossip-Klein DJ, Richmond RL, Swan GE. Measures of abstinence in clinical trials: Issues and recommendations. *Nicotine and Tobacco Research* 2003;5(1):13–25. [PubMed: 12745503]
- Jarvis MJ, Tunstall-Pedoe H, Feyerabend C, Vesey C, Saloojee Y. Comparison of tests used to distinguish smokers from nonsmokers. *American Journal of Public Health* 1987;77:1435–1438. [PubMed: 3661797]
- Kawachi I, Troisi RJ, Rotnitzky AG, Coakley EH, Colditz GA. Can physical activity minimize weight gain in women after smoking cessation? *American Journal of Public Health* 1996;86:999–1004. [PubMed: 8669525]
- McBride CM, French SA, Pirie PL, Jeffery RW. Changes over time in weight concerns among women smokers engaged in the cessation process. *Annals of Behavioral Medicine* 1996;18:273–279. [PubMed: 18425673]
- Perkins KA, Epstein LH, Pastor S. Changes in energy balance following smoking cessation and resumption of smoking in women. *Journal of Consulting and Clinical Psychology* 1990;58:121–125. [PubMed: 2319045]
- Perkins KA, Levine MD, Marcus MD, Shiffman S. Addressing women's concerns about weight gain due to smoking cessation. *Journal of Substance Abuse Treatment* 1997;14:173–182. [PubMed: 9258862]
- Pomerleau CS, Pomerleau OF, Namenek RJ, Mehninger AM. Short-term weight gain in abstaining women smokers. *Journal of Substance Abuse Treatment* 2000;18(4):339–342. [PubMed: 10812306]
- Pomerleau CS, Zucker AN, Stewart AJ. Characterizing concerns about post-cessation weight gain: Results from a national survey of women smokers. *Nicotine & Tobacco Research* 2001;3:51–60. [PubMed: 11260811]
- Speroff, L.; Glass, RH.; Kase, NG. *Clinical Gynecologic Endocrinology and Infertility*. Baltimore: Lippincott Williams & Wilkins; 1994. p. 97-114.
- Williamson DF, Madans J, Anda RF, Kleinman JC, Giovino GA, Byers R. Smoking cessation and severity of weight gain in a national cohort. *New England Journal of Medicine* 1991;324:739–745. [PubMed: 1997840]

Table 1

Demographics, Smoking Behavior, Weight Concerns, and Weight Gain by Group Classification in Women Attempting to Quit Smoking

	F-Relapsed (n=52)	F-Quit (n=22)	L-Relapsed (n=42)	L-Quit (n=36)	p-value
Demographics					
Age	27.21 ± 6.10	29.55 ± 5.78	30.10 ± 6.91	31.39 ± 6.43	0.0199
% Never Married	67.31%	54.55%	54.76%	47.22%	n.s.
% ≤12 years of Education	38.46%	45.45%	33.33%	36.11%	n.s.
BMI	29.29 ± 7.06	26.80 ± 5.67	27.41 ± 6.46	27.60 ± 6.60	n.s.
Baseline Weight	175.11 ± 43.05	162.75 ± 36.27	166.61 ± 43.50	166.86 ± 42.21	n.s.
Smoking Behavior					
CPD	16.76 ± 5.55	15.77 ± 4.59	18.07 ± 6.81	16.22 ± 6.21	n.s.
Age Started	16.57 ± 3.52	17.32 ± 3.08	17.33 ± 4.62	17.58 ± 3.93	n.s.
Number of Previous Quit Attempts	2.32 ± 1.92	3.41 ± 1.99	2.93 ± 2.22	3.42 ± 3.77	n.s.
Longest Previous Quit (Days)	74.61 ± 110.17	226.39 ± 263.94	178.99 ± 430.72	242.53 ± 457.61	n.s.
FTND Score	4.40 ± 1.93	3.91 ± 1.90	4.24 ± 2.23	3.19 ± 1.72	0.0343
Weight Concerns					
Weight Concern (1–5 likert-type scale)	4.12 ± 1.25	3.64 ± 1.18	4.33 ± 0.95	4.03 ± 1.32	n.s.
Acceptable Weight Gain (% 6 pounds or less)	84.61%	95.46%	80.95%	83.34%	n.s.
Weight Gain from Baseline (pounds)					
Day 2	0.17 ± 0.43	1.02 ± 0.67	1.02 ± 0.49	1.72 ± 0.52	-
Day 5	0.16 ± 0.45	1.63 ± 0.71	0.97 ± 0.50	1.69 ± 0.53	-
Day 9	0.10 ± 0.48	2.07 ± 0.69	0.93 ± 0.51	2.51 ± 0.53	-
Day 12	0.54 ± 0.49	2.17 ± 0.68	0.74 ± 0.54	2.58 ± 0.53	-
Week 4	1.42 ± 0.52	3.12 ± 0.68	0.97 ± 0.54	3.32 ± 0.53	0.0067