Debunking Myths About Self-Quitting

Evidence From 10 Prospective Studies of Persons Who Attempt to Quit Smoking by Themselves

Sheldon Cohen	*Carnegie Mellon University*
Edward Lichtenstein	*University of Oregon and Oregon Research Institute*
James O. Prochaska	*University of Rhode Island*
Joseph S. Rossi	*University of Rhode Island*
Ellen R. Gritz	*University of California, Los Angeles*
Clifford R. Carr	*University of California, Los Angeles*
C. Tracy Orleans	*Fox Chase Cancer Center*
Victor J. Schoenbach	*University of North Carolina at Chapel Hill*
Lois Biener	*Brown University*
David Abrams	*Brown University*
Carlo DiClemente	*University of Houston*
Susan Curry	*Group Health Cooperative and University of Washington*
G. Alan Marlatt	*University of Washington*
K. Michael Cummings	*Roswell Park Memorial Institute*
Seth L. Emont	*Roswell Park Memorial Institute*
Gary Giovino	*University of Rochester*
Deborah Ossip-Klein	*University of Rochester*

ABSTRACT: This article examines data from 10 long-term prospective *studies (N > 5,000) in relation to key issues about the self-quitting of smoking, especially those discussed by Schachter. When a single attempt to quit was evaluated, self-quitters' success rates were no better than those reported for formal treatment programs. Light smokers (20 or less cigarettes per day) were 2.2 times more likely to quit than heavy smokers. The cyclical nature of quitting was also examined. There was a moderate rate (*mdn *= 2.7%) of long-term quitting initiated* after *the early months (expected quitting window) of these studies, but also a high rate (*mdn *= 24%) of relapsing for persons abstinent for six months. The number of previous unsuccessful quit attempts was unrelated to success in quitting. Finally, there were few occasional smokers (slips) among successful long-term quitters. We argue that quitting smoking is a dynamic process, not a discrete event.*

Cigarette smoking is considered the major preventable risk in physical morbidity and premature mortality in the United States (U.S. Department of Health and Human Services, 1986). Information about the risks of smoking has been widely disseminated, and smokers and nonsmokers alike report awareness of cigarette-related health risks. In fact, epidemiologic survey data indicate that millions of persons report that they have quit smoking. Most of these persons (as many as 95%) are presumed to have quit on their own, without the help of a formal cessation program (U.S. Department of Health, Education, and Welfare, 1977). The apparent success of self-quitting is in contrast to what appears to be a disappointing performance of formal treatment programs. Abstinence rates of formal programs at 6 and 12 month followups tend to cluster around 20% of those beginning treatment, with only a few programs showing long-term quit rates of 30% or more (Glasgow & Lichtenstein, 1987; Schwartz, 1987).

A provocative and influential article by Schachter (1982) added fuel to the self-quit bonfire. Schachter presented lifetime retrospective self-reports from 83 members of the Columbia University Psychology Department and from 78 entrepreneurial and working people from a small seaside resort on Long Island. The major thrust of Schachter's argument was that persons who attempt to quit by themselves are more successful than those attending formal programs; 55.8% of persons in his sample who attempted to quit smoking reported abstaining from cigarettes for at least a year at the time of the interview. Comparable data were reported in a replication using a sample of 92 members of the Psychology Department at the University of Vermont (Rzewnicki & Forgays, 1987). According to Schachter (1982) "those who attempted to quit were at least two to three times more successful than were those self-selected subjects who in other studies went for professional help" (p. 439). Three explanations were provided for the presumed superiority of self-quitting. First, persons in formal programs are not representative of quitters in general but rather are likely to be hard-core

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smokers, unable or unwilling to help themselves. Second, evaluations of formal programs assess success at a single attempt to quit, whereas lifetime retrospective reports of successful quitting reflect success on any of multiple attempts to quit that were made over the years. Finally, Schachter suggested that formal program interventions may be ineffective or even perverse, making any alternative, such as self-quitting, appear to be a relatively successful approach.

Schachter also addressed whether how much one smokes influences success in self-quitting. The Nicotine Addiction Model (e.g., Schachter, 1977; U.S. Department of Health and Human Services, 1987) predicts that heavier smokers will have less success quitting. However, data from intervention studies are equivocal in this regard (U.S. Department of Health and Human Services, 1987). One reason for these results may be that intervention studies typically attract only those who smoke a pack a day or more, thereby restricting the samples to the relatively addicted. In contrast, the Multiple Risk Factor Intervention Trial, which included large samples of both light and heavy smokers, found a strong negative relation between baseline smoking rate and successful quitting (Ockene, Hymowitz, Sexton, & Broste, 1982). In their retrospective analyses, Schachter (1982) and Rzewnicki and Forgays (1987) found that although heavy smokers reported that it was harder to quit smoking, they were as successful at quitting as light smokers.

Schachter's methods and conclusions have been criticized before. The foci of the criticism have included the questionable accuracy of long-term retrospective interview methods for estimating rates of smoking (Jeffrey & Wing, 1983) and the limited generalizability produced by using a small and unrepresentative sample (Jeffrey & Wing, 1983; Prochaska, 1983). Schachter's study also failed to use any of the standard procedures for verifying the smoking status of the respondents. Rzewnicki and Forgays's (1987) replication is subject to the same criticisms.

Our purpose in this article is to reexamine the evidence and arguments presented in the Schachter article as well as to consider a range of other issues central to understanding the process of quitting smoking by oneself. The data we present are derived from *10* recent longitudinal-prospective studies of 5,389 persons attempting to quit smoking by themselves or with minimal (self-quit manual) assistance. In each of these studies, smoking status was monitored for six or more months after persons made an attempt to quit smoking.

First, we report the abstinence rates of the 10 self-quitting studies and compare them to rates reported in evaluations of formal programs. Separate comparisons are made using three different definitions of abstinence. Second, we compare the success rates of heavy and light smokers. Finally, we address the limitations of evaluating a single attempt to quit for estimating a lifetime of smoking behavior. This is accomplished by examining the cycling from smoking to nonsmoking and back again that occurs during the course of these studies.

Using data from 10 studies conducted by different investigators in different parts of the country allows us to overcome the biases and errors that occur in making inferences from small and unrepresentative samples and to improve our ability to generalize our results to the population as a whole. Because these studies are prospective, we also can avoid the problems associated with asking subjects to recall smoking behavior over very long periods of time and can accurately track duration of abstinence over the course of the study. Finally, the use of procedures to verify smoking status in all the reported studies allows greater confidence in the validity of our results.

Study Descriptions

Data reported in this article are restricted to subjects whose baseline data were collected prior to their attempts to quit and whose study participation did *not* include meeting with a change agent, or receiving any face-to-face personalized help. Subjects receiving self-quit manuals and related printed materials (received by mail or passed out in worksites) were included.

Descriptive information on the 10 prospective studies (eligible subjects only) is provided in Table 1. Study sites included Buffalo, NY (BUF), Los Angeles (CA), Pittsburgh (PA), Providence (RI), Providence and Houston (RITX), Rochester, NY (ROCH), Houston and Providence (TXRI), and Seattle, WA (WA1, WA2, & WA3). Detailed descriptions of procedures employed in six of the studies are available elsewhere (BUF: Cummings, Emont, Jaen, & Sciandra, 1988; CA: Gritz, Carr, & Marcus, 1988; PA: Cohen & Lichtenstein, 1989; RITX: DiClemente & Prochaska, 1985; WA1: Marlatt, Curry, & Gordon, 1988; WA3: Schoenbach et al., 1985), with further articles soon to be available for the remaining studies.

All 10 studies monitored participants' smoking behavior for a minimum of six months. In order to investigate the influence of length of long-term followup on conclusions about quitting success, we report data on both 6- and 12-month abstinence. Six-month abstinence data are available for seven studies, and 12-month abstinence

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Correspondence concerning this article should be addressed to Sheldon Cohen, Department of Psychology, Carnegie Mellon University, Pittsburgh, PA 15213-3890.

Table 1
Description of the 10 Prospective Self-Quitting Studies Whose Data Are Discussed in This Article

Site	Materials	Sample	*N*	% Women	*M* age	Minimum no. of cigs. per day to participate	Panels	Verification procedure
Buffalo, NY (BUF)	Compared 5 manuals	Community	1,462	65	44	1	Baseline, 1 mo., 6 mo.	Confederate at 6 mo.
Los Angeles, CA (CA)	None	Community	554	56	41	3	Baseline, 1, 2 & 3–8 days, 1 wk., 1, 3, 6 & 12 mo. or base, 1 mo., 6 mo. & 12 mo.	Confederate at wk. 1; and 1, 3, 6 & 12 mo.
Pittsburgh, PA (PA)	Manual and none	Community	329	68	41	10	Baseline, 1, 2, 3, 6 & 12 mo.	CO and saliva cotinine at 6 mo.
Providence, RI (RI)	Manual	Hospital employees	71	65	39	5	Baseline, 8 wk., 6 mo., 12 mo.	Saliva cotinine at all followups
Providence, RI & Houston, TX (RITX)	None	Community	414	70	38	1	Baseline, 6 & 12 mo.	Saliva thiocyanate at 12 mo.
Rochester, NY (ROCH)	Manual	Community	861	64	44	10	1, 3, 6 & 12 mo. or 1 & 12 mo.	Confederate at all followups
Houston, TX & Providence, RI (TXRI)	Compared three manuals	Community	175	62	42	1	Baseline, 1 mo., 3 mo., 6 mo.	Confederate at 1 mo. & at 6 mo.
Seattle, WA (WA1)	None	Community	69	65	39	10	1, 4 & 12 mo.	Confederate at 1 mo.
Seattle, WA (WA2)	Manual	Community	120	68	41	10	Baseline, 1 mo., 6 mo.	Saliva cotinine at 6 mo.
Seattle, WA (WA3)	Compared manual plus various aids	HMO members	1,334	64	44	2	8 mo., 16 mo.	Saliva cotinine at 16 mo.

rates are available for six of the studies. Six-month followups in these studies actually occur between four and six months following a planned quit attempt or receipt of self-help materials, with 12-month followups actually occurring between 10 and 12 months. Eight- and 16-month data available from the WA3 study are also reported in the text but are not included in the tables or meta-analyses.

All the studies verified smoking status for those claiming abstinence. In some cases this effort involved contacting a confederate who would know if the subject was smoking. In other cases, it involved biochemical verification procedures: carbon monoxide, saliva thiocyanate, and/or saliva cotinine. Accurate reporting of smoking status was often further facilitated by reminding subjects that their status would be verified during the course of the study (Murray, O'Connel, Schmid, & Perry, 1987).

Eight of the samples were recruited from local communities. Recruitment techniques included newspaper, television, and radio advertisements. Persons calling community service organizations such as the American Lung Association and Cancer Society for self-help materials were also recruited in some cases. One sample was recruited from members of a health maintenance organization (HMO) through the HMO's own magazine, and one from the employees of a hospital that was encouraging smoking cessation. All the samples included more women (56%–70%) than men, with mean ages ranging from 38 to 44 years old. As apparent from Table 1, the minimum number of cigarettes required for study participation ranged from 1 per day to 10 per day.

Table 2 presents *baseline* smoking characteristics from each of the studies. Three rough measures of dependence on cigarettes at baseline are used to describe subjects in each study: mean number of cigarettes smoked, percentage of heavy smokers in the study (those who smoked more than a pack a day), and percentage of subjects waiting at least 15 minutes after waking before

Table 2
Smoking Characteristics at Baseline

Study	Mean no. of cigs.	% heavy smokers	% >15 min. to 1st cig.	% with previous attempt: Formal program	% with previous attempt: Self-quit attempt
Buffalo (BUF)	28	55	NA	NA	89
Los Angeles (CA)	23	40	59	35	90
Pittsburgh (PA)	28	65	35	16	NA
Providence (RI)	26	62	37	NA	NA
Providence & Houston (RITX)	27	56	NA	5	90
Rochester (ROCH)	28	60	38	20	74
Houston & Providence (TXRI)	29	63	NA	31	59
Seattle (WA1)	27	46	NA	39	90
Seattle (WA2)	25	48	NA	28	86
Seattle (WA3)	25	53	44	36	84
Range	23–29	40–65	35–59	5–39	59–90
Mdn	27	54.8	38	29.5	88

Note. NA = not available.

smoking. Number of minutes to smoking the first cigarette in the morning is an item from the Fagerstrom Dependence Scale (Fagerstrom, 1978) that was available in a number of the studies. The more minutes to the first cigarette, the less the dependence. As apparent from Table 2, the samples are quite similar on smoking characteristics. The exception is that participants in the CA study appear less dependent than those in other studies on all three measures. Only a small number of participants had not tried to quit smoking before. One third of the subjects reported previous enrollment in a formal cessation program (*mdn* = 29.5%, with a range of 5% to 39%), and most (*mdn* = 87.5%, with a range of 59% to 90%) reported previous attempts to quit by themselves.

It is noteworthy that both the demographic and smoking characteristics of these self-quit volunteers are not unlike those of smokers who enroll in formal treatment programs. For example, a sample of 547 participants in the American Lung Association Clinic Study were 59% female with a mean age of 43 and mean smoking rate of 29 cigarettes per day (Schoenbach, Orleans, & Wagner, 1988).

Four of the studies (CA, RITX, WA1, and part of the PA sample) involved persons quitting by themselves without any aids, whereas the remainder of the studies examine persons receiving self-quitting materials. Primarily, the materials consisted of booklets describing either specific quitting or maintenance strategies or offering multiple strategies in a menu-type format. A number of the studies compared different manuals that varied in their format or approach; persons requesting aids were randomly assigned to a particular manual. Data reported in this article are collapsed over different manuals. This is justified in that existing data from these studies suggest that differences in manuals did not influence outcome criteria (e.g., Cummings, et al., 1988).

Results

Abstinence Rates

How long must someone have abstained from cigarettes to be called a quitter? How many cigarettes can a person smoke and still be called a nonsmoker or quitter? These are controversial issues with definitions varying widely across published studies. Published evaluations of quitting programs and of self-quit attempts generally use *point-prevalence abstinence* at the longest followup as the major criterion for quitting success. Point-prevalence abstinence refers to the percentage of persons who are not smoking at the point of assessment. A common procedure is to define persons as abstinent if they were not smoking at the time of the interview and had not smoked during the last week. The advantage of this measure is that it is sensitive to quitting initiated at *any* point prior to assessment. This includes late quitters who failed to initiate a successful quitting attempt at their original target quit dates. Point-prevalence is also readily corroborated by biochemical measures of smoking that have finite half-lives. The disadvantage is that it sets a relatively easy duration criterion for being defined as a quitter and so provides an inflated estimate of the percentage of persons who abstain from smoking for an extended period of time.

Alternatively, it is possible to use *continuous* abstinence rates—not smoking since a particular quit attempt. Hence a person who is continuously abstinent at 12 months has not smoked for 12 months. The advantage to this measure is that it includes only "real" long-term quitters who are less likely to relapse at a later time. The disadvantage is that it evaluates success on a single attempt to quit, ignoring persons who failed initially but made additional successful attempts during the course of the study. Continuous abstinence is difficult to corroborate biochemically because of the relatively short half-lives of accepted biochemical measures.

We use two definitions of continuous abstinence in this article. We refer to the more liberal definition as abstinent "at all panels"—no smoking for at least a week at *any* of the followup interviews.[1] Hence to be considered

[1] The exception is the CA study, which used a 48-hour criterion in defining both point prevalence and abstinent at all panel continuous abstinence.

continuously abstinent by this definition at 12 months in the PA study (see Table 1), persons would have to report point-prevalence abstinence at the 1-, 2-, 3-, 6-, and 12-month followups *and* be supported in these reports by analyses of their 6-month CO and cotinine samples. The "abstinent at all panels" measure allows slips and occasional smoking, as long as this smoking does not occur within a week of a followup interview. A minimum of two followup assessment points is required for calculating an "at all panel" continuous abstinence rate. This is because a rate based on one interview is no different than a point-prevalence rate. Hence we do not calculate an "at all panels" rate at 6 months for the RITX study, or at 8 months for the WA3 study. In both cases, these are the first followup interviews.

We refer to the more conservative definition of continuous abstinence as "not a puff"—point-prevalent abstinent at all panels and *no* reported smoking, not even a puff, between followup periods. Hence, the conservative definition for any of the studies reporting 12-month continuous abstinence is that subjects report not smoking at all for an entire year. Rates for the "not a puff" definition of continuous abstinence are reported only for the eight studies collecting sufficient information to implement this definition. Because the studies differ in the number of followups, time between followups, and timing of the verification procedure (see Table 1), the sensitivity of both measures is expected to vary somewhat across studies.

Table 3
Six-Month Abstinence Rates

Study	% point-prevalence abstinence	% continuous abstinence	
		All panels	Not a puff
Buffalo (BUF)	16.8	7.7	5.5
Los Angeles (CA)	26.9	16.3	10.1
Pittsburgh (PA)	8.5	4.6	2.5
Providence (RI)	7.0	6.0	4.2
Providence and Houston (RITX)	5.1	NA[a]	NA
Rochester (ROCH)	13.5	6.6	5.7
Houston & Providence (TXRI)	12.6	5.0	2.8
Seattle (WA2)	25.8	5.0	NA
Range	5.1–26.9	4.6–16.3	2.5–10.1
Mdn	13.2	6.0	4.9

Note. NA = Not available.
[a] Because this was the first followup in the RITX study, it was not possible to calculate an "all panels" continuous abstinence rate.

Table 4
Twelve-Month Abstinence Rates

Study	% point-prevalence abstinence	% continuous abstinence	
		All panels	Not a puff
Los Angeles (CA)	25.1	10.6	6.7
Pittsburgh (PA)	16.4	4.3	2.2
Providence (RI)	12.7	4.2	4.2
Providence and Houston (RITX)	8.2	3.9	3.4
Rochester (ROCH)	15.1	5.4	4.3
Seattle (WA1)	8.7	4.3	NA
Range	8.2–25.1	3.9–10.6	2.2–6.7
Mdn	13.9	4.3	4.2

Note. NA = Not available.

Rates for the studies with six-month followups are presented in Table 3. Point-prevalence abstinence rates vary widely among studies, from 5.1% in the RITX study, to 26.9% in the CA study. However, data from the two continuous abstinence measures are quite consistent. In the case of the "all panel" rates, only the CA study is outside of the 4.6% to 7.7% range. In the case of the six studies for which "not a puff" data were available, only the CA study is outside the 2.5% to 5.7% range. Eight month rates from the WA3 study are similar with a point-prevalence rate of 14.7% and a "not a puff" rate of 5.6%.

Rates for studies with 12-month followups are presented in Table 4. Point-prevalence data at 12 months show much greater convergence than at 6 months, ranging from 8.2% to 16.4%, except 25.1% for the CA study. Moreover, this convergence among study rates also occurs in the two continuous abstinence measures. The range for the "all panels" rate is 3.9% to 5.4%, except 10.6% for the CA study, and 2.2% to 6.7% for the five studies (including CA) for which "not a puff" data were available. A 16-month rate is available for the WA3 study instead of a 12-month rate. Point-prevalence (16.7%) and "not a puff" (2.8%) rates at 16 months were equivalent to 12-month rates in the remaining studies. A relatively elevated 10.4% "all panels" rate in the WA3 study may be attributable to the fact that the rate was based on only two assessment points.

Unaided versus aided self-quitting trials. As noted earlier (see Table 1), some of the studies reported in this article involved persons who received self-quitting materials, whereas others involved those who quit without any aids from the investigator. If "hard-core" smokers were selecting themselves into the aided groups, we might expect differences among aided and unaided groups. Un-

aided groups' "at all panels" rates at six months were 16.3% for the CA study, and 6.0% for unaided PA sample. Although we cannot calculate an "at all panels" rate for the RITX study (the remaining study of unaided quitting) at 6 months, the 5.1% point-prevalence rate can be used as a "high end" (continuous abstinence by definition would be equal or lower) estimate. Twelve-month rates for unaided groups were 10.6% for CA, 5.4% for the unaided PA sample, 3.9% for RITX, and 4.3% for WA1. Clearly, the rates for the unaided studies (6-month median of 6.0% and 12-month median of 4.9%) are in the same range as those from the aided studies (6-month median of 5.8% and twelve month median of 4.8%). Hence the issue of whether persons quit with a manual or totally on their own does not seem to discriminate among these studies.

In contrast to Schachter's results, neither the point-prevalence nor continuous abstinence rates found in these studies suggest that self-quitters are more successful than clinic quitters. The 12-month point-prevalence rates range from 8.2% to 25.1% (*Mdn* = 13.9) and tend to be lower than those (clustering around 20%) reported in evaluations of clinic programs (Glasgow & Lichtenstein, 1987; Schwartz, 1987; U.S. Department of Health and Human Services, 1987). The *continuous* abstinence rates reported in Tables 3 and 4 suggest that long-term success for a single attempt to quit occurs among an even smaller proportion of those attempting to quit; 12-month medians were 4.3% for "all panels" and 4.2% for "not a puff." These latter rates are consistent with a 3% 12-month continuous abstinence rate reported in an early evaluation of various American Lung Association self-quit materials (Davis, Faust, & Ordentlich, 1984). The convergence in long-term rates among studies reported in our analysis is especially impressive in light of the fact that the studies vary widely in terms of the number of followup interviews (between two and eight at 12 months) that are used to calculate continuous abstinence.

Surprisingly, there was also little difference (especially at 12 months) between the rates resulting from the two definitions of continuous abstinence. This suggests that there are very few long-term (12 month) quitters who smoke occasionally. That is, successful long-term quitters tend to be persons who never smoke!

The remaining analyses in this article focus on continuous abstinence because it provides a stable and conservative definition of long-term abstinence. Because there is little difference between the two measures of continuous abstinence and because we have "abstinent at all panels" data from all of the studies at 12 months, we use only the "at all panels" definition.

Heavy Versus Light Smokers

Schachter's data indicated no difference in success in quitting based on the number of cigarettes smoked. As discussed earlier, although the Nicotine Addiction Model predicts that heavy smokers will be less successful in quitting, research with formal programs has been equivocal, probably because few light smokers were recruited. In all the studies reported in this article, data were collected on the number of cigarettes smoked at baseline, and all included persons smoking less than a pack a day.

We defined heavy smokers as those who smoked at least 21 cigarettes a day (more than a pack), whereas light smokers were defined as those who smoked less than 21 (a pack or less). Table 5 presents the continuous abstinence rates separately for heavy and light smokers for the 6-month criterion, and Table 6 presents these rates for

Table 5
Six-Month Continuous Abstinence Rates for Heavy (21 or More Cigarettes) and Light (20 or Fewer Cigarettes) Smokers

	Light smokers			Heavy smokers						
Study	% abs.	Actual no. abs.	No. nonabs.	% abs.	Actual no. abs.	No. nonabs.	*n*	Chi-square	*p*<	Phi
Buffalo (BUF)	9.0	58	584	6.6	53	746	1441	2.89	.09	.05
Los Angeles (CA)	20.3	67	263	10.3	23	201	554	9.88	.00	.13
Pittsburgh (PA)	8.0	11	126	2.1	4	187	328	6.44	.01	.14
Providence (RI)	11.1	3	24	2.3	1	43	71	—	—	—
Rochester (ROCH)	8.3	16	176	5.3	14	251	457	1.69	.19	.06
Houston & Providence (TXRI)	3.1	2	62	2.7	3	108	175	—	—	—
Seattle (WA2)	4.8	3	59	5.2	3	55	120	—	—	—

Note. Abs. = abstinent. The Pearson chi-square statistic, its significance level, and the phi coefficient are not reported for those studies in which more than 20% of the cells have expected frequencies of less than 5.

the 12-month criterion. Chi square statistics for individual studies are reported when appropriate, that is, when 80% or more of the cells have an expected frequency of at least five (Fleiss, 1981). For the six-month studies, six of seven report higher abstinence rates for light smokers, although only two (CA and PA) reach traditional levels of significance. The Mantel-Haenszel statistic was used as a meta-analytic technique to combine the seven 2 × 2 contingency tables (Fleiss, 1981). This statistic addresses whether the common degree of association is significant (chi square), and provides a risk (odds) ratio as an estimate of the degree of association. Use of the Mantel-Haenszel statistic assumes that the degree of association is consistent from one table to another (homogeneity), and hence we also report a chi-square statistic testing for homogeneity. Homogeneity is supported if this statistic is *not* significant. In the case of the 6-month data, the degree of association was found to be consistent across studies, $\chi^2 = 5.86$, df = 6, $p = .44$, and the common degree of association significant with a $\chi^2 = 16.89$, df = 1, $p < .0001$, and a risk ratio of 1.75. In other words, the combined analysis indicates that light smokers were 1.75 times more likely to quit for six continuous months following the onset of the study than heavy smokers.

For the 12-month studies, all six studies found higher continuous abstinence rates for light smokers, with three (CA, PA, ROCH) reaching statistical significance. The degree of association was consistent across all of the studies, $\chi^2 = 3.27$, df = 5, $p = .66$, and the common degree of association significant, a $\chi^2 = 18.44$, df = 1, $p < .0001$, and a risk ratio of 2.2. Hence light smokers were 2.2 times more likely to quit for 12 continuous months than were heavy smokers. In sum, rate differences across the studies provide strong support for the hypothesis that self-quitters who are light smokers are more successful in attaining long-term abstinence.

Smoking Cessation as a Dynamic Process

As eloquently argued by Schachter, the evaluation of a single attempt to quit smoking is a poor predictor of the probability of quitting smoking over a life-time. The obvious argument in support of this proposal is that most people who fail a single attempt will try again and again and eventually quit. There is, however, another reason to expect a discontinuity between single attempts and life-time success. Even persons who successfully initiate long-term quitting may return to regular smoking at a later point. In short, over the life course, many people cycle from smoking to nonsmoking and back again (see Prochaska & DiClemente, 1983). In order to increase our understanding of the dynamic characteristics of the smoking cessation process we address three issues: (a) whether the probability of quitting smoking increases with each additional attempt to quit; (b) the extent to which the emphasis on single-attempt evaluation in our analyses has missed persons initiating long-term quitting *late* (after the first month) in the course of our studies; and (c) the extent to which long-term quitters in our studies return to smoking.

Influence of previous attempts to quit on current success. Does the probability of a successful quitting attempt increase with each additional attempt to quit? One position is that one cannot quit if one does not try and hence the greater the number of quitting attempts, the greater the probability of quitting. There are, however, other alternatives. For example, early attempts to quit may provide information that allows a later attempt to be successful, or failed attempts may reflect strong de-

Table 6
Twelve-Month Continuous Abstinence Rates for Heavy (More Than 20 Cigarettes) and Light (20 or Fewer Cigarettes) Smokers

	Light smokers			Heavy smokers						
Study	% abs.	Actual no. abs.	No. nonabs.	% abs.	Actual no. abs.	No. nonabs.	*n*	Pearson chi-square	*p*<	Phi
Los Angeles (CA)	13.6	45	285	6.3	14	210	554	7.65	.01	.12
Pittsburgh (PA)	8.0	11	127	1.6	3	188	329	8.06	.00	.16
Providence (RI)	7.4	2	25	2.3	1	43	71	—	—	—
Providence & Houston (RITX)	4.4	8	174	3.4	8	224	414	.25	.62	.02
Rochester (ROCH)	7.5	26	320	3.9	20	493	859	5.33	.02	.08
Seattle (WA1)	5.4	2	35	3.1	1	31	69	—	—	—

Note. Abs. = abstinent. The Pearson chi-square statistic, its significance level, and the phi coefficient are not reported for those studies in which more than 20% of the cells have expected frequencies of less than 5.

pendence, poor quitting skills, and/or an unsupportive environment, all of which may presage future failure or inhibit future cessation attempts.

Figure 1 reports the continuous abstinence rates at 6 and 12 months for persons who have no previous serious attempts to quit, 1 to 5, and 6 or more. In Figure 1, we have graphed only those studies with a minimum of 40 subjects per cell, an arbitrarily chosen minimal criterion for a reasonable estimate of population means. Figure 2 presents similar data based on the weighted mean of *all* studies. The weighted mean is equivalent to treating all subjects as if they are in the same study.

As apparent from Figure 1, there is little relation between previous attempts to quit and the probability of success on a current attempt. Although the CA study suggests a trend, none of the chi-square statistics for these studies reach even marginal statistical significance. The 18-month WA3 data also indicate no relation between number of quit attempts and probability of a successful quit. The weighted data presented in Figure 2 similarly fail to indicate a relation.

A major limitation of our results lies in our having to group prior quitting attempts: 0, 1 to 5, 6 or more. It is possible that lumping together subjects with one to five attempts may have masked a relation. However, an analysis of continuous data on prior quitting (0 through 9 or more previous attempts to quit) in the BUF study, a study with a large enough sample to use such a breakdown, similarly found no relation between previous attempts to quit and quitting outcomes (Cordova, 1988).

Late quits. Persons who do not initiate long-term quitting during the first month of a study could initiate successful attempts to quit at later points. These "late quits" would not be reflected in the continuous abstinence rates discussed earlier. To assess the extent to which late quitting efforts were initiated during the first six months

Figure 1.
Relation Between Number of Attempts to Quit and 6- and 12-Month Continuous ("at all Panels") Abstinence for Studies With at Least 40 Persons per Group

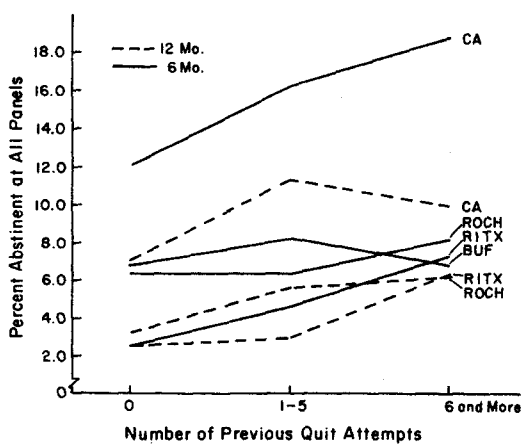
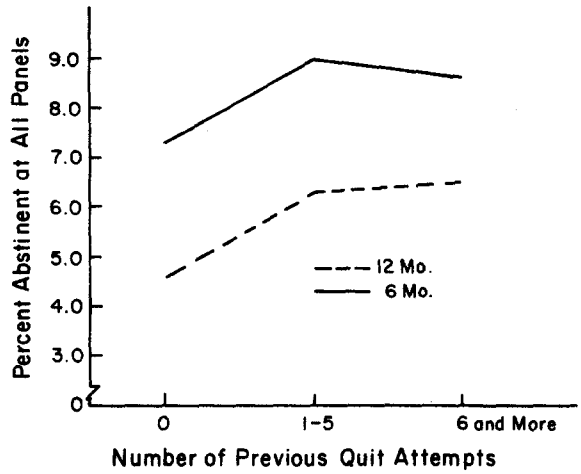


Figure 2.
Relation Between Number of Attempts to Quit and 6- and 12-Month Continuous ("at all Panels") Abstinence Based on a Weighted (for Sample Size) Mean of all Studies



of these studies, we calculated the proportion of persons who were not continuously abstinent at 6 months but were abstinent for at least 6 months at the 12-month followup. Data for these calculations were available in four of the studies. *Late* six-month continuous abstinence rates were 7.9% for CA, 1.6% for PA, 1.4% for RI, and 3.4% for ROCH (*Mdn* of 2.7%). Although the overall number of persons initiating successful late quitting attempts within six months is small (1.4% to 7.9%), these rates constitute 45%, 35%, 23%, and 52% (median of 40%) of the initial 6-month continuous abstinence rates for these studies and hence suggest considerably more success in quitting during the course of the study than reflected in the continuous abstinence rates presented in Table 3.

Late relapses. Do our long-term continuous abstinence criteria define persons who are now "safe," that is, unlikely to go back to smoking (Brownell, Marlatt, Lichtenstein, & Wilson 1986; Hunt, Barnett, & Bronch, 1971)? Although we do not have data on late relapse for persons continuously abstinent at 12 months, we do have data from four studies to evaluate the extent of relapse that occurs after 6 months of continuous abstinence. We calculated the percentage of persons continuously abstinent at 6 months who relapsed before 12 months. These relapse rates are substantial, ranging from 7% to 35% (CA, 35%; PA, 7%; RI, 30%; ROCH, 18%) with a median relapse rate of 24%. Hence substantial numbers of long-term (6-month criterion) quitters return to smoking.

Discussion

Schachter's (1982) article influenced the field's view of self-quitting, in part accurately and in part inaccurately. First, self-quitting is not a panacea, nor do persons attempting to quit by themselves have any greater success than those attending formal programs. When comparing

12-month point-prevalent abstinence rates from evaluations of programs (cf. Schwartz, 1987) and the data reported here, the resulting success rates are similar or lower for self-quitting. Moreover, the smoking characteristics of persons in our studies (Tables 1 and 2) were similar to those found in reports on formal cessation programs. Apparently, the differences between Schachter's (1982; and Rzewnicki & Forgays, 1987) retrospective recall data and data from formal program evaluations were not attributable to more "hard-core" smokers attending programs or to the ineffectiveness or "perversity of the therapeutic process" (Schachter, 1982, p. 443). More likely, they were attributable to comparing quitting rates based only on a single attempt to quit (actually attempts to quit within a single year) with lifetime quitting rates.

Second, heavy smoking self-quitters are less successful at long-term quitting than their light smoking counterparts. Light smokers were 1.75 times more likely to quit when 6-month continuous abstinence was used as the outcome and 2.2 times more likely when 12-month continuous abstinence was used. It is possible that the discrepancy between our results and Schachter's was attributable to the use of different breakdowns for heavy and light smoking. Although Schachter used 15 cigarettes as the breaking point, we used 21. Given that in 1985, only 28% of men and 35% of women smoked fewer than 15 cigarettes a day (U.S. Department of Health and Human Services, 1986), our cut point seems more defensible than Schachter's. It is also possible that Schachter's subjects were making rather substantial errors in retrospectively estimating their smoking rates in years past or that a relatively small relation between rate and quitting success can only be detected with reasonably large sample sizes.

Schachter's argument that persons make many attempts to quit in their lives and that the evaluation of success on a single attempt cannot provide an estimate of the possibility of quitting during a lifetime is well taken. Our data indicate that significant numbers of persons initiate successful long-term quitting after the quitting window (usually one-month) of our studies expires and hence there is reason to think that estimates based on single attempts underestimate attempts to quit that occur during the study period. However, our data also indicate a good deal of relapse among persons who have abstained from smoking for six months or more, suggesting a bias in the direction of overestimating the proportion of lifetime quitters when using a six-month criterion. The high rate of late relapsing we find is consistent with retrospective data from a national probability sample also indicating considerable relapse among self-quitters after six or more months of abstinence (U.S. Department of Health and Human Services, 1989). The important conclusion from these data has to do with the dynamic character of the process of quitting smoking. Neither retrospective reports, prospective evaluations of single attempts to quit, nor one-shot national surveys are adequate to tap the nature of the on and off cycle of smoking that occurs for many over their life course. This can only be accomplished with large-scale longitudinal studies that monitor subjects' smoking behaviors over many years.

Also relevant to Schachter's argument regarding the relevance of single attempts to quit for estimating lifetime quitting are the data indicating little, if any, effect of the number of previous attempts to quit a person has made on the probability of success of a current attempt. Two interpretations of these data seem possible. First, the number of previous attempts to quit may just be unrelated to success on any particular attempt. That is, previous failed attempts neither increase or decrease the probability of a success in a future attempt to quit. Second, a self-selection process may be operating with those who are relatively unmotivated or otherwise unable to quit dropping out of the quitting process after one or more attempts obscuring a negative effect of previous unsuccessful quitting experiences. As in the issues raised earlier, further clarification of this process requires studies in which smoking and quitting behavior are tracked for several years.

Definitions of Quitting

Most evaluations of quitting attempts, whether aided or unaided, use a point-prevalence measure assessed at the last-followup. We think that the data presented in this article provide especially good evidence that continuous abstinence data should also be used in such evaluations to provide a more conservative long-term measure. Moreover, the striking similarity of continuous abstinence rates across the studies reported in this article provides a strong argument for their relative superiority in terms of reliability and validity. The choice of appropriate outcomes when evaluating attempts to quit is not, however, merely an issue of choosing a short- or long-term criterion. Understanding when and how people quit smoking will require recognition and measurement of the recycling that occurs during studies (and during the life course) as well.

Surprisingly, we found little difference (especially at 12 months) between the rates resulting from the "not a puff" and abstinent "at all panels" definitions of continuous abstinence. Very few participants who were abstinent at all panels engaged in occasional smoking between assessments. This suggests that continuous abstinence can be calculated with the abstinent "at all panels" procedure with little loss of the accuracy obtained from detailed questions at each panel about smoking behavior since the last interview. However, our data suggest that the "at all panels" rates are most accurate for those studies using at least three followup interviews over the course of a year. This is good news from a practical perspective because this measure is relatively easy to implement in new studies, can be corroborated with biochemical measures, and many existing data sets from clinical trials and smoking treatment evaluations contain the data required for calculating the abstinent "at all panels" definition.

Is Our Sample Representative of Self-Quitters?

It is possible that our data do not represent unobserved self-quitting in the general population. All subjects in our

studies volunteered to participate and in some cases, requested self-quit materials. Because we do not know the characteristics of the population of persons ready to make serious attempts to self-quit, it is difficult to assess the extent of bias in these samples. Hence the representativeness of our samples and generality of the results are still in question. However, data from representative community studies suggesting a 3% to 4% quitting rate per year (Garvey, 1988; Pechacek, 1987) are consistent with rates reported in this article and hence suggest that our data may provide accurate estimates of general population trends.

Explaining Higher Abstinence Rates in the CA Study

The CA study found higher point-prevalence abstinence rates, continuous abstinence rates, and late quit rates than any of the other nine studies we report. As we noted earlier, the CA sample was made up of relatively less dependent smokers than the other samples. They waited longer to smoke their first cigarette in the morning, smoked fewer cigarettes, and fewer of the sample smoked over a pack a day. The higher abstinence rates in the CA sample are consistent with the finding that light smokers are more likely to initiate successful long-term quitting than heavy smokers. Hence higher abstinence rates appear to be at least partly attributable to the sample containing more light smokers than other studies.

It is clear, however, that the higher proportion of light smokers in the CA study does not totally account for the higher abstinence rates. For example, the six-month continuous abstinence rate for *heavy* smokers in the CA study is 10.3%, whereas the range of rates for the entire samples (heavy and light smokers) of the remaining studies is 4.6% to 7.7%. In short, even the heavy smokers in the CA study have success rates that are relatively elevated as compared to all smokers in the other studies.

A close examination of Table 1 indicates that the CA study also had fewer women than other samples. The gender difference, however, does not seem to affect abstinence rates. Neither the CA study nor a meta-analysis of all the relevant studies indicates an effect of gender on either 6- or 12-month continuous abstinence rates.

Another explanation for the higher abstinence rates in the CA study is an extremely high level of motivation and self-efficacy in this sample as manifest in an impressive 90% of the sample quitting for at least 24 hours (Gritz et al., 1988). These differences may reflect differences in recruiting procedures of this and other studies. There may also have been some positive influence of the California health conscious environment and of the debate and passage of a city ordinance requiring nonsmoking areas in worksites that occurred during the course of the study.

Conclusions

Smoking cigarettes is a central part of many persons' lifestyles, and quitting smoking is difficult for many, often requiring multiple attempts before long-term success is accomplished. This article provides initial descriptive data on the relative success of self-quitting attempts, the prevalence of relapse among long-term quitters, and on the recycling that naturally occurs over a period of several months. A major thrust of our analysis has been that quitting smoking (by oneself or with the aid of a program) should be viewed as a dynamic process not a discrete event. Better understanding of this process will require studies in which smokers are tracked for several years with data on their changes in smoking status, and data on the cognitive and attitudinal correlates of stability and change carefully documented.

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