

would have to show that such tailoring was more successful than simply assigning all participants to the best available treatment.

Antecedents of Relapse

Social models and pressures to smoke, drink, or take drugs and feelings of frustration, anxiety, or sadness may frequently precede relapse (32). In this analysis, social pressure was divided into two classes, direct and indirect. Direct social pressure involved offering or encouraging consumption. Indirect social pressure primarily included other people smoking, drinking, etc., in one's presence. For alcohol and drug groups, 14 percent and 28 percent of relapses, respectively, were in response to direct social pressure, but only 4 and 6 percent followed indirect social pressure. For smokers, this was reversed; direct social pressure preceded 6 percent of relapses, but 19 percent were preceded by indirect social pressure.

The findings of Marlatt and Gordon (32) have been replicated by Lichtenstein et al. (30). Subjects who had quit on their own and then relapsed reported that social pressure, interpersonal conflict, and negative emotional states accounted for 80 percent of the relapses. These same circumstances also accounted for 80 percent of the relapses studied by Marlatt and Gordon. The subjects interviewed by Lichtenstein et al. reported more social pressure (48 versus 25 percent) and fewer negative emotional states (20 versus 43 percent) as antecedents of relapse than did the subjects studied by Marlatt and Gordon, but the general pattern remains similar. One area of appreciable difference between the two studies concerns "urges and temptations," coded as the major antecedent of relapse for 18 percent of subjects interviewed by Lichtenstein et al., but for only 6 percent of those studied by Marlatt and Gordon.

Lichtenstein et al. (30) also asked subjects about the circumstances surrounding their relapses. Most took place either at home or in a bar, tavern, or restaurant. Only 7 percent took place while working. Other persons were present at 83 percent of the relapses, 59 percent occurred in small groups, but only 5 percent at parties, reflecting the setting in which indirect social pressure may occur. Sixty-two percent of relapses occurred when other people were smoking; 46 percent of relapse cigarettes were requested from others, 11 percent were offered by others, and only 27 percent were bought. Thirty-six percent of subjects said they were drinking alcohol at the time of their relapse.

An important pattern emerging from the survey of Lichtenstein et al. that describes the impact of social facilitation of relapse and the social atmosphere surrounding relapses: others are present (83 percent), they are often smoking (62 percent), and they are often the source of the relapse cigarette (57 percent). The importance of these factors is reflected indirectly in respondents' answers to a question

regarding what they thought would be "most helpful" in quitting and in remaining abstinent. Answers varied widely, but the most frequent was social support, mentioned by 25 percent.

Shiffman (46) studied relapse crises described by callers to a smoking cessation hotline. Relapse crises were situations threatening continued abstinence, defined by the subjects' decisions whether or not to call the hotline. Sixty-one percent of the callers had not relapsed. Callers had to have been abstinent for at least 2 days. The median number of days abstinent was 9.7, but duration of abstinence ranged up to 2 years.

Shiffman's results were similar to those of Lichtenstein et al. (30) and Marlatt and Gordon (32). Although 56 percent of the crises took place in the callers' homes, in contrast with 26 percent of relapses in the sample of Lichtenstein et al., others were present during most of the crises (61 percent). Someone else was smoking in 32 percent of the situations. Thus, social facilitation and modeling are again implicated in relapses.

Relapse crises were often preceded by consumption of food (29 percent), alcohol (19 percent), or coffee (18 percent). These data may be understood in conjunction with the withdrawal symptoms that accompanied 53 percent of the crises. It may be that food, alcohol, or coffee serve as conditioned stimuli for urges to smoke. Shiffman's sample suggests this possibility in that half of the subjects had been abstinent fewer than 10 days at the time of their crises, perhaps accentuating the role of withdrawal symptoms.

Affect and stress were also found by Shiffman to be major antecedents of relapse crises. Seventy-one percent were preceded by negative affect, 42 percent of all callers indicated their crises were preceded by anxiety, 26 percent by anger or frustration, and 22 percent by depression (callers could cite more than one antecedent of relapse).

Relapse crises were coded as to the circumstance or setting most responsible for them. Fifty-two percent were coded as negative affect or stress and 32 percent as smoking stimuli, most often the smoking of others, but also including the presence of cigarettes, ashtrays, and so forth. Together, these two categories accounted for 84 percent of the crises, almost matching the 80 percent of the relapses attributed to interpersonal conflict, negative emotional states, and social pressure found by Lichtenstein et al. (30) and Marlatt and Gordon (32).

The factors governing whether or not relapse crises actually resulted in smoking were explored in analyses of over 30 variables. Only a few were significant. The presence of another smoker, the consumption of alcohol, and the location of the occurrence were all instrumental. If another smoker was present, 54 percent of the crises led to relapse, as opposed to only 32 percent in the absence of other

smokers. When alcohol was consumed, 61 percent of crises led to relapse, as opposed to 33 percent in the absence of alcohol. Finally, being at home or at work was relatively safe; only 33 percent of crises in these settings led to relapse, as opposed to 57 percent in other settings. This replicates the findings of Lichtenstein et al. that relapses occurred less frequently when respondents were alone or at work.

Coping strategy reports differentiated crises that did and did not lead to relapse. Subjects using behavioral coping strategies (e.g., leaving the situation) relapsed in only 28 percent of crises in contrast with 58 percent of those who did not. Similarly, those who did and those who did not employ cognitive coping strategies (e.g., talking oneself out of an urge) relapsed 30 and 55 percent of the time, respectively.

Reports of types of coping used were associated with other aspects of crises. Behavioral coping was reported less often when respondents had been drinking than when they had not. Use of cognitive coping, however, was not influenced by alcohol.

Depressed mood was also related to cognitive and behavioral coping skills. A greater percentage of subjects reporting cognitive coping overcame crises centered on depressed moods than of those reporting behavioral coping strategies. Only a modest difference favoring behavioral coping was found in the success rates for subjects with crises centered on moods other than depression. Of course, associations among subjects' reports of moods, actions, and outcomes need to be interpreted cautiously. Social perception and labeling processes (2) may distort them. They may also reflect interactions among length of abstinence, type of crisis precipitant, and use of coping skills. For instance, after several weeks of abstinence, when negative emotion may be more related to relapse (38), ex-smokers may grow weary of the vigilance or effort demanded by behavioral coping strategies and either stop using them or use them with less vigor and, thus, less effect.

Differences among the findings of Marlatt and Gordon (32), Lichtenstein et al. (30), and Shiffman (46) may be attributed in part to differences in their samples.

In addition to the antecedents of relapse, the "abstinence violation effect" may lead some to give up the attempt to maintain abstinence or control (32). The abstinence violation effect is a hypothesized reaction to first relapse and entails the attribution to oneself of insufficient skill to maintain abstinence, feelings of dejection over relapse, and anticipation of positive benefits from the use of the previously denied substance. The abstinence violation effect and Shiffman's findings regarding cognitive coping skills suggest several treatment approaches. These include the correction of misattributions of relapse to immutable personal failings, as well as procedures

to teach cognitive and behavioral skills with which to cope with social pressures or with troublesome emotions leading to relapse. Several reports of such procedures used with smokers have not indicated success (6, 20).

Social Support

As reviewed above, many relapses take place in social circumstances and in apparent response to social facilitation by other people smoking. Furthermore, those surveyed by Lichtenstein et al. (30) identified social support as a potential aid in maintaining abstinence. The importance of social support is suggested further by findings, for instance, that the presence of a smoking spouse is related to smoking status (22) and to relapse following smoking programs (51). Returning to smoking following abstinence has also been found by Eisinger (14) to be inversely related to the proportion of former smokers among the friends of the individual.

In spite of the replication of findings linking smoking status and success in quitting with social factors, few studies have attempted to manipulate social support for abstinence. A buddy system was explored by Janis and Hoffmann (26), in which 30 adults in a five-session smoking cessation program were assigned to one of three treatments: "high contact" partners, who made daily phone contact with each other; "low contact" partners, who spoke to each other only at clinic meetings; and controls, who had different partners at each meeting. At followup 1 year after treatment, the high contact partners indicated smoking at only 25 percent of the levels reported at pretreatment. In contrast, subjects in the low contact group reported smoking at approximately 75 percent of pretreatment levels. Those in the control group had returned to their pretreatment levels by the time of the 1-year followup. The authors did not report abstinence data.

The role of spouses has been further explored by Mermelstein et al. (35) with clients of a cessation program. Respondents indicated which spouse behavior they found helpful or unhelpful. Cluster analyses of these responses identified four groups of spouse behaviors: (1) nagging or shunning, (2) policing or monitoring, (3) cooperation and advice, and (4) reinforcement and support. Cooperation and reinforcement were positively correlated with reduction or abstinence, while nagging and shunning were negatively correlated with reduction or abstinence.

Lichstein and Stalgaitis (29) explored "reciprocal aversion" among spouses. In this procedure, a spouse who had smoked a cigarette was responsible for telling his or her spouse of it. The spouse so informed then was also to smoke a cigarette. Six months after treatment, 5 of 10 subjects located for followup reported abstinence. If the two subjects who were unavailable for the followup are counted as still

smoking, the abstinence rate is 42 percent. The potential utility of including spouses in treatment is also suggested by the work of Brownell et al. (7) in weight-loss treatment administered to couples.

Powell and McCann (39) combined an intensive 1-week treatment program with three maintenance conditions manipulating social support: a 4-week support group in which thoughts and feelings could be discussed, a 4-week telephone contact system for group members, and a no-contact control group. All subjects received the same cessation treatment and a series of self-help maintenance messages at the final treatment session before being divided into the three maintenance programs. At the end of treatment, 100 percent of the 51 subjects completing treatment were abstinent. At 1-year followup, 63 percent of the subjects reported total abstinence. There were no significant differences among the three maintenance programs and no gender differences in abstinence. The unexpectedly high long-term abstinence rates, therefore, cannot be attributed to either of the social support maintenance conditions. The authors suggest that the self-help maintenance message manual received by all groups may alone have been sufficient. Furthermore, self-control techniques learned during the program may have served as appropriate maintenance tools.

The power of social support as a component in cessation and maintenance strategies may be imputed from the results of the Multiple Risk Factor Intervention Trial (MRFIT) available to date (24, 35a). This unique study constituted a 6-year clinical trial utilizing random assignment to treatment (Special Intervention) and control (Usual Care) conditions. It investigated the effects of reducing three cardiovascular risk factors (elevated cholesterol level, hypertension, and smoking) in a large sample of asymptomatic men in the upper ranges of heart disease risk. The Usual Care (UC) condition was not a non-treatment control group. Participants knew of their elevated risk status, were contacted at 4-month intervals, and received annual examinations and testing. The Special Intervention (SI) group consisted of 4,103 smokers, aged 35 to 57, who received an intensive 10-week group intervention program for simultaneous reduction of all three risk factors, followed by continued maintenance of abstinence or extended intervention to lower CHD risks. All return visits (annual physical examinations, data collections at 4-month intervals, and more frequent visits for risk-factor management) provided opportunities for intervention. Techniques used in the 10-week cessation program excluded aversive methods such as rapid smoking, satiation smoking, and warm, smoky air because of potential health risks and to pursue the goal of maximizing subject retention in the program. A wide variety of educational and behaviorally-based cessation techniques were utilized in small groups of 6 to 10 participants and their wives, led by

professional counselors. Wives were invited to participate in the smoking cessation program, and to provide support and reinforcement for their spouses. In addition to spousal involvement, group support, utilization of group dynamics, and generalization of learning were invoked to enhance cessation efforts.

Abstinence rates for men in the SI condition were high, estimated at 47.3 percent at the end of intervention (4 months) and at 45.9 percent at 48-month screening, using both self-report and objective measures of smoking cessation (serum thiocyanate level). Conservative estimates counting missing subjects as smokers were 43.9 percent and 40.3 percent, respectively (24). Greater reduction of smoking occurred among UC participants than was anticipated (35a). Quit rates were adjusted using serum thiocyanate levels to correct for underreporting of smoking in both groups. The adjusted quit rate difference between SI and UC groups was approximately 18 percent, decreasing only slightly from 20 percent at 12 months to about 19 percent at 48 months. For third and fourth years of the study, the observed differences in overall cigarette smoking reductions between SI and UC groups exceeded predictions.

Among the many results reported for this study was the identification of subgroups of smokers: those who can quit with minimal assistance; those who can quit with the aid of a formal cessation program; those who are unable to quit with any technique provided; and those who are capable of quitting and remaining abstinent only while in contact with a formal program.

While the MRFIT program represents a special group of persons—men at high risk for cardiovascular disease—who received perhaps the most extensive intervention/maintenance program ever devised for smoking cessation, the results deserve close scrutiny for the wealth of relationships to be measured and the generalizations that can be made to smoking research and intervention as a whole.

Predictors of Outcome

Pomerleau et al. (38) found that a lower pre-treatment rate of smoking, fewer number of years smoked prior to quitting, lower percent overweight, and compliance with a record-keeping requirement of treatment all predicted abstinence at the end of a 2-month cessation program. These variables, however, were not related to abstinence 1 year after treatment. Rather, extended abstinence was inversely related to the extent to which subjects indicated that negative affect was a mood most likely to lead to smoking. Subjects were asked to list five moods in order of the likelihood that they would lead to smoking. Those mentioning negative moods as most likely to lead to smoking were coded as "negative affect smokers." Among them, only 26 percent were abstinent 1 year later in comparison with 50 percent of those who were not negative affect

smokers. This also supports the findings on the role of negative emotions in relapses cited above.

Results analyzed to date from the MRFIT trial show that lighter smokers were more successful in quitting than heavier smokers (24). At end of treatment, conservatively estimated abstinence rates for light (1 to 19 cigarettes/day), medium (20 to 39 cigarettes/day) and heavy (≥ 40 cigarettes/day) smokers were, respectively, 66.8, 46.7 and 35.3 percent. At 48-month evaluation, these rates were 66.1, 42.8, and 31.2 percent respectively. The recidivism rate is thus also lower among the lighter smokers. Relationships between success in quitting and psychosocial or demographic variables are not yet available.

Emerging from several findings reviewed here is the distinction between smoking as a habit and smoking as a response to negative moods. The results of Pomerleau et al. (38) suggest that initial success in quitting is closely related to the extent to which smoking has been an overlearned habit, as gauged by number of years of smoking and number of cigarettes smoked per day. However, having quit, the likelihood of remaining abstinent may be more closely related to the extent to which smoking is cued by negative moods. This pattern suggests that cessation strategies should concentrate on breaking habits and that maintenance strategies should concentrate on coping with negative moods.

Contradictory findings were reported in a recent study by Flaxman (19). She explored relationships among factors derived from the subjects' scores on Horn's Reasons for Smoking Scale and the subjects' reports of self-control techniques used to prolong abstinence following a smoking cessation clinic. Flaxman reasoned that, if self-control techniques varied in their effectiveness for different types of smokers, they should be more closely related to measures of type of smoker among successful quitters than among the unsuccessful. This expectation was confirmed. Reports of use of relaxation and thought stopping were more highly correlated with measures of smoker types among those abstinent than among those nonabstinent at a followup 1 or 6 months after cessation. However, the use of these two procedures was more closely related to a factor representing the extent to which smoking is a firm habit than to factors measuring emotional causes of smoking. It had been expected that reported use of relaxation, especially, would be more related to the measure of emotional causes of smoking. The import of Flaxman's paper is limited by a design problem. The outcome data for 65 percent of the subjects were gathered at a 6-month followup, but data for the other 35 percent were based on 1-month followup. Pomerleau et al. (38) found smoking habit and history to predict abstinence at the earlier followup, but status as a negative affect smoker was found to predict the later outcome. The failure of Flaxman's paper to replicate these

latter findings may be due to combining data from different followup intervals for which the findings would be expected to vary.

A final predictor of outcome is self-perception, the extent to which subjects see themselves as responsible for changes they make or as having a good chance of maintaining them. Bandura's concept of perceived self-efficacy (1) has drawn attention to such factors in many areas of psychology.

Colletti and Kopel (9) and Fisher et al. (16) found abstinence at followups positively related to measures of the extent to which subjects attributed their cessation to their own efforts, skills, or changes in attitudes. Such self-attribution was contrasted with attribution to external factors such as luck and the skill of the group leader.

Finding self-attribution of change related to positive outcomes suggests more recent concepts of self-efficacy (1). Self-efficacy refers to the extent that one feels he or she has the skills or abilities necessary to accomplish a goal. Cooney and Kopel (11) increased self-efficacy by giving group participants a "controlled relapse" in which they gained experience at handling a slip. Contrary to the hypothesis, those with self-efficacy most enhanced by this procedure were most likely to relapse. Shiffman et al. (47) also found this pattern among callers to a relapse prevention hotline. Reported levels of self-efficacy prior to a relapse crisis were greater among those who had returned to smoking than among those who had not. However, Condiotte and Lichtenstein (10) found general levels of self-efficacy regarding outcomes related to observed outcomes. Resolution of this is suggested by Gottlieb et al. (21) showing that general confidence regarding long-term abstinence and low confidence for dealing with "slips" both predicted reduction in smoking 1 and 4 months after cessation. The findings of Cooney and Kopel (11) and Shiffman et al. (47) both pertain to self-efficacy for dealing with a slip while those of Condiotte and Lichtenstein (10) pertain to more generalized confidence in outcomes.

Implications

There are a number of promising approaches to encouraging continued nonsmoking that go beyond strong cessation procedures and focus on maintenance itself. These approaches may be divided into those that try to make smoking cessation clinics better, and those that look for alternatives to smoking cessation clinics.

A number of ways to improve cessation clinics may be extracted from the papers reviewed. Perhaps most current is the focus on antecedents of relapse: the emotions of frustration, anxiety, anger, and perhaps sadness, as well as the social models and cues and settings that seem to bring on relapses (30, 32, 46). Skills for dealing

with the emotional antecedents may be developed, perhaps sharpening the focus of previous successful self-management approaches to maintenance (27). Clarifying cognitive coping skills (46) and finding ways to teach them may be helpful. They may be more versatile or simply more acceptable to people than the more overt behavioral coping approaches. While most smoking programs are conducted in groups, it may be that those groups can be made stronger counterforces to the social cues that seem to encourage relapse.

Outcomes are sometimes better with less rather than more therapeutic contact. This and the improvements observed through tailoring treatments to individual characteristics suggest another dimension for improving cessation programs. In the review of Best's (4) findings regarding results of tailoring treatment to subjects' levels of motivation and internality versus externality, the findings did not seem strong enough to provide a basis for individual clinical decisions. Nevertheless, the findings do suggest the importance of packaging treatment components so that they will be well accepted by target audiences. The timing of manipulations, especially those intended to shape or alter attitudes, needs to be considered carefully. Satiation or aversion procedures may be best presented in a way that offers the individual whom they do not suit a way to decline their use without taking the role of a noncompliant deviant within the program.

The findings of Condiotte and Lichtenstein (10) that subjects can predict the situations in which they relapse further support the possible utility of self-tailoring. So, too, does the finding of 6-month abstinence rates of 33 percent and 29 percent in two separate studies (validated by saliva thiocyanate) using no aversive procedures but a self-control package in which subjects develop their own specific self-control strategies based on their own needs as they judge them (31). More generally, these results suggest that participant's subjective evaluations of program components need to be considered.

Programs conducted through institutions may hold much promise as alternatives to cessation clinics. Including incentives or reinforcements for nonsmoking may prove beneficial. While cessation clinics may be part of such programs, use of the institution's organizational features to support, encourage, and reinforce nonsmoking should extend far beyond a cessation clinic meeting held once a week. The social and organizational factors that may be harnessed to encourage nonsmoking appear to have only begun to be identified. Some social support interventions have been effective (26, 29). Reliable findings link social cues, smoking friends, and smoking spouses to relapses and smoking (14, 22, 30, 32, 46, 51). These findings suggest that harnessing social forces to encourage nonsmoking will be productive.

Summary

1. Until recently, the long-term outcome of intensive smoking cessation clinics has remained at 25 to 30 percent abstinence. New emphasis on techniques to improve the maintenance phase of cessation promises to improve these rates, with several reports of greater than 50 percent abstinence at followups of 6 months or longer.
2. To improve maintenance of nonsmoking after intensive treatment programs have ended, reinforcement should be built into the natural environment. Smoking cessation programs in the workplace may offer an opportunity for this.
3. Comprehensive self-management packages that have been shown to boost maintenance rates include a wide variety of techniques.
4. Treatment outcome may be improved by focusing on the antecedents of relapse. These include feelings of frustration, anxiety, anger, and depression as well as social models and smoking-related cues and settings. Behavioral and cognitive skills for dealing with such antecedents should be developed.
5. Social support interventions are promising. Reliable findings link social cues, smoking friends, and smoking spouses to relapse, whereas the presence of group support, nonsmoking spouses, and professional contact decreases recidivism.

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PREVENTION IN ADOLESCENCE: INITIATION AND CESSATION

Introduction

In this section, what is known about spontaneous cessation rates in adolescence and the predictors of spontaneous cessation in adolescence will be considered.

Spontaneous Cessation Rates

Spontaneous cessation rates in adolescence may be estimated from several data sources. However, comparisons between studies are difficult to make because of the variety of ways the cessation question has been asked. Often the "quit" category is in reality a residual category without precise meaning. A distinction probably should be made between cessation from regular use and cessation from occasional or experimental use (17). Also, the way data usually are reported, the totality of cessation can only be implied. All persons who perceive themselves as having quit are grouped together, whether the last cigarette was smoked years before or only days earlier. Most studies reporting cessation rates are retrospective, although there are exceptions (most notably 14).

With these data limitations in mind, four sources of data on smoking cessation in adolescence are considered. It has been necessary to conduct secondary analyses on published data found typically in tabular form in order to estimate spontaneous cessation rates, since cessation was not the focus in any of these studies.

Johnston, Bachman, and O'Malley (23, 24) conducted annual national surveys of high school seniors to study trends in the prevalence and frequency of recent drug use and, retrospectively, when several types of drugs were first used. The numbers of persons reporting having smoked "regularly in the past" (but not now) has remained stable from 1975 to 1978 (the last year reported to date). The proportion of high school seniors reporting regular smoking (half a pack per day or more) in the past but not now was 8.6 percent, 9.2 percent, 8.8 percent, and 9.1 percent for 1975, 1976, 1977, and 1978, respectively. By summing the use categories, "regularly in the past" and "regularly now," it is possible to estimate the proportion of one-time regular smokers who have stopped. For 1975, 1976, 1977, and 1978 the proportion of regular smokers who had quit was 28.2, 35.3, 27.0, and 28.5 percent, respectively, an average of 29.8 percent, with no apparent temporal trend.

In the only study to date reporting a prospective analysis of smoking cessation in adolescence, Green (14) reinterviewed by telephone 1,194 of 2,553 respondents (ages 17 to 23) who had been interviewed 5 years earlier as part of a national survey of smoking

behavior in youth. She found that 27 percent of the original "current regular smokers," those smoking one or more cigarettes per week, had stopped smoking and continue not to smoke. These figures, although they include less frequent smoking as part of the "regular" smoking category, are similar to the cessation rates of the Johnston (24) respondents.

In a longitudinal study of junior high school students in suburban Minneapolis, Luepker et al. (26) enhanced the validity of cessation estimates by collecting saliva samples for thiocyanate analysis (27). If only those persons who report smoking twice or more monthly are counted as smokers, the proportion of quitters by ninth grade was 26.5 percent, a figure that is comparable to the cessation rates for high school students reported by Johnston et al. (23).

A study of drug use among 13- to 19-year-old Vancouver, British Columbia secondary school students reports cessation rates for less frequent users (16). In 1974, 63.9 percent of all respondents reported having smoked at some time in their lives. Forty-three percent of these "ever smokers" were still smoking, and 57 percent had stopped. Of the 1978 cohort, 72.1 percent reported having ever smoked. Of these, 40.4 percent said they were still smoking and 59.6 percent said they had quit.

The Chilton survey data as presented by Green (14) were reanalyzed for reports of duration since last cigarette to help interpret the meaning of cessation for these adolescent groups. Only 1 percent said they had quit within the last month, giving some assurance that the "quitter" category did not contain a high proportion of wishful thinkers. Still, 28.9 percent said they quit between 1 and 5 months before the followup survey, and 13.4 percent said they quit 6 to 11 months before. Expected quit rates for those periods (based on 1.67 percent per month for 60 months) were 7.3 and 10.0 percent, respectively, suggesting that a substantial proportion of recent "quitters" would remain abstinent for a relatively short duration. If 6 months' abstinence is taken as a criterion for cessation, 70.1 percent of self-proclaimed quitters qualify. At an average monthly quit rate of 1.30 percent for 54 months, we would expect about 78 percent of "quitters" would be enduring quitters, or a stable quit rate of about 21 percent instead of the 27 percent reported by Green. This does not represent a substantial difference and may even somewhat underestimate true cessation. Nevertheless, the bias from reports of recent quitting should be kept in mind in estimating the range of possible adolescent cessation rates.

In the Chilton survey, 91.8 percent expressed interest, either by cessation attempts or by positive responses to a questionnaire item, in stopping smoking. This compares favorably with results found among adults surveyed in 1975 with 86.2 percent of males and 84.8 percent of females not wanting to continue to smoke (7).

In summary, the spontaneous smoking cessation rate among adolescent regular smokers (those who smoke once a week or more often) appears to be between 20 and 30 percent. Cessation rates are higher if experimental and occasional smokers are considered as well.

Predictors of Spontaneous Cessation

In 1979, Green (14) reported the results of a followup interview of two national samples interviewed as adolescents 5 years earlier. At the time of the followup interview, respondents ranged in age from 17 to 23 years, and 47 percent of the original 2,553 were successfully reinterviewed. Older groups (who tend to smoke more) and smokers within each age cohort, especially female smokers, were under-represented in the followup interviews, resulting in a possible over-estimation of spontaneous cessation (reported to be 27 percent for the 5 years).

Retrospective Predictions

Green reported the retrospective associations between various "predictor" variables measured in 1979 and smoking transitions between 1974 and 1979.

Reported cessation rates were the same for both sexes, which were 28.0 percent for males and 25.7 percent for females. Age was a significant factor. The highest cessation rates (31.5 percent) were found in the 20- to 21-year-old cohort (15 or 16 at time of the original survey). The 17- to 19-year old cohort (12 to 14 at original survey) had the lowest cessation rate: 18.2 percent. The oldest cohort, age 22 to 23 (17 or 18 originally), had a moderate spontaneous cessation rate: 26.3 percent.

Prospective Attitudinal Predictors

Green (14) explored changes in smoking behavior prospectively by creating 8 factors from 24 questions about smoking attitudes. Two of the eight factors were significant prospective predictors of cessation. Those who had given up smoking by 1979 were less likely in 1974 to have held to "stereotypes of smoking." That is, those who continued as smokers were more likely than those who became quitters to agree with the statements, "Most girls start smoking cigarettes to attract boys," "Most boys start smoking cigarettes to try to become popular," and "If you don't smoke cigarettes other teenagers put you down." This may represent a greater sensitivity to or belief in social influences to smoke and may have motivated continued smoking. Quitters were also less likely to adhere to "stereotypes of smokers." Those still smoking in 1979 were more likely than quitters to have agreed in 1974 with the statements, "Kids who smoke are showoffs,"

"Teenage smokers think they are grown up but they really aren't," and "Teenage smokers think they look cool, but they don't really." There is some irony in the way that nonquitters perceived the social plight of smokers. Whereas they saw smokers as more responsive to what they believed to be social benefits of smoking, they seemed to perceive the actual social consequences in a more negative light (e.g., "...think they look cool, but they don't really"). The original nonsmokers were the group with the strongest stereotypic beliefs about smokers and those who continued to smoke, more than those who quit, shared this somewhat negative view of smokers. This pattern is consistent with findings that adults who fail in cessation programs tend to have lower self-esteem than those who succeed (35).

Social Influences

Smoking by parents, older siblings, and peers all have been shown consistently to predict the *onset* of smoking in adolescents, both by retrospective and prospective association (3, 32, 33, 35). Flay et al. (13) found that parental smoking had a different effect on cessation than on smoking onset. The probability of experimental or regular (one or more weekly) smoking was 9.7 percent for 6th graders if neither parent smoked, 18.0 percent if one parent smoked, and 21.9 percent if both smoked. Cessation probability (denominator includes experimenters) was 35.5 percent if neither parent smoked, but 44.8 percent if one parent smoked, and 47.9 if both smoked. Given that both current regular and experimental smokers were included in the denominator when these figures were computed, this unexpected finding could be taken to mean that although children of smoking parents are more likely than others to try smoking by sixth grade, this greater tendency is expressed largely in experimentation, from which experimenters typically revert quickly to nonsmoking status.

Secondary analyses of the published Chilton survey data (14) reveals that, by retrospective association, smoking by older siblings was associated with cessation probability. Among respondents with older siblings, the probability of quitting was 25.3 percent if no older sibling was smoking at the time of the followup interview, and 32.4 percent if one or more siblings smoked; the probability was 27.3 percent for those who had no older siblings. This finding is consistent with that reported by Flay et al. (13), and suggests that a large portion of the excess smoking due to family influences was experimental smoking that was likely to be given up.

Spielberger et al. (41) recently reported a study of smoking habits in 955 college students with a median age of 19. They examined differences in family smoking patterns among current smokers, occasional smokers, and ex-smokers in this sample. Overall, it appeared that neither parental nor sibling smoking habits differentiated these groups. This conclusion may obscure important sex

differences. In males, more ex-smokers come from families in which neither parent smokes, as expected. Among females, ex-smokers are more likely to come from families in which at least one parent smokes. In the NIE survey, boys whose siblings do not smoke are least likely to be ex-smokers; the highest quit rates were reported among boys who came from families where one, but not both, siblings smoked (14).

Cessation probability was even more closely related to the smoking practices of close friends. The likelihood of a smoker's quitting was 50 percent if none of his or her four closest friends smoked regularly, and was 23.4 percent if one or more smoked regularly.

Previous research has shown consistently that level of education is inversely associated with cigarette smoking behavior (42, 43, 44). This relationship also occurs with adolescent cessation rates (14). The probability of cessation was 42.0 percent for 1974 adolescent smokers who had at least started college by 1979 and 24.6 percent for smokers who did not go to college. For those who failed to complete high school, the cessation probability was only 10.3 percent. Smoking onset rates after 1974 were 14.8 percent for those who started college, 25.6 percent for those who did not, and 35.9 percent for those who did not complete high school (14).

The probability of quitting decreased linearly with the duration of the smoking practice (Figure 1). There was a 64.5 percent probability of quitting in the first year of smoking, declining to 30.8 percent by the third year, and to 14.3 percent after 7 years. This finding is consistent with the results reported by Pomerleau et al. (38) that adults in a cessation clinic were less successful the longer they had smoked. However, Hansen (15) found no relationship between spontaneous cessation of adolescence and duration of the smoking practice.

Age of onset, surprisingly, was earlier for ex-smokers than for those who still smoked. Cessation probability was 49.4 percent for those who began regular smoking at age 13 or 14 and 37.2 percent for those who began at age 15 or 16, 32.5 percent for those who began at age 17 or 18, and 30.1 percent for those who began at age 19 or older.

Studies have shown that quitting "cold turkey" is a more effective cessation strategy for adults than is trying to cut back gradually (35). The Chilton survey suggests as much for adolescents as well. Of those who said they had tried to cut down without trying to stop entirely, eventually 24.0 percent went on to quit. Of those who said they had never tried just cutting back, 38.6 percent successfully quit smoking (14).

Quitting appears to have been the result of persistence more than anything else, since 73.4 percent of smokers who kept trying to stop eventually were successful. Figure 2 reveals the cumulative probability of stopping smoking at each successive try. Whereas only 24.7

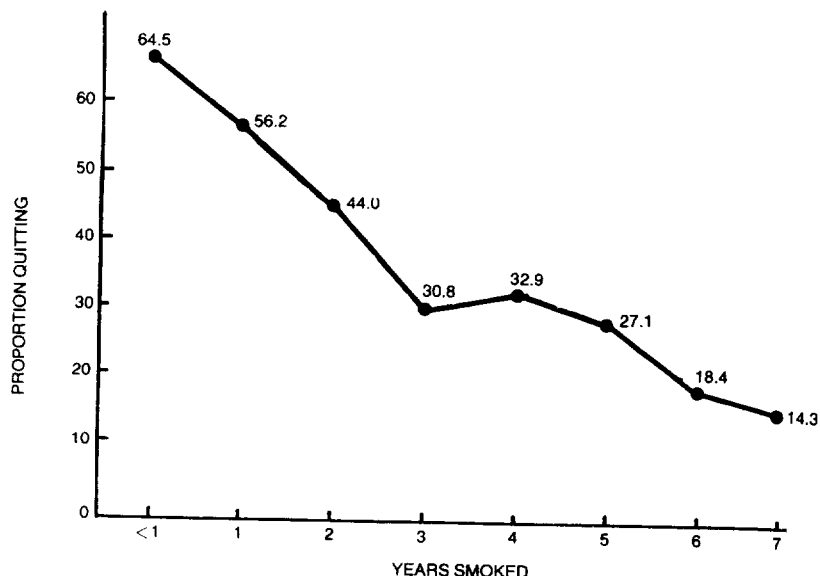


FIGURE 1.—Probability of quitting smoking in adolescence and duration of smoking practice

SOURCE: Green (14).

percent were successful the first time they tried, 38.4 percent were successful by the second attempt, 58.6 percent by the third attempt, and 73.4 percent by the fourth or more try. One can conclude that persistence pays off. Still, only 27 percent of original smokers had quit by the time of the 5-year followup interview, presumably because more than a third (37.8 percent) of those still smoking had never tried to stop, and 35.6 percent of those who had tried only tried once. Repeated cessation attempts may indicate stronger motivation to stop. In addition, coping skills may be learned with conscientious repeated attempts to stop smoking, increasing the possibility of success. At the same time, repeated failures probably reduce expectations of self-efficacy (2), decreasing the likelihood that one will try again.

The intensity by which the practice of smoking occurs ought to be a predictor of cessation probability. Studies with adults have shown that the number of cigarettes smoked (3) and cigarette nicotine/tar content (39) are related to cessation probability. The number of cigarettes smoked per day was associated with cessation probability (Table 1) (14). Cessation probabilities declined in a roughly linear fashion from 65.8 percent for those who never smoked more than one cigarette per day to 22.2 percent for those who had advanced as far as 25 to 34 per day. Cessation probability for those smoking more

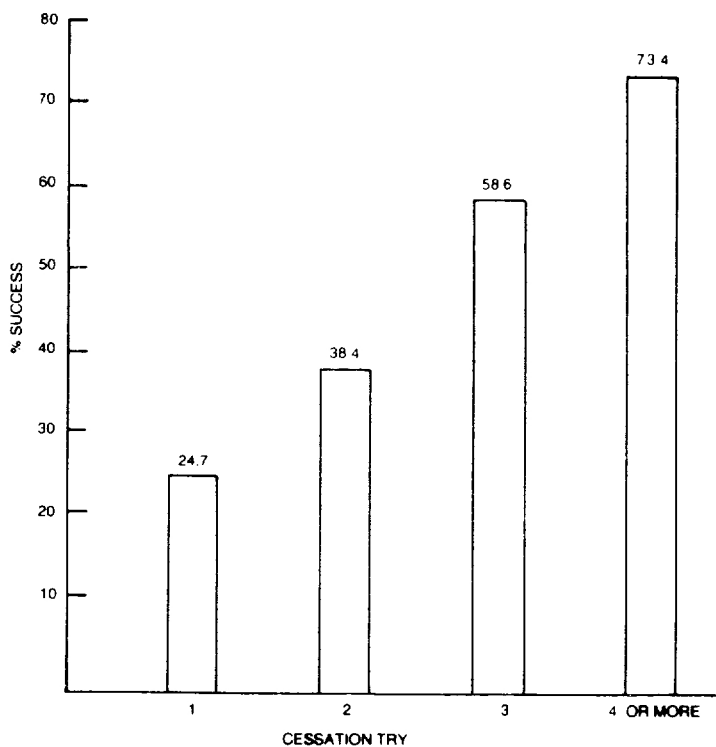


FIGURE 2.—Cumulative probability of quitting smoking in adolescence and number of tries

SOURCE: Green (14).

than 34 per day was 48.4 percent. Whether this means that reaching higher smoking levels provides an extra impetus to stop, or whether the results are a chance finding perhaps due to sample bias, is unknown. Excluding the heavy use category, the pattern is similar to the association between frequency of smoking and cessation probability for adults reported elsewhere (38). The findings are also similar to other findings reported for adolescents (15).

In a study of 76 high school smokers, age 16 to 18, Hansen (15) found that regularity of smoking pattern was significantly associated with cessation probability ($r = -0.40$). Those who smoked in a more regular and predictable fashion were less likely to stop smoking than those who smoked without apparent pattern. This effect still held when controlling for amount smoked per unit time. It may be that "pattern" smokers were maintaining or achieving what was for them an optimal dosage level upon which they became dependent, or it may be that smoking was in response to predictable environmental

TABLE 1.—Frequency of smoking and probability of cessation in adolescence

Number of cigarettes	Cessation probability (%)
Less than everyday	65.8
1-4/day	50.0
5-9/day	45.5
10-14/day	27.1
15-24/day	29.5
25-34/day	22.2
≥ 35/day	48.4

SOURCE: From the NIE-sponsored Chilton Survey; Green (14).

demands or stressors (38). Either would predict greater cessation difficulty for "pattern" smokers.

Recent Developments in Smoking Prevention Programs

Smoking prevention has been espoused as a desirable alternative to cessation programs aimed at youth. This position is based on the arguments that (1) more young people can be reached in prevention than in cessation programs, (2) preventing the onset of smoking is easier than eliciting and maintaining cessation, (3) smoking of even short duration may be harmful to some, and (4) even if programs only delay rather than truly prevent the onset of smoking, there will be substantial health benefits to the population for whom the delay has occurred.

Recently a number of researchers have developed and tested adolescent smoking prevention programs (4, 5, 11, 12, 13, 18, 20, 21, 28, 29, 40). Critical reviews of these recent prevention programs are Johnson (19), Flay et al. (13), and Evans (9). The programs that have met with consistent success share a number of features in common. All have been based on social-psychological theory and research, most notably on attitude change theory (31), social learning theory (2), and attribution theory (25). All have been school-based programs targeted for the most part at seventh grade students.

Evans (8) developed the first of several recently tested social-psychological strategies for deterrence of cigarette smoking in youth. Although the original study (12) did not show experimental interventions to be superior to just monitoring smoking behavior periodically, it did establish the rationale and feasibility of several social-psychological principles for an adolescent prevention program. Emphasis was on the short-term consequences of smoking; films were used extensively to demonstrate typical pressures to smoke from peers, parents, and media, and to depict role models resisting smoking pressures. Students were encouraged to develop counter-

arguments against smoking in order to strengthen themselves against future persuasion attempts (30). Evans (9) has been especially interested in developing social modeling films that would provide a standard and easily transportable medium for the prevention message. Although the effectiveness of standard films used alone is not yet established (19), the general approach to role model presentation employed by Evans has been used in other social-psychological prevention research efforts of this type. A methodological contribution was the use of saliva sample collection (for nicotine analysis) to augment the validity of self-reports about smoking. Evans et al. (10) found that persons were twice as likely to report smoking when self-reports were preceded by saliva collection for analysis than when not.

McAlister and others (28, 29, 36, 37) of Stanford and Harvard also used role models to teach smoking resistance skills. Their role models were live, rather than on film, and consisted of a team of five to seven students from a nearby high school recruited and trained to conduct six sessions in seventh grade classrooms. Skills training was more active as well, employing role-playing of resistance techniques. Although at the start of the sessions in the fall more persons in the treatment school (2 percent) than in the control school (0.9 percent) said "yes" to the question "Have you smoked in the last week?," by spring, 10.3 percent in the control condition and 5.3 percent in the treatment condition reported smoking in the previous week. In May 1980, 2 years after termination of the program, 15.1 percent and 5.2 percent, respectively, said they had smoked in the previous week (36). Program effects seem to have endured for at least 2 years beyond the end of the program.

McAlister et al. (28), report an extension of the smoking prevention model to prevent alcohol and marijuana abuse as well. There was a 4.7 percent increase and a 0.1 percent decrease in regular or experimental smoking by end of year among sixth and seventh grade students in the five control schools and five experimental schools, respectively. Finally, Perry et al. (37) have reported a successful replication of the 7th grade smoking program for 10th grade students, with college students acting as peer leaders. The authors report a 21 percent overall reduction in the number of self-reports of smoking in the last week, compared with the baseline number.

Johnson and Luepker at the University of Minnesota developed a similar strategy for smoking prevention in adolescents (1, 18, 22). Experimental adaptations of social-psychological theory were based on systematic interviews with Twin Cities seventh and eighth grade students, and scenarios for role model films and for active role playing were distilled from these interactions. As a result, the emphasis on immediate negative consequences took on a decidedly social aspect (e.g., yellow teeth, bad breath). This research program,

which was developing independent of the research at Stanford, also used peer leaders, but with two important differences. First, peer leaders were defined as same-age persons already in the classroom who are "natural" opinion leaders. Leaders were selected by peer nomination, recruited into prevention leadership status, and brought to the university for leadership training. Second, the peer leader component was tested quasi-experimentally with the prevention program implemented in one school without peer leader recruitment and in another school with peer leader recruitment. Each school was then compared with a control school in which traditional health-oriented smoking prevention was taught in compulsory health education classes by school health educators. Approximately an equal number of class sessions (five) were devoted to all three curricula. As in the Houston and Stanford programs, all sessions in the experimental schools were supervised by nonschool personnel who were members of the research team. Finally, public commitment was tested experimentally by having students in a random number of classrooms in the peer-led school give a public speech on why they would not smoke. In the fall of 1977, baseline measure students in the three schools did not differ in mean number of cigarettes smoked in the past week: 0.89, 0.46, and 0.29 in the control, social consequences curriculum, and peer-led social curriculum, respectively. By May, the average number of cigarettes smoked in the past week were 2.50, 1.47, and 0.40, respectively. By May of the following year, controls were smoking five times as many cigarettes per week as were students in the peer-led school—5.86 versus 1.02. By this time, smoking in the social consequences school (5.71) had ceased to differ from the control school. Two years after program termination, the mean number of cigarettes smoked in the previous week were 10.97, 10.60, and 4.61 in the control, social consequences, and peer-led schools, respectively (26). As in the Stanford study, the effects of a peer-led prevention program endured for at least 2 years. An important finding from the Minnesota study was that prevention effects of an equivalent program led by adults rather than peers were weak in the short run and not measurable at 1 year. The preventive advantage of a peer-led program was particularly great for females; only with peer leader involvement was the experimental program effective with females, both in the short and long run (22).

A conceptual replication of the initial Minnesota smoking prevention study was begun by the Minnesota researchers in 1979. All seventh grade students in two schools were assigned to a peer-led, short-term consequences treatment, and a standard media package was used in conjunction with other activities. Students in two other schools received the same peer-led, short-term consequences program without the media package. Students in two additional schools

received the media-augmented social program taught by health educators rather than by peer leaders. Students in the final two schools received an equivalent health-oriented curriculum taught by the health educators brought in for that purpose. End-of-year data (1) indicate that all four programs were effective compared with an external control group consisting of seventh grade students not receiving a program in the previous year. By spring of the following year, the peer-led program with media appeared to be most effective, and the teacher-led health program was least effective in preventing onset of regular (weekly or more) cigarette smoking. Currently, a replication is underway with school health educators teaching or supervising in the various schools.

In addition to theory-based experimental tests of program effects, the Minnesota group has developed biochemical assays for independent validation of self-reports (27). The Minnesota group has found that post-treatment saliva thiocyanate levels are greater in control groups than in treatment groups and, like Evans et al. (10), that self-reports of smoking are twice as likely when saliva samples are collected prior to self-reports.

Botvin et al. (4, 5) have reported a more general approach to life-skills training for prevention of cigarette smoking. This program consists of 10 weekly sessions designed to teach skills necessary to resist social pressures to smoke, to develop students' autonomy and thereby reduce their susceptibility to indirect social pressures to smoke, to develop self-esteem and self-confidence, and to provide a means of coping with anxiety. Hence, the approach begun by Botvin at the American Health Foundation and continued at Cornell goes beyond teaching the skills specific to smoking avoidance. The original program was implemented by allied health professionals and a followup program was implemented by older peer leaders. Three-month followup data in the original study and 6-month followup data in the second study indicate that significantly fewer students began smoking in the experimental group compared with the nontreatment control group (6 versus 18 percent onset at 6-month followup in the second study). Botvin is replicating these studies with a program conducted by classroom teachers.

Flay et al. (13) have filled a large methodological gap created by the quasi-experimental methodology employed in each of the previously reported prevention research programs. In each of these programs, researchers opted to devote whole schools to interventions, with the number of schools per group ranging from one to five. Consequently, random assignment of participants was not possible, raising questions about what one can infer from any one study (6). Strictly speaking, the unit of analysis in these studies ought to be school, a practical impossibility because of limited degrees of freedom. Flay et al. (13) were able to find multiple schools in the

Waterloo (Ontario, Canada) area, each with a single classroom per grade. Eleven schools were randomly assigned to either program or control conditions. The strength of this methodology is that it permits random assignment of classrooms and, appropriately, the use of the classroom as the unit of analysis. The Waterloo program was administered in sixth grades, except for two booster sessions given in seventh and eighth grades. The program is similar to those at Stanford and Minnesota. Smoking-related information is elicited from students rather than told to them; there is a focus on social influences; decision-making skills are taught; and a public commitment is obtained. By seventh grade, differences in experimental smoking were beginning to emerge between treatment and control groups. If these trends continue, this methodologically tight study will lend experimental support for the consistent pattern of findings to date.

The weight of data available to date consistently supports the finding that smoking prevention programs with certain identifiable components can be successful in preventing the onset of smoking in adolescence.

Summary

1. Spontaneous smoking cessation among regular users (approximately once a week or more often) is estimated to be on the order of 25 percent during adolescence.
2. Probability of quitting was greater for those adolescent smokers first interviewed in 1974 who had at least started to attend college by 1979 than for those smokers who did not attend college (42.0 percent vs. 24.6 percent).
3. Probability of quitting decreases linearly with duration of the smoking practice, changing from 64.5 percent in the first year of smoking to 14.3 percent after 7 years.
4. Quitting "cold turkey" appears to be a more effective cessation strategy than cutting down without trying to stop entirely.
5. Success at quitting increased with the number of efforts made: about 73.4 percent of adolescents who kept trying eventually succeeded.
6. Smoking prevention programs are desirable alternatives to cessation programs aimed at youth. Successful programs have been based on social psychological theory and research, and are school based. Results have shown a 50 percent or more reduction in smoking onset.
7. The most successful programs were those emphasizing the social and immediate consequences of smoking rather than long-term health consequences. These programs have placed

special emphasis on teaching skills in recognizing and resisting social pressures to smoke.

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