

Characterizing concerns about post-cessation weight gain: results from a national survey of women smokers

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Differences among adult women smokers with differing levels of concern about post-cessation weight gain were investigated in a national random-digit-dialing survey. To avoid defining weight concerns in terms of possible etiologies or contributory factors, respondents were stratified using a single item querying concern about post-cessation weight gain; 39% described themselves as very concerned (VC), 28% as somewhat concerned (SC), and 33% as not concerned (NC). Significant between-groups differences were detected for measures of weight and body image, eating patterns and weight control practices, and nicotine dependence, but not for depression. Differences, primarily between VC and NC, were also detected for several weight-related smoking variables, including importance of weight as a factor in initiation, smoking as a weight control strategy, increased appetite and weight gain as withdrawal symptoms, willingness to gain weight upon quitting, self-efficacy about relapse in the face of weight gain, and readiness to quit smoking. Most differences persisted even after adjusting for body mass index and nicotine dependence. Although the importance of thinness was rated higher by weight-concerned women, the difference did not reach significance. Rather, what differentiated groups was the importance of overall body image, suggesting a larger pattern of preoccupation with body image that may not be captured by queries about weight concerns alone. We conclude that weight-concerned women smokers will be especially unlikely to seek treatment or attempt self-quitting; and that redirecting attention to other aspects of body image is likely to be more helpful than attempting to divert attention away from body image.

Introduction

Weight gain has long been recognized as a distinguishing feature of nicotine withdrawal, as opposed to other drug-withdrawal syndromes (Hughes, Higgins, & Bickel, 1994). Although evidence is mixed, population studies tend to suggest that smokers weigh several pounds less than never-smokers, and that when they quit, they gain until they reach the weight they would have weighed had

they never smoked (Perkins 1993; USDHHS, 1988). A recent study raises the possibility that smoking causes irreversible changes such that ex-smokers weigh *more* than they would have weighed had they never smoked (Klesges, Ward, Ray, Cutter, Jacobs, & Wagenknecht, 1998). Although the average post-cessation weight gain for women has been variously reported (Hall, McGee, Tunstall, Duffy, & Benowitz, 1989; Kawachi, Troisi, Rotnitzky, Coakley, & Colditz, 1996; Moffatt & Owens, 1991; Stamford, Matter, Fell, & Papanek, 1986; Williamson, Madams, Anda, Kleinman, Giovino, & Byers, 1991) as something on the order of 8–10 pounds, depending on age, race, smoking rate, pre-cessation weight, eating patterns, length of abstinence, and other factors, it can range from zero or less to well in excess of 25 or 30 pounds. A rough approximation (Pomerleau & Kurth, 1996) is that around 20–30% will gain less than 5 pounds, with few maintaining or losing weight (Nides *et*

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al., 1994; Pirie *et al.*, 1992); a similar number, around 25%, will gain more than 15 pounds (Nides *et al.*, 1994), with around half of these women gaining more than 30 pounds (Williamson *et al.*, 1991); the remaining 50% of women will gain somewhere between 5 and 15 pounds.

Reluctance to contemplate weight gain following smoking cessation is almost endemic among women, with 40% expressing unwillingness to gain any weight at all and 75% stating they would be unwilling to tolerate a gain in excess of 5 pounds (Pomerleau & Kurth, 1996). Thus, the amount of weight women profess to be willing to tolerate gaining upon smoking cessation will be exceeded by a substantial majority of women. Despite the remarkable universality of this 'reality gap' among women smokers, however, many within the research community remain skeptical about the impact of post-cessation weight gain upon quitting and even suggest that post-cessation weight gain may be protective of abstinence. Support for this contention is provided by several studies showing long-term weight gain to be positively associated with success in quitting and decreased long-term relapse (Gritz, Berman, Read, Marcus, & Siau, 1990; Hall, Ginsberg, & Jones, 1986; Killen, Fortmann, Kraemer, Varady, Davis, & Newman, 1996; Norregaard, Tonnesen, & Petersen, 1993). Moreover, adding weight control components to smoking cessation programs has not improved long-term abstinence rates (Hall, Tunstall, Vila, & Duffy, 1992; Pirie *et al.*, 1992). These results have not been universally observed, however. Borrelli and Mermelstein (1998), in a prospective study, found that weight gain was associated with subsequent relapse. Swan, Ward, Carmelli & Jack (1993) found that among 265 participants in smoking cessation clinics, women ≤ 32 years old relapsed at an extraordinarily high rate and were more likely than any other group to cite 'weight gain' as a reason for relapsing in the past. There are also conflicting reports on the effect of weight concerns upon treatment outcome: Gourlay, Forbes, Marriner, Pethica, and McNeil (1994) and Gritz *et al.* (1990) have reported that greater concerns about gaining weight predict successful cessation; Meyers, Klesges, Winders, Ward, Peterson, and Eck (1997), by contrast, found a lower likelihood of quitting among weight-concerned smokers who present for treatment.

How can we account for the discrepancies in the literature, and for the resulting differences over the importance of this phenomenon from the public health point of view? A possible explanation is suggested by evidence that large numbers of weight-concerned women smokers are essentially invisible, either because they do not attempt to quit at all or because they terminate their quit attempts very early, without ever seeking treatment (Klesges & Klesges, 1988; Klesges *et al.*, 1988; Namenek Brouwer & Pomerleau, in press; Perkins, Levine, Marcus, & Shiffman, 1997; Weekley, Klesges, & Relyea, 1992). Further support is provided by findings that individuals presenting for formal smoking cessation

interventions may be less weight-concerned than the general population of smokers (Meyers *et al.*, 1997), and that quit attempts by women smokers who engage in dieting are shorter than those made by non-dieting smokers (Jarry, Coombs, Polivy, & Herman, 1998). It may also be that weight-concerned smokers represent a heterogeneous group of women differing on race and life-stage, initial body mass, past experience with abstinence-induced weight gain, atypical depression or other psychopathology, adherence to conventional values about appearance, etc., who may not be equally at risk of poor outcome. Finally, it may be a function of how weight concerns are defined, as noted by Jeffery, Hennrikus, Lando, Murray, and Liu (2000) in a study in which concerns about post-cessation weight gain, but not generalized weight concerns, were predictive of a decreased likelihood of quitting.

Resolution of this issue will have important implications for the formulation of public policy. Should weight gain, though a consistent sequela of smoking abstinence, not constitute a barrier to cessation in large numbers of women, then devoting funds for research and policy development to this problem would not be the best use of limited resources. On the other hand, if weight gain or fear of weight gain, even in amounts that pose relatively little health threat, constitutes a deterrent to quitting for large numbers of women, then it is important to avoid trivializing the issue by dismissing it as a cosmetic concern (e.g., Williamson *et al.*, 1991) and to address it more aggressively than has been done to date. As noted above, efforts to achieve differential results in this population have met with modest success at best; research designed to identify effective strategies to discourage continued use of a product that may be regarded by many women as having desirable effects upon appearance will therefore need to be prioritized.

The present study was designed to investigate weight concerns among women smokers with the hope of increasing our understanding of the nature of these concerns as a barrier to quitting and helping in the development of more effective interventions. Our analyses drew on data provided by women smokers who participated in a random-digit-dialing survey conducted in a national sample of women and focusing on smoking, weight concerns, and related issues. To avoid defining weight concerns in terms of possible etiologies or contributory factors (e.g., adherence to conventional values about thinness and attractiveness, current overweight, past experience with abstinence-induced weight gain, or body image dissatisfaction combined with unhealthy dieting and nutritional practices and compensatory behaviors), a single item querying concern about post-cessation weight gain was used to stratify participants as (1) not at all concerned, (2) somewhat concerned, or (3) very concerned.

Our first aim was to characterize the three groups based on attitudes and behaviors not specific to smoking. We anticipated that women smokers with strong concerns about post-cessation weight gain would have more

problems with weight and body image and be more likely to engage in a cluster of potentially unhealthy eating and weight control practices than women expressing less concern. Because depression can be associated with such practices (Carter, Bulik, Lawson, Sullivan, & Wilson, 1996), we expected them to score higher on a measure of depression as well. Based on findings in the literature (e.g., Jeffery *et al.*, 2000), we also anticipated a relationship between concerns about post-cessation weight gain and nicotine dependence.

Our second aim was to investigate the impact of weight concerns on initiation, maintenance, readiness to quit smoking, and other variables specific to smoking and weight. To determine whether the association of weight concerns with nicotine dependence and/or overweight might account for our findings, all analyses were re-run controlling for these variables. Our primary hypotheses were that weight-concerned women smokers would indicate less readiness to quit smoking than women with fewer concerns about post-cessation weight gain and have lower self-efficacy about ability to remain abstinent in the face of weight gain. We further expected that they would be more likely to endorse weight control as a motive for starting and maintaining smoking. We were also interested in investigating whether women with strong concerns about post-cessation weight gain differed sufficiently from those with lesser concerns to warrant targeted interventions and special attention to their needs.

Our third aim was to examine aspects of body image other than thinness and to explore their potential for competing with thinness among women concerned about post-cessation weight gain. At least two studies have documented that smokers may be more dissatisfied with their body image than non-smokers (Ben-Tovim & Walker, 1991; King, Matarin, Marcus, Bock, & Tripolone, 2000). In fact, smoking affects many aspects of physical appearance: it suppresses body weight, which many women regard as a positive effect; but it also has an impact on aspects of body image that have been less extensively queried in studies of smoking, including body shape and fat deposition (Hans, Bijnen, Lean, & Seidell, 1998; Lissner, Bengtsson, Lapidus, & Bjorke-lund, 1992), hair (Mosley & Gibbs, 1996), teeth (Axelsson, Paulander & Lindhe, 1998; Qandil, Sandhu, & Matthews, 1997; Tonetti, 1998), and skin (wrinkling, color, texture; Dunn, Damesyn, Moore, Reuben, & Greendale, 1997; Ernster, Grady, Miike, Black, Selby, & Kerlikowske, 1995; Lopez Hernandez, Tercedor, Rode-nas, & Simon Lopez, 1995; Pugliese, 1995), as well as aspects of physical attractiveness other than appearance, such as voice (Yonekawa, 1988), breath (Miyazaki, Sakao, Katoh, & Takehara, 1995), and smell of hair and clothing – all in ways that most women would regard as negative. We hypothesized that the preoccupation of weight-concerned women smokers with body shape would cluster with other aspects of body image, suggesting possible new avenues for intervention in this population.

Methods

Participants

Participants were 371 current smokers (including 335 daily and 36 non-daily smokers) aged 18–45 who participated in a national random digit dialing survey of women current smokers, ex-smokers, and never-smokers ($n=945$) on attitudes and behaviors relating to smoking and weight. To be eligible to participate as a smoker, respondents were required to have smoked at least 4 days per week for at least a year, with cigarette smoking their primary form of tobacco use, and to meet the following additional criteria: not currently pregnant or having given birth within the past six weeks, and not currently using any nicotine replacement product.

Procedure

The protocol was approved by the Institutional Review Boards of both the University of Michigan Medical School and the Institute for Social Research (ISR). Data were gathered by trained interviewers at ISR via a Computer-Assisted Telephone Interview (CATI). In addition to demographic data, the following items were collected:

- (1) Degree of concern about post-cessation weight gain was determined by response to the query ‘If you stopped smoking cigarettes today, how concerned would you be about gaining weight?’ A single non-specific question was used as a stratification variable because it minimized assumptions about the nature or origins of such concerns. Participants were classified as not at all concerned (NC), somewhat concerned (SC), or very concerned (VC).
- (2) Measures of weight, body image, and dieting and other weight control practices included ideal (preferred) weight, actual (self-reported) weight, and the difference between the two; body mass index (BMI, kg/m²); obesity (BMI of at least 27); willingness to risk health to be slim; and items from the Dieting and Bingeing Severity Scale (DBSS; Krahn, Kurth, Demitrack, & Drewnowski, 1992; Krahn, Krahn, Nairn, & Drewnowski, 1995), an instrument designed to assess disordered eating and validated using structured psychiatric interview.
- (3) Smoking and nicotine dependence were assessed using the Fagerström Tolerance Questionnaire (FTQ, Fagerström, 1978; Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994) and smoking rate.
- (4) Measures of depression included the Center for Epidemiological Studies-Depression scale (CES-D; Radloff, 1977); both means and percentage scoring at least 16, a standard cut-off for clinical depression, were tested. Also included as an index of depression was endorsement of being a current user of anti-depressant medications.
- (5) Items relating to smoking and weight included whether weight was an important factor in initiation;

the Weight-Control Smoking Scale (WCSS; Pomerleau, Ehrlich, Tate, Marks, Flessland, & Pomerleau, 1993), which assesses use of smoking as a strategy for controlling weight and appetite; hunger and weight gain as abstinence effects; weight as a motive for resuming smoking during past quit attempts; and willingness to tolerate post-cessation weight gain (Pomerleau & Kurth, 1996). Self-efficacy about maintaining abstinence despite weight gain was assessed as response on a three-point scale (very, somewhat, not at all) to the question, 'If you stopped smoking cigarettes today, how concerned would you be that you might start smoking again because of any weight gained after quitting?' General readiness to quit was measured by asking about plans to quit within 30 days and within 6 months (Prochaska & DiClemente, 1983); participants answering no to both questions were rated as 'unready to quit' (precontemplators).

- (6) Body image and importance of thinness were measured using an instrument developed for this survey in which respondents were asked to rate the degree to which they endorse, on a scale of 1 (not at all important) to 4 (very important), statements about 11 aspects of body image that are affected by smoking (being thin; having nice skin; having fresh breath; having white teeth and a nice smile; being feminine and womanly; having a clear and feminine voice; having flattering clothes; looking young; remaining youthful-looking as one ages; looking healthy; being athletic). Participants with a Significant Other ('romantic partner') were also asked to rate the extent to which they believed their partner valued these attributes in them.

Data analysis

Differences among groups in continuous measures were assessed using SPSS GLM/Univariate; for variables with an overall significant *F*, differences among groups were tested using the Bonferroni method. Categorical measures were tested by computing an odds ratio (OR) using

SPSS Binary Logistic Regression, method=enter, and specifying contrasts using NC as the indicator variable. For smoking-related variables, analyses were repeated controlling for BMI and FTQ score: for continuous variables, they were included as covariates in the GLM/Univariate analyses. For categorical measures, a likelihood ratio test was first conducted to confirm that level of concern about post-cessation weight gain made a significant contribution after adjusting for BMI and FTQ; BMI and FTQ were then included as additional covariates in the Logistic Regression analyses using method=enter to determine the extent to which they attenuated group differences based on level of concern about post-cessation weight gain. To examine the importance of global body image as well as of thinness relative to each of the other body image values, analyses were conducted on the 11 items using GLM/Repeated Measures, with weight concerns as a grouping variable. For participants with a Significant Other, similar analyses were conducted for perceived partner values.

Results

Women smokers classified as VC ($n=145$) constituted 39.1% of the sample. One hundred and five women were classified as SC (28.3%) and 121 as NC (32.6%).

Demographic characteristics for the three groups are shown in Table 1. Although mean ages for all groups fell within 3 years of one another, SC women were significantly older than NC women, with VC women falling between them in age. VC were significantly more likely to be White and less likely to be college-educated than NC women. No significant differences for family income or marital status emerged.

Weight and body image variables for the three groups are shown in Table 2. Significant between-group differences were detected for all variables.

Eating patterns and weight control practices, both dietary and non-dietary, for the three groups are shown in Table 3. Significant differences were detected in most variables, especially between VC and NC. Exceptions were use of vomiting and laxatives, which were reported

Table 1. Demographic characteristics (current smokers with different levels of concern about post-cessation weight gain)

	How concerned about post-cessation weight gain?			Significance (<i>p</i> -value)
	Not at all ($n = 121$)	Somewhat ($n = 105$)	Very ($n = 145$)	
Age (years)	32.5±7.9 ^a	35.0 ± 7.5 ^a	33.5 ± 7.3	$F = 3.03, p < 0.05$
Race (% White)	66.1%	75.2%	77.2%	Somewhat: NS Very: OR = 1.74, $p < 0.5$
Household income (% above \$25 000)	75.7%	78.8%	75.9%	NS
Educational status (% with post-high school education)	54.5%	54.3%	30.3%	Somewhat: NS Very: OR = 0.36, $p < 0.001$
Marital status (% married)	44.6%	54.3%	50.3%	NS

^a Identifies means that differ significantly in multiple comparisons using the Bonferroni correction. OR, odds ratio, as compared with not at all concerned.

Table 2. Weight and body image in current smokers with different levels of concern about post-cessation weight gain

	How concerned about post-cessation weight gain?			Significance (p-value)
	Not at all (n = 121)	Somewhat (n = 105)	Very (n = 145)	
Body mass index (BMI; kg/m ² ; mean ± SD)	22.2 ± 4.3 ^{a,b}	25.0 ± 5.4 ^a	26.8 ± 6.2 ^b	F = 23.79, p < 0.001
Obesity (% with BMI at least 27)	11.8%	27.0%	37.8%	Somewhat: OR = 2.77, p < 0.005 Very: OR = 4.55, p < 0.001
Self-reported weight (lbs; mean ± SD)	130.2 ± 26.0 ^{a,b}	149.0 ± 36.1 ^a	157.3 ± 35.8 ^b	F = 22.45, p < 0.001
Ideal weight (lbs; mean ± SD)	124.6 ± 16.2 ^{a,b}	131.6 ± 19.3 ^a	131.2 ± 17.1 ^b	F = 6.11, p < 0.005
Difference between self-reported and ideal weight	5.4 ± 16.5 ^a	18.4 ± 23.5 ^a	26.0 ± 27.1 ^a	F = 26.16, p < 0.001
Body satisfaction (% rarely or never satisfied)	9.9%	17.1%	46.2%	Somewhat: NS Very: OR = 7.80, p < 0.001
Willingness to risk health to be slim (% very willing)	1.7%	4.8%	13.9%	Somewhat: NS Very: OR = 9.57, p < 0.005

^{a,b} Identify means that differ significantly in multiple comparisons using the Bonferroni correction. OR, odds ratio, as compared with not at all concerned.

infrequently in all groups and for which differences among groups were not significant, although in both instances the percentages followed the pattern of VC>SC>NC, with rates in VC approximately three times those in SC.

Measures of smoking/nicotine dependence and depression for the three groups are shown in Table 4. Significant between-group differences were detected for FTQ, with *post hoc* analyses indicating significant differences between NC and VC. Smoking rate also differed between groups, with *post hoc* analyses showing differences between NC and both SC and VC. No

significant differences were detected for either mean CES-D scores or percent exceeding the cutoff for clinical depression.

Association of smoking and weight-related variables for the three groups are shown in Table 5. Analyses were repeated covarying FTQ and BMI, both of which showed significant between-groups differences in previous analyses. Group differences for continuous variables (WCSS and amount of weight willing to gain) remained highly significant. For all categorical variables, the likelihood ratio test showed that concern about post-cessation weight gain made a significant contribution even after

Table 3. Eating patterns and weight control practices in current smokers with different levels of concern about post-cessation weight gain

	How concerned about post-cessation weight gain?			Significance (p-value)
	Not at all (n = 121)	Somewhat (n = 105)	Very (n = 145)	
Percentage reporting eating binge within past 3 months	24.0	26.0	36.6	Somewhat: NS Very: OR = 1.83, p < 0.05
Dieting				
Dieting frequency (% often or always dieting)	7.4	20.0	36.6	Somewhat: OR = 3.11, p < 0.01 Very: OR = 7.17, p < 0.001
Currently dieting (% yes)	7.4	17.1	26.9	Somewhat: OR = 2.57, p < 0.05 Very: OR = 4.58, p < 0.001
Use of alternative weight control strategies in past 3 months (% yes)				
Exercise	47.1	72.4	69.0	Somewhat: OR = 2.94, p < 0.001 Very: OR = 2.50, p < 0.001
Diet pills	6.6	9.6	18.9	Somewhat: NS Very: OR = 3.29, p < 0.01
Fasting	5.8	5.7	13.9	Somewhat: NS Very: OR = 2.63, p < 0.05
Diuretics	0.8	4.8	9.7	Somewhat: NS Very: OR = 12.81, p < 0.05
Vomiting	0.8	1.0	3.4	Somewhat: NS Very: NS
Laxatives	0.0	1.0	2.8	Somewhat: NS Very: NS

OR, odds ratio, as compared with not at all concerned.

Table 4. Indices of nicotine dependence and depression in current smokers with different levels of concern about post-cessation weight gain

	How concerned about post-cessation weight gain?			Significance (<i>p</i> -value)
	Not at all (<i>n</i> = 121)	Somewhat (<i>n</i> = 105)	Very (<i>n</i> = 145)	
Fagerström Tolerance Questionnaire score (range 0–11; mean ± SD)	4.9 ± 2.2 ^a	5.4 ± 2.0	5.9 ± 2.1 ^a	<i>F</i> = 6.39, <i>p</i> < 0.005
Smoking rate (cigarettes/day)	12.1 ± 9.6 ^{a,b}	16.1 ± 8.3 ^a	17.8 ± 11.3 ^b	<i>F</i> = 10.82, <i>p</i> < 0.001
Depression (CED-D; mean ± SD)	13.0 ± 9.5	12.8 ± 8.7	15.2 ± 10.8	NS
Depression (CES-D, % scoring ≥ 16)	34.5%	34.3%	39.0%	Somewhat: NS Very: NS

^{a,b}Identify means that differ significantly in multiple comparisons using the Bonferroni correction.

adjusting for FTQ and BMI. For the most part, relationships were attenuated but persisted, though differences between VC and NC were no longer significant for the importance of weight in the initiation of smoking, and differences between SC and NC were no longer significant for self-efficacy, though differences between VC and NC remained.

Ratings of body image values for the three groups are shown in Figure 1. Internal consistency for the items was high ($\alpha=0.78$). Global body image (mean of all measures of body image) differed significantly across groups (mean±SD: NC, 3.24±0.52; SC, 3.29±0.423; VC, 3.40±0.43; *F*=4.08, *p*<0.05) in univariate analyses; *post hoc* testing revealed that VC differed significantly from

Table 5. Association of smoking and weight among current smokers with different levels of concern about post-cessation weight gain

	How concerned about post-cessation weight gain?			Significance (<i>p</i> -value)	Significance after adjusting for nicotine dependence and BMI (<i>p</i> -value)
	Not at all (<i>n</i> = 121)	Somewhat (<i>n</i> = 105)	Very (<i>n</i> = 145)		
Weight an important factor in initiation (% yes)	6.6%	10.5%	15.2%	Somewhat: NS Very: OR = 2.53, <i>p</i> <0.05	Somewhat: NS Very: NS
Use of smoking as a weight control strategy (Weight Control Smoking Scale; range 0–9)	0.6 ± 1.2 ^a	2.1 ± 1.9 ^a	4.4 ± 3.1 ^a	<i>F</i> = 98.39, <i>p</i> < 0.001	<i>F</i> = 73.20, <i>p</i> < 0.001
<i>Withdrawal symptomatology</i>					
Excessive hunger (% yes)	28.7%	36.5%	44.6%	Somewhat: NS Very: OR = 2.03, <i>p</i> < 0.05	Somewhat: NS Very: OR = 1.94, <i>p</i> < 0.05
Weight gain (% yes)	22.1%	22.6%	44.6%	Somewhat: NS Very: OR = 2.84, <i>p</i> < 0.001	Somewhat: NS Very: OR = 2.22, <i>p</i> < 0.05
Percentage endorsing weight gain as important motive for resuming smoking after quitting	21.1%	32.9%	40.2%	Somewhat: NS Very: OR = 2.52, <i>p</i> <0.005	Somewhat: NS Very: OR = 1.78, <i>p</i> <0.01
Amount willing to gain upon quitting (lbs)	8.4 ± 9.5 ^a	6.6 ± 5.2 ^b	3.9 ± 4.9 ^{a,b}	<i>F</i> = 14.2, <i>p</i> < 0.001	<i>F</i> = 12.02, <i>p</i> < 0.001
Percentage unwilling to gain any weight upon quitting	29.7%	23.1%	50.7%	Somewhat: NS Very: OR = 2.44, <i>p</i> <0.001	Somewhat: NS Very: OR = 2.17, <i>p</i> < 0.01
Self-efficacy about relapse if gain weight (% with poor self-efficacy)	5.0%	14.3%	69.0%	Somewhat: OR = 3.19, <i>p</i> < 0.05 Very: OR = 42.52, <i>p</i> < 0.001	Somewhat: NS Very: OR = 35.42, <i>p</i> < 0.001
Unready to quit smoking (% in pre-contemplation stage)	37.4%	37.4%	57.3%	Somewhat: NS Very: OR = 2.25, <i>p</i> <0.005	Somewhat: NS Very: OR = 1.93, <i>p</i> < 0.05

^{a,b}Identify means that differ significantly in multiple comparisons using the Bonferroni correction. OR, odds ratio, as compared with not at all concerned.

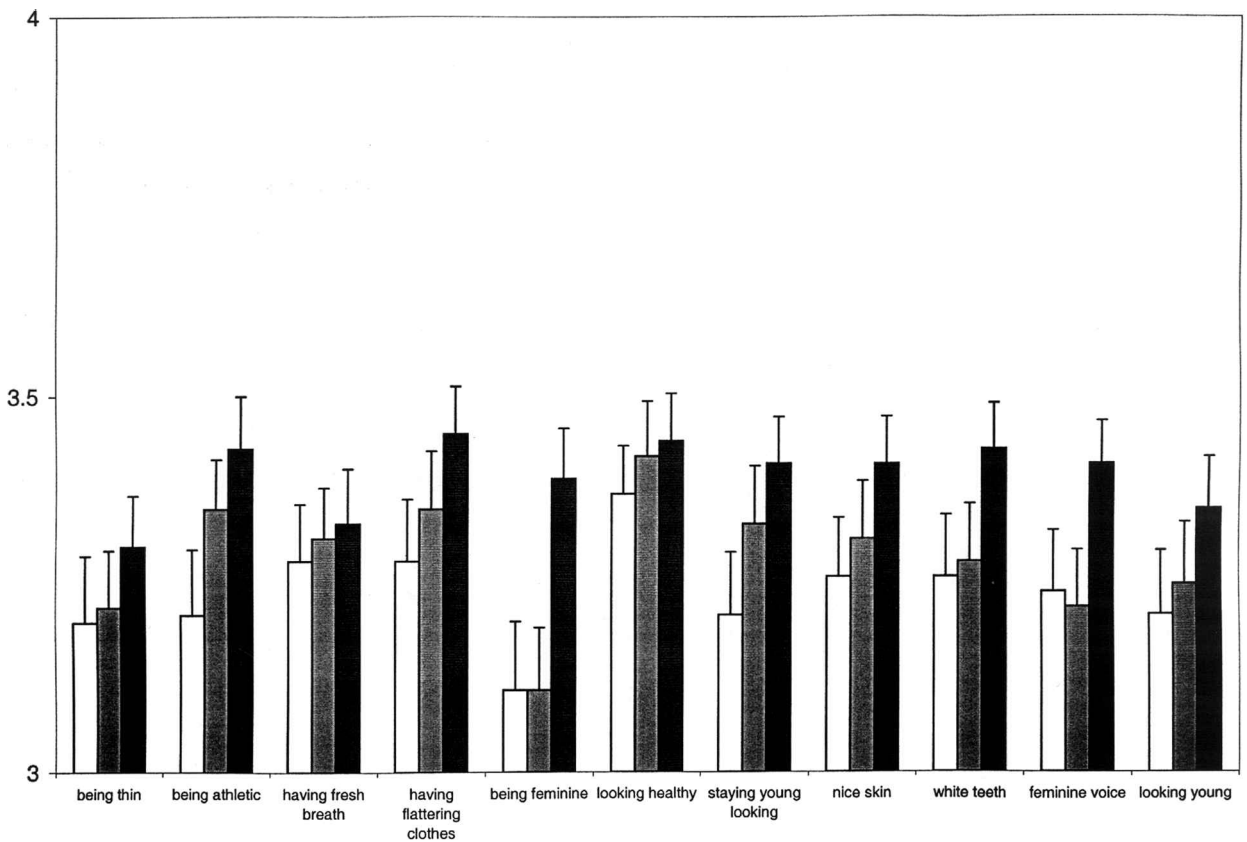


Figure 1. Body image values for women who are not concerned ($n=121$; unfilled bars), somewhat concerned ($n=105$; half-toned bars), and very concerned ($n=145$; filled bars) about post-cessation weight gain; means \pm SEM.

NC; no other between-group differences emerged for global body image. Overall, thinness was rated as being less important than any other value except being feminine; within-subjects contrasts revealed significant overall differences across groups between thinness and (1) nice clothing and looking healthy (both $p < 0.05$), with trends for 1) being athletic, 2) having nice skin, and 3) having nice teeth (all $p < 0.10$). Although no significant group by value interaction emerged in the multivariate analyses, one value, being feminine, showed significant group differences in univariate analyses ($F=4.52$, $p < 0.05$), with *post hoc* testing revealing significant differences between VC and both of the other two levels of weight concern. For the women who had Significant Others (NC, $n=95$; SC, $n=93$; VC, $n=120$), no significant between-groups differences were detected for perceived partner values.

Discussion

Nearly 40% of women smokers interviewed expressed strong concerns about weight gain upon smoking cessation, a figure consistent with other reports in the literature (Gerend, Boyle, Peterson, & Hatsukami, 1998; Klesges & Klesges, 1988). This group somewhat over-included White women, also consistent with the findings of others (Camp, Klesges, & Relyea, 1993); this observation must be tempered, however, by a recent

report by our group (Pomerleau, Zucker, Namenek Brouwer, Pomerleau, & Stewart, in press) indicating that weight concerns may be conceptualized differently by women of other races and ethnicities, for whom thinness *per se* may be less prized but who have no more tolerance than White women for exceeding their 'ideal' weight (and who may therefore use terms like 'fit' and 'firm' rather than 'slim' or 'svelte' to describe their desired appearance). Contrary to the perception that weight concerns are the province of young women of high socioeconomic status, women with strong concerns about post-cessation weight gain were less likely to be college-educated than women with less intense concerns, and there were no linear age differences across groups. Although it is possible that including older women in the sample would have produced a falling off of weight concerns with age, a perimenopausal resurgence of concerns about post-cessation weight gain is an alternative hypothesis that deserves investigation.

As predicted, women with strong concerns about post-cessation weight gain differed markedly from women with fewer concerns along a number of relevant dimensions. They were more likely to report dissatisfaction with their weight and body shape and to engage in a variety of unhealthy behaviors (in addition to smoking) to control weight, including use of diet pills, diuretics, and vomiting. Probably not coincidentally, they were more likely to be overweight than

women with fewer concerns. Whether obesity *per se* is a cardinal feature of the weight-concerned smoker, however, remains unresolved (e.g., Pomerleau *et al.*, 1993); indeed, the majority of all groups in the present study were not obese.

Women with strong concerns about post-cessation weight gain also smoked more and were more nicotine dependent. Although the nature of the relationship between weight concerns and heaviness of smoking requires further clarification, it should be noted that since more dependent smokers consume more nicotine, they may have experienced greater weight gain during previous periods of abstinence due to the greater impact of the removal of nicotine.

No significant between-groups differences were detected for depression. Elevated depression levels in women with disordered eating patterns have been reported elsewhere (Casper, 1998). On the other hand, clinical depression is typically manifested by loss of appetite, though atypical depression is characterized by vegetative symptoms that include increased appetite and weight (Davidson, Miller, Turnbull, & Sullivan, 1982). Unfortunately, the measure of depression used in the present study queries loss of appetite as one of its 20 items; a measure of depression that accommodated the possibility of increased appetite as a symptom of depression might have produced more pronounced group differences in this measure. Since depression is an important cofactor for smoking and predictor of difficulty in quitting, further study of the association between depression and concerns about post-cessation weight gain is needed.

Our findings provide considerable evidence for the active use of smoking as a means of controlling weight among women with strong concerns about post-cessation weight gain. These women were significantly more likely than less concerned women to endorse having initiated smoking to control weight. They were more likely to report increased appetite and weight gain as smoking withdrawal symptoms and to have resumed smoking following a quit attempt because of weight gain. They scored significantly higher on a scale of weight control smoking and were unwilling to tolerate more than an unrealistically small weight gain following cessation. They were significantly more likely to lack confidence in their ability to maintain abstinence if they gained weight, should they attempt to quit – a key finding in view of recent findings about the importance of self-efficacy in maintaining abstinence (Shiffman *et al.*, 2000).

Importantly, women with strong concerns about post-cessation weight gain were significantly more likely to be unready to quit (that is, to be pre-contemplators). Even though readiness is an imperfect proxy for quitting (Farkas *et al.*, 1996), our findings strongly suggest that weight concerned women smokers will be especially unlikely to seek treatment or attempt self-quitting. This observation, collected in a representative national sample of women smokers, underscores the need to assess weight concerns in epidemiological studies of smoking.

Longitudinal population-based studies, as well as broad interventions for which smokers are recruited without regard to motivation or expressed interest in quitting (including well-elaborated assessments of weight concerns not only of enrollees but also of those who decline to participate), however, will be required to confirm the impact of strong concerns about post-cessation weight gain upon likelihood of quitting smoking.

Because women with strong concerns about post-cessation weight gain were significantly more nicotine dependent than women with less intense concerns, and because the fact that weight-concerned women were heavier may also have contributed to their greater reluctance to relinquish a weight management tool, analyses on the smoking-related variables were re-run controlling for these variables. Although all relationships were attenuated by inclusion of the covariates, they remained significant for all variables except the importance of weight concerns in the initiation of smoking.

It has recently been suggested that the cut-off point for concerns about post-cessation weight gain as a barrier to quitting lies between those with no concerns at all and those with any concerns whatsoever (Jeffery *et al.*, 2000). Our results, in a randomly selected national sample not limited to women participating in either a cessation trial or a work-site intervention, do not support this observation, and rather indicate that for most variables, particularly for smoking-specific variables and particularly after controlling for nicotine dependence and body mass index, women with strong concerns are more likely to differ from women with no concerns than are women with an intermediate level of concerns.

Probably because the effects of smoking on body weight are viewed by many women as favorable and might therefore reinforce continued smoking, and perhaps also because advertisements by the tobacco industry have emphasized the weight-controlling effects of smoking (Berman & Gritz, 1991; French & Perry, 1996), most studies to date have queried concerns about weight in isolation from other aspects of body image. Our inclusion of a variety of body image values, an important feature of our study, led to the somewhat surprising observation that thinness did not predominate over other body image values in either women with strong concerns about post-cessation weight gain or less concerned women. In fact, the importance of thinness, though rated higher by women with strong concerns, failed to reach significance in univariate analyses. Rather, what differentiated the groups was the overall importance of body image in general. Thus, instead of trying to persuade women with strong concerns that post-cessation weight gain is acceptable, or to divert their attention from body image issues, it may be more useful to focus on the favorable impact of quitting upon many aspects of body image. In our survey, fresh breath and looking healthy, and to a less marked extent having nice skin, having nice teeth, and being athletic, competed successfully with thinness across all groups, suggesting the utility of stressing the negative effects of smoking on breath, teeth,

skin, and the appearance of fitness. Although being feminine received a relatively low rating overall, evidence that women with strong concerns about post-cessation weight gain did not share this attitude with the other two groups suggests that these women may be especially receptive to the information that smoking results in a less feminine ('pear-shaped') body fat distribution. Although counter-advertising and public education campaigns about the effects of smoking on appearance have most often been used in adolescents, a life stage in which such concerns are considered to be high, it is possible that they may be effectively addressed to adult women for whom wrinkling and gray hair are more immediate prospects (e.g., Demierre, Brooks, Koh, & Geller, 1999).

Lack of any significant findings for perceived partner attitudes suggests that these values are driven more by the respondents' own poor body image than by partner feedback. A comprehensive assessment of partner pressures, however, would require direct assessment of the partners themselves, something that was not possible within the context of the current study.

Our observations suggest that there may be substantial numbers of women for whom the likelihood of attempting to quit and of achieving and maintaining abstinence could be enhanced by identification of and attention to their concerns about post-cessation weight gain, possibly including sophisticated behavioral and/or pharmacological strategies that resolve the competing health and cosmetic claims of smoking cessation and weight management. Thus, despite the puzzling inconsistencies in the literature, and despite the recent suggestion that targeting specific interventions to women with high levels of concern about post-cessation weight gain is of questionable value (Jeffery *et al.*, 2000), we conclude that there is still much to be learned about this potential barrier to smoking cessation, including research to refine our characterization of high-risk individuals and to determine how they can be better motivated to quit; and that it is therefore too soon to close on this issue.

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