ABSTRACT

We evaluated gender differences in demographic, smoking history, nicotine dependence, transtheoretical, and perceived stress variables as predictors of smoking cessation. Participants ($n=381$) smoked at least 15 cigarettes per day and were motivated to quit. The outcome variable was 7-day abstinence at 1-year follow-up. Predictor variables included: age, education level, number of years smoking, cigarettes per day, quit attempts, nicotine dependence, stage of change, decisional balance, processes of change, self-efficacy, and perceived stress. Logistic regression analysis was used to derive predictive models for women and men. In women, lower scores for pre- and mid-treatment perceived stress significantly increased the likelihood of being abstinent at follow-up. For men, a higher level of education or number of quit attempts lasting > 24 hours in the past year, along with less frequent use of behavioural processes of change at baseline increased the probability of being abstinent at follow-up.

ABRÉGÉ

Nous avons évalué les différences attribuables au sexe dans certaines variables prédictives du renoncement au tabac. Les participants ($N=381$) fumaient au moins 15 cigarettes par jour et voulaient cesser de fumer. La variable de résultat était une abstinence de sept jours lors du suivi après un an. Les variables prédictives étaient l'âge, le niveau de scolarité, le nombre d'années de tabagisme, le nombre de cigarettes fumées par jour, les tentatives de renoncement au tabac, la dépendance envers la nicotine, la phase de changement, l'équilibre décisionnel, les processus de changement, l'auto-efficacité et le stress perçu. Par analyse de régression logistique, nous avons dérivé des modèles de prévision pour les femmes et les hommes. Chez les femmes, un score inférieur pour le stress perçu (avant le traitement et à mi-parcours) augmentait considérablement la probabilité d'abstinence lors du suivi. Chez les hommes, des scores supérieurs pour la scolarité ou les tentatives de renoncement au tabac de plus de 24 heures au cours de l'année précédente, ainsi qu'un recours moins fréquent, au départ, aux processus de changement de type comportemental, augmentaient la probabilité d'abstinence lors du suivi.

Gender Differences in Predictors for Long-term Smoking Cessation Following Physician Advice and Nicotine Replacement Therapy

Monika E. Slovinec D'Angelo, MEd,¹ Robert D. Reid, PhD,¹
K. Stephen Brown, PhD,² Andrew L. Pipe, MD¹

Given the time-lag between the onset of smoking and the development of smoking-related diseases, most of the people who will die from smoking over the next 20 years are already smoking.¹ Smoking cessation interventions are of critical public health importance.

Physicians' clinical interventions are an effective approach to cessation.² Three key strategies for successful physician-assisted smoking cessation are advice and support, pharmacotherapy, and behavioural counselling.³ We recently reported a clinical trial that included all of these key strategies, and we achieved a 1-year abstinence rate of 23.7%.⁴

Several factors are associated with improved long-term abstinence following clinician-assisted smoking cessation, including high education level,^{5,6} low nicotine dependence,^{6,9} low perceived stress,¹⁰ high proximal self-efficacy,¹¹⁻¹³ greater social support,^{14,15} and abstinence during the first 1 to 2 weeks of treatment.^{16,17} The transtheoretical (Stages of Change) model,¹⁸ suggests that factors such as readiness to change,¹⁹⁻²¹ decisional balance,²² and certain processes of change²³⁻²⁵ may also predict cessation outcomes.

Population-based,^{26,27} community intervention,^{28,29} and clinic intervention³⁰ data indicate that men are more likely than

women to successfully quit smoking. Other studies have suggested that the process of quitting may vary by gender.³¹ Knowledge of the mechanism(s) by which gender influences abstinence could provide potential targets for intervention.

In this study, we examined gender differences in demographic, smoking history, nicotine dependence, transtheoretical and perceived stress variables as predictors of 1-year smoking abstinence in participants from a randomized controlled trial.

METHODS

Design and participants

We conducted logistic regression analyses of data from a clinical trial of telephone counselling in addition to physician advice and nicotine replacement therapy.⁴ Participants ($n=381$) smoked at least 15 cigarettes per day and were motivated to quit. The trial excluded people with psychiatric disorders, and included 205 males and 189 females.

Outcome variable

The dependent variable was self-reported abstinence for at least 7 days prior to follow-up at one year (i.e., point-prevalent abstinence).³² Non-responders were considered to be smoking. Point-prevalent abstinence is appropriate for process and mechanistic questions, and can accommodate non-linear patterns of change (i.e., relapse and recycling) and delayed quits³³ which are typical of the cessation process. Confirmation of quitting, by carbon monoxide monitoring of breath samples, was attempted for all those reporting abstinence at 12 months; samples were obtained for 75.5% (71/94) of self-reported quitters. As the present study was not an evaluation of an intervention, and false negative report-

1. Prevention and Rehabilitation Centre and Smoking Cessation Clinic, University of Ottawa Heart Institute, Ottawa, ON
2. Department of Statistics, University of Waterloo, Waterloo, ON

Correspondence and reprint requests: Monika Slovinec, Prevention and Rehabilitation Centre, University of Ottawa Heart Institute, 40 Ruskin Street, Ottawa, ON K1Y 4W7, Fax: 613-228-1226, E-mail: mslovinec@ottawaheart.ca

This research was supported by the National Cancer Institute of Canada with funds from the Canadian Cancer Society (Grant in Aid of Research 006062). McNeil Consumer Products provided nicotine replacement therapy.

ing of smoking status is primarily a problem for studies of high risk/medical patients or adolescents,³³ we used self-reported quit rates for the gender-related analyses.

Predictor variables

Categories of predictor variables included demographic, smoking history, nicotine dependence, intervention group, transtheoretical, and perceived stress. Predictor variables were measured at baseline, prior to any intervention. Transtheoretical processes of change and perceived stress were also assessed at mid-treatment (4 weeks after target quit date).

Demographics

Demographic variables included age and education level (high school graduate or less vs. some post-secondary).

Smoking History

Smoking history variables included number of years smoked and number of quit attempts lasting > 24 hours in the past year.

Nicotine Dependence

Nicotine dependence variables included number of cigarettes smoked per day, how soon after waking the first cigarette of the day was smoked (< 30 minutes v. ≥ 30 minutes), and the Fagerstrom Tolerance Questionnaire score.³⁴

Intervention Group

Participants were randomly assigned to either of two groups: usual care (control group) and usual care plus telephone counselling (treatment group). Usual care involved physician advice, self-help materials, and 12 weeks of nicotine replacement therapy. For participants in the treatment group, 3 sessions of telephone counselling were added.

Transtheoretical Variables

Transtheoretical variables included stage of change (contemplation vs. preparation), decisional balance, use of experiential and behavioural processes of change, and self-efficacy. Stage of change was measured by a 5-item questionnaire¹⁸ that queried current smoking status and intentions concerning quitting. Decisional balance was measured by a

TABLE 1
Relationships of Predictor Variables with Gender

Predictor Variable	Relation with Gender		P
	Women N=189 M (SD)	Men N=205 M (SD)	
Demographics			
Age	38.07 (8.18)	37.97 (8.12)	0.90
Education (% >High school)	55.6	56.1	0.91
Smoking History			
Years smoking	22.00 (8.00)	21.46 (8.45)	0.51
Number previous quit attempts	1.43 (1.71)	1.60 (2.22)	0.39
Nicotine Dependence			
Cigarettes per day	22.80 (7.24)	24.08 (8.02)	0.10
Time to first cigarette (% <30 min)	88.4	82.0	0.08
Fagerstrom Score	7.28 (1.71)	6.97 (1.84)	0.09
Heaviness of smoking (% >25 cigs/day)	17.5	19.5	0.60
Intervention Group			
% in Treatment Group	50.3	48.3	0.70
Pre-cessation Transtheoretical Variables			
Pros-cons	-0.85 (3.81)	-1.02 (3.57)	0.65
Confidence	44.64 (15.06)	47.20 (13.16)	0.08
% in Contemplation Stage	37.6	45.9	0.10
% in Preparation Stage	62.4	54.1	0.10
Experiential POCs	34.83 (6.91)	30.91 (6.14)	0.00
Behavioural POCs	26.00 (6.80)	25.71 (6.09)	0.65
Mid-cessation Transtheoretical Variables			
Experiential POCs	26.79 (12.62)	27.76 (13.12)	0.45
Behavioural POCs	28.81 (13.31)	29.99 (13.75)	0.39
Pre-cessation Perceived Stress	5.03 (2.80)	5.01 (2.58)	0.96
Mid-cessation Perceived Stress (4 weeks)	5.34 (3.44)	4.56 (3.06)	0.02

6-item Pros and Cons of Smoking Scale.³⁵ Processes of change were measured using a 20-item questionnaire that included two items for each of 10 processes (5 experiential and 5 behavioural).²⁵ Self-efficacy was measured using a 20-item questionnaire³⁶ that measured confidence in not smoking across daily situations.

Perceived Stress

Perceived stress was measured by Cohen's 4-item Perceived Stress Scale.³⁷ The PSS-4 queries how often in the past month respondents have been able to control important things in their lives, felt confident in handling their personal problems, felt things were going their way, and felt that difficulties were piling up so high that they could not be overcome. The coefficient alpha reliability estimate for the PSS-4 is 0.72 and the scale is correlated with a range of self-report (e.g., life events scores, depressive and physical symptomatology) and behavioural criteria (utilization of health services, smoking reduction).

Data analyses

Baseline differences between males and females were assessed using Chi-square tests for categorical variables and t-tests for continuous variables.

Univariate logistic regression analyses were used to estimate the relation of each variable to abstinence at one year. Further logistic regression analyses tested whether gender moderated the association between each variable and abstinence. The predictor variable was entered on the first step, gender on the second step, and interaction between the two on the third step.

Predictor variables significant at $p < 0.20$ in the univariate analyses or in their interaction with gender were entered into multivariate logistic regression analyses separately for each gender. Variables were dropped using a backward elimination process; the predictor with the smallest, non-significant Wald Chi-Square value was removed at each step. Interactions among the variables retained in the final model were also tested.

To confirm that our data supported a different model for each gender, predictors from the women's model were tested in the men's model and vice versa.

RESULTS

Participant characteristics

Study participants were mostly high nicotine-dependent smokers with long smoking histories (Table I). The average number of years smoked was 21.7, and the mean number of cigarettes smoked per day was 23.5.

TABLE II
Univariate Relationships and Gender Interactions of Predictor Variables with 7-day Abstinence at One-year Follow-up

Predictor Variable	Relation with Abstinence (n=394)			Predictor Variable X Gender		
	B	Partial R ²	P	B	Partial R ²	P
Demographics						
Gender	-0.368	-0.03	0.12	n/a	n/a	n/a
Age	-0.006	0.00	0.70	-0.026	0.00	0.39
Education (>High school)	0.762	0.13	<0.01	-0.573	0.00	0.26
Smoking History						
Years smoking	-0.011	0.00	0.46	-0.022	0.00	0.45
Number previous quit attempts	0.049	0.00	0.38	-0.333	-0.08	0.02
Nicotine Dependence						
Cigarettes per day	-0.007	0.00	0.65	-0.021	0.00	0.52
Time to first cigarette (<30 min)	0.288	0.00	0.36	-1.156	-0.03	0.12
Fagerstrom Score	-0.119	-0.05	0.07	-0.085	0.00	0.53
Heaviness of smoking (>25 cigs/day)	-0.285	0.00	0.23	-0.000	0.00	1.0
Intervention Group						
Treatment Group	-0.099	0.00	0.68	0.253	0.00	0.60
Pre-cessation Transtheoretical Variables						
Pros-cons	-0.004	0.00	0.90	-0.01	0.00	0.87
Confidence	-0.007	0.00	0.43	0.01	0.00	0.55
Contemplation Stage						
Preparation Stage	0.102	0.00	0.67	-0.552	0.00	0.26
Experiential POCs	-0.002	0.00	0.89	0.056	0.02	0.13
Behavioural POCs	-0.030	-0.04	0.11	0.101	0.11	<0.01
Mid-cessation Transtheoretical Variables						
Experiential POCs	0.006	0.00	0.53	-0.014	0.00	0.46
Behavioural POCs	0.010	0.00	0.26	-0.018	0.00	0.32
Pre-cessation Perceived Stress	-0.159	-0.14	<0.001	-0.029	0.00	0.76
Mid-cessation Perceived Stress	-0.139	-0.16	<0.001	-0.101	0.00	0.20

B = Logistic Regression Coefficient

TABLE III
Multivariate Logistic Regression Analysis of Predictors of 7-day Abstinence at One-year Follow-up by Gender

Predictor Variable	Multivariate Analyses							
	Women (n=189)				Men (n=205)			
	B	p	OR	95% CI	B	p	OR	95% CI
Demographics								
Education (>High school)	0.29	0.47	1.34	0.60, 2.96	0.89	0.02	2.43	1.18, 5.02
Smoking History								
Number previous quit attempts	-0.27	0.08	0.76	0.56, 1.04	0.13	0.08	1.13	0.98, 1.31
Nicotine Dependence								
Time to first cigarette (<30 min)	-1.41	0.10	0.24	0.05, 1.29	0.48	0.36	1.62	0.57, 4.58
Fagerstrom Score	-0.35	0.02	0.71	0.53, 0.94	0.02	0.87	1.02	0.81, 1.28
Pre-cessation Transtheoretical Variables								
Experiential POCs	0.02	0.45	1.02	0.96, 1.09	0.03	0.40	1.02	0.96, 1.09
Behavioural POCs	< -0.01	0.88	1.00	0.93, 1.06	-0.10	<0.01	0.91	0.85, 0.96
Pre-cessation Perceived Stress	-0.17	<0.01	0.86	0.74, 1.00	-0.04	0.19	0.91	0.79, 1.05
Mid-cessation Perceived Stress	-0.14	0.06	0.84	0.75, 0.95	-0.09	0.44	0.96	0.85, 1.07

B = Adjusted Logistic Regression Coefficient; OR = Adjusted Odds Ratio

Gender differences in abstinence

The 7-day abstinence rate at 1-year follow-up in the combined sample was 23.6% (95/394). The quit rate was 6.7% higher in men than women (27.3% vs. 20.6%; $p = 0.12$). While this difference in quit rate was not statistically significant, many practitioners would consider it clinically important.

Gender differences on predictor variables

Interactions of predictor variables with gender are shown in Table II. There were significant interactions between gender and

number of previous quit attempts and pre-cessation use of behavioural processes of change, confirming the appropriateness of separate analyses for each gender.

Relations of predictor variables and abstinence

Univariate regression and correlation coefficients associated with predictor variables are shown in Table II. Eight variables, identified as univariate predictors of long-term quitting (at $p < 0.20$), were entered into multiple logistic regressions to derive predictive models for each gender.

Coefficients and odds ratios for predictors are shown in Table III.

Through systematic model reduction, a model that fit the data and reliably predicted long-term abstinence was derived for each gender. For women, perceived stress scores at pre- and mid-cessation were significant predictors of abstinence ($-2\log L = 176.75$; model $\chi^2 = 15.68$, $df = 2$, $p < 0.001$). For men, level of education, the number of previous quit attempts, and use of behavioural processes of change pre-cessation were significant predictors of abstinence ($-2\log L = 217.636$; model

$\chi^2 = 22.78$, $df = 3$, $p < 0.001$). Table IV shows the coefficients and odds ratios for the final models.

Women abstinent at one year perceived less stress during the month preceding and the month following their target quit date. Men abstinent at one year were more likely to have post-secondary education, had more quit attempts in the previous year, and used fewer behavioural processes of change at baseline.

Each model was found to be unique to its gender group. That is, perceived stress reliably predicted abstinence in women only; education, number of quit attempts in the past year, and use of behavioural processes of change were relevant predictors only for men.

DISCUSSION

This secondary analysis of data from a randomized controlled trial of a clinical smoking cessation intervention revealed gender differences in predictors of cessation. Consistent with previous reports, we found that women tended to be less likely than men to have quit smoking at 1-year follow-up. In women, lower scores for pre- and mid-treatment perceived stress significantly increased the likelihood of being abstinent at follow-up. For men, a higher level of education or number of quit attempts lasting > 24 hours in the past year, along with less frequent use of behavioural processes of change at baseline increased the probability of being abstinent at follow-up.

This study is one of the few to report gender differences when transtheoretical (stages of change) measures were included as predictor variables. All participants included in the present analyses were either in the contemplation or preparation stages at enrollment, and all took action to quit (i.e., they made at least one 24-hour quit attempt) after the baseline screening. We did not observe any independent effects of stage of change or decisional balance on outcome.

From a practical perspective, only perceived stress and the use of behavioural processes of change are amenable through intervention. Further discussion will be limited to these predictors.

TABLE IV				
Multivariate Logistic Regression Models Predicting 7-day Abstinence at One-year Follow-up by Gender				
Predictor Variable	Regression Coefficient	Multivariate Analyses		
		95% CI	Odds Ratio	p
Women (n=189)				
Pre-cessation Perceived Stress	-0.14	0.76, 1.00	0.87	0.05
Mid-cessation Perceived Stress	-0.17	0.75, 0.94	0.84	<0.01
Men (n=205)				
Demographics				
Education (>High school)	1.02	1.38, 5.56	2.78	<0.01
Smoking History				
Number previous quit attempts	0.14	1.01, 1.32	1.16	0.04
Pre-cessation Transtheoretical Variables				
Behavioural POCs	-0.09	0.86, 0.97	0.91	<0.01

The relationship between perceived stress and outcome in women was not surprising. Other authors have noted that negative affect, stress and depression are important determinants of outcomes among women; women more often report using smoking as a coping mechanism to deal with negative affect.³⁸⁻⁴⁰ This suggests that perceived stress would be a target for interventions designed for women. We reran the analysis separating specific items on the perceived stress scale into individual predictor variables. Baseline confidence in handling personal problems and mid-treatment feelings that things were going their way were independently related to abstinence.

With respect to processes of change, Perz, DiClemente, and Carbonari⁴¹ suggested that successful smoking cessation would be associated with an optimal pattern of high use of experiential processes and low use of behavioural process during contemplation and preparation stages of change (i.e., before quitting) and the inverse pattern during the action stage. Our data partially supported this pattern of use; we observed that men abstinent at 1-year follow-up used fewer behavioural processes of change at baseline than men who were smoking at follow-up (23.6 v. 26.5; $p < 0.01$). Men who quit successfully also showed a greater change in the use of behavioural processes between baseline and mid-treatment than men who were unsuccessful (+8.6 points v. +2.7 points; $p = 0.01$), indicating that it may be the change over treatment that is more impor-

tant than the total volume of processes. Men attempting to quit smoking would do well to focus more on tasks centering on attitude change and less on behavioural processes prior to taking action. Once an action attempt is begun, relatively greater focus should be placed on behavioural tasks.

It was somewhat surprising that measures of nicotine dependence were not independent predictors of success among men or women. One possible explanation is that study participants were predominantly high nicotine dependent, limiting the ability of this variable to discriminate between successful and unsuccessful quitters.

Participants in clinical trials tend to have a higher motivational readiness to quit smoking and may be more addicted to nicotine compared to smokers at large; 88% of the present sample smoked their first cigarette of the day within 30 minutes of waking, an indicator of high nicotine dependence.⁴² This compares with 60% of daily smokers in Canada.⁴³ The intervention components were consistent with current guidelines;² still it is unclear whether these gender differences would apply to smokers attempting to quit with different forms of assistance or on their own.

This study has functional implications: tailored interventions can be designed to more effectively address gender-specific factors that are amenable to change. More effective treatment matching could lead to higher cessation rates.

ACKNOWLEDGEMENTS

The authors thank Drs. Mariana Herskovitz, Arlene Pagtakhan, and Joie Zeglinski, who served as study physicians; and Sue Tracey, Vivian Welch, and Karin Boucher, for their assistance in data collection during this trial.

REFERENCES

1. Reid R, Coyle D, Papadakis S, Boucher K. Nicotine Replacement Therapies in Smoking Cessation. Ottawa: Canadian Council on Tobacco Control, May 1999.
2. Fiore MC, Bailey WC, Cohen SJ, Dorfman SF, Goldstein MG, Gritz ER, et al. Treating Tobacco Use and Dependence. Clinical Practice Guideline. Rockville, MD: U.S. Department of Health and Human Services. Public Health Service, 2000.
3. Rivo PG, Irvine MJ, Lindsay EA, Kraetscher N, Blair N, Shnek ZM. A critical review of research related to family physician-assisted smoking cessation interventions. *Cancer Prev Control* 1997;1(4):289-302.
4. Reid RD, Pipe AL, Dafoe WA. Is telephone counselling a useful addition to physician advice and nicotine replacement therapy in helping patients to stop smoking? A randomized controlled trial. *CMAJ* 1999;160(11):1577-81.
5. US Department of Health Education and Welfare. The Health Benefits of Smoking Cessation: A Report of the Surgeon General. Public Health Service, Centers for Disease Control, Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 1990. Report No.: DHHS Publication No (CDC) 90-8416.
6. Duncan CL, Cummings SR, Hudes ES, Zahnd E, Coates TJ. Quitting smoking: Reasons for quitting and predictors of cessation among medical patients. *J Gen Intern Med* 1992;7(4):398-404.
7. Fagerstrom KO. Physical dependence on nicotine as a determinant of success in smoking cessation. *World Smoking Health* 1980;5:22-23.
8. Norregaard J, Tonnesen P, Simonsen K, Petersen L, Sawe U. Smoking habits in relapsed subjects from a smoking cessation trial after one year. *Br J Addict* 1992;87(8):1189-94.
9. Rohren CL, Croghan IT, Hurt RD, Offord KP, Marusic Z, McClain FL. Predicting smoking cessation outcome in a medical center from stage of readiness: Contemplation versus action. *Prev Med* 1994;23(3):335-44.
10. Cohen S, Lichtenstein E. Perceived stress, quitting smoking and smoking relapse. *Health Psychol* 1990;9(4):466-78.
11. Coelho RJ. Self-efficacy and cessation of smoking. *Psych Reports* 1984;54:309-10.
12. DiClemente CC. Self-efficacy and the addictive behaviours. *J Soc Clin Psychol* 1986;4(3):302-15.
13. Stuart K, Borland R, McMurray N. Self-efficacy, health locus of control, and smoking cessation. *Addict Behav* 1994;19(1):1-12.
14. Glasgow RE, Hollis JF, Ary DV, Lando HA. Employee and organizational factors associated with participation in an incentive-based worksite smoking cessation program. *J Behav Med* 1990;13:403-18.
15. Sorensen G, Pechacek TF. Attitude toward smoking cessation among men and women. *J Behav Med* 1987;20:129-37.
16. Kenford SL, Fiore MC, Jorenby DE, Smith SS, Wetter D, Baker TB. Predicting smoking cessation: Who will quit with and without the nicotine patch. *JAMA* 1994;271(8):589-94.
17. Yudkin P, Jones L, Lancaster T, Fowler G. Which smokers are helped to give up smoking using transdermal nicotine patches? Results from a randomized, double-blind, placebo-controlled trial. *Br J Gen Pract* 1996;46:145-48.
18. Prochaska JO, DiClemente CC, Norcross JC. In search of how people change. Applications to addictive behaviors. *Am Psychol* 1992;47(9):1102-14.
19. Prochaska JO, DiClemente CC. Stages of change in the modification of problem behaviors. *Prog Behav Modif* 1992;28(183):183-218.
20. Prochaska JO, DiClemente CC, Velicer WF, Rossi JS. Standardized, individualized, interactive, and personalized self-help programs for smoking cessation. *Health Psychol* 1993;12(5):399-405.
21. Rollnick S, Heather N, Gold R, Hall W. Development of a short 'readiness to change' questionnaire for use in brief, opportunistic interventions among excessive drinkers. *Br J Addict* 1992;87(5):743-54.
22. Prochaska JO, Velicer WF, Rossi JS, Goldstein MG, Marcus BH, Rakowski W, et al. Stages of change and decisional balance for 12 problem behaviors. *Health Psychol* 1994;13(1):39-46.
23. Kristeller JL, Rossi JS, Ockene JK, Goldberg R, Prochaska JO. Processes of change in smoking cessation: A cross-validation study in cardiac patients. *J Subst Abuse* 1992;4(3):263-76.
24. Ahijevych K, Wewers ME. Processes of change across five stages of smoking cessation. *Addict Behav* 1992;17(1):17-25.
25. Prochaska JO, Velicer W, DiClemente C, Fava J. Measuring processes of change: Applications to the cessation of smoking. *J Consult Clin Psychol* 1988;56:520-28.
26. Centers for Disease Control and Prevention. Surveillance for selected tobacco-use behaviours—United States, 1900-1994. *MMWR* 1994;43:1-43.
27. Escobedo LG, Peddicord JP. Smoking prevalence in U.S. birth cohorts: The influence of gender and education. *Am J Public Health* 1996;86:231-36.
28. Bjornson W, Rand C, Connett JE, Lindgren P, Nides M, Pope F, et al. Gender differences in smoking cessation in the Lung Health Study. *Am J Public Health* 1995;85:223-30.
29. Community Intervention Trial for Smoking Cessation Research Group. Community intervention trial for smoking cessation (COMMIT): I. Cohort results from a four-year community intervention. *Am J Public Health* 1995;85:183-92.
30. Wetter DW, Kenford SL, Smith SS, Fiore MC, Jorenby DE, Baker TB. Gender differences in smoking cessation. *J Consult Clin Psychol* 1999;67(4):555-62.
31. Whitlock EP, Hollis JF, Vogt TM, Lichtenstein E. Does gender affect response to a brief clinic-based smoking intervention? *Am J Prev Med* 1997;13(3):159-66.
32. Ossip-Klein DJ, Bigelow G, Parker SR, Hall S, Kirkland S. Task Force 1: Classification and assessment of smoking behaviour. *Health Psychol* 1986;5(Suppl.):3-11.
33. Velicer WF, Prochaska JO, Rossi JS, Snow MG. Assessing outcome in smoking cessation studies. *Psychol Bull* 1992;111(1):23-41.
34. Fagerstrom KO, Schneider NG. Measuring nicotine dependence: A review of the Fagerstrom Tolerance Questionnaire. *J Behav Med* 1989;12(2):159-82.
35. Velicer WF, DiClemente CC, Prochaska JO, Brandenburg N. A decisional balance measure for assessing and predicting smoking status. *J Pers Soc Psych* 1985;48(5):1279-89.
36. Velicer WF, Prochaska JO, Bellis JM, DiClemente CC, Rossi JS, Fava JL, et al. An expert system intervention for smoking cessation. *Addict Behav* 1993;18:269-90.
37. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983;24:385-96.
38. Borrelli B, Bock B, King T, Pinto B, Marcus BH. The impact of depression on smoking cessation in women. *Am J Prev Med* 1996;12:378-87.
39. Glassman AH. Cigarette smoking: Implications for psychiatric illness. *Am J Psychiatry* 1993;150(4):546-53.
40. Hall SM, Reus VI, Munoz RF, Sees KL. Nicotine, negative affect and depression. *J Consult Clin Psychol* 1993;61(5):761-67.
41. Perz CA, DiClemente CC, Carbonari JP. Doing the right thing at the right time. *Health Psychol* 1996;15(6):462-68.
42. Fagerstrom KO. Towards better diagnosis and more individual treatment of tobacco dependence. *Br J Addict* 1991;86(5):543-47.
43. Health Canada. National Population Health Survey Highlights: Smoking behaviour of Canadians: Health Canada, January 1999.

Received: October 31, 2000

Accepted: July 9, 2001