CHAPTER VII

TREATMENT OF TOBACCO DEPENDENCE

CONTENTS

Introduction

The previous chapters have established that nicotine is a drug of dependence. Chapter II provided a detailed description of the pharmacokinetics and pharmacodynamics of nicotine from various forms of tobacco. Chapter III addressed sites and mechanisms of nicotine action. Chapter IV documented addictive properties of tobacco including those related to its use as a vehicle for nicotine delivery and physiological dependence produced by nicotine administration. Chapter V demonstrated the commonalities between tobacco use and use of other drugs such as heroin and cocaine. Chapter VI discussed effects of nicotine that may promote to tobacco use.

Unfortunately, much of this work has seen limited clinical application in the treatment of the tobacco user. Most current treatment approaches are primarily psychological. Relatively few studies have addressed pharmacologic determinants of tobacco use (Pomerleau et al.). An increased understanding of the addictive properties of nicotine should lead to improved treatment approaches. Interventions for tobacco users who seek assistance should consider the addictive properties of tobacco and the ways that these can be overcome. They should also be sensitive to other effects of nicotine that may promote tobacco use. The failure to address these types of issues may be an important cause of the less than optimal results attained by existing treatment approaches.

It is evident that smoking is maintained by both pharmacologic and psychological determinants. The relative contributions of these factors are virtually impossible to separate and are likely to vary dramatically not only among individual smokers, but perhaps also within individuals at different times and stages of their smoking histories. Pharmacologic and psychological factors become closely linked in a conditioning process in which smoking is associated with multiple cues. A typical smoker who has averaged 20 cigarettes/day over a 15-year period is likely to have taken more than 1 million puffs during the course of his or her smoking history. The highly dependent smoker who presents for treatment tends to have an even longer and more extensive history of nicotine self-administration than does the average smoker. The sheer magnitude of this overlearning appears unmatched in any other form of drug abuse.

Cues associated with smoking (an ashtray, the sight of another person smoking) can elicit strong cravings not only in current and newly abstinent smokers, but also in individuals who have achieved longer term abstinence (Abrams 1986). Some cues may extinguish relatively quickly upon cessation. Others may be more problematic, especially in long-term dependent smokers (Abrams et al., in press). Smokers who report smoking more when they are angry, frustrated, or unhappy may be especially vulnerable to a crisis even when the crisis occurs after an extended period of abstinence (Pomerleau,

Adkins, Pertschuk 1978). Cues associated with smoking that are encountered only infrequently might continue to elicit conditioned cravings over a longer time period (Abrams et al., in press).

Individual differences should also be considered. Conditioning histories vary among smokers, although there are also likely to be important commonalities. Some smokers have relied more heavily upon nicotine in regulating mood, especially negative affect (Chapter VI). Others have used cigarettes as a means of sustaining attention to monotonous tasks. Still others have used cigarettes more frequently as an aid to relaxation (Ikard, Green, Horn 1969; Chapter VI). Few experimental studies have related individual differences to reasons for smoking (Ikard and Tompkins 1973; Leventhal and Avis 1976).

Physiological reactions (e.g., elevated heart rate) to smoking cues have been documented to persist for extended intervals (Abrams et al., in press). The interaction of physiological, social, conditioning, and cognitive factors may be critical. The combination of tobacco pharmacology and users' conditioning histories can help to explain cravings even after long periods of abstinence. Expectations concerning the consequences of tobacco use also appear to be extremely important. Thus, among individuals who are currently abstinent, the anticipation of highly reinforcing physiological reactions to tobacco use is predictive of relapse (Marlatt and Gordon 1985).

It is ironic in light of the broad-spectrum treatment of other drug dependencies that tobacco prevention and cessation treatments have been focused so narrowly. Even where pharmacologic strategies have been employed (e.g., nicotine replacement therapy; Fagerstrom 1982b; Schneider et al. 1983), these often have not been integrated systematically with behavioral treatments. Chapter V details some of the physiological and psychosocial interventions for various drug dependencies including those on alcohol, opiates, cocaine, and other illicit substances. This body of literature may have important and largely overlooked implications for the clinical treatment of tobacco dependence.

According to the 1985 National Health Interview Survey (NHIS), there are approximately 41 million former smokers in the United States. Approximately 90 percent of former smokers report that they quit smoking without formal treatment programs or smoking cessation devices (Fiore et al., in press). Achieving abstinence from tobacco and other substances outside the context of formal treatment programs (spontaneous remission) is discussed in Chapter V. Not only smokers but other drug takers often discontinue use of the dependence-producing substance outside the context of formal intervention. Several common factors may be operating to influence smokers to quit (e.g., response to social pressures, observed and anticipated health consequences). Unfortunately, millions of new individuals have been recruited to smoking.

Despite the well-known health hazards of smoking and the documented difficulties in quitting, few intensive treatment options are available to the highly dependent smoker (Sachs 1986). Cigarette dependence or addiction can be as intractable as any addictive disorder (Russell 1976). Studies have found considerable similarity in relapse processes between tobacco and other drugs of dependence (Hall and Havassy 1986; Marlatt and Gordon 1980; see also Chapter V).

As shown in Chapter IV, cigarette smoking is not a random or capricious behavior; rather it is orderly and controlled. The role of nicotine in cigarette smoking is functionally similar to the roles of other addicting, psychoactive drugs in behaviors that lead to their self-administration (Chapter V; US DHHS 1984b, 1987).

A practical result of these conclusions has been the development of methods to treat cigarette smoking that are similar to methods used to treat other forms of drug dependence. An additional implication is that because cigarette smoking, like other forms of drug dependence, involves both pharmacologic and behavioral factors, treatment approaches also may involve pharmacologic agents, behavioral strategies, or a combination of these. There is some evidence, as discussed in the present Chapter, that treatment approaches which address both pharmacologic and behavioral factors are most effective.

Current data indicate that smoking prevalence is declining much more rapidly among certain segments of the population (e.g., better educated, higher income, professional) than among others (blue collar, minority, less educated, lower income) (Appendix A). Individuals from lower socioeconomic status (SES) backgrounds appear to have less access to treatment and may be less likely to enroll in treatment programs when they are available. Participants in most formal treatment programs have been from the middle and upper-middle class (US DHHS 1987). To have maximum impact upon the prevalence of smoking, interventions must be responsive to and meet the needs of lower SES smokers in a variety of circumstances.

Women represent an additional population that could benefit from tailored programming. Women may be more likely to use cigarettes for stress reduction and mood regulation (Brunswick and Messeri 1984; Mitic, McGuire, Neumann 1985). Potential weight gain may represent an especially serious concern for many female smokers (Jacobson 1981; US DHEW 1980; Chapter VI).

Knowledge of the dependence-producing aspects of tobacco underscores the need for early intervention in preventing habitual chronic tobacco use. This approach needs to be sensitive to both pharmacologic and social aspects of smoking. Intervention for children and adolescents also may need to focus upon cessation of well-established smoking patterns in addition to the prevention of smoking onset.

Treatments that assist smokers to achieve initial cessation and to maintain long-term abstinence are needed. High rates of relapse plague the vast majority of treatment programs as well as self-initiated quit attempts. Close examination of the physiological, psychological, and social factors that promote relapse should suggest more effective intervention strategies. Conceptualizing the quitting process as ongoing may also be useful (Marlatt and Gordon 1985; Prochaska and DiClemente 1983). Work is needed not only to reduce the risk of initial relapse, but to accelerate recycling of quitting attempts in the event that relapse does occur (Glasgow, Lando, Rand 1986).

Although discussed in earlier chapters in this Volume, it is appropriate to summarize some observations about cigarette smoking that are important in the development and implementation of treatment strategies.

1. Chronic tobacco use produces physical dependence such that cessation may be accompanied by a withdrawal syndrome that includes feelings of discomfort or distress, reduced capacity to work or handle stressful situations, and heightened urges to resume smoking.
2. Consumption of tobacco products, which inevitably results in administration of nicotine, can produce effects which are perceived as desirable or otherwise useful to the cigarette smoker, thereby providing a strong incentive for cigarette smoking. There is evidence that nicotine can enhance performance of smokers on certain types of attention and memory tasks. Nicotine also exerts an important role in the relationship between smoking and body weight.
3. The desire to handle cigarettes may be an important reason for smoking (Leventhal and Avis 1976). Such stereotypical behaviors are characteristic of other forms of drug addiction and other compulsive behaviors not involving psychoactive drug self-administration. For cigarette smoking, the behaviors appear to occupy small periods of time with hand-oral manipulations (Ikard, Green, Horn 1969).
4. Nicotine may reduce the aversiveness of stressors for smokers (Pomerleau, Turk, Fertig 1984). Stress has been demonstrated to increase the rate of smoking (Leventhal and Cleary 1980; Schachter, Silverstein, Perlick 1977; Chapter VI).
5. There are numerous environmental factors that can facilitate the initiation and maintenance of smoking (e.g., peer pressure, family influences, images conveyed in tobacco advertising, association with social and work activities) (Flay 1985b; Warner 1986).

Smoking treatment programs are designed to counter these important motivations to smoke. For example, skills training

treatments are designed to inculcate skills so that individuals can cope with stressors or negative affective states without smoking. Aversion treatments are designed to condition cigarette aversions so that smokers anticipate little pleasure from smoking. Nicotine polacrilex gum and nicotine fading treatments are designed to reduce the magnitude of the nicotine withdrawal syndrome. This Chapter attempts to summarize what is known about how pharmacologic and behavioral treatments exert their clinical effectiveness. Knowledge of how treatments influence smoking will be the base on which more effective treatments are designed.

This Chapter describes pharmacologic, behavioral, and combined treatments applied in clinical and laboratory settings. It concentrates on work published since the last major Surgeon General's review of smoking treatment (US DHEW 1979), but refers back to that Report for historical perspective. Pharmacologic and behavioral treatment strategies are reviewed in light of the current acceptance of tobacco use as a form of drug self-administration that has clear addictive properties as well as commonalities with other forms of drug abuse.

The review of treatment approaches is necessarily selective. Smoking interventions can be placed along a clinical-public health continuum. At the extreme clinical end are intensive and costly one-to-one interventions, often with a highly trained provider. Examples include one-to-one behavioral or psychological counseling. Proceeding somewhat toward the public health end, one finds group programs, many of them offered by nonprofit or voluntary organizations, but some also conducted on a proprietary basis. These programs typically entail 4 to 10 sessions and are usually led by facilitators with some background in health education and psychology, although trained lay facilitators are also used. Further along the public health segment of the continuum are minimal interventions emphasizing self-help manuals and including brief contact with physicians during office visits.

The current Chapter focuses primarily upon the treatment of smokers who seek assistance in quitting. There is no intent, however, to deny the importance of public health interventions that will ultimately reach a far greater number of smokers. Both clinical and public health approaches are absolutely essential. The reader is referred to previous Surgeon General's Reports and other publications for more detailed discussions of such topics as physician intervention, self-help strategies and outcomes, workplace and community interventions (US DHEW 1979; US DHHS 1982, 1984b, 1985; Schwartz 1987).

Treatment

Although most pharmacologic treatment strategies also encompass behavioral components and some studies have systematically combined pharmacologic and behavioral interventions, it is conceptually useful to consider these two major types of approaches separately.

One major pharmacologic approach has involved various nicotine replacement strategies. As discussed in Chapter V, the general principle of replacement therapies for drug dependence is to present the patient with a safer and more therapeutically manageable form of the drug that directly alleviates signs and symptoms of withdrawal and craving (Jaffe 1985). These strategies are modeled after those originally developed to treat dependence on heroin and other opiates (Henningfield and Jasinski 1988). A variety of nontobacco-based delivery systems provide potentially effective means for nicotine replacement. Experimental and theoretical aspects of each of these delivery systems have been described in part in Chapter IV. In the present Chapter, data regarding those nicotine delivery systems that are most relevant to direct treatment application will be summarized.

In addition to nicotine replacement approaches, the following additional pharmacologic treatment approaches developed for other forms of drug dependence may be applied to tobacco dependence: Nonspecific Pharmacotherapy, in which the patient is treated symptomatically; Nicotine Blockade Therapy, in which the behavior-controlling effects of the dependence-producing drug are blocked by pretreatment with an antagonist; and Deterrent Therapy, in which administration of the treatment drug results in the occurrence of aversive consequences. All three approaches have potential applications in the treatment of cigarette smoking. Each of these strategies is discussed.

Nicotine Replacement Strategies

To date, only one form of nicotine replacement has been approved by the Food and Drug Administration (FDA): nicotine polacrilex chewing gum (2-mg pieces only). Three other nicotine delivery systems that will be briefly discussed are (1) a transdermal patch for delivery of nicotine through the skin, (2) a nasal nicotine solution, and (3) a nicotine vapor inhaler (smokeless cigarette).

There is considerable current interest in nicotine replacement strategies for smoking cessation because (1) nicotine is the critical dependence-producing component in tobacco, (2) some treatment outcome data on the efficacy of the first nicotine replacement procedure to be evaluated (nicotine polacrilex gum) are encouraging, and (3) other forms of nicotine substitution may hold further

potential for more effective treatment. The assumption underlying this treatment approach is that nicotine-specific withdrawal interferes with successful cessation and can be prevented or attenuated by nicotine replacement, thereby both promoting cessation and aiding the inhibition of relapse. For a more extensive review of nicotine replacement, see Grabowski and Hall (1985) and Pomerleau and associates (1988).

Forms of Replacement and Rationale

The first reported systematic use of nicotine replacement to help people quit smoking was the intravenous administration of nicotine by Johnston (1942). This approach is not clinically practical because of the short half-life of nicotine (Chapter II) and its potential toxicity with excessively rapid administration (Appendix B). The next systematic approach was the development of nicotine polacrilex gum by Ferno, Lichtneckert, and Lundgren (1973). The weaning from nicotine would actually begin with the switch from cigarettes to gum in that nicotine polacrilex (1) produces slower-rising plasma nicotine levels than cigarettes and (2) reduces the inhaled nicotine bolus effect believed to contribute to nicotine's addictive potential in smoke (Russell and Feyerabend 1978; Chapter II).

The same rationale applies to other replacement approaches (Jarvik 1986; Russell 1986) including nicotine transdermal delivery systems, nasal nicotine solution (NNS), and smoke-free nicotine cigarettes. The different forms allow variations in delivery (dose and speed) which may influence effectiveness, relief of withdrawal, patient acceptance, and outcome.

Nicotine Polacrilex Gum

"Nicotine polacrilex" or "nicotine resin complex" (American Hospital Formulary 1987) is also commonly referred to as nicotine gum. It is a nicotine delivery system in which the nicotine is incorporated into an ion exchange resin base which permits release of nicotine in the proper environment (i.e., saliva in the mouth) when appropriate physical pressure (i.e., chewing) is applied. Twenty to thirty minutes of proper chewing can result in the release of approximately 90 percent of the nicotine (Ferno, Lichtneckert, Lundgren 1973), although there are multiple determinants of how much nicotine actually is absorbed. As discussed in Chapter II, 10 to 15 min of chewing results in the release of approximately 50 to 60 percent of the nicotine in a piece of gum. However, considerable variability exists both within and across subjects (Benowitz, Jacob, Savanapridi 1987; Nemeth-Coslett et al. 1987; Pickworth, Herning, Henningfield 1986; Chapter II). Swallowed nicotine is approximately

70 percent detoxified as a result of its first pass through the liver (Benowitz, Jacob, Savanapridi 1987; Chapter II).

Nicotine polacrilex gum does not usually lend itself to full replacement of the nicotine provided by cigarette smoking. Russell, Feyerabend, and Cole (1976) and McNabb, Ebert, and McKusker (1982) reported that 4-mg-nicotine gum produced plasma nicotine levels approximating that of a 1.2-mg-nicotine-yield cigarette. However, Benowitz, Jacob, and Savanapridi (1987) found only about 50 percent replacement of nicotine levels with 4-mg gum. Benowitz, Jacob, and Savanapridi (1987) reported that chewing 10 pieces of 2-mg gum on an hourly schedule resulted in blood levels of nicotine that were one-third of those achieved while smoking. Therefore, ad libitum chewing of the 2-mg nicotine polacrilex gum probably results in even lower nicotine levels. When nicotine polacrilex gum is chewed, drug levels in plasma rise slowly, peaking in around 20 to 30 min. Although the 4-mg nicotine polacrilex gum replaces nicotine more completely, most testing has proceeded with the 2-mg dose; only the 2-mg dose has been approved for use in the United States. It should be noted, however, that effective nicotine replacement strategies may not require the same range of nicotine blood levels as those produced by cigarette smoking. Even the 2-mg-dose nicotine polacrilex gum has increased smoking cessation rates significantly in several placebo-controlled studies (Table 1).

Withdrawal symptom relief: Several short-term trials (8 hr to 5 days) have found that nicotine polacrilex gum reduced symptoms of withdrawal in comparison to placebo controls (Hughes et al. 1984; Schneider, Jarvik, Forsythe 1984; West, Jarvis, Russell, Carruthers et al. 1984). Jarvis and associates (1982) reported relief of several symptoms for a 6-week period, with scores averaged over weekly sessions. Expectancy may also play a role in withdrawal symptom relief, as suggested in a study by Gottlieb and others (1987). Interpretation of this study is limited, however, by a brief (2-week) observation period and by the possibility that subjects failed to achieve adequate nicotine plasma levels.

In previous studies, not all symptoms were relieved with replacement nor was there consistency among the studies in which symptoms were relieved (Fagerstrom 1988; West 1984). Irritability was consistently relieved in all studies, whereas hunger, depression, anxiety, difficulty in concentrating, restlessness, annoyance, hostility, and somatic complaints were reduced in some but not others. The degree to which most symptoms are relieved is directly related to the dose of nicotine that is actually obtained when the polacrilex gum is used (Henningfield and Jasinski 1988). The urge to smoke (craving) is not reliably decreased by nicotine replacement (Henningfield and Jasinski 1988; West and Schneider 1987).

TABLE l.--Efficacy trials for nicotine polacrilex gum: Followup abstinence rates (percentages)

Study	Number [1]	I. Placebo-controlled studies: Active gum	Placebo	Followup	P
Puska et al. 1979)	160	35	28	6 mo	N.S.
Malcolm et al. (1980)	210	23	5	6 mo	p<0.05
Fee and Stewart (1982)	352	13	9	1 Yr	N.S.
Fagerstrom (1982b)	96	49	37	1 Yr	N.S.
Jarvis et al. (1982)	116	47	21	1 Yr	p < 0.01
British Thoracic Society (1983)	802	10	14	1 Yr	N.S.
Schneider et al. (1983)	60	30	20	1 Yr	N.S.
Hjalmarson (1984)	205	29	16	1 Yr	p<0.05
Jamrozik et al. (1984)	200	10	8	6 mo	N.S.
Campbell et al. (1987)	985	3	2	1 Yr	N.S.
Hall et al. (1987)	139	44	21	1 Yr	p < 0.01

Study	Number [1]	II. No-gum control studies: Nicotine gum	No gum	Followup	P
Russell et al. (1983)	1,938	9	4	1 Yr	p < 0.01
Fagerstrom (1984)	145	25	9	1 Yr	p<0.05
Hjalmarson (1985)	2,404	25	18	1 Yr	p < 0.05
Page et al. (1986)	227	12	9	6 mo	N.S.

TABLE l.--Continued

Study	III. Nicotine polacrilex gum vs. other active treatment				
	Number [1]	GUM	Comparison	Followup	P
Behavioral counseling and rapid smoking					
Raw et al. (1980)	118	38	14	1 Yr	$p < 0.01$
Hall et al. (1985)	78	36	28	1 Yr	N.S
Skills training					
Killen et al. [2] (1984)	42	23	30	10 mo	N.S.
Acupuncture					
Clavel et al. [3] (1985)	429	12	8	13 mo	N.S.

[1] Number of subjects based on relevant conditions. may not include all subjects assigned to treatment.

[2] Also included a combined skills training and nicotine polacrilex gum condition.

[3] Included a control condition in which subjects were assigned a cigarette case programmed to lock at variable intervals.

SOURCE: Modeled after Fagerstrom (1988).

The studies noted above used ad libitum administration of the 2-mg gum. This level of replacement may be insufficient to reverse some of the symptoms of nicotine withdrawal. Studies which have shown little difference between the 2-mg dose and placebo are not clearly interpretable unless they have confirmed adequate dosing through biochemical markers (e.g., plasma cotinine). When the nicotine polacrilex dose has been increased to 4 mg, more complete reversal of withdrawal (Henningfield, Sampson, Nemeth-Coslett 1986), of electroencephalogram (EEG) changes with abstinence (Pickworth, Herning, Henningfield 1986), and of performance deficits during cessation (Snyder, Davis, Henningfield 1985) is observed.

Different withdrawal symptoms may also require different levels of nicotine replacement. Whether a particular withdrawal symptom is nicotine specific cannot be determined until there is systematic testing by dose and speed of delivery of nicotine replacement. In addition, recent studies show that intrasubject and intersubject variability in chewing can affect the amount of nicotine reaching the circulation (Benowitz et al. 1983; Nemeth-Coslett et al. 1985).

There is also some evidence that weight gain, a significant problem in cessation, can be reduced by nicotine replacement (Fagerstrom 1987). Even low-dose, 2-mg-nicotine gum has been shown to produce significantly less weight gain over a 10-week period compared with a placebo (Stitzer and Gross 1988).

Cravings-urges-desires. Findings regarding urges or craving are complicated by semantic and measurement considerations (Kozlowski and Wilkinson 1987) and by ambiguity as to what constitutes craving (West and Schneider 1987). Definitions of craving have proven elusive. It is often described as an increase in the desire or urge to use a drug. Although the term craving is used in the present context, a more appropriate phrase might be substituted, e.g., "strength of an urge to use a drug" (Chapters IV and V).

In the tobacco abstinence studies cited above, craving generally was not relieved by nicotine replacement. By contrast, significant relief of craving has been reported with 2-mg-nicotine polacrilex gum compared with placebo controls in an outcome trial (Hjalmarson 1984), in a clinical trial with NNS (Jarvis 1986), and with a nicotine patch in an acute placebo-controlled trial (Rose et al. 1985). The discrepancies may be due to how "craving" is assessed. In a study by Schneider and Jarvik (1985), treatment had no effect on "craving" but did significantly affect "urges to smoke" and "missing a cigarette" from the Shiffman-Jarvik (1976) "craving" subscale. Because nicotine seeking is believed to precede most relapse and its relief is a goal of replacement systems, appropriate operational definitions and testing are essential.

Craving should not be viewed simply as a symptom of a negative withdrawal state. Smokers clearly seek desired effects of nicotine in addition to relief from withdrawal (Chapters II and VI). Nicotine polacrilex gum may reduce negative withdrawal symptoms without providing other effects (e.g., a "high") sought by many smokers.

Efficacy trials. Table 1 summarizes efficacy trials that evaluated nicotine polacrilex gum against placebo controls, no-gum controls, or other active treatment. This Table does not include all the studies that combined nicotine polacrilex gum with behavioral interventions.

The early studies of nicotine replacement involved testing of the nicotine regulation hypothesis (e.g., the extent to which cigarette smokers show compensatory changes in their cigarette smoking behavior; Chapter IV). These studies assessed the capacity of nicotine in polacrilex gum to replace nicotine in cigarettes (Brantmark, Ohlin, Westling 1973; Russell et al. 1976; Turner et al. 1977). Several studies have demonstrated that cigarette smoking can be decreased in laboratory subjects by replacement of the nicotine normally obtained by smoking with nicotine delivered by gum (Nemeth-Coslett and Henningfield 1986). Early clinical outcome

trials, although supporting the efficacy of nicotine polacrilex gum, were flawed by statistical problems, inadequate nicotine delivery, concurrent smoking and use of gum by subjects, and lack of validation or inappropriate controls (Malcolm et al. 1980; Puska, Bjorkqvist, Koskela 1979; Raw et al. 1980). In the placebo-controlled clinical trials, nicotine polacrilex gum significantly increased success rates for as long as 6 months in some studies (Fagerstrom 1982a; Schneider et al. 1983) and 1 year in others (Hjalmarson 1984; Jarvis et al. 1982; Table 1). It should be noted, however, that in most of these studies, other treatment procedures (e.g., group therapy) were applied in addition to either nicotine polacrilex gum or placebo.

Subsequent efficacy trials proceeded without regard to control of dose or scheduled use of nicotine polacrilex gum. The trials may be divided into those conducted in clinic settings versus physician or dispensary trials. Different trials compared active gum with a placebo, active gum with no-gum conditions, or gum with other treatments (Fagerstrom 1988).

Hall and coworkers (1985) assessed nicotine polacrilex gum plus an intensive contact behavioral treatment (14 sessions over an 8-week period), nicotine polacrilex gum plus low-contact behavioral treatment (4 sessions over a 3-week period), and the intensive behavioral treatment alone. The combination of intensive behavioral treatment and nicotine polacrilex gum was significantly superior to the other interventions through 6-month followup. Differences were no longer significant at 1 year, however. In a subsequent study, Hall and colleagues (1987) assigned subjects to intensive behavioral or to low-contact smoking treatment and to 2-mg-nicotine gum or to placebo gum in a 2-by-2 factorial design. Results at l-year followup indicated significant effects only for nicotine polacrilex gum. No differences were found between low-contact treatment and intensive behavioral intervention. In a study by Killen and colleagues (1984), the success rate of nicotine polacrilex gum combined with behavioral treatment at a 10.5-month followup was 50 percent as opposed to 23 percent for gum and 30 percent for behavioral treatment alone. However, these differences between treatment conditions were not significant.

Physician trials have resulted in lower overall success rates for all groups and some equivocal findings. These lower success rates may be attributable, at least in part, to a selection bias. Clinics may attract only a small proportion of smokers who are interested specifically in treatment. Physician trials sometimes have included all smoking patients regardless of their level of interest in quitting. The British Thoracic Society (1983) reported no differences among four conditions involving active nicotine polacrilex or placebo gum. However, this study included patients who were not actively seeking treatment and failed to instruct patients in the use of the preparation. Jamrozic and coworkers (1984), using patients who were

motivated to quit, reported no differences between patients given nicotine polacrilex or placebo gum. In that study, only 70 percent of the subjects even tried the active nicotine polacrilex gum, and only one-half of the subjects used it regularly. In a dispensary study with nicotine polacrilex versus placebo gum, all individuals started gum but most stopped use within 3 to 5 days and failed (Schneider et al. 1983).

Differences in outcome comparing the clinic setting versus physician offices have been interpreted as indicating the requirement for support treatment with nicotine polacrilex gum. However, it is not clear whether support treatment per se is necessary or whether it serves to encourage sufficient use of the preparation. In fact, compliance with gum use instructions is often unsatisfactory in both clinic and physician office settings. In a large physician trial, Russell, Merriman, and colleagues (1983) reported that 47 percent of subjects given active nicotine polacrilex gum did not use it. However, use of nicotine polacrilex gum resulted in significantly higher success rates (8.8 percent) compared with no gum (4.0 percent) at 1 year, and when patients used a total of at least three boxes of nicotine polacrilex gum, success rates tripled to 24 percent without further intervention. It is unclear whether these substantially increased success rates are a function of gum use per se or simply a reflection of a greater overall commitment to treatment.

Followup may also prove to be important for a good outcome. Fagerstrom (1984) assigned subjects to either short or long followup and to either nicotine polacrilex gum or no-gum conditions. Short followup consisted of one physician appointment approximately 14 days after cessation. Long followup included two physician appointments (approximately 14 and 30 days after cessation), a telephone call (after about 7 days), and a personal letter inquiring about patients' smoking status (3 months after cessation). Results at l-year followup indicated significant differences in favor of nicotine polacrilex gum over no gum. Initial effects were also found for long over short followup. However, these effects were no longer significant at l-year followup. At this point 27 percent of the subjects assigned long followup and nicotine polacrilex gum were abstinent, compared with 22 percent of those receiving short followup and nicotine gum, 15 percent of those assigned long followup and no gum, and 3 percent of those receiving short followup and no gum. In a recent physician trial by Hughes and associates (1988), with minimal intervention and a followup visit, significant differences in favor of active gum over placebo gum were observed at 1 and 6 months, although the differences were no longer evident at 1 year.

The high long-term relapse rate observed in their own and other published reports led Hughes and coworkers (1988) to conclude that nicotine polacrilex gum in the physician setting is not more effective

than placebo. However, the issue may be a different one. In several studies, early significant effects reported at 1 month (Fee and Stewart 1982) and 6 months (Fagerstrom 1982a; Hall et al. 1985; Schneider et al. 1983) disappeared at 1 year although the trends continued to favor active nicotine polacrilex gum. Rather than being interpreted as a failure for nicotine polacrilex gum versus a placebo, this may mean that what is effective treatment for initial quitting (e.g., relief of withdrawal symptoms) is different from effective long-term relapse prevention.

Another variable which may affect outcome is duration of nicotine polacrilex gum use. It has been suggested that longer use will be more effective (Russell, Raw, Jarvis 1980; Wilhelmsen and Hjalmarson 1980), yet duration of use remains an untested and unresolved issue. The one prospective trial comparing l- with 6-month use of nicotine polacrilex gum (Fagerstrom and Melin 1986) was flawed by differential clinical intervention for the l-month group. Duration of use is also an issue in evaluating followup results. Followup is virtually never calculated as time since discontinuation of nicotine polacrilex gum. One-year followup results might be considerably shorter if the end of treatment were defined as the point at which nicotine polacrilex gum is no longer consumed. In fact, a significant proportion of subjects appear to persist in their use of this gum for at least 6 months to 1 year (Hughes 1988).

Dose and patient relationship. A few trials have used both 2- and 4-mg doses of nicotine polacrilex gum (Kornitzer et al. 1987; Toennesen et al., in press; Toennesen 1986). These studies have not found a direct effect of dose but report that dose interacts significantly with degree of nicotine dependence in the smokers tested. Four-milligram nicotine polacrilex gum improved success rates for more highly dependent smokers, whereas 2-mg nicotine polacrilex gum was superior in less-dependent smokers. The problem, once again, is that ad libitum dosing (thus uncontrolled dose-response testing) reduces the interpretability of the observed effects. Otherwise, the logic is reasonable: smokers who have a greater degree of dependence on nicotine may require treatment with higher doses than those required by lessdependent smokers.

With respect to the selection of subjects for treatment with nicotine polacrilex gum, Hall and colleagues (1985) reported a significant positive correlation between smokers with high pre-quit cotinine levels and abstinence with nicotine polacrilex gum. Jarvik and Schneider (1984) reported that individuals scoring high on the Fagerstrom Tolerance Scale had greater success with replacement. Other selection issues may be equally important. For example, Toennesen and coworkers (in press) reported a substantial difference in outcome at 1 year between healthy subjects (45 percent success) and those with chronic bronchitis (16.2 percent). Patient selection

and variations in severity of nicotine dependence are expected to interact with success rates for any replacement therapy (Chapter IV).

Nasal Nicotine Solution

Russell, Jarvis, and colleagues (1983) have investigated nicotine replacement in the form of an NNS. NNS is a gel-like droplet of nicotine squeezed into the nose from a small vial. NNS was formulated to provide more rapid and efficient absorption of nicotine than is possible with use of nicotine in polacrilex gum (Russell 1986; Jarvis 1986).

Russell, Jarvis, and colleagues (1983) reported average peak plasma nicotine levels of 25.7 ng/mL in three male smokers for a single cigarette (1.4-mg machine-determined nicotine yield), 8.5 ng/mL for one piece of 2-mg gum, and 14.1 ng/mL for NNS (0.1 mL, of a 2 percent aqueous solution of nicotine, 2 mg, at pH 5.0 without added buffer). Higher levels with hourly dosing of NNS versus nicotine polacrilex gum were also documented (West, Jarvis, Russell, Feyerabend 1984).

Only very preliminary data are available with respect to the clinical efficacy of NNS. Jarvis (1986) reported decreased craving and encouraging abstinence outcomes in a sample of 26 consecutive new attenders at the Maudsley Smokers Clinic (approximately two-thirds of the subjects achieved initial abstinence and one-third remained abstinent at l-year followup). The faster absorption and higher plasma nicotine levels attained with NNS as opposed to nicotine polacrilex gum suggest that NNS may be more effective and better accepted by smokers as a replacement for cigarettes. However, subjects in the Jarvis study reported NNS to be somewhat embarrassing to use in the company of others.

Nicotine Transdermal Patch

Rose, Jarvik, and Rose (1984) initially suggested that a transderma1 nicotine delivery system might be an effective route of administration. In a short-term (hours) laboratory trial, Rose and colleagues (1985) reported a decrease in craving and nicotine preference in subjects using a nicotine patch versus a placebo patch.

A transdermal delivery system could eliminate some of the compliance and chewing problems associated with nicotine polacrilex gum. Steady-state administration expected from such a system may be more effective in preventing withdrawal symptoms. While the patch does not allow for self-dosing in response to smoking urges, it could potentially be used in combination with the other rapidly absorbed forms of nicotine replacement. Transdermal delivery

systems have not yet been tested in clinical trials or in nonlaboratory settings.

Nicotine Aerosols

Devices have been marketed that provide for inhalation of nicotine without other components of tobacco. One such product was on the commercial market for approximately 18 months, but was removed by the FDA (Chapter IV). Because the nicotine vapor inhaler was devoid of tobacco (other than the tobacco constituent nicotine), it was deemed by the FDA to be a nicotine delivery system. Because nicotine is regarded as a drug with clinical application (namely to treat nicotine dependence), the FDA ruled that it could not be sold until it had been shown to be safe and effective in appropriate clinical trials.

Technical engineering problems have also been encountered. The shelf life of the unrefrigerated vapor inhaler was apparently limited to approximately 1 month. In addition, this device delivers little nicotine unless there is extraordinary effort on the part of the user (Sepkovic et al. 1986). Russell and associates (1987) reported negligible plasma nicotine levels when vapor inhalers were puffed at a regular rate for 10 min. When the nicotine vapor inhalers were puffed at the rate of 10 puffs/min and 4 of these inhalers were used in a 20-min period, plasma nicotine levels increased to 17.3 ng/mL, levels similar to those seen after cigarette smoking.

If nicotine aerosols can be improved, they may be of value to smokers for whom slow-release nicotine replacement preparations are inadequate to produce the desired effects of nicotine. Such aerosols would allow nicotine replacement with some replacement also of the oral, handling, and sensory reinforcements (Rose 1986) for individuals who need to be weaned more slowly. Whether these aerosols will be effective in smoking cessation treatment is unknown.

Comparisons of Preparations

All nicotine replacement products produce side effects. Nicotine polacrilex gum may produce mouth sores, gastric upset, and hiccups. NNS produces runny nose and irritation, whereas transdermal devices can result in skin irritation. Transdermal devices have the advantages of better patient compliance with treatment and steady-state drug levels, whereas NNS and nicotine polacrilex gum have the advantage of ad libitum access to replacement. Because triggers to smoke can appear at any time, the flexibility offered by the latter may be essential. Ultimately, a combination of preparations may be most useful to control symptoms as well as to allow instant responses to smoking urges. At this point, the replacement therapies in development must undergo testing for bioavailability, safety, and

toxicity as well as testing for dose-response effectiveness in relief of withdrawal and efficacy in treatment.

Dependence on Nicotine Replacement

West and Russell (1985) and Hughes and coworkers (1986) reported the appearance of withdrawal symptoms upon abrupt cessation of nicotine polacrilex gum. However, the authors have different interpretations of these findings. Hughes and coworkers (1986) consider this phenomenon as an indication that nicotine polacrilex gum produces physical dependence. West and Russell (1986) point out that any dependence on this gum is part of the continued dependence on nicotine that originated with smoking and is bound to transfer during weaning (Chapter IV).

A more complicated issue is that of continued compulsive long-term use. The definition of excessive long-term use cannot be resolved without studies to determine the length of treatment necessary and sufficient for successful intervention. No such studies are available in the current published literature. Hughes (1988) reports that many abstinent smokers are unable to discontinue nicotine polacrilex gum use (35 to 90 percent of abstinent smokers at 6 months and 13 to 38 percent at 1 year continued to use nicotine polacrilex gum despite advice to stop).

An important additional issue is whether it is possible to initiate and maintain physical dependence on nicotine with replacement products alone. Nicotine polacrilex has been used widely with no reported cases of such development. This would suggest that nicotine polacrilex gum, through a combination of regulatory, packaging, marketing, and physical characteristics, does not readily lend itself to such abuse. Systematic investigation of the dependence-producing potential of other replacement products is needed.

Other Pharmacologic Approaches

Nonspecific Pharmacotherapy-Symptomatic Treatment

As reviewed in Chapters III and IV, administration and withdrawal from nicotine produce a number of neurohormonal and other physiological effects. These effects, as well as those on receptors in the central nervous system, mediate the various actions of tobacco (Chapters IV and VI). Because several such effects are functional in the maintenance of cigarette smoking and in relapse, it is generally assumed that addressing such factors would enhance treatment programs (Pomerleau and Pomerleau 1984; Shumaker and Grunberg 1986). Such strategies are also an integral part of many interventions for drug addiction in general, as described in Chapter V.

Prevention of relapse to tobacco may be aided by specific intervention (pharmacologic or behavioral) for needs met by the use of

tobacco. The present summary will mainly address pharmacologic methods, excluding nicotine replacement, that have been either used or suggested as means to alleviate the effects of tobacco abstinence that are considered adverse by patients themselves. The categories of such adverse effects for which pharmacologic treatment intervention appears viable are derived from the effects of tobacco in the regulation of mood, weight, performance, and the prevention of specific withdrawal-related discomfort. In addition, the results of studies involving pharmacologic approaches to directly alter cigarette consumption will be summarized.

The emphasis in this Section is upon recent research. It should be noted that there is a long history of generally unsuccessful pharmacologic treatment of smokers (Gritz and Jarvik 1977; Jarvik and Gritz 1977). Experimentation with lobeline sulfate as a smoking substitute dates back to the early 1900s (Edmunds 1904). Lobeline appears to be no more effective than a placebo in facilitating abstinence (Schwartz 1987). Medications intended to reduce withdrawal symptoms (sedatives, tranquilizers, anticholinergics, sympathomimetics, and anticonvulsants) also have failed to improve outcome relative to placebos (Gritz and Jarvik 1977).

Treatment of Discomfort Associated with Tobacco Withdrawal

The signs and symptoms of tobacco withdrawal vary to some degree in nature and severity among individuals, as shown in Chapter IV (also Hughes and Hatsukami 1985). Because symptoms can be treated independently of their origin, symptomatic therapy approaches might be useful in alleviation of tobacco abstinence-associated discomfort. This approach was used in a study by Glassman and his colleagues (1984). In this study, alprazolam (1 mg orally) and clonidine (0.2 mg orally) were compared with a placebo for heavy cigarette smokers on days when they abstained from tobacco. The subjects were exposed to one of the medication conditions on each of 3 smoking abstinence study days, which were separated by at least 3 days of normal smoking. Alprazolam, a benzodiazepine tranquilizer, was included as a control because of the known sedative effects of clonidine. Both clonidine and alprazolam were more effective than the placebo in reducing anxiety, irritability, restlessness, and tension. Only clonidine, however, successfully reduced the craving for a cigarette. Because craving tended to increase during the day, the difference between clonidine and the other two conditions became more evident as the day progressed.

Glassman and colleagues (1988) reported a clinical intervention study with clonidine in a sample of 71 smokers who consumed at least 1 pack/day and who had made at least one previous unsuccessful quit attempt. Each smoker began taking one 50-µg tablet of clonidine (N = 33) or a matched placebo (N = 38) at least 3 days before

a designated quit date. Dosage was increased by one tablet every day (or as tolerated) until subjects were taking four tablets by the quit date. Subjects were seen weekly for the next 4 weeks. After 4 weeks of treatment, clonidine was gradually withdrawn (50 µg every 3 days over an average of 12 days). Success rates both at the end of 4 weeks on clonidine or placebo and at followup 6 months after discontinuance of medication favored clonidine. At 6-month followup, 27 percent of the subjects receiving clonidine and 5 percent of those on placebos reported abstinence. An unexpected finding, however, was that clonidine appeared to be effective only for women; among male subjects, drug treatment did not significantly affect outcome.

Before any recommendation of clonidine as an adjunct to smoking cessation, potentially hazardous side effects must be weighed carefully. Clonidine has been extensively used in the treatment of hypertension. Abrupt cessation has sometimes led to severe hypertension and in rare instances to hypertensive encephalopathy and even death. Far more common is sedation, which could be dangerous if individuals use this drug while driving or operating dangerous machinery.

It is interesting to compare the utility of clonidine in the treatment of tobacco withdrawal with its utility in the treatment of opioid withdrawal (Chapter V). When assessed in a paradigm analogous to that described for tobacco abstinence, clonidine was as effective as morphine in reducing certain physiological signs of opioid withdrawal (Jasinski, Johnson, Kocher 1985). However, in the study by Jasinski and colleagues, clonidine did not reduce the self-reported "discomfort" as effectively as did morphine (measures of "desire to use narcotics" or narcotic-seeking behavior were not collected).

Treatment of Abstinence-Associated Mood Changes

As discussed in Chapter VI, nicotine may serve as a regulator of mood. This observation suggests that for certain persons, selective use of minor tranquilizers, antidepressants, or even psychomotor stimulants may be beneficial in preventing relapse. Again, issues of possible side effects and drug dependence must be considered before such an approach would be recommended in clinical practice.

Laboratory studies with human subjects have shown that stressful situations lead to increased smoking and that smoking may reduce smoker distress responses to stressful stimuli and enhance reported mood (Gilbert 1979; Golding and Mangan 1982; Rose, Ananda, Jarvik 1983). Also, relapse to cigarette smoking often occurs in response to stressful situations (Gunn 1983a; Ockene et al. 1982; Shiffman 1982; Marlatt and Gordon 1980; Lichtenstein, Glasgow, Abrams 1986). There have been no clinical trials in which the targeted use of more specific anxiolytics (e.g., benzodiazepines) has been evaluated in the maintenance of tobacco abstinence. The only study involving a

benzodiazepine was that of Glassman and associates (1984), who compared alprazolam with clonidine during a brief abstinence.

Nicotine Blockade Therapy

Whereas the goal of both replacement therapies and symptomatic treatments is to relieve withdrawal by mimicking critical effects of the drug from which the person is attempting to abstain, blockade therapy provides no such potentially rewarding or therapeutic effect. Rather, the goal of blockade therapy is to reduce or eliminate any rewarding pharmacologic effects should the person attempt to resume drug use. The prototypical blockade therapy is that used in the treatment of opioid dependence (Jaffe 1985). The long-acting opiate antagonist naltrexone can be given on a daily basis to opioid abusers to prevent them from experiencing the reinforcing effects of opioid agonists. Unfortunately, only about 5 percent of opioid-abusing patients are willing to comply with such a therapeutic regimen. Success in naltrexone treatment is correlated with the following characteristics: the patient is highly motivated, well adjusted in society, and has a steady job (Greenstein et al. 1983).

Relapse to former levels of cigarette smoking begins with the first few cigarettes which are smoked. If smoking levels do not progress beyond these few cigarettes, the incident is generally referred to as a "slip" (Shumaker and Grunberg 1986). Slips can lead to relapse because they provide the stimuli which were important in maintenance of the smoking behavior in the first place. Because nicotine itself is the source of many of the effects which are sought by cigarette smokers (Chapters II, IV, and VI), blocking the effects of nicotine should assist in the prevention of relapse. As described in Chapter V, such an approach is effective in preventing relapse to opioid use if the morphine-blocking drug (opioid antagonist) is taken (see also Greenstein et al. 1983).

Pharmacologic antagonists of nicotine, the administration of which could diminish a variety of responses to nicotine, have been known for several decades (Domino 1979). Those antagonists which act both centrally and peripherally (mecamylamine), but not those which only act peripherally (e.g., pentolinium and hexamethonium), appear to have functional effects on patterns of cigarette smoking in humans. Central antagonists also alter the behavioral effects of nicotine (including self-administration) in animals (Henningfield 1984; Stolerman 1986).

Preliminary data suggest the possibility that mecamylamine could be used as an antagonist to block the nicotine-mediated reinforcing consequences of cigarette smoking. The following findings are of particular relevance: (1) Mecamylamine pretreatment produces a dose-related blockade of the ability of animals and humans to discriminate nicotine from a placebo (mecamylamine is injected in

animals and administered orally to humans) (Rosecrans and Meltzer 1981; Stolerman 1986; Henningfield et al. 1982), (2) mecamylamine pretreatment diminishes the reinforcing efficacy of intravenous nicotine administration in animals (Goldberg et al. 1983) and possibly in humans (Henningfield and Goldberg 1983), (3) mecamylamine pretreatment increases the preference for high-nicotine-delivering cigarette smoke (apparently by reducing its nicotinic effects) when subjects are tested with a device which blends smoke from high- and low-nicotine-delivering cigarettes (Rose, Sampson, Henningfield 1985), and (4) mecamylamine pretreatment increases various measures of cigarette smoking behavior and tobacco smoke intake when subjects are allowed to freely smoke (Stolerman et al. 1973; Nemeth-Coslett et al. 1986; Pomerleau, Pomerleau, Majchrzak 1987). Results from the study by Pomerleau and colleagues also suggested that the toxicity of nicotine exposure was reduced substantially by mecamylamine pretreatment.

In one clinical trial, Tennant, Tarver, and Rawson (1984) attempted to determine if mecamylamine could be used safely and efficaciously to treat cigarette smoking. Mecamylamine was given to heavy cigarette smokers in conjunction with counseling to quit smoking. Mecamylamine reduced tobacco craving in 13 of 14 subjects, and half of the subjects quit smoking within 2 weeks of initiation of mecamylamine treatment. The mean dose of mecamylamine at the time of quitting was 26.7 mg/day. Mecamylamine was not used to maintain abstinence as naltrexone is used for opioid dependence. Rather, it was used as an aid to initial quitting. In theory, because mecamylamine blocks the effects of nicotine, it should precipitate withdrawal and, therefore, would not be indicated for acute cessation. Despite this theoretical problem and the lack of placebo controls in the trial, these data suggest that nicotine blockade warrants further exploration.

The main obstacles to this treatment approach are the ganglionic blocking and antihypertensive effects of mecamylamine, the strong likelihood of considerable difficulty in obtaining adequate therapeutic compliance, and conditioned and non-nicotine-mediated reinforcers of tobacco use which may be powerful enough to sustain urges to smoke even when they are no longer associated with the pharmacologic effects of nicotine.

Deterrent Therapy

Deterrent therapy is based on the premise that pretreatment with an agent may transform smoking from a rewarding to an aversive behavior. Disulfiram treatment of alcoholism provides the pharmacologic analogy for this form of treatment (Chapter V).

With regard to cigarette smoking, the main analog to disulfiram treatment is the administration of silver acetate. Variants on this

method have been marketed for over-the-counter purchase for a number of years. The physiological basis of the approach is that sulfide salts are produced when silver acetate contacts the sulfides in tobacco smoke. The resulting silver sulfides are extremely distasteful for most people. The approach is not specific to nicotine intake, but rather to sulfide-containing smoke. Most recently, a gum preparation of silver acetate has been tested as a means to maintain abstinence from tobacco smoking (Malcolm, Currey, Mitchell, Keil 1986). The gum must be chewed upon awakening and then repeatedly during the day to assist in abstinence, because a single piece of gum is apparently only effective for a few hours. Although many over-the-counter silver acetate smoking remedies are available, their efficacy never has been validated scientifically.

Conclusions

In evaluating experimental and clinical trials involving nicotine polacrilex gum, it should be noted that actual nicotine intake may have been significantly less than had been intended or reported if there were not systematic procedures to standardize administration (Benowitz et al. 1986; Nemeth-Coslett et al. 1987; Chapters II and IV). Criteria for the determination of successful outcome in nicotine replacement studies are ambiguous. It is unclear how to interpret results in which nicotine replacement is significantly more effective than a placebo at 6 months, but not at 1 year (Fagerstrom 1982a; Schneider et al. 1983). Nicotine replacement may be effective in facilitating cessation and in developing early resistance to relapse (withdrawal symptoms, reported cravings for tobacco; Harackiewicz et al. 1987; Hjalmarson 1984; Hughes et al. 1984; West et al. 1984a), but may not have residual effects that prevent relapse (Chapter IV).

Overall, the outcomes of experimental and clinical trials of nicotine polacrilex gum are modestly encouraging, at least for short-term results. In the vast majority of these trials, however, nicotine polacrilex gum has been combined with additional treatment components.

The combination of low doses (with the 2-mg gum), poorly defined criteria for self-administration, compliance problems, and variable absorption of nicotine from polacrilex gum is part of the rationale for the development of alternative replacement strategies (Pomerleau et al. 1988). At the same time, additional work with nicotine polacrilex gum is continuing to address compliance and dosage problems. Availability of a 4-mg preparation might be useful for highly tobacco-dependent individuals. Little clinical application of other replacement strategies has been reported to date. Alternative forms of nicotine replacement should help to determine the relative roles of nicotine and sensory/ritual phenomena in compulsive tobacco use

and improve the therapeutic effectiveness of nicotine replacement strategies.

The precedent for the use of pharmacologically based therapies to help establish and maintain abstinence from tobacco products is the use of similar kinds of techniques to treat other substance-use disorders. It should be noted, however, that some variant on each of the pharmacologic treatment approaches described in this review has been applied to other forms of substance abuse, but with limited success. Individual differences are very important. Some smokers appear to be much more dependent upon the pharmacologic properties of nicotine (both withdrawal relief and positive mood enhancement) than are others (Chapters IV and VI). The efficacy of pharmacologic intervention may be limited by the extent to which the substance-seeking behavior and the desired effects have become functionally autonomous from the drug itself. This problem is not unique to tobacco (Henningfield and Brown 1987). It is known that treating opiate users involves considerably more than blocking physiological withdrawal; an entire lifestyle may require change (Grabowski and Hall 1985; Bigelow, Stitzer, Liebson 1986).

Behavioral Treatment Strategies

Pharmacologic strategies may have a useful role in alleviating withdrawal symptoms or in blocking gratification typically derived from smoking, but these agents do not address conditioned cues and reinforcers or the social context of tobacco use. Effective treatment of the dependent smoker requires behavioral intervention in addition to any pharmacologic agents that might be administered. Research generally indicates that pharmacologic intervention is most effective when applied in a context that includes social support and skills training (Fagerstrom 1988; Hall, Ginsberg, Jones 1986). Furthermore, behavioral intervention may also be useful in increasing adherence to pharmacologic treatment procedures (Epstein and Cluss 1982).

Behavioral interventions have been applied in treating dependent smokers for many years. This Section will provide an overview of that research, with an emphasis upon current approaches. The review of the literature is necessarily both selective and limited. A major review in a previous Report of the Surgeon General (US DHEW 1979) listed 452 references. Schwartz (1987) prepared a comprehensive monograph reviewing smoking cessation in the United States and Canada. Although he focused upon the period 1978-85, he included 883 references. As noted above, some topics are deliberately either excluded or minimized because they have received extensive coverage in recent Reports. These topics include physician intervention, community trials, and worksite smoking programs. Excellent reviews of other approaches such as self-help

and use of the mass media are available elsewhere (Flay 1985a; Schwartz 1987). These methods are not considered in the current Report. It is recognized, however, that self-help, mass media, physician, worksite, and community interventions can have critical impact in overall public health initiatives designed to address the smoking problem. The vast majority of smokers who have quit to date have done so in the absence of formal treatment.

Schwartz (1987) compiled a summary table listing quit rates of 416 smoking cessation trials by method. This Table is reprinted here as Table 2. The Table provides overall outcomes for a number of different intervention techniques. As discussed by Schwartz, however, considerable caution is needed in interpreting these data. Methodology in the various studies is uneven. Many studies suffered from deficient followup procedures and from an exclusive reliance upon subject self-reports. Noteworthy perhaps is the difference in outcome between nicotine polacrilex gum trials using gum alone and those combining nicotine polacrilex gum with behavioral intervention. Reported outcomes for programs including multiple components (40 percent l-year median abstinence) are encouraging. The relative success achieved by cardiac patients indicates that treatments delivered at the time of a health crisis may be especially effective.

Aversion Procedures

Aversive strategies have involved pairing smoking with unpleasant imagery scripts (covert sensitization), with electric shock, or with the unpleasant effects produced by smoking itself (directed smoking procedures). All these techniques are designed, at least in part, to create aversions to cigarette smoke-affective reactions characterized by distaste, disgust, fear, or displeasure. The presumption is that such reactions will reduce the incentive to smoke. A wide variety of directed smoking strategies have been used. These include satiation, rapid smoking, and focused smoking.

Satiation

In this procedure cigarette consumption is dramatically increased prior to attempted abstinence. Smokers typically are asked to at least double their smoking intake. Despite promising early results (60 percent abstinence at 4-month followup, N=40; Resnick 1968), satiation procedures by themselves do not produce effects greater than those of attention/placebo interventions (Claiborn, Lewis, Humble 1972; Lando 1975; Sushinsky 1972).

In its most recent application, satiation has been used in multicomponent programs (Best, Owen, Trentadue 1978; Lando 1977), in which its contribution to outcomes has been difficult to ascertain.

TABLE 2.—Summary of followup quit rates (percentages) of 416 smoking cessation trials, by method, reported 1959–1985

Intervention method	Quit rate (at least 6-mo followup)				Quit rate (at least 1-yr followup)			
	Number of trials	Range	Median	Percent 33%	Number of trials	Range	Median	Percent 33%
Self-help	11	0–33	17	18	7	12–33	18	14
Educational	7	13–50	36	71	12	15–55	25	25
Five-day plan	4	11–23	15	0	14	16–40	26	21
Group[1]	15	0–54	24	20	31	5–71	28	39
Medication	7	0–47	18	14	12	6–50	18.5	17
Nicotine chewing gum	3	17–33	23	33	9	8–38	11	11
Nicotine chewing gum and behavioral treatment or therapy	3	23–50	35	67	11	12–49	29	36
Hypnosis, individual	11	0–60	25	36	8	13–68	19.5	38
Hypnosis, group	10	8–68	34	50	2	14–88	—	50
Acupuncture	7	5–61	18	29	6	8–32	27	0
Physician advice or counseling	3	5–12	5	0	12	3–13	6	0
Physician intervention more than counseling	3	23–40	29	33	10	13–38	22.5	20
Physician intervention, pulmonary patients	10	10–51	24	20	6	25–76	31.5	50

TABLE 2.—Continued

Intervention method	Quit rate (at least 6-mo followup)				Quit rate (at least 1-yr followup)			
	Number of trials	Range	Median	Percent 33%	Number of trials	Range	Median	Percent 33%
Physician intervention, cardiac patients	5	21–69	44	80	16	11–73	43	63
Risk factor	—	—	—	—	7	12–46	31	43
Rapid smoking	12	7–62	25.5	33	6	6–40	21	17
Rapid smoking and other procedures	21	8–67	38	57	10	7–52	30.5	50
Satiation smoking[2]	11	14–76	38	64	12	18–63	34.5	58
Regular-paced aversive smoking[2]	13	0–56	29	31	3	20–39	26	33
Nicotine fading[2]	7	26–46	27	29	16	7–46	25	44
Contingency contracting[2]	9	25–76	46	89	4	14–38	27	25
Multiple programs[2]	13	18–52	32	38	17	6–76	40	65

NOTE: Percent 33% is percentage of trials with quit rates of at least 33 percent. Median not calculated for fewer than three trials. Caution: Quit rates provided suggest overall trends. Most quit rates were based on self-reports. Some quit rates were recalculated to include all subjects, but most quit rates were based on reports by investigators. Some quit rates omitted subjects who did not complete treatment or persons who did not reply to followups. Definitions of followup may vary between trials.

[1] Three group trials had 5-month followups.

[2] Other procedures may have been used, and some trials may be included in more than one method.

SOURCE: Schwartz (1987).

Lando (1982) conducted a dismantling strategy in which he attempted to isolate the specific contributions of individual treatment components to gauge the relative contribution of satiation to a multicomponent treatment. By itself satiation produced dismal results (15 percent l-year abstinence, N=13). When satiation has been incorporated into multicomponent treatments that include maintenance, l-year followup results have approached 50 percent (Lando and McGovern 1985). Lando (1986) has suggested that satiation represents a plausible preparation strategy for quitting. However, there is little evidence that satiation results in an aversion to cigarettes (Baker et al. 1984; Tiffany, Martin, Baker 1986).

Rapid Smoking

Rapid smoking typically requires smokers to inhale cigarette smoke every 6 sec until they reach the point that they would become ill if they were to continue. Whereas early interventions varied the number of rapid smoking sessions to fit client needs (Lichtenstein et al. 1973), more recent applications have tended to use standardized regimens involving six to eight sessions (Erickson et al. 1983; Hall, Rugg et al. 1984).

Multicomponent programs including rapid smoking generally yield good outcomes, but when used by itself, rapid smoking continues to yield variable results. Raw and Russell (1980) found that rapid smoking, cue exposure, and group/therapist support all produced poor outcomes when used separately (only 1 of 16 (6 percent) rapid smoking subjects was abstinent at 1 year). Similarly discouraging results have been reported by Poole, Sanson-Fisher, and German (1981) and by Corty and McFall (l984). In contrast, Hall and associates have consistently obtained high rates of success (50 percent 6-month abstinence levels) using rapid smoking alone, both with normal volunteers (Hall, Sachs, Hall 1979) and medical patients (Hall, Sachs et al. 1984).

Hall, Sachs, and colleagues (1984) observed that, in contrast to many recent applications of rapid smoking, their procedure was similar to that of early, successful rapid-smoking interventions (Lichtenstein et al. 1973). Their procedure involved (a) a single client format, (b) a warm client-therapist relationship, (c) positive expectations of success, (d) individualized scheduling, (e) office rather than home treatment, and (f) warnings against smoking outside of therapy sessions (Danaher 1977). However, Hall's research involved either elaborate physiological/medical assessment (Hall, Sachs, Hall 1979) or the use of medical patients as subjects (Hall, Sachs et al. 1984). Either of the latter two factors could have enhanced the effectiveness of rapid smoking. At this point, the weight of evidence suggests that rapid smoking by itself can have a substantial immediate impact on cessation (Poole, Sanson-Fisher, German 1981).

The long-term effects of rapid smoking do not appear to be sufficient by themselves to prevent relapse. Hall's results suggest that rapid-smoking effectiveness is greatly influenced by auxiliary treatment elements such as a warm interpersonal atmosphere, positive expectations, and admonitions regarding smoking.

Multicomponent programs involving rapid smoking have generally obtained reasonably high long-term cessation rates, i.e., 40 percent abstinence at 6 to 12 months posttreatment (Brandon, Zelman, Baker, in press; Erickson et al. 1983; Hall, Rugg et al. 1984; Tiffany, Martin, Baker 1986). The relative success of multicomponent programs comprising rapid smoking has been noted by earlier reviewers (Lichtenstein 1982; Pechacek 1979). Considerable research has been conducted to characterize the nature of the processes subserving rapid-smoking effectiveness. One approach to this problem is to determine whether rapid smoking results in a conditioned aversive response. In this regard, researchers have demonstrated that after rapid smoking, individuals show a conditioned tachycardia to cigarettes. The magnitude of this tachycardiac response is increased when the aversive smoking procedure produces intense gastrointestinal discomfort. The magnitude of this response is positively related to relapse latency--the greater the tachycardiac response, the longer smokers take to relapse (Erickson et al. 1983; Tiffany, Martin, Baker 1986). The similarity of these results to those found with chemical aversion treatments of alcoholism (Baker, Cannon et al. 1984; Cannon et al. 1986) suggests that part of the success of rapid smoking may be due to taste aversion learning. Thus, some aversion indices may constitute rare examples of therapy process measures that are predictive of treatment success. Previous attempts to assess aversion acquisition may have yielded inconsistent findings because the investigators attempted to relate clinical outcomes to unconditioned stimulus magnitude (e.g., number of cigarettes smoked in aversion sessions) or to unconditioned response magnitude (rapid-smoking-induced malaise) rather than to conditioned response magnitude (e.g., the cardiac response elicited by the taste of cigarettes; Glasgow et al. 1981; Norton and Barske 1977; Merbaum, Avimier, Goldberg 1979; Russell, Epstein, Dickson 1983).

Reduced-Aversion Techniques

Some investigators have compared rapid smoking and alternative low-aversion treatments for their abilities to enhance the effectiveness of a behavioral counseling or self-management treatment. Focused smoking, in which the person smokes for a sustained period but at a slow or normal rate, and rapid puffing, in which a person smokes rapidly but does not inhale, often are used as comparison conditions in order to permit assessment of specific effects of aversion (Danaher et al. 1980; Erickson et al. 1983; Hall, Rugg et al.

1984). While these treatments are unpleasant, they differ from rapid smoking in that they do not elicit the dysphoria produced by rapid smoking and they are less risky (Erickson et al. 1983; Glasgow et al. 1981; Tiffany, Martin, Baker 1986). Most research suggests that these alternative treatments produce long-term outcomes that are quite similar to, or just moderately lower than, those produced by rapid smoking (Danaher et al. 1980; Erickson et al. 1983; Hall, Rugg et al. 1984; Powell and McCann 1981; Tiffany, Martin, Baker 1986). Moreover, research shows that these treatments do not produce the conditioned cardiac response produced by rapid smoking. Thus, these treatments probably produce their effects through routes other than aversion conditioning. That low-aversion treatments produce effects comparable to those of rapid smoking indicates that aversion acquisition per se is not essential to successful treatment outcome. Other active components might be habituation to cigarettes, withdrawal reduction due to nicotine intake, and removal of control over smoking.

There has been concern about the possible effects of rapid smoking on the cardiovascular system. Horan and coworkers (1977) reported that rapid smoking produced elevations in blood pressure, heart rate, and carboxyhemoglobin levels as well as electrocardiographic abnormalities. Lichtenstein and Glasgow (1977) provided recommendations for screening and subject selection. Recent research suggests that the rapid-smoking procedure is fairly safe when used with healthy adults screened for such conditions as cardiovascular disease, diabetes, chronic obstructive pulmonary disease, seizure disorder, and hypertension (Hall, Sachs, Hall 1979; Sachs et al. 1979). Rapid smoking has been used safely even with medical populations (cardiac and pulmonary patients) in the presence of close medical supervision (Hall, Sachs et al. 1984). However, given that in the context of multicomponent programs focused smoking and rapid puffing yield results roughly comparable to those of rapid smoking, there appears to be little need to use rapid smoking with at-risk populations (e.g., cardiac and pulmonary patients).

Aversion therapies for smoking are constrained by some of the same limitations that apply to the use of aversion therapies for other forms of substance seeking. The aversions are rarely permanent, and the aversive conditioning is less effective in attempts to establish an aversion to substances that have had a history of repeated use.

Relaxation Training

Progressive relaxation is a popular treatment for anxiety-related disorders (Haugen, Dixon, Dickel 1958). As noted previously, smokers often report smoking to cope with anxiety and stress (Chapter VI). A large proportion of smoking relapses occurs during negative emotional states (Brandon, Tiffany, Baker 1986; Marlatt and Gordon

1980; Shiffman 1982). In theory, relaxation training should provide smokers with a means other than smoking for coping with stress and negative emotion. In a nontreatment experiment, relaxation was found to reduce levels of smoking in the face of external stress (Dobbs, Strickler, Maxwell 1981). Today, relaxation is rarely used as a sole treatment and is instead incorporated into multicomponent behavioral skills training programs (Erickson et al. 1983; Hall, Rugg et al. 1984; Hall et al. 1985; O'Connor and Stravynski 1982; Tiffany, Martin, Baker 1986); it may best be conceptualized as one of many possible stress-coping skills taught to clients. Poole, Sanson-Fisher, and German (1981) found that relaxation training did not improve the outcome of a rapid-smoking treatment. Seventy-five subjects were assigned to rapid smoking only; rapid smoking and relaxation training; rapid smoking, relaxation, and contingency contracting; or contingent rapid smoking. In none of these conditions did l-year abstinence exceed 25 percent.

Contingency Contracting

Operant conditioning techniques have been used in smoking treatments to reward clients for not smoking and/or to punish them for smoking. The usual procedure is to collect monetary deposits from clients early in treatment with periodic repayments contingent on client achievement of abstinence goals. Variations include having the client pledge to donate money to a disliked organization or individual for every cigarette smoked, or contracting for nonmonetary rewards and punishments based on smoking status (Lando 1977; Tiffany, Martin, Baker 1986).

The rationale behind contracting techniques is that they may bolster commitment to abstinence by providing contingent concrete rewards. Contracts are in effect until withdrawal has abated and the individual has had an opportunity to begin alternative, nonsmoking activities that may be rewarding. Murray and Hobbs (1981) compared the effects of self-reinforcement ($1 reward per day for meeting smoking reduction goal), self-punishment ($1 'forfeited for not meeting goal), combined self-reward and self-punishment, and self-monitoring alone on cessation. They found that only self-punishment led to improved outcomes: 11 of 20 subjects (55 percent) in the two self-punishment conditions reached abstinence versus only 1 of 20 subjects (5 percent) in the other two conditions. Three years posttreatment, 25 percent of self-punishment subjects still reported abstinence. A small sample size and reliance on self-report, however, indicate the need for caution in interpreting these findings.

Paxton (1980) compared multicomponent behavioral interventions with and without contingency contracting (weekly repayments if subjects were abstinent) and found that contracting significantly improved maintenance of abstinence, but only during the 8 weeks of

repayment. The end of the repayment schedule was followed by a sharp increase in relapse, and no subsequent difference between conditions was found. Overall abstinence at 6-month followup was 42 percent (25 of 60 subjects). Bowers, Winett, and Frederiksen (1987) also reported that extended contingency contracting delayed and decreased relapse, but they did not report abstinence rates. In a variation of the contracting procedure, Stitzer and Bigelow (1982) provided contingent payments of $5 to subjects for reducing carbon monoxide (CO) levels by 50 percent. Other attempts to increase the effectiveness of contingency contracts by manipulating the length, frequency, or amount of repayment or the frequency or size of deposits have largely been unsuccessful (Paxton 1981, 1983). Yet when it is part of a multicomponent program, contingency contracting appears to aid smoking cessation, at least over the short term.

Social Support

Attempts to capitalize on the effects of social support in treatment settings have met with mixed results. Hamilton and Bornstein (1979) developed a package that included a buddy system among group members and public announcements of client successes at quitting smoking. When this package was appended to a behavioral treatment program, it significantly increased abstinence rates compared with those for behavioral treatment alone both at treatment termination (55 vs. 27 percent) and during the 6 months of followup (27 vs. 9 percent; N=12 in each of these two conditions). Etringer, Gregory, and Lando (1984) were able to improve smoking treatment outcome over the short term by emphasizing group cohesion. McIntyre-Kingsolver, Lichtenstein, and Mermelstein (1986) examined the effects of including clients' spouses in a smoking cessation program and teaching them how to be supportive of the clients' quitting attempts. At the end of treatment, 73 percent of clients in the spouse-training condition (total N=33) were abstinent compared with only 48 percent in the condition without spouse training (total N=31). This difference failed to reach significance, however, and diminished during followup. In another study, the outcome of a worksite-controlled smoking program was not affected by encouraging the social support of quitting coworkers (Malott et al. 1984). Lichtenstein, Glasgow, and Abrams (1986) summarized the results of five recent smoking cessation studies from three separate research programs (including McIntyre-Kingsolver, Lichtenstein, and Mermelstein (1986) and Malott and coworkers (1984)). Results generally indicated a positive relationship between measures of social support and treatment outcome. However, specific attempts to improve outcome by enhancing social support were uniformly unsuccessful.

Coping Skills Training

The value of coping skills training is suggested by evidence that smokers who use cognitive and/or behavioral coping responses when they are tempted to smoke reduce their likelihood of relapsing (Shiffman 1984a). The rationale for coping skills training of tobacco-dependent individuals is similar to that for such training in other forms of drug dependence. Alternative behavioral repertoires are developed that help to maintain comfortable, satisfactory functioning in the absence of drugs (Grabowski and Hall 1985; Jasinski and Henningfield 1987).

Examples of behavioral coping responses are distracting activities, escape from a stressor, relaxation, and physical activity. Cognitive coping may involve reminding oneself of the benefits of quitting or the negative consequences of smoking or simply telling oneself that smoking is not an option. Coping responses may be directed either at the smoking temptation/urge itself or at a precipitating stressor (Wills and Shiffman 1985).

Coping skills training is generally used in cessation research as part of multicomponent treatments (Brandon, Zelman, Baker, in press; Davis and Glaros 1986; Erickson et al. 1983; Hall, Rugg et al. 1984; Tiffany, Martin, Baker 1986). There is considerable variation, however, in the specific coping skills taught, in the strategies used to teach them, and in the names given to the treatment. Coping skills training appears to be effective in enhancing short-term outcomes, especially when combined with an aversive-smoking procedure. The long-term effects are less clear. This strategy has the potential for maintaining changes in smoker behavior because, presumably, once the skills are learned they may be used long after treatment has terminated. Nevertheless, in studies of maintenance of abstinence, results are mixed but generally negative (Glasgow and Lichtenstein 1987). These generally negative results may be a function of the diversity of treatments in which coping skills training is incorporated and of inadequate compliance with coping skills techniques. Adherence to coping skills instructions should be monitored more closely. Hall, Rugg, and colleagues (1984) found that the outcome differences between coping skills and discussion conditions were seen only in clients who smoked 20 or fewer cigarettes/day. It should be noted, however, that the outcome differences were computed for the number of cigarettes smoked per day and not for abstinence rates. Coping skills training may be most effective for certain subpopulations of smokers, such as less-dependent smokers (Hall, Rugg et al. 1984; Hall et al. 1985) who smoke primarily to cope with emotional stress (O'Connor and Stravynski 1982).

Stimulus Control

Stimulus control treatments are based on the assumption that a wide variety of environmental cues are associated with and serve to trigger smoking. A gradual reduction in smoking is accomplished by having clients progressively eliminate situations in which they smoke. In some cases, temporal, rather than situational, constraints upon smoking are instituted (e.g., the individual is permitted to smoke only on the half hour; Shapiro et al. 1971). In theory, a gradual reduction in smoking should result in a weaker, more manageable withdrawal syndrome.

Stimulus control procedures generally have produced weak, transient results when used alone and have been of questionable value when combined with other self-management techniques (Lando 1978). In more recent studies stimulus control has been used primarily as an element in multicomponent programs in which its effectiveness is difficult to ascertain (Best, Owen, Trentadue 1978; Colletti and Kopel 1979; Colletti, Supnick, Rizzo 1982; Karol and Richards 1981; Lando 1982; Rabkin et al. 1984).

Nicki, Remington, and MacDonald (1984) added a stimulus control component, which was designed to maximize client self-efficacy (Bandura 1977a), to a nicotine fading treatment. The combined treatment produced a 5-month abstinence rate of over 50 percent--twice that of the fading procedure alone. This level of success is unusual in research on stimulus control techniques and may be due to the self-efficacy manipulation rather than stimulus control per se. Also, as is true for so much of the smoking cessation literature, the small sample size used by Nicki and colleagues (fewer than 15 subjects per condition) requires that their results be interpreted cautiously.

Nicotine Fading

Nicotine fading (or brand switching) is based on a straightforward pharmacologic rationale. The intensity of the withdrawal syndrome, including both physical and psychological discomfort, can be reduced when the dependence-producing drug is gradually withdrawn (at least within certain limits). The procedure generally involves clients monitoring their nicotine consumption while switching (in three to six stages) to cigarette brands with progressively lower rated tar and nicotine deliveries, and then quitting completely. Chapter V supports this approach for drugs other than nicotine, and Chapter IV indicates this for nicotine as well. Foxx and Brown (1979) specifically assumed that nonabstinent nicotine fading subjects would benefit from continued smoking of low-tar and low-nicotine brands. In this study as well as in more recent nicotine fading studies, actual nicotine dose levels have been uncontrolled. At least some compensa-

tion is likely to be occurring, and nicotine reduction is undoubtedly significantly less pronounced than would be expected based upon machine-rated nicotine yields (McMorrow and Foxx 1983).

The treatment is based primarily on the idea that a gradual phaseout of smoking will minimize nicotine withdrawal symptoms. Nicotine fading can be viewed as an alternative to "cold turkey" quitting. However, to the extent that actual nicotine intake is not decreased or is decreased only minimally (Benowitz et al. 1983), this procedure might more appropriately be viewed as an additional preparation method for abrupt cessation. Furthermore, even when nicotine intake is decreased, thereby potentially reducing physiological dependence, postcessation cravings may be relatively unaffected. These continued cravings can be important in leading a newly abstinent individual to relapse. Lando and McGovern (1985) suggested that self-efficacy is increased by allowing clients to experience a series of successes (in reducing apparent nicotine intake) prior to quitting.

Nicotine fading should be distinguished from gradual reduction procedures in which smokers are instructed to progressively reduce their *number* of cigarettes. Procedures that emphasize progressive reductions in the number of cigarettes generally have been ineffective. Smokers typically report that the remaining cigarettes are more reinforcing. Furthermore, they often reach a "stuck point" beyond which additional reduction does not occur (Levinson et al. 1971).

A preliminary study by Foxx and Brown (1979) assessed a combination of nicotine fading and self-monitoring, nicotine fading alone, self-monitoring alone, and a modified American Cancer Society clinic program. Results at 18-month followup favored the combined nicotine fading and self-monitoring procedure (4 of 10 subjects or 40 percent were abstinent in this condition as opposed to no more than 10 percent of the subjects in any of the other three conditions). In several other studies, however, nicotine fading and self-monitoring produced less encouraging results (Beaver, Brown, Lichtenstein 1981; Brown et al. 1984; Foxx and Axelroth 1983; Nicki, Remington, MacDonald 1984). Lando and McGovern (1985) added a systematic behavioral maintenance procedure to nicotine fading with disappointing results (only 8 of 42 or 19 percent of subjects assigned this procedure were abstinent at l-year followup). Lando (1987) obtained somewhat more positive findings for a treatment including nicotine fading and behavioral maintenance (35 percent abstinence at 12-month followup). However, nicotine fading subjects in this study were self-selected.

Results for nicotine fading in a field application (community rather than laboratory setting, lay rather than professional group leaders) have been encouraging (Lando 1986). Participants were

given a choice of preparation strategy (satiation or nicotine fading). Approximately 80 percent elected the nicotine fading procedure. Outcomes for nicotine fading and satiation treatments were virtually identical. Survival analyses performed on field data for several hundred participants yielded a projected permanent smoking cessation rate of 32 percent. This projection was based on relapse curves from 3- to 5-year followup data. The choice of preparation strategy may be effective in enhancing both compliance and outcome.

There is also some evidence that nicotine fading may be useful in minimal intervention programs (Prue et al. 1983; Scott et al. 1986). A strategy similar to nicotine fading involves the use of progressively stronger graduated filters (Martin et al. 1981). Hymowitz, Lasser, and Safirstein (1982) found low abstinence rates with this method and also continued use of the filters by few nonabstinent smokers after the end of treatment. Improved outcomes might occur if filters are more systematically linked with multifaceted behavioral intervention.

Controlled Smoking

Controlled-smoking programs have been developed to treat smokers who are unable or unwilling to quit completely. This approach is based in part on the assumption that reduced smoking will be associated with diminished health risk. The prototypical program attempts to decrease risk by reducing cigarette consumption, altering smoking inhalation patterns (e.g., number of puffs, duration of puffs, CO intake), and minimizing the tar and nicotine content of cigarettes (e.g., nicotine fading). A key is to change multiple aspects of the smoking behavior to minimize compensation.

Stimulus control procedures may also be used (Glasgow, Klesges, Vasey 1983). In addition, clients may be taught coping skills to use as substitutes for smoking (Frederiksen 1979). Controlled-smoking treatments have produced reductions of at least 50 percent in the rated nicotine content of cigarettes smoked, with more modest reductions in reported numbers of cigarettes, the percentage of each cigarette smoked, and CO levels (Glasgow, Klesges, Vasey 1983; Godding and Glasgow 1985; Malott et al. 1984). In general, however, by the 6-month followup the magnitude of these initial reductions had diminished by approximately one-half.

Reservations about the controlled smoking approach center around the premise that smokers can substantially diminish their health risk without total abstention. The change in health risks associated with moderate reduction is not known. Moreover, there is experimental evidence that smokers regulate their bodily levels of nicotine through compensatory changes in smoking patterns (McMorrow and Foxx 1983). These compensatory changes are not complete, however. In a short-term (3- or 4-day) restriction study, a

reduction from an average of 37 cigarettes to 5 cigarettes/day was associated with a threefold increase in the intake of tobacco toxins per cigarette (Benowitz et al. 1986). Daily exposure to tar (estimated by mutagenic activity of the urine), nicotine, and CO declined only 50 percent from the baseline. Thus, consistent with the tendency to maintain intake of nicotine, the benefit of smoking fewer cigarettes was much less than expected. Benowitz and associates used laboratory volunteers rather than smokers who were specifically concerned with reducing their levels of tar and nicotine exposure.

The basic premise of the controlled-smoking approach-that it reduces health risk-remains to be validated. Some investigators have argued that until there is clear evidence that controlled smoking actually decreases health risks, it should not be recommended as a treatment option. Finally, there is concern both that smokers who otherwise may have been successful quitters will instead be attracted to controlled-smoking programs (at this point no data are available) and that these programs may provide an illusion of safety.

If reductions in smoke exposure can be maintained over time, if a reduction in health risk can be established, and if clients can be limited to those for whom the prospect of total abstinence is highly unlikely, then reduced smoking may be an alternative for recalcitrant smokers. Given all these conditions, controlled smoking does not appear likely to represent an effective treatment. However, possible risk reduction is not the only rationale for this type of approach. Controlled-smoking interventions may appeal to a larger cross-section of smokers, may have a positive impact upon self-efficacy, and may facilitate subsequent progress toward complete abstinence. Currently, empirical data on these points are lacking.

Multicomponent Programs

In recent years, multicomponent programs have been a principal target of research. This is due to both the relatively high level of clinical success produced by these programs (Lichtenstein 1986) and the recognition that smoking is multidetermined and relatively invulnerable to any single intervention (Schwartz 1987). The most effective multicomponent programs yield almost universal short-term abstinence and long-term abstinence rates that approach or exceed 50 percent (Brandon, Zelman, Baker, in press; Elliott and Denney 1978; Erickson et al. 1983; Hall, Rugg et al. 1984; Hall et al. 1985; Fagerstrom 1982b; Killen, Maccoby, Taylor 1984; Lando 1977; Tiffany, Martin, Baker 1986). These results are extremely encouraging and are rarely matched in trials that place exclusive emphasis upon pharmacologic intervention. Dismantling or constructive studies have shown that combinations of treatments generally outperform any single constituent treatment (Lando 1982).

Best, Owen, and Trentadue (1978) compared satiation and rapid smoking in the context of self-management training. Subjects rehearsed possible alternatives or coping strategies for each anticipated problem situation. Suggested techniques were applied on an individualized basis and included relaxation, deep breathing, contingency contracting, social support, stimulus control, and behavioral rehearsal. The overall result with 60 subjects was 47 percent abstinence at 6-month followup.

Powell and McCann (1981) achieved successful results with a combination of lectures, self-control techniques, and aversive smoking. Aversive smoking consisted of rapid puffing without inhalation and holding the cigarette in an awkward position. Efforts were made to increase the unpleasantness of the procedures by providing ashtrays that were full of cigarette litter, dipping cigarettes in a bitter-tasting solution, and showing slides of diseased organs. Subjects were randomly assigned to one of three maintenance conditions: a 4-week support group, 4 weeks of telephone calls between subjects, or a no-contact control group. Results for the 51 subjects at l-year followup were impressive, although there were no significant differences between conditions. The support group and the no-contact controls achieved 65 percent abstinence, and telephone contact subjects achieved 59 percent abstinence.

Hall, Rugg, and colleagues (1984) assessed two levels of relapse prevention (skills training versus discussion control) and two levels of aversive smoking (6- vs. 30-sec inhalations) in a 2-by-2 factorial design. Of 135 subjects recruited, 123 completed treatment. Of 14 treatment sessions, 8 included aversive smoking. Six sessions were devoted to relapse prevention. Specific skills training components included cue-produced relaxation, commitment enhancement, and rehearsal of commonly experienced relapse situations. Subjects assigned to the skills training condition were more likely to report use of coping skills. One-year abstinence outcomes were as follows: 52 percent for 6-sec inhalations/skills training, 39 percent for 30-sec inhalations/skills training, 34 percent for 6-sec inhalations/discussion, and 26 percent for 30-sec inhalations/discussion. Skills training was superior to the discussion control at the l-year followup (dropouts were excluded from this analysis). No differences were observed between the 6- and 30-sec smoking procedures.

Lando (1977) compared a comprehensive treatment procedure (satiation, contingency contracts, group support, booster aversion) against a satiation control. Subjects were seen in small groups. All subjects attended six treatment sessions over a l-week period. Subjects assigned the comprehensive intervention attended an additional seven sessions during 2 months of maintenance. Results at 6-month followup indicated 76 percent abstinence for the comprehensive procedure and 35 percent abstinence for the satiation

condition. However, it should be noted that these results were based upon a total of only 34 subjects and 2 small groups per condition.

Lando (1981) assigned 99 subjects to a 2-stage treatment (aversion and maintenance) similar to that employed in his 1977 study or to a 3-stage procedure that also included fear appeals and stimulus control. Subjects were in addition randomly assigned to intensive or minimal contact conditions. Efforts to implement a maintained reduction procedure among nonabstinent subjects were unsuccessful. One-year followup results favored the two-stage intensive contact procedure. The group of subjects in this condition achieved a 46 percent abstinence rate whereas subjects in each of the other conditions attained abstinence rates less than 20 percent. In a 3-year followup, Lando and McGovern (1982) again found 46 percent abstinence among subjects in the two-stage intensive treatment (continuous abstinence from the end of treatment in this condition was 33 percent).

Elliott and Denney (1978) developed a package treatment encompassing self-reward and punishment, cognitive restructuring, applied relaxation, behavioral rehearsal, systematic desensitization, emotional role playing, covert sensitization, and rapid smoking. This comprehensive program was compared against rapid smoking by itself and two control conditions. Six-month followup results (N=60) indicated a significant effect in favor of the package treatment. Subjects in this condition achieved a 45 percent abstinence rate as opposed to 17 percent for rapid smoking by itself, 12 percent for a nonspecific control, and 0 percent for an untreated control.

Erickson and colleagues (1983) assigned subjects to either rapid smoking or to a less-aversive rapid-puffing procedure. These subjects also were assigned behavioral counseling which included training in problem-solving strategies. A comparison group underwent only behavioral counseling, without any aversive smoking. Results favored the combination of rapid smoking and behavioral counseling. At l-year followup 70 percent of rapid-smoking subjects and only 33 percent of rapid-puffing and 14 percent of behavioral counseling subjects reported abstinence. A total of only 26 subjects were included in this study.

Tiffany, Martin, and Baker (1986) assessed full-scale rapid smoking with full counseling, truncated rapid smoking with full counseling, rapid puffing with full counseling, and full-scale rapid smoking with reduced counseling. Eighty-two subjects completed treatment. During behavioral counseling, subjects learned to anticipate potential problem situations and to plan coping strategies for these situations. The full-scale rapid-smoking and rapid-puffing procedures included three trials per session. Truncated rapid smoking consisted of only one trial per session. Reduced counseling emphasized support and encouragement rather than specific behavioral

procedures. Six-month followup results favored the full-scale rapid-smoking and rapid-puffing conditions combined with full-scale counseling (59 and 55 percent abstinence, respectively). Either truncated rapid smoking or reduced counseling appeared to detract from effectiveness (35 percent of subjects in each of these conditions were abstinent at 6-month followup).

As noted in the section on methodological issues in treatment (below), many multicomponent treatments are based on clinical intuition or on the effectiveness of a treatment when used by itself and few are based on an explicit theory or model of addiction and behavioral change. Moreover, few multicomponent evaluative studies contain sound process measures that tap processes theoretically linked to particular interventions. Therefore, even though multicomponent treatments are often effective, the basis of their efficacy is little understood.

It is unclear why particular treatment elements are effective when combined. Perhaps these elements interact so that an individual who would not be especially helped by one treatment is aided by the combination. Perhaps the treatment components are additive because their individual effects are largely independent. To investigate the nature of multicomponent treatment effects, researchers might strive to develop experimental designs that are sensitive to particular components and to determine whether these reflect interactive effects when auxiliary treatments are added. It is recognized, however, that required numbers of subjects and statistical power issues often render this type of approach impractical. Furthermore, isolation of very precise or subtle treatment elements, as opposed to major differences, appears both impractical and unlikely (Lando 1982).

Some multicomponent treatments contain elements that are labeled as "maintenance" and are delivered during the postcessation, followup interval. These are based on the notion that extending therapist contact or skills training in the followup interval will prolong treatment gains. Evidence is mixed as to whether such maintenance treatments significantly enhance the long-term effectiveness of complete, multicomponent programs (Brandon, Zelman, Baker, in press).

Although multicomponent programs are often very effective, more is not always better (Lando 1981). Inclusion of too many procedures may overwhelm subjects and thereby reduce adherence to treatment. A point of diminishing returns may be reached by simply adding additional components to an already complex intervention. Combinations of multicomponent behavioral treatment and pharmacologic intervention may be promising for highly dependent smokers, especially for those who have been unable to achieve even short-term abstinence despite repeated attempts.

Other Treatment Strategies

Hypnosis

The usual intent of hypnosis is to increase client motivation or ability to quit smoking through posthypnotic suggestions. The most commonly used posthypnotic suggestions are variations of those originated by Spiegel (1970): (1) smoking is a poison to your body; (2) you need your body to live; and (3) you owe your body this respect and protection (Berkowitz, Ross-Townsend, Kohberger 1979; Hyman et al. 1986; Javel 1980; Perry, Gelfand, Marcovitch 1979). Suggestions may also involve problem-solving techniques (Frank et al. 1986; Javel 1980), review of the client's history of smoking (Javel 1980), desensitization to environmental cues (Wagner, Hindi-Alexander, Horwitz 1983), and an assortment of other elements (Katz 1980). Despite the variety of possible hypnotic procedures, some research reports fail to describe the procedure used (Lambe, Osier, Franks 1986; Schubert 1983). Hypnosis might most usefully be applied to the small percentage of the population that is highly susceptible to hypnotic induction. Some individuals are essentially unresponsive to hypnosis, whereas others evidence varying degrees of susceptibility. Individual differences in hypnotic susceptibility have in fact influenced outcome (Perry and Mullen 1975; West 1977), although this has not been reported by all investigators (Mott 1979).

No significant outcome differences were found when posthypnotic suggestions were compared with suggestions without hypnosis (Javel 1980), with suggestions after relaxation (Schubert 1983), with focused smoking or an attention placebo control condition (Hyman et al. 1986), or with behavior modification or health education interventions (Rabkin et al. 1984). Most studies have found hypnosis to be superior to no-treatment control groups, although Lambe, Osier, and Franks (1986) found no such difference. Followup abstinence rates reported for hypnosis in recent studies have ranged from less than 4 percent (Perry, Gelfand, Marcovitch 1979) to 60 percent (Javel 1980), with a mean of approximately 28 percent. These figures may be spuriously high because several studies reported less than 6 months of followup and most relied exclusively on subject self-report.

There is little evidence that hypnotic induction per se facilitates smoking cessation and maintenance above and beyond the effects of other treatment components (including the posthypnotic suggestions themselves) (Holroyd 1980; Katz 1980).

Acupuncture

Acupuncture involves the use of needles or staple-like attachments and commonly is given at the ear either by press needle or staple puncture. Acupuncture has gained popularity over the past 10 years (Schwartz 1987). There are few carefully controlled evaluations of

this procedure for smoking cessation. Many published reports have suffered from serious methodological shortcomings (e.g., lack of control conditions, short or nonexistent followup periods, failure to include data from all treated subjects). Six studies have compared acupuncture at the "correct" site for smoking cessation against an "incorrect" or sham site. In only one study (MacHovec and Mann 1978) was the correct site significantly superior to the sham site. As with hypnosis, most evaluations of acupuncture have relied exclusively on self-reports. At this point, there is little evidence that acupuncture relieves withdrawal symptoms or promotes smoking cessation. A combination of acupuncture and supportive counseling or skills training may be more effective (Schwartz 1987).

Treatment of Special Smoker Populations

Recognition of smoking as a dependence-producing behavior leads to important implications in treating several populations of smokers including women, blacks, and Hispanics. Current trends (Appendix A) indicate that the burdens of smoking in the future may be disproportionately felt by lower socioeconomic and minority population groups. For treatment to have optimal impact, it must meet the needs of smokers from diverse circumstances. Presently, the vast majority of those who avail themselves of formal intervention are white and are from relatively advantaged socioeconomic backgrounds.

It is not obvious that interventions for special populations should differ substantially from those that are currently available. There are indications based on smoking patterns and environmental and social factors that suggest the importance of tailored intervention. A great deal more research is needed, however. At this point, for example, it is unclear whether self-help treatment manuals oriented to specific target groups are preferable to more general manuals. Currently there are almost no materials or programs prepared especially for blacks or Hispanics. If the needs of lower SES and minority smokers are not met, the trend for smoking to be disproportionately concentrated among these groups is likely to continue. Considerations of treatment for the dependent smoker are not complete without substantial attention to issues of application and dissemination, especially to smokers not being served by current interventions.

Applying Smoking Interventions to Women,

Sex Differences in Cessation and Relapse Rates

Trends in cigarette smoking among men and women in this century have followed roughly similar curves, except that increases and decreases in smoking prevalence among women have lagged 15

to 30 years behind rates for men (Harris 1983; US DHEW 1980; Appendix A). Recent declines in overall smoking prevalence are attributed to lower initiation rates among teenage males and higher cessation rates among adult males (Remington et al. 1985). The percentage of former smokers in the male population has increased more dramatically than the percentage of former smokers in the female population (Appendix A). Jarvis (1984) adjusted cigarette cessation rates in Britain and in the United States to reflect the proportion of males who switched from smoking cigarettes to smoking pipes and cigars. After this adjustment, sex differences in cigarette cessation rates disappeared for individuals under age 50.

Several recent, well-controlled prospective evaluations of cigarette cessation programs found no differences in the proportions of women and men who achieved initial cessation and/or long-term maintenance (Curry 1986; Gritz 1982; Hall, Ginsberg, Jones 1986). The question of whether previously observed gender differences in cessation and relapse rates (the magnitude of which is often small) reflect real and stable sex differences, historical effects true only in older smokers, or statistical artifacts due to analytical limitations is not resolved.

Motivation to *quit*. In one of the few studies addressing gender differences in motivation to quit, Curry (1986) found that successful male and female abstainers did not differ in their overall reasons for quitting (e.g., "Smoking is inconsistent with my commitment to good health"). However, women in Curry's (1986) study differed significantly from men on questions related to four more specific subdimensions of motivation: self-determination ("I will like myself better"), reinforcement ("My hair and clothes won't smell"), influence of significant others ("I can get praise from people I am close to [for quitting]"), and social consequences ("Smoking is less socially acceptable"). Perhaps these more specific reasons for quitting should be considered in tailoring the content of smoking treatments to female subjects.

Education. The personalization (perception of the personal relevance) of abstract information has been shown to be an important aspect of behavioral change in general (Mahoney 1974) and of health-related behavioral change in particular (Ben-Sira 1982; Schinke and Gilchrist 1984). Available evidence suggests that many women may not fully be aware of some important gender-specific health consequences of smoking (Shiffman 1986b; Sorensen and Pechacek 1987). Adolescent women in particular often either are not well informed or choose to ignore information on the harmful effects of smoking during pregnancy (Simms and Smith 1983; Stewart and Dunkley 1985). It may be useful to develop educational campaigns that publicize the gender-specific risks of smoking.

Information that might be used in such educational campaigns comes from studies of important adverse interactions between smoking and female physiology, especially estrogen-related processes. Several studies have found a positive association between cigarette smoking and early menopause (Baron 1984; Willett et al. 1983), estrogen-related postmenopausal osteoporosis and associated fractures (Daniell 1976; Paganini-Hill et al. 1981), and invasive cervical cancer (Brinton et al. 1986).

Social values and beliefs. Cigarette smoking is a multidetermined behavior shaped by both personal and environmental variables (Chassin, Presson, Sherman 1985; Jones and Battjes 1985). The bulk of research on smoking has assumed that the developmental pathways leading to cigarette use and later dependence are the same for males and females. Several lines of recent research suggest that this assumption is overly simplistic (Barton et al. 1982; Baumrind 1985; Ensminger, Brown, Kellam 1982; Gritz 1982; Yamaguchi and Kandel 1984). The developmental and social dynamics that propel female adolescents into smoking may differ from those operating on young males. Several studies suggest that female smokers appear attracted to cigarette smoking by a need to identify with a particular social image (Gritz 1982, 1984; Jacobson 1982; Mausner and Brand-Spiegel 1985). Studies of advertising influence show that women, more than men, choose cigarette brands for image reasons (Bergler 1981; Fisher and Magnus 1981). Cigarette smoking today is often associated in the media with independent women who are not only sexually desirable (and slender) but also successful in traditionally male activities (Baker, Dearborn et al. 1984; Godley, Lutzker, Lamazor, Martin 1984). Reliance on cigarettes for bolstering an important, self-selected social image may make some women resistant to educational messages on the health consequences of smoking.

Another factor bearing on women's use of cigarettes for social image reasons involves body size and weight control (Gritz 1985; Jacobson 1982; US DHEW 1980). Data from junior high students suggest that even at young ages females more than males are interested in cigarettes as a weight control aid (Charlton 1984; Chapter VI).

Achieving Abstinence

Weight gain. Women's fear of weight gain has been widely observed (US DHEW 1980). Some animal data (Grunberg, Bowen, Winders 1986; Grunberg, Winders, Popp 1987; Levin et al. 1987) as well as preliminary results from a study with human subjects (Klesges, Meyers et al. 1987) suggest that females are more likely than males to gain weight following removal of nicotine. In contrast, Hall, Ginsberg, and Jones (1986) found that although all subjects gained weight after achieving abstinence, weight gain was no more

likely to cause female subjects than male subjects to relapse (Chapter VI). More studies are needed to determine whether fear of weight gain in the early stages of cessation is a more powerful obstacle for women than is actual weight gain later in the cessation process.

Stress management. Social, psychological, and epidemiological studies consistently report the greater importance of cognitive appraisal processes and monitoring of internal states and feelings on the part of females compared with males (Blechman 1984). Several studies have characterized women as negative-affect smokers-i.e., individuals who smoke in response to emotional discomfort and for purposes of tension reduction (Brunswick and Messeri 1984; Christen and Glover 1983; Dembroski 1984; Livson 1985; Mitic, McGuire, Neumann 1985; Rust and Lloyd 1982; US DHEW 1980). Other researchers have found that negative-affect smokers grow more reliant on cigarettes than do smokers who respond to social or external stimuli (Ockene et al. 1981; Pomerleau, Adkins, Pertschuk 1978). In current cessation studies, female subjects, compared with male subjects, have reported more stress during the quit process (Abrams et al. 1987) and more concern about finding alternatives to cigarettes for coping with stress (Abrams et al. 1987; Moreton and East 1983; Sorensen and Pechacek 1987; Chapter VI).

Social support. Women, more often than men, report a preference for interacting and learning in settings that involve close, informal, personal, dyadic, or small-group interactions (Brody 1987; Glynn, Pearson, Sayers 1983; Grady, Brannon, Pleck 1979; Linehan 1984). Both the quantity and the quality of women's participation increase in groups composed solely of women (Burden and Gottlieb 1987; Linehan and Egan 1979; Gambrill and Richey 1986). Gritz (1982) concluded that women are more successful in programs that provide social support and individualized therapist-client contact, and less successful in programs in which such support is absent or when external environmental supports are lacking. Data continue to indicate the importance of social support (and partner support in particular) for maintenance of smoking cessation among women (Coppotelli and Orleans 1985; Sorensen and Pechacek 1987).

Smoking Cessation Initiatives for Black Americans

Black Americans constitute the Nation's largest minority group, making up 12 percent of the population, and have the highest smoking rate of the major U.S. ethnic/racial groups; 34.8 percent of all black American adults smoke, compared with 29.7 percent of non-Hispanic whites and 25.7 percent of Hispanic adults (Appendix A). Blacks also suffer the Nation's highest rates of mortality and morbidity from cardiovascular diseases and cancer, including coronary heart disease and lung cancer (Cooper and Simmons 1985; US DHHS 1985, 1986). Moreover, smoking represents an especially

serious health risk for blacks, given the disproportionate incidence of infant mortality and low birth weight, hypertension, diabetes, and hazardous occupational exposures within the U.S. black population (US DHHS 1985). To date, relatively little research has been done to clarify smoking/quitting patterns and determinants among black Americans or to test smoking cessation interventions in black populations.

The 1985 Cancer Prevention Awareness Survey (US DHHS 1987) found that blacks were less likely than the general public to report hearing or reading about cancer prevention in the preceding 6 months, and were less likely to view tobacco use as a cancer risk. There is also evidence that blacks have less belief in personal control over health outcomes and disease, particularly cancer (Deniston 1981; Snow 1983; US DHHS 1987).

Sociodemographic Factors

The sociodemographic correlates of smoking status among black Americans are similar to those for the U.S. population as a whole: these include lower income, lower education levels, lower occupational status, unemployment, being male, and being unmarried (never married, separated, or divorced) (Eisinger 1971; Marcus and Crane 1987; Orleans et al. 1987; US DHHS 1985; Warneke et al. 1978).

Restricted Health Care Access

More limited access to health care, particularly to preventive health services, may also play a role in the higher black smoking rate (Eisinger 1971; Green 1975; Rogers and Shoemaker 1971; US DHHS 1985; Warneke et al. 1978). Fewer blacks (54 percent) than whites (70 percent) report a physician's office as their regular source of care, and twice as many blacks as whites say they receive their regular care from hospital outpatient clinics and emergency rooms or public health clinics (where continuous care and preventive health services are less likely) (US DHHS 1985). Therefore, it is not surprising that the 1985 National Health Interview Survey (NHIS) found fewer adult black smokers (33 percent men, 43 percent women) than white smokers (40 percent men, 47 percent women) reporting medical advice to quit smoking (Marcus and Crane 1987).

Social Norms and Advertising Influences

Peer and family modeling appears to play the usual role in the initiation and maintenance of smoking as well as in smoking cessation (Orleans et al. 1987; Warneke et al. 1978). However, the combination of a higher smoking rate among blacks and a pervasive, well-financed, black-focused tobacco advertising campaign may lead

to stronger smoking norms within the black community (Cooper and Simmons 1985; Cummings, Giovino, Mendicino 1987; Davis 1987).

Determinants of Quitting Motivation and Success Among Black Smokers

Factors influencing quitting motivation and success among black smokers appear to be similar to those among smokers in general, including beliefs in smoking-related health harms and quitting benefits; personal relevance of the health threat; a greater number of sources of support and communication about smoking health risks and quitting; the extent to which family, friends, and health professionals provide personal information about smoking risks; personal medical advice to quit; self-mastery motivation; past efforts to quit or cut down; degree of tobacco dependence; and primary group social supports for quitting and nonsmoking (Eisinger 1971; McDill 1975; Orleans et al. 1987; Pechacek and Danaher 1979; Prochaska and DiClemente 1983; Warneke et al. 1978). Again, however, considerably more research is needed.

Smoking and Quitting Patterns Among Black Americans

Although black smokers smoke fewer cigarettes per day than white smokers, they smoke brands with higher tar/nicotine yields, especially menthol brands (Friedman, Sidney, Polen 1986; Appendix A). The 1981 NHIS showed that 65 percent of black smokers smoked brands with 1.1 mg or more of nicotine, in contrast to only 35 percent of white smokers, and that 67 percent of black smokers smoked menthol cigarettes, in contrast to only 26 percent of white smokers. In fact, it has been estimated that three high-nicotine menthol brands account for more than 60 percent of cigarettes purchased by blacks (Cummings, Giovino, Mendicino 1987). Menthol additives may pose additional health risks (Cummings, Giovino, Mendicino 1987); these additives could conceivably influence puffing patterns (e.g., by reducing the perceived “harshness” of the tobacco) so as to heighten nicotine delivery or smoking risks (e.g., by enabling the smoker to tolerate inhaling more often or more deeply or to smoke the cigarette to a shorter length). However, to date no studies that address this issue have been published. National survey data (US DHHS 1985) suggest that black smokers attempt to quit at the same rate that white smokers do. However, blacks appear to be less likely to remain abstinent (Appendix A). Quitting barriers faced more often by blacks include the same sociodemographic factors that explain their higher smoking rate, including the greater life stress and more limited resources associated with lower SES.

Quitting methods. A recent survey of black ex-smokers showed that like U.S. ex-smokers as a whole, the vast majority had quit "on their own": 9 in 10 said they relied on "willpower," and only 1 in 10 reported using formal treatment programs, self-help guides or aids, or nicotine polacrilex gum (Orleans et al. 1987). There are, to date, no published data on the extent to which black and white U.S. smokers differ specifically in their access to, or use of, quit-smoking services and resources.

Sources/treatment agents. Physicians and other health care providers are powerful sources of quit-smoking assistance (Orleans 1985) and may be especially important sources for black Americans. In the 1985 Cancer Prevention Awareness Survey (US DHHS 1987), blacks reported more often than the general population that they would be very likely to follow a doctor's advice about ways to reduce cancer risks (US DHHS 1987).

Messages/methods. It is currently unclear whether black smokers would benefit any more or less than other groups from generally effective quit-smoking strategies and treatments. When outreach has assured equal black-white access to treatments and information (broadly defined in terms of recruitment efforts, location, affordability, appeal, and readability), outcomes for black and white smokers have been similar. For instance, Windsor and colleagues (1985) offered clearly worded pregnancy-focused self-help materials on quitting to women in public health maternity clinics and found no differences in quit rates between black and white participants of similar SES. High-coronary-risk black men assigned to the Special Intervention of the Multiple Risk Factor Intervention Trial (MRFIT) achieved 6-year quit rates (43 percent) essentially comparable to those of white participants (46 percent) despite lower SES (Connett and Stamler 1984). On the other hand, preliminary unpublished results from several ongoing trials suggest that interventions developed for the general population may not be appropriate for or acceptable to lower SES minority smokers.

Channels/delivery modes. Church groups, fraternal organizations, and other groups within the black community have a unique role to play in bringing effective programs and resources to the attention of smokers and to provide support needed for compliance (Eng, Hatch, Callan 1985; Orleans et al. 1987). Besides improving treatment accessibility, these organizations have the potential to provide ongoing assistance and support for quitting efforts and nonsmoking maintenance. Eng, Hatch, and Callan (1985), for instance, describe working through black churches in rural North Carolina to offer smoking cessation, weight control, diet modification, and stress management health education and behavioral change programs. Lay health advisers were recruited to work with local professionals to

organize church-based health fairs and to provide screening and referral on an individual basis.

Interventions for Smoking Cessation Among Hispanics

As the most rapidly growing ethnic group in the United States, Hispanics have caught the attention of demographers, social scientists, and health planners, yet relatively little is known of their smoking behaviors or responses to various intervention and treatment approaches. There is recent evidence (Davis 1987) that cigarette advertising is increasingly targeted to specific groups and that Hispanics have become a major focus of sophisticated marketing approaches.

Prevalence

Smoking prevalence among Hispanic males is comparable to that among white males and considerably less than that among blacks. Smoking among Hispanic women, in contrast, is considerably lower than smoking among either white or black women (Marcus and Crane 1985). Hispanics consume considerably fewer cigarettes per day than do whites. Heavy smoking among Hispanics is relatively infrequent (Marcus and Crane 1985, 1987; Samet et al. 1982; Stern et al. 1975).

Data from the 1985 Current Population Survey indicate substantial differences in smoking status by Hispanic subgroup. More Puerto Ricans reported smoking than did other subgroups (Mexican-Americans, Cubans, and Central and South Americans). Caution is needed in interpreting these data as they are based on limited numbers of respondents. Marcus and Crane (1985) reported that the pattern of high smoking prevalence among Hispanic men and relatively low prevalence among Hispanic women held true across a number of Hispanic subgroups. Overall, the data suggest considerable ethnic diversity within the Hispanic population. Diversity in smoking prevalence among Hispanics also has been found in the Hispanic Health and Nutrition Examination Survey (HHANES) conducted between 1982 and 1984 (Appendix A). Cultural differences among divergent Hispanic groups may need to be considered in the design and content of treatment programs.

Smoking Antecedents

Markides, Coreil, and Ray (1987) used data from a three-generational study and found that smoking behavior among younger Mexican-Americans was positively correlated with that of their middle-aged parents. This association was stronger for women. In a study of Mexican-American high school students who were identified as potential school dropouts, Bruno and Doscher (1984) found more

smokers in this group than among other students. These researchers found that 56 percent of their survey population of 78 potential dropouts had increased their cigarette consumption in the previous year. Otero-Sabogal and colleagues (1986) reported that "positive social presentation" as a consequence of smoking was mentioned by Hispanics in their study group. Castro and coworkers (in press) state that smoking and other habitual behaviors do not occur in isolation, but are part of a lifestyle. Smoking has been identified by these authors and others as a "core unhealthy behavior" that is associated with other such behaviors as use of illicit drugs, alcohol abuse, driving while intoxicated, nonuse of seat belts, and a pattern of little aerobic exercise. However, on a test of knowledge about the health consequences of smoking, moderate-to-heavy cigarette smokers were the highest scorers, suggesting an intellectual awareness of the risks involved in their behavior.

Smoking Interventions

The only available study that specifically targeted Hispanics was reported by Wittenberg (1983). During a market survey for the "Healthy Mothers, Healthy Babies" campaign, focus groups were organized to gather information from minority women. Researchers held sessions with eight groups of black women and seven groups of Mexican-American women. The results of these sessions suggested that the women involved largely ignored health advice, including advice to quit smoking, believing that the negative consequences would affect the mother and not the baby. Wittenberg (1983) found that the physician was considered the most credible source of health information but that family and friends were also important sources of information, which sometimes was in conflict with professional advice. Mexican-American women cited a paucity of Spanish-speaking health providers, and both minority groups stressed the need for such providers to have a better understanding of dietary preferences and traditional cultural patterns to more adequately serve pregnant minority women. The roles of the family, the Catholic Church, and the Spanish language have been said to be at the heart of the cultural identity of Hispanics in the United States (Guernica and Kasperuk 1982; Perez-Stable 1987). These influences have not been systematically assessed or harnessed in the design of smoking intervention programs for Hispanics.

Research addressing other ethnic groups is virtually nonexistent.

Methodological Issues in Treatment Study Design and Evaluation

Since the late 1970s researchers and theoreticians have made progress in developing theoretical comparison strategies in evaluating pharmacologic and behavioral treatment interventions. This has

gradually resulted in the use of more sophisticated analytic comparisons in at least a few studies (Brandon, Tiffany, Baker 1987; Hall, Rugg et al. 1984; Harackiewicz et al. 1987; Raw and Russell 1980; Tiffany, Martin, Baker 1986). The development of specific measures and investigator adoption of theory-driven analytic strategies (Abrams et al. 1987; Davis and Glaros 1986; Erickson et al. 1983; Hall, Rugg et al. 1984; Harackiewicz et al. 1987; Mermelstein, Lichtenstein, McIntyre 1983; Shiffman and Jarvik 1976; Tiffany, Martin, Baker 1986) should result over the next 10 years in a clearer understanding of therapeutic change processes. Integrated theoretical approaches in which treatment, subject, and context factors are considered simultaneously may prove especially fruitful.

A second major methodological concern is the typical smoking intervention study design. Most researchers, when they do use control or comparison treatments, merely pit one treatment against another, often with no clear theoretical basis. Some investigators systematically remove or add treatment elements largely on pragmatic grounds. Unfortunately, such experimental designs permit only weak inferences concerning the specific effective elements of treatment (McFall 1978).

Earlier reviews (Pechacek 1979) noted that the principal problem plaguing smoking treatment evaluation was that clinical outcomes were typically inferred from data of suspect validity. Previously, most long-term outcome data were based on client self-reports of smoking status, possibly supported by informant reports. Both self- and informant reports are vulnerable to biases that make them inadequate in research settings as sole measures of outcome (Glynn, Gruder, Jegerski 1986; Li et al. 1984; Murray et al. 1987). Fortunately, over the last 9 years biochemical verification of self-reports has become a more common practice, although it is by no means universal.

Carboxyhemoglobin estimates from breath samples and measurements of thiocyanate in urine, saliva, or plasma and of cotinine in saliva and serum have been used most frequently to assess smoking status. Carboxyhemoglobin has a relatively brief half-life and is affected by ambient CO, activity level, and some drugs (Ringold et al. 1962; Henningfield, Stitzer, Griffiths 1980). However, this measure is inexpensive and can provide subjects immediate feedback on an important health risk factor. Thiocyanate may remain elevated for up to 12 to 14 days after smoking cessation (Barylko-Pikielna and Pangborn 1968; Pettigrew and Fell 1973). Thiocyanate levels may be quite variable within individuals (Barylko-Pikielna and Pangborn 1968). Assays of thiocyanate are insensitive to low levels of smoking (Vogt et al. 1977) and are often poorly correlated with self-reported smoking rates or actual measures of puffing patterns (Abueg, Colletti, Rizzo 1986; Burling et al. 1985; Vogt et al. 1977). Further-

more, thiocyanate levels may be considerably affected by consumption of common foods (e.g., almonds, tapioca, cabbage, broccoli, and cauliflower; Bliss and O'Connell 1984). For these reasons, cotinine is a generally preferred assay. Cotinine, a major metabolite of nicotine, is detected above nonsmoker levels for up to 48 hr after a single cigarette is smoked (Zeidenberg et al. 1977). Cotinine levels may persist for up to 7 days after cessation of habitual smoking (Benowitz et al. 1983). Cotinine assays tend to be expensive, limiting their usefulness. Readings will not accurately reflect smoking in individuals who use nicotine polacrilex gum. Immediate feedback to subjects is not possible with thiocyanate and cotinine measures.

Biochemical assays do not provide complete information concerning posttreatment smoking status. Self-report, although not adequate when used alone, is a necessary measure. Also, when subjects are aware of the use of biochemical assays, their self-reports of abstinence agree well with assay results (Hall, Rugg et al. 1984; Hall, Sachs et al. 1984; Glynn, Gruder, Jegerski 1986; Raw and Russell 1980). However, other studies have found no improvement in the accuracy of reporting with the use of physiological measures (Bliss and O'Connell 1984).

Insufficient attention has been devoted to length and intensity of treatment as determinants of outcome (Chapter V). As noted previously, the vast majority of individuals who have quit to date have done so in the absence of formal intervention. Spontaneous remission among chronic drug users has been observed not only for tobacco but for opioids and alcohol as well (Chapter V). However, evidence of spontaneous remission does not justify a failure to treat chronic smokers who are (or who perceive themselves to be) unable to achieve abstinence on their own.

Changing social norms appear to be extremely significant in the recent decline in smoking prevalence (Appendix A). Public health approaches have the potential of reaching far larger numbers of smokers than do intensive clinical treatments, yet some individuals obviously are resistant to these normative influences. Many tobacco users do not appear responsive to minimal contact or community interventions. Sachs (1986) has argued that highly intensive clinical procedures may be cost-effective for certain populations of high-risk smokers (e.g., those who already have suffered myocardial infarctions). Some individuals persist in their tobacco use despite the presence of immediate life-threatening health problems related to their dependence.

Other issues with which the field still struggles are definitional, e.g., the operational definitions of abstinence and relapse. Studies that report abstinence rates during followup split on whether they require continuous abstinence from the end of treatment or merely abstinence at the point of followup. Abstinence levels can differ

substantially depending on which measure is used. Failure to follow a common practice in reporting outcome (or to provide sufficient information to allow independent calculations) substantially increases the difficulty of comparing success rates across studies (Bigelow and Ossip-Klein 1986).

The National Interagency Council on Smoking and Health formulated stringent standards for the evaluation of smoking cessation programs. Complete cessation including total abstinence from tobacco in all forms for a period of 1 year was defined as the primary criterion for success. Several major health agencies (the American Cancer Society, the American Heart Association, and the American Lung Association) have endorsed these standards. Biochemical validation of self-reported abstinence is not required in these guidelines. The guidelines fail to distinguish between an isolated "slip" and actual relapse in the definition of successful quitting (Ossip-Klein et al. 1986).

Many studies still fail to include enough subjects to permit adequate statistical power and to promote generalizability of results. Few cessation studies have used validity checks to determine the extent to which treatment manipulations actually were implemented effectively. This is especially important when counseling strategies are being compared (Hall, Rugg et al. 1984; Tiffany, Martin, Baker 1986). Counseling manipulations and therapist training and experience should be adequately described, and validity checks of counseling differences should be incorporated into the assessment plan. Selection of subjects represents another important issue (e.g., type of smoker, cigarette consumption, prior history of failures). Treatment outcome may be influenced substantially by the characteristics of the smokers assigned to intervention.

In sum, cessation research has made methodologically notable strides in that, in the best studies, outcomes are verified with multiple assays (including biochemical ones), the design and evaluations of treatments are now theory driven, improved therapy process measures are used, and a variety of specific pragmatic problems such as subject attrition have been reduced. These improvements are recent, however, and characterize a relatively few published studies.

Conclusions

Smoking treatment research has been marked by considerable progress since it was reviewed in the 1979 Report of the Surgeon General (US DHEW 1979), both in methodological sophistication and to a lesser extent in the consistency of success achieved by the best multicomponent cessation programs.

In contrast to the generally positive outcomes of multicomponent treatments, there is mounting evidence that no single intervention

constitutes a generally effective method. In the case of multicomponent treatment interventions, individual components should complement one another. Interventions that hold promise and deserve additional attention are low-aversion directed-smoking strategies, skill-training treatments, interventions that enhance the self-attribution of treatment success, and interventions that train individuals to obtain and use social support resources. Low-aversion smoking treatments are important because of their acceptability, ease of administration, and generally promising results when used with other treatment elements. Research on skills training should explore the extent to which enhanced clinical outcomes depend on the acquisition and actual use of specific smoking-relevant skills. Therapeutic manipulations that enhance self-attributions of success or self-efficacy estimates could have wide treatment applicability. The combination of increased knowledge and skills, self-efficacy, and social support should enhance treatment outcomes.

Investigators should make more explicit the relationship between theory and therapeutic manipulations, valid assessments should be tailored to tap processes implicated by theory in behavioral change, and greater sample sizes should be included in treatment evaluation studies. Individual differences may be important in assigning smokers to combined pharmacologic and behavioral treatment (Hughes 1986). Some smokers appear to resist pharmacologic intervention. Smokers who attribute their success to pharmacologic agents may be at increased risk for relapse when these agents are withdrawn (Davison and Valins 1969). Conversely, some smokers accept pharmacologic treatment but refuse behavioral approaches. Many of these refusals stem from required time commitments that the smokers view as excessive.

Dissemination of effective treatment strategies is critically needed. Considering the vast body of treatment literature that has accumulated, surprisingly little systematic transfer to community settings has occurred. Many treatment programs that are available (e.g., proprietary, public service) have not been subjected to rigorous evaluation. Furthermore, these programs often do not reflect recent laboratory findings. This is especially true for pharmacologic ap proaches. Very few applied programs adequately address nicotine replacement therapies or other potentially relevant pharmacologic adjuncts to treatment. Dissemination is especially lacking for minority and lower SES populations, which may have the greatest need for these types of services.

Relapse

As in many areas of clinical practice, therapeutic interventions have been developed and implemented in the absence of a complete

understanding of the processes being treated. Future development of smoking cessation treatments designed to maintain abstinence in the face of high relapse prevalence should benefit greatly from an expanded knowledge base that is being accumulated concerning the correlates and determinants of smoking relapse.

Research has shown that smoking cessation is a process involving several discrete stages. These stages include precontemplation, contemplation, decision, action, and maintenance (Prochaska and DiClemente 1983, 1985, 1986; DiClemente and Prochaska 1985; Prochaska et al. 1985; Velicer et al. 1985; Wilcox et al. 1985). This Section considers recent research on factors related to successful maintenance of nonsmoking once initial cessation has been achieved during the action stage. Studies of long-term outcomes in smoking cessation indicate that relapse, rather than maintenance, is the most prevalent outcome during this stage. Hunt and his colleagues (Hunt, Barnett, Branch 1971; Hunt and Matarazzo 1973) showed that over a wide range of treatments, relapse rates of 75 to 80 percent could be expected among smokers who achieved initial cessation (Figure 2, Chapter V). These findings have been replicated many times in recent treatment outcome studies (Schwartz 1987). It should be noted, however, that these relapse rates are based on single quit attempts. Cumulative long-term abstinence rates covering multiple quit attempts may be considerably better (Schachter 1982).

Defining Relapse

Given that relapse depends on the achievement of initial cessation, definitions of relapse must include a definition of cessation. In addition, many investigators distinguish between a "slip" or smoking one's first cigarette and a "relapse" or return to regular smoking (Brownell et al. 1986). The National Working Conference on Smoking Relapse recommended a duration of 24 hr of continuous tobacco abstinence to define initial cessation. A slip was defined as a "period of not more than 6 consecutive days of smoking following at least 24 hr of abstinence" (Ossip-Klein et al. 1986). Smoking beyond 6 consecutive days was then defined as a relapse. These definitions of quit episode, slip, and relapse are somewhat lenient. Many investigators require a longer period of initial abstinence (e.g., 48 hr or 1 week) for a quit episode and regard even a few smoking occasions as a relapse rather than a slip. Considerable data indicate that an initial slip is highly predictive of subsequent relapse (Brandon, Tiffany, Baker 1986; Ossip-Klein et al. 1986).

Conceptual Frameworks

Research on the relapse process has focused on two general areas: (1) identifying factors that predispose individuals to relapse or to successful maintenance and (2) identifying factors that precipitate or

immediately precede the return to smoking following initial success (Shiffman et al. 1986). Predisposing factors include characteristics of individuals and their environments that make them more or less vulnerable to relapse as they begin the maintenance process. Precipitating factors relate to the circumstances surrounding a specific relapse situation or smoking the first cigarette following a period of abstinence.

Social learning theory has provided a useful framework for much of the research on predisposing factors (Bandura 1977b; Brownell et al. 1986; Leventhal and Cleary 1980; Shiffman et al. 1986). From this perspective, the effects of environmental or behavioral elements on maintenance of nonsmoking are mediated by individual factors such as prior experience with smoking cessation and beliefs about the cessation process. In addition to personal demographic characteristics, predisposing variables examined that are consistent with this framework include smoking and quitting history, social factors (social support and the presence of smoking cues in the social environment), stress, and cognitive factors such as self-efficacy, outcome attributions, and perceptions about the consequences of quitting smoking (Chapter VI).

Marlatt and Gordon's model of the relapse process (Marlatt and Gordon 1980, 1985) has provided the foundation for much of the research on the circumstances associated with initial slips and suggests specific hypotheses regarding factors that mediate the transition from an initial slip to a full-blown relapse. This model proposes that initial smoking following a period of abstinence is likely to occur in certain types of high-risk situations, As suggested by the types of predisposing factors listed above, high-risk situations could include intrapersonal factors such as negative affect and severe withdrawal symptoms following a long history of heavy smoking. The first determinant of whether smoking occurs in a high-risk situation is whether the individual uses specific strategies to cope with the situation. Successful coping is assumed to lead to increased confidence in one's ability to maintain abstinence, thereby decreasing the probability of relapse. Failure to cope in the situation coupled with positive expectations about the effects of smoking can lead to an initial slip. The Abstinence Violation Effect (AVE) is proposed as the major mediating factor between an initial slip and a full-blown relapse. Defined as an attributional construct (Curry, Marlatt, Gordon 1987; Marlatt and Gordon 1985), the AVE is characterized by internal, stable, and global causal attributions for smoking the initial cigarette. Research on specific factors within these conceptual frameworks is reviewed below.

Predisposing Factors

Demographics

To the extent that demographic factors are related to initial cessation, the population of individuals who achieve cessation and are "eligible" for relapse is relatively homogeneous. It is not surprising, therefore, that the majority of studies that examined these variables have not found differences in relapse rates by socioeconomic status (Campbell 1983; Eisinger 1971; Evans and Lane 1981; Garvey, Heinold, Rosner, in press; Hirvonen 1983; Horwitz, Hindi-Alexander, Wagner 1985; Jacobs et al. 1971), age (Coppotelli and Orleans 1985; Cummings et al. 1985; Evans and Lane 1981; Hirvonen 1983; Horwitz, Hindi-Alexander, Wagner 1985; Jacobs et al. 1971), or gender (Eisinger 1971; Evans and Lane 1981; Shapiro and Gunn 1985; Horwitz, Hindi-Alexander, Wagner 1985). Exceptions to the findings for age include one study that found an inverse relationship (Garvey, Heinold, Rosner, in press) and two studies reporting a positive relationship between age and long-term success (Campbell 1983; Eisinger 1971). One study did report that males were more successful than were females at long-term maintenance (Hirvonen 1983).

Although women and men may be equally likely to relapse, data suggest that their return to smoking is precipitated by different factors. Hirvonen (1983) reports that men more frequently cited alcohol consumption and strong cravings as causes of relapse, whereas women more often cited the influence of other smokers and negative affect. In a prospective study, Swan and colleagues (in press) found that craving predicted relapse for women and not for men, while psychological withdrawal symptoms predicted relapse among men but not women. Studies that have analyzed reports of specific relapse episodes (Shiffman 1982, 1986a) have found no gender differences.

The large study by Swan and coworkers (in press) of treated smokers suggests that sex differences in factors associated with relapse may be pervasive. They found almost no overlap between men and women in the factors that predicted relapse. The following factors predicted relapse among women, but not men: the machine-rated nicotine delivery of cigarettes, employment status, rated likelihood of success, and lower work strain. Among men, relapse was predicted by greater stress (hassles) and higher work strain. Campbell (1983) also reports sex differences in predictors of outcome, some of which contradict Swan's findings, and Guilford (1967) reports sex differences on almost all aspects of cessation and maintenance. Although it may be premature to draw conclusions about the causes of relapse among males and females, clearly sex differences must be examined in future work.

Smoking and Quitting History

Smoking History

Most studies indicate that the length of a person's smoking history influences the process of initial cessation (Pomerleau, Adkins, Pertschuk 1978) but is unrelated to relapse (Ashenberg 1983; Carl 1980; Coppotelli and Orleans 1985; Cummings et al. 1985; Evans and Lane 1981; Garvey, Heinold, Rosner, in press; Hirvonen 1983; Horwitz, Hindi-Alexander, Wagner 1985; Jacobs et al. 1971; Pomerleau, Adkins, Pertschuk 1978; Swan et al., in press). The two studies that report relationships between length of smoking history and relapse are contradictory, with one reporting that smoking longer increased relapse risk (Graham and Gibson 1971) and the other reporting an inverse relationship between the duration of smoking and the risk of relapse (Eisinger 1971).

Conflicting findings have been reported for the number of cigarettes smoked per day. Although there are some positive findings (Ockene et al. 1982; Shapiro and Gunn 1985), most studies suggest that the number of cigarettes smoked is not a good predictor of relapse (Campbell 1983; Coppotelli and Orleans 1985; Cummings et al. 1985; Eisinger 1971; Evans and Lane 1981; Graham and Gibson 1971; Hirvonen 1983; Horwitz, Hindi-Alexander, Wagner 1985; Jacobs et al. 1971; Pomerleau, Adkins, Pertschuk 1978; Swan et al., in press). A few studies do find an effect of the number of cigarettes smoked on initial cessation (Hirvonen 1983). Precessation cigarette consumption has been positively associated with the length of time between having an initial lapse and a return to regular smoking (Brandon, Tiffany, Baker 1986). It should be noted, however, that number of cigarettes is only a rough indicator of actual intake, particularly for levels above 20 cigarettes/day.

Kabat and Wynder (1987) reported that the time between waking up and smoking the first cigarette was a good predictor of outcome. This variable represents one item on the Fagerstrom Tolerance Questionnaire (Fagerstrom 1978) and appears to be strongly related to physical dependence.

Smoking Typologies

Although their predictive value has been questioned (Joffe, Lowe, Fisher 1981), smoking typologies have been widely used in an attempt to classify smokers or smoking situations (e.g., smoking for stimulation, handling, relaxation; Ikard, Green, Horn 1969). The strongest evidence for the relationship of type of smoking to relapse has been found with people who smoke to control negative affect. In a widely cited study, Pomerleau, Adkins, and Pertschuk (1978) reported that people who said they smoked when experiencing negative affect were more likely to relapse. Similarly, Campbell

(1983) reported that smokers who experience craving when emotionally upset were more likely to relapse. These findings are diluted, however, by those of other studies showing no relationship between negative-affect smoking and relapse (Coppotelli and Orleans 1985; Eisinger 1971; Garvey, Heinold, Rosner, in press; Jacobs et al. 1971).

Quitting History

Several studies have found a positive relationship between number of previous quit attempts and success in quitting smoking (Brandon, Zelman, Baker, in press; Tiffany, Martin, Baker 1986). However, other studies report no relationship between the number of prior quit attempts and relapse (Swan et al., in press; Horwitz, Hindi-Alexander, Wagner 1985; Cummings et al. 1985; Coppotelli and Orleans 1985; Ockene, Benfari et al. 1982). Some studies in fact report that subjects with fewer previous quit attempts are more successful in maintenance (Horwitz, Hindi-Alexander, Wagner 1985; Graham and Gibson 1971; Garvey, Heinold, Rosner, in press). Garvey and Hitchcock (1987) found that among recidivists, smokers with more past experience in quitting showed a slower rate of progression to regular smoking. Gottlieb and coworkers (1981) and Hirvonen (1983) also report data that suggest a positive relationship between duration of the longest previous cessation effort and successful maintenance. Clearer descriptions of quitting history with respect to both number of previous quit attempts and duration of abstinent periods would be helpful in evaluating the relationship between quit attempts and outcome.

Withdrawal and Dependence

Withdrawal symptoms, whether elicited by acute deprivation or by conditioned stimuli, are hypothesized to be the link between dependence and relapse (Baker, Morse, Sherman 1987; Shiffman 1979; Wikler 1965). The tobacco withdrawal syndrome consists of a cluster of symptoms that are typically experienced after even brief or partial tobacco deprivation (Hughes and Hatsukami 1986; American Psychiatric Association 1980, 1987; Chapter IV). The symptoms include craving for cigarettes, irritability, anxiety, difficulty in concentrating, restlessness, and increased appetite (American Psychiatric Association 1987). Some physical signs are also commonly reported, but with the possible exception of bradycardia, these appear to be less consistent (Shiffman 1979; Hughes and Hatsukami 1986). Especially significant is the fact that the syndrome has a rapid onset and generally declines within 2 weeks (Shiffman 1979; Shiffman and Jarvik 1976; Cummings et al. 1985; Gottlieb 1985).

Several studies have examined the role of withdrawal symptoms as predisposing factors for relapse. In a retrospective study, Burns

(1969) reported that recidivists cited withdrawal symptoms as the most common reason for relapse. Other retrospective studies at least partially support this finding (Garvey, Heinold, Rosner, in press; though see Evans and Lane 1981). Gottlieb (1985) found that both physical and psychological withdrawal symptoms predicted early relapse in a group of treated smokers; symptoms accounted for 14 percent of the variance in smoking after 2 weeks. Other investigators have also found that mood disturbance, a possible withdrawal symptom, predicts relapse (Hall et al. 1984; Hirvonen 1983; Manley and Boland 1983). Manley and Boland (1983) found that mood disturbance characterized relapsers even before they quit and after they resumed smoking. The literature also includes negative findings (Garvey, Heinold, Rosner, in press; Hughes and Hatsukami 1986; Swan and Denk, in press; Swan et al., in press).

Although craving is difficult to define precisely (Kozlowski and Wilkinson 1987), a number of studies have reported relationships between craving and relapse (Campbell 1983; Garvey, Heinold, Rosner, in press; Gottlieb 1985; Hirvonen 1983). The effect appears to be more marked among female smokers, with several studies reporting that it is a significant predictor of relapse only among women (Guilford 1967; Gunn 1986; Swan et al., in press).

Cognitive Factors

Concern About Weight Gain

Quitting smoking often results in weight gain (Grunberg 1986; Chapter IV). Multiple factors may contribute to postcessation weight gain, including decreased metabolism, increased food consumption, and increased preference for sweet-tasting, high-caloric foods (Grunberg 1982). Highly dependent smokers and those who tend to eat in response to specific emotional and environmental cues appear to be at greatest risk of gaining weight following smoking cessation (Emont and Cummings 1987; Hall, Ginsberg, Jones 1986; Chapter VI).

The data relating concern about weight gain to relapse are inconsistent. Klesges and Klesges (in press) found that women were more likely to report relapse for weight-related reasons. Other studies have found that concern about weight gain was not a major determinant of relapse (Fuller 1982; Greaves, Barnes, Vulcano 1983; Hirvonen 1983; Shapiro and Gunn 1985). Though there are exceptions (DiClemente 1981), studies typically report that recidivists experience less weight gain than successful abstainers (Manley and Boland 1983; Hall, Ginsberg, Jones 1986). In at least some of these studies, this cannot be confounded by the effects of continued abstinence, because the studies used prospective designs in which weight gain was assessed prior to relapse (Hall, Ginsberg, Jones

1986). Even so, the possibility remains that relapsers are more weight conscious in the first place and exert greater efforts to curtail initial weight gain (Hall, Ginsberg, Jones 1986; Herman and Polivy 1975). Smoker perceptions concerning weight gain may be critical. For some individuals, a gain of only 2 or 3 pounds may be viewed as a cause for great concern. Other individuals may be essentially indifferent to weight gains of 15 to 20 pounds.

Self-Efficacy

Bandura (1977a, 1982) proposed a common mechanism underlying behavioral change achieved by different procedures: successful psychological interventions all function by creating and strengthening expectations of personal mastery or efficacy. An efficacy expectation is the conviction that one can execute the behaviors necessary to achieve a desired outcome. Such expectations are assumed to affect the initiation of coping behavior, the amount of effort that will be expended to maintain coping behavior, and the persistence of coping behavior in the face of external and internal obstacles.

Self-efficacy is an important construct in Marlatt's theory of relapse. Marlatt's theory specifies that people's ability to resist the use of a substance (e.g., cigarettes) in a high-risk situation depends on, among other factors, their self-efficacy level (Marlatt and Gordon 1980). If people have expectations that they can cope with a smoking urge without smoking, they are less likely to relapse. Moreover, people who successfully resist temptation should experience an increase in self-efficacy. The theory also states that self-efficacy is a determinant of whether people who experience an initial lapse are able to prevent escalation to full relapse.

Various scales assumed to measure self-efficacy have predicted smoking status at followup (Coelho 1984; DiClemente 1981; Killen et al. 1984; McIntyre, Lichtenstein, Mermelstein 1983; Ockene et al. 1982; Yates and Thain 1985) and latency from treatment end to relapse (Brandon, Tiffany, Baker 1986; Brandon, Zelman, Baker, in press; Erickson et al. 1983; Tiffany, Martin, Baker 1986). Efficacy ratings have also predicted smoking intake after a controlled-smoking intervention (Godding and Glasgow 1985) and have differentiated joiners from nonjoiners of a smoking treatment program (Brod and Hall 1984).

Important qualifications, however, relate to the timing of the relapse assessment and the subject sample observed. Studies predicting relapse that are based on all treatment subjects (including those who never achieve abstinence) will achieve higher correlations with outcome than will studies assessing only abstinent subjects. Self-efficacy is a less useful predictor when measured shortly after

cessation rather than after 1 or 2 months of abstinence (Baer, Holt, Lichtenstein 1986).

Condiotte and Lichtenstein (1981) reported seven distinguishable clusters of smoking situations and found a congruence between the situation clusters for which subjects indicated low self-efficacy and the clusters that comprised their actual relapse situations. However, a conceptual replication of the use of efficacy subscales has not demonstrated utility (Baer, Holt, Lichtenstein 1986). Thus, at this point situation-specific self-efficacy assessments have not proved to be of value.

Self-efficacy may reflect the influence of diverse treatments or smoking history variables related to cessation success. Skills training, for example, might be effective to the extent that it enhances smokers' beliefs that they can cope with temptation. Aversion therapy might be effective to the extent that smokers attribute their self-punishment to their high motivation to quit and their ability to use available resources to help stay abstinent. Self-efficacy may in fact be confounded with Bandura's (1977a) concept of outcome expectancy. Rather than measuring subjects' convictions that they could execute specific coping behaviors, most of the studies simply assessed subjects' confidence that they would resist the urge to smoke in the future.

The global construct of self-efficacy is somewhat ambiguous. Self-efficacy may include not only response effectiveness, but also motivation to quit and judgment of skills necessary to undertake the quitting program. Self-efficacy as a global predictor can be useful. However, it may be more important to assess what skills individuals learn from different treatment components. A better understanding of the process of acquiring competency in quitting is needed. Knowledge of the specific treatment components that enhance self-efficacy could be significant in developing and refining effective interventions.

Outcome Attributions

Attribution theory suggests that individuals who attribute their behavioral change to internal factors are more likely to successfully maintain their change (Davison and Valins 1969). This hypothesis was supported in a study by Harackiewicz et al. (1987) which found that, for individuals participating in intrinsically oriented treatment programs (a self-help manual emphasizing individual cessation efforts either with or without nicotine polacrilex gum), internal attributions for initial success were significantly related to longer maintenance of nonsmoking. Contrary to the hypothesis, however, these investigators found that external attributions were positively related to long-term maintenance for individuals participating in extrinsically oriented treatment (nicotine polacrilex gum with a self-

help manual emphasizing a doctor's prescribed program). These findings suggest that the degree of consistency between attributions for initial success and the orientation of the cessation approach can affect the probability of relapse.

Social Factors

Smoking Cues

Most exposure to smoking-specific cues is socially mediated--e.g., watching others smoke. Such exposures have been labeled "social contagion" (Shiffman and Jarvik 1987). Few studies have assessed social contagion directly. Many studies have, however, examined the effect of having a spouse, friends, or coworkers who smoke.

The literature on the effect of spouse smoking status is surprisingly contradictory. Several studies report moderate-to-large increases in the probability of relapse among subjects with a smoking spouse (Campbell 1983; Graham and Gibson 1971; McIntyre-Kingsolver, Lichtenstein, Mermelstein 1986; Tongas, Patterson, Goodkind 1976). Some studies, though, report no effect of spousal smoking (Horwitz, Hindi-Alexander, Wagner 1985; Garvey, Heinold, Rosner, in press; Swan et al., in press).

One possible explanation for the inconsistent findings is that the influence of spousal smoking is so strong that it often prevents initial cessation. This would cause the effect to be only sporadically observed in maintenance. The effects of spouse smoking status may also be complicated by interactions with social support. The risk incurred by having a smoking spouse may be reduced or eliminated if the spouse is supportive (Mermelstein, Lichtenstein, McIntyre 1983). This may be especially true if the spouse refrains from smoking in the presence of the subject, thereby resulting in fewer exposures to smoking cues.

The data on friend smoking are clearer. Several studies find that subjects who have more smokers among their friends are more likely to relapse (Eisinger 1971; Garvey, Heinold, Rosner, in press; Ockene et al. 1982; Gottlieb et al. 1981; Goldstein 1981). One study failed to replicate this effect (Swan et al., in press). Brandon, Tiffany, and Baker (1986) found that smokers having a lapse cigarette in the presence of other smokers progressed to regular smoking more quickly than did other lapsers. The most parsimonious explanations of these social contagion effects are that people with many smoking friends tend to experience more exposure to smoking cues and that cigarettes are likely to be more readily available to them.

Social Support

Social support can serve as a buffer to reduce the negative psychological effects of stressors (Cobb 1976; Cohen, Sherrod, Clark

1986; Cohen and Wills 1985; Dean and Lin 1977). Correlational studies have found that the level of perceived social support is related to smoking cessation and maintenance. Coppotelli and Orleans (1985), for example, examined the determinants of maintenance among women who recently quit smoking. They found that a measure of "partner facilitation" (problem solving, rewarding quitting, understanding, listening, and facilitating coping responses) accounted for 32 percent of the outcome variance at 6 to 8 week postcessation. General social support from spouses, as well as smoking-specific spousal support, has been related to smoking treatment outcome (Horwitz, Hindi-Alexander, Wagner 1985; Mermelstein et al. 1986; Mermelstein, Lichtenstein, McIntyre 1983; although see Glasgow et al. 1985).

Global Support

Global support has usually been assessed as perceived support. Using the Interpersonal Support Evaluation List (ISEL; Cohen and Hoberman 1983) to measure support, Mermelstein and coworkers (1986) found that greater perceived support (having someone to talk to about personal matters) predicted maintenance at a 3-month followup. However, the ISEL was unrelated to smoking status at 6 or 12 months, and the 3-month findings were not replicated in a second study by the same investigators (Mermelstein et al. 1986). As noted above, Coppotelli and Orleans (1985) found that women who reported receiving greater support from their husbands were more likely to maintain abstinence. There was no comparison group of male subjects.

Smoking-Specific Support

Several studies have examined the role of social support directed at smoking cessation. The most thorough investigations of specific support have been conducted by researchers at the University of Oregon, who developed the Partner Interaction Questionnaire (PIQ; Mermelstein, Lichtenstein, McIntyre 1983) to assess perceived helper behaviors. These investigators found that perceived helpfulness of partner behaviors was related to cessation and maintenance. The actual number of partner behaviors was not related to outcome; however, a measure of the character of the interactions was related. A cluster of partner behaviors labeled "Support and Encouragement" (e.g., expressing understanding or pride) was related to maintenance of abstinence. In contrast, a cluster of behaviors involving "Nagging and Policing" (Mermelstein, Lichtenstein, McIntyre 1983) predicted relapse. Subsequent studies using the PIQ have only partially replicated these findings (Lichtenstein,

Glasgow, Abrams, in press; Malott et al. 1984; McIntyre-Kingsolver, Lichtenstein, Mermelstein 1986).

Other studies using other measures have also yielded mixed results. In a large prospective study, Prochaska, DiClemente, and colleagues (Prochaska and DiClemente 1983; DiClemente and Prochaska 1985; Prochaska et al. 1985) reported that social support predicted continuing abstinence. However, several other research groups have failed to find evidence that smoking-specific support aids maintenance (Evans and Lane 1981; Ockene et al. 1982; Garvey, Heinold, Rosner, in press).

Stress

Some studies have used the life events approach to the assessment of stress (Holmes and Rahe 1967). This technique asks subjects about major life events that have occurred since the subjects stopped smoking. Most studies have found little or no relationship between life stress events and relapse (Shapiro and Gunn 1985; Shiffman, Read, Jarvik 1985). This may be because life stress events are relatively uncommon.

Recent research on stress has begun to focus on more frequent and smaller-scale stressors, which Lazarus and colleagues (1981) and DeLongis and coworkers (1982) have called "Hassles." The Hassles Scale assesses the frequency and perceived severity of everyday stressors, such as having difficulties with coworkers or not having enough time for recreation. Swan and colleagues (Swan and Denk, in press; Swan et al., in press) found that hassles during the second month of abstinence only weakly predicted outcomes at 1 year. The effect of hassles was more reliable for men than for women.

A somewhat different approach to examining background stress was taken by Cohen and his colleagues, who developed and used the Perceived Stress Scale (PSS). The PSS measures perceived stress and demoralization without reference to particular events or sources of stress. Cohen and colleagues found that PSS scores did predict relapse and that they were strongly associated with daily cigarette consumption among recidivists.

Stress and coping theories of smoking imply that deficiencies in personal resources for coping with stress may enhance the risk of relapse (Wills and Shiffman 1985). Using the Ways of Coping checklist, Ashenberg (1983) assessed how subjects who had quit smoking coped with stress in situations that are often associated with relapse. There were no differences between relapsers and abstainers in the kinds of coping reported, but abstainers reported using fewer coping strategies. The meaning of this finding is unclear. Abstainers could have experienced less severe stress or less severe threats to abstinence, and therefore needed fewer coping responses. Conversely, abstainer coping responses could have been more

effective, therefore mitigating the need for more coping. Also, when Ashenberg examined recidivists, stressful situations associated with coping were found to be less likely to lead to relapse than those not associated with coping.

Precipitating Factors

High-Risk Situations

A number of studies support the theory that initial smoking following cessation tends to occur in specific types of high-risk situations. Work by Marlatt and his associates (Marlatt and Gordon 1980, 1985) has identified craving/withdrawal, intrapersonal negative emotional states (e.g., frustration, boredom, and anxiety), interpersonal conflict situations, and social pressure, both direct and indirect, as common types of high-risk situations. Shiffman (1986c) and Baer and Lichtenstein (in press) clustered data on the precipitants of relapse crises and lapses.

Data from studies of relapse episodes confirm that smoking cues are often involved in smoking relapse. Several studies report the smoking of others in the immediate environment in one-half to three-quarters of all relapse episodes (Brandon, Tiffany, Baker 1986; Colletti, Supnick, Rizzo 1981; Baer and Lichtenstein, in press; Shiffman 1982, 1986c; Cummings, Jaen, Giovino 1985). Many of these same studies report that specific smoking stimuli (usually seeing someone smoking) are responsible for precipitating 24 to 32 percent of all relapses (Shiffman 1982, 1986c; Ossip-Klein et al. 1986; Shapiro, Ossip-Klein, Stiggins 1983). Studies also report that relapse crises in which someone else is smoking are more likely to result in a smoking episode and in a shorter interval between the initial slip and relapse (Brandon, Tiffany, Baker 1986; Ossip-Klein et al. 1986; Shiffman 1982).

Abrams and his colleagues (Abrams et al., in press; Chapter III) have recently published data suggesting that individual differences in reactivity to smoking cues may influence cessation and relapse. In retrospective and prospective studies, these researchers found that recidivists responded more strongly than successful quitters to verbally presented smoking situations or to observations of another smoking. Recidivists displayed more anxiety and showed greater heart rate responses. It may be that responses elicited by smoking stimuli (Saumet and Dittmar 1985) reflect conditioned responses to nicotine effects.

Other smokers serve not only as cues for smoking but as sources of cigarettes. In half of all relapse episodes, another smoker provides the cigarettes that are smoked (Colletti, Supnick, Rizzo 1981; Baer and Lichtenstein, in press; Cummings, Jaen, Giovino 1985). This does not imply that the smokers exert social pressure to smoke; in most

cases, the ex-smoker specifically asks for a cigarette (Brandon, Tiffany, Baker 1986).

Data on relapse episodes suggest that relapse also can be cued by other stimuli or activities that have become associated with smoking through contiguity, for instance, food, drink, or relaxation (Baer and Lichtenstein, in press; Brandon, Tiffany, Baker 1986; Ossip-Klein et al. 1986; Shiffman 1986b).

Studies of specific relapse episodes consistently suggest that stress and negative affect play major roles in relapse. Findings from many studies encompassing diverse samples reveal that the majority of relapse episodes are preceded by negative affect (Brandon, Tiffany, Baker 1986; Shiffman 1982, 1986b; Marlatt and Gordon 1980; Cummings, Marlatt, Gordon 1980; O'Connell and Martin 1987; Gregory 1984; Baer and Lichtenstein, in press; Ossip-Klein et al. 1986; Shapiro, Ossip-Klein, Stiggins 1983; Giovino et al. 1986; Shapiro 1984). In some studies, as many as 9 out of 10 subjects report negative affect (Coppotelli and Orleans 1985). The most frequently reported emotion is anxiety, but boredom, depression, and anger are also common.

Data suggest that the more severe the stress surrounding a temptation to smoke, the higher the likelihood of smoking. Shiffman, Read, and Jarvik (1985) report a significant linear relationship between stress and smoking in relapse crises. There are contradictory data as to whether lapses associated with negative affect are particularly likely to progress to full relapse (Brandon, Tiffany, Baker 1986; O'Connell and Martin 1987). In sum, momentary stress and distress are major factors in relapse episodes. It should be noted, however, that these studies involve retrospective accounts of relapse episodes.

The role of negative affect in relapse may change over time. Cummings, Jaen, and Giovino (1985) report that early relapse episodes are more likely to be precipitated by stress; later in abstinence, alcohol and other appetitive cues become more prominent.

Coping Strategies

Coping strategies can be used both to prevent (anticipatory coping) and to directly respond to (immediate coping) high-risk situations, In either case, the strategies used can be behavioral, consisting of responses that are outwardly visible (e.g., leaving a party where others are smoking, engaging in physical activities), or cognitive, consisting of internal responses such as thoughts or images.

One of the most commonly used and studied anticipatory coping strategies is stimulus control--the avoidance of stimuli associated with smoking. Research on this strategy shows mixed outcomes, yielding no definitive conclusions (Evans and Lane 1981; Horwitz,

Hindi-Alexander, Wagner 1985; Prochaska and DiClemente 1983; DiClemente and Prochaska 1985). Data on the relative efficacy of cognitive and behavioral strategies weakly support the superiority of cognitive strategies. Evans and Lane (1981) report weak indications that successful maintainers were more likely to use cognitive techniques rather than behavioral ones.

Immediate coping has been assessed in studies that examined situations in which an ex-smoker was tempted to smoke. Studies of immediate coping with the temptation to smoke typically compare episodes in which smoking was averted with episodes in which relapse occurred. Shiffman (1982, 1984b, 1985) found that failure to perform any coping response was the single best predictor of smoking in a tempting situation, accounting for nearly a quarter of the variance in the outcomes of high-risk situations. This finding has been directly and indirectly supported in several other studies (Curry, Marlatt, Gordon 1987; Ossip-Klein et al. 1986; Shapiro, Ossip-Klein, Stiggins 1983; Sjoberg and Johnson 1978; Sjoberg and Samsonowitz 1978). These studies consistently show immediate coping to be effective in preventing smoking in a relapse-promoting situation. One problem with all of these studies, however, is retrospective bias. Subjects may introduce a self-justifying slant into their responses. Unfortunately, it may be virtually impossible to obtain prospective data on immediate coping.

Although there is no evidence that greater numbers of coping responses are more effective, there is evidence that it is better to use both cognitive and behavioral coping strategies when faced with a risk situation (Curry, Marlatt, Gordon 1987; Shiffman 1982, 1984b). Cognitive and behavioral coping are rather broad categories of responses. The relative efficacy of specific responses within those categories has also been examined in an attempt to identify effective and ineffective coping responses. Shiffman (1984b) examined the effectiveness of seven behavioral and eight cognitive coping strategies. Only one type of coping was not more effective than no coping: subjects who reported using self-punitive cognitions (berating oneself for being tempted to smoke) to cope were as likely to relapse as subjects who made no cognitive coping response. (See Glasgow et al. 1985, for parallel findings on cessation.) Self-punitive cognitions may diminish self-efficacy and engender negative affect, which in turn promotes smoking. Another finding from these comparative analyses was that subjects who reported “willpower” as a means of cognitive coping were significantly more likely to relapse (nearly half relapsed) than subjects who used other cognitive coping responses. Nevertheless, subjects who reported willpower fared better than subjects who made no cognitive coping response at all.

These two distinctions notwithstanding, the effectiveness of various coping responses was surprisingly uniform: 13 of the 15

responses were better than no response, but there were no significant differences among these 13 responses. Curry, Marlatt, and Gordon (1987) conducted a very similar set of analyses and arrived at a similar conclusion.

Several studies have examined whether individual differences in coping skill are associated with maintenance. The studies used similar analog methods to assess coping skill: subjects were presented with situations known to elicit desire to smoke, and their responses to these situations were rated. These studies used both retrospective and prospective analyses and had subjects respond either to written or role-played coping scenarios (Abrams et al. 1987, in press; Davis 1983; Davis and Glaros 1986; Shiffman, Maltese, Jarvik 1982). Results of retrospective analyses showed that 6-month abstainers did not differ in coping skill from recidivists (Abrams et al. 1987; Shiffman et al. 1985). Prospective studies also yielded little evidence that coping skill protects against relapse. Such studies have found no relationship between skill level and relapse likelihood, although there was evidence that high-skill subjects took longer to relapse (Abrams et al. 1987, in press; Davis 1983; Davis and Glaros 1986). Also, Davis and Glaros (1986) showed that a skill-based treatment increased the level of smoker coping skills assessed immediately posttreatment but did not enhance smoker followup performance.

Abstinence Violation Effect

Marlatt and Gordon (1980, 1985) define the Abstinence Violation Effect (AVE) as an attributional construct that mediates the transition from an initial lapse to a full-blown relapse. Curry, Marlatt, and Gordon (1987) found that individuals who smoked but did not return to regular smoking ("slippers") reported significantly greater AVEs than those who relapsed following an initial slip. Brandon, Tiffany, and Baker (1986) reported that only one-third of their subjects (N=72) used any coping response after a lapse and that the occurrence of coping was unrelated to relapse probability or speed of relapse.

Summary and Conclusions

1. Tobacco dependence can be treated successfully.
2. Effective interventions include behavioral approaches and behavioral approaches with adjunctive pharmacologic treatment.
3. Behavioral interventions are most effective when they include multiple components (procedures such as aversive smoking, skills training, group support, and self-reward). Inclusion of too

many treatment procedures can lead to a less successful outcome.

4. Nicotine replacement can reduce tobacco withdrawal symptoms and may enhance the efficacy of behavioral treatment.

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