(21) DAWBER, T.R., KANNEL, W.B., GORDON, T. Coffee and cardiovascular disease. Observations from the Framingham Study. New England Journal of Medicine 291(17): 871-874, October 24, 1974.

(22) DUNN, W.L., JR. Experimental methods and conceptual models as applied to the study of motivation in cigarette smoking. In: Dunn, W.L., Jr. (Editor). Smoking Behavior: Motives and Incentives. Washington, D.C., V.H. Winston and Sons, 1973, pp. 93-111.

(23) EISINGER, R.A. Psychosocial predictors of smoking behavior change. Social Science and Medicine 6(1): 137-144, February 1972.

(24) EISINGER, R.A. Psychosocial predictors of smoking recidivism. Journal of Health and Social Behavior 12: 355-362, December 1971.

(25) EVANS, R.R., BORGATTA, E.F., BOHRNSTEDT, G.W. Smoking and MMPI scores among entering freshmen. Journal of Social Psychology 73: 137-140, October 1967.

(26) EYSENCK, H.J. Personality and the maintenance of the smoking habit. In: Dunn, W.L., Jr. (Editor). Smoking Behavior: Motives and Incentives. Washington, D.C., V.H. Winston and Sons, 1973, pp. 113-146.

(27) EYSENCK, H.J. Smoking, Health and Personality. New York, Basic Books, 1965, pp. 75-106.

(28) EYSENCK, H.J. Smoking, personality and psychosomatic disorders. Journal of Psychosomatic Research 7(2): 107-130, October 1963.

(29) FOOTE, E. The time has come: Cigarette advertising must be banned. In: Jarvik, M.E., Cullen, J.W., Gritz, E.R., Vogt, T.M., West, L.J. (Editors). Research on Smoking Behavior. NIDA Research Monograph 17. U.S. Department of Health, Education, and Welfare, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute on Drug Abuse, DHEW Publication No. (ADM) 78-581, December 1977, pp. 339-346.

(30) FOSS, R. Personality, social influence and cigarette smoking. Journal of Health and Social Behavior 14(3): 279-286, September 1973.

(31) GOODE, E. Cigarette smoking and drug use on a college campus. International Journal of the Addictions 7(1): 133-140, February 1972.

(32) GREEN, D.E. Psychological factors in smoking. In: Jarvik, M.E., Cullen, J.W., Gritz, E.R., Vogt, T.M., West, L.J. (Editors). Research on Smoking Behavior. NIDA Research Monograph 17. U.S. Department of Health, Education, and Welfare, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute on Drug Abuse, DHEW Publication No. (ADM) 78-581, December 1977, pp. 149-155.

(33) GROVES, W.E. Patterns of college student drug use and lifestyles. In: Josephson, E., Carroll, E.E. (Editors). Drug Use: Epidemiological and Sociological Approaches. Washington, D.C., Halsted Press, 1974, pp. 241-275.

(34) GUILFORD, J.S. Factors Related to Successful Abstinence from Smoking: Final report. U.S. Public Health Service, Division of Chronic Diseases, Bureau of State Services, July 1966, 170 pp.

(35) HERMAN, C.P. External and internal cues as determinants of the smoking behavior of light and heavy smokers. Journal of Personality and Social Psychology 30(5): 664-672, November 1974.

(36) HJELLE, L.A., CLOUSER, R. Internal-external control of reinforcement in smoking behavior. Psychological Reports 26(2): 562, April 1970.

(37) HORN, D. Some factors in smoking and its cessation. In: Borgatta, E.F., Evans, R.R. (Editors). Smoking, Health, and Behavior. Chicago, Aldine Publishing Company, 1968, pp. 12-21.

(38) IKARD, F.F., GREEN, D.E., HORN, D. A scale to differentiate between types of smoking as related to the management of affect. International Journal of the Addictions 4(4): 649-659, December 1969.

(39) JACOBS, M.A. The addictive personality: Prediction of success in a smoking withdrawal program. Psychosomatic Medicine 34(1): 30-38, January/February 1972.

(40) JACOBS, M.A., KNAPP, P.H., ANDERSON, L.S., KARUSH, N., MEISSNER, R., RICHMAN, S.J. Relationship of oral frustration factors with heavy cigarette smoking in males. Journal of Nervous and Mental Diseases 141(2): 161-171, August 1965.

(41) KANDEL, D. Interpersonal influences on adolescent illegal drug use. In: Josephson, E., Carroll, E.E. (Editors). Drug Use: Epidemiological and Sociological Approaches. Washington, D.C., Halsted Press, 1974, pp. 207-240.

(42) KANDEL, D. Stages in adolescent involvement in drug use. Science 190: 912-914, November 1975.

(43) KANEKAR, S., DOLKE, A.M. Smoking, extraversion, and neuroticism. Psychological Reports 26: 384, February-June 1970.

(44) KOZLOWSKI, L.T. Effect of caffeine on coffee drinking. Nature 264 (5584): 354-355, November 25, 1976.

(45) KOZLOWSKI, L.T. Effects of caffeine consumption on nicotine consumption. Psychopharmacology 47: 165-168, May 28, 1976.

(46) KOZLOWSKI, L.T., HARFORD, M.A. On the significance of never using a drug: An example from cigarette smoking. Journal of Abnormal Psychology 85(4): 433-434, August 1976.

(47) LARSON, P.S., HAAG, H.B., SILVETTE, H. Tobacco: Experimental and Clinical Studies: A Comprehensive Account of the World Literature. Baltimore, Williams and Wilkins Company, 1961, pp. 526-551.

(48) LARSON, P.S., SILVETTE, H. Tobacco: Experimental and Clinical Studies, Supplement I. Baltimore, Williams and Wilkins Company, 1968, pp. 259-322.

(49) LEBOVITS, B., OSTFELD, A. Smoking and personality: A methodological analysis. Journal of Chronic Diseases 23(10/11): 813-821, March 1971.

(50) LEBOVITS, B., OSTFELD, A.M., MOSES, V.K., PAUL, O. Cigarette smoking and personality. Journal of Chronic Diseases 25(10/11): 581-598, 1972.

(51) LEVENTHAL, H., AVIS, N. Pleasure, addiction, and habit: Factors in verbal report or factors in smoking behavior? Journal of Abnormal Psychology 85(5): 478-488, October 1976.

(52) LEVITT, E.E. The television cigarette commercial: Teenage transducer or paper tiger? Yale Scientific Magazine 45(1): 10-13, October 1970.

(53) LICHTENSTEIN, E., KEUTZER, C.S. Further normative and correlational data on the internal-external (I-E) control of reinforcement scale. Psychological Reports 21(3): 1014-1016, December 1967.

(54) MATARAZZO, J.D., SASLOW, G. Psychological and related characteristics of smokers and nonsmokers. Psychological Bulletin 57(6): 493-513, November 1960.

(55) MAUSNER, B. An ecological view of cigarette smoking. Journal of Abnormal Psychology 81(2): 115-126, April 1973.

(56) MCARTHUR, C., WALDRON, E., DICKINSON, J. The psychology of smoking. Journal of Abnormal Psychology 56(2): 267-275, March 1958.

(57) MCKENNELL, A.C. British research into smoking behavior. In: Borgatta, E.F., Evans, R.R. (Editors). Smoking, Health, and Behavior. Chicago, Aldine Publishing Company, 1968, pp. 140-164.

(58) MCKENNELL, A.C. A comparison of two smoking typologies. Research Paper 12. London, Tobacco Research Council, 1973, 95 pp.

(59) MEYER, A.S., FRIEDMAN, L.N., LAZARSFELD, P.F. Motivational conflicts engendered by the on-going discussion of cigarette smoking. In: Dunn, W.L., Jr. (Editor). Smoking Behavior: Motives and Incentives. Washington, D.C., V.H. Winston and Sons, 1973, pp. 243-254.

(60) NATIONAL CANCER INSTITUTE. AMERICAN CANCER SOCIETY. Cigarette Smoking Among Teen-agers and Young Women. U.S. Department of Health, Education, and Welfare, Public Health Service, National Institutes of Health, National Cancer Institute, DHEW Publication No. (NIH) 77-1203, 1975, 31 pp.

(61) NATIONAL CLEARINGHOUSE FOR SMOKING AND HEALTH. Adult Use of Tobacco, 1975. U.S. Department of Health, Education, and Welfare, Public Health Service, June 1976, 23 pp.

(62) NESBITT, P.D. Chronic smoking and emotionality. Journal of Applied Social Psychology 2(2): 187-196, April-June 1972.

(63) NESBITT, P.D. Smoking, physiological arousal, and emotional response. Journal of Personality and Social Psychology 25(1): 137-144, January 1973.

(64) NISBETT, R., WILSON, T.D. Telling more than we can know: Verbal reports on mental processes. Psychological Review 84(3): 231-259, May 1977.

(65) O'ROURKE, T.W. Research on smoking behavior: Some limitations and suggestions for improvement. Public Health Reviews 2(1): 105-112, February 1973.

(66) PALMER, A.B. Some variables contributing to the onset of cigarette smoking among junior high school students. Social Science and Medicine 4(3): 359-366, September 1970.

(67) PETO, J. Price and consumption of cigarettes: A case for intervention? British Journal of Preventive and Social Medicine 28: 241-245, 1974.

(68) REEDER, L.G. Sociocultural factors in the etiology of smoking behavior: An assessment. In: Jarvik, M.E., Cullen, J.W., Gritz, E.R., Vogt, T.M., West, L.J. (Editors). Research on Smoking Behavior. NIDA Research Monograph 17. U.S. Department of Health, Education, and Welfare, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute on Drug Abuse, DHEW Publication No. (ADM) 78-581, December 1977, pp. 186-200.

(69) REYNOLDS, C., NICHOLS, R. Personality and behavioral correlates of cigarette smoking: One-year follow-up. Psychological Reports 38(1): 251-258, February 1976.

(70) RODE, A., ROSS, R., SHEPHARD, R.J. Smoking withdrawal programme. Personality and cardiorespiratory fitness. Archives of Environmental Health 24: 27-36, January 1972.

(71) RUDOLPH, J.P., BORLAND, B.L. Factors affecting the incidence and acceptance of cigarette smoking among high school students. Adolescence 11(44): 519-525, Winter 1976.

(72) RUSSELL, M.A.H. Changes in cigarette price and consumption by men in Britain, 1946-71: A preliminary analysis. British Journal of Preventive and Social Medicine 27: 1-7, 1973.

(73) RUSSELL, M.A.H. Cigarette smoking: Natural history of a dependence disorder. British Journal of Medical Psychology 44(1): 1-16, May 1971.

(74) RUSSELL, M.A.H. The smoking habit and its classification. Practitioner 212: 791-800, June 1974.

(75) RUSSELL, M.A.H. Smoking problems: An overview. In: Jarvik, M.E., Cullen, J.W., Gritz, E.R., Vogt, T.M., West, L.J. (Editors). Research on Smoking Behavior. NIDA Research Monograph 17. U.S. Department of Health, Education, and Welfare, Public Health Service, Alcohol, Drug Abuse and Mental Health Administration, National Institute on Drug Abuse, DHEW Publication No. (ADM) 78-581, December 1977, pp. 13-34.

(76) RUSSELL, M.A.H., PETO, J., PATEL, U.A. The classification of smoking by factorial structure of motives. Journal of the Royal Statistical Society A 137 (Part 3): 313-332, 1974.

(77) RYAN, F.J. Cold turkey in Greenfield, Iowa: A follow-up study. In: Dunn, W.L., Jr. (Editor). Smoking Behavior: Motives and Incentives. Washington, D.C., V.H. Winston and Sons, 1973, pp. 231-241.

(78) SALBER, E.J., ABELIN, T.. Smoking behavior of Newton school children—5-year follow-up. Pediatrics 40 (3, part I): 363-372, September 1967.

(79) SALBER, E.J., WELSH, B., TAYLOR, S.V. Reasons for smoking given by secondary school children. Journal of Health and Human Behavior 4: 118-129, 1963.

(80) SCHACHTER, S. Nesbitt's paradox. In: Dunn, W.L., Jr. (Editor). Smoking Behavior: Motives and Incentives. Washington, D.C., V.H. Winston and Sons, 1973, pp. 147-155.

(81) SCHACHTER, S. Nicotine regulation in heavy and light smokers. Journal of Experimental Psychology: General 106(1): 5-12, March 1977.

(82) SCHACHTER, S. Pharmacological and psychological determinants of smoking. Annals of Internal Medicine 88(1): 104-114, January 1978.

(83) SCHACHTER, S., KOZLOWSKI, L.T., SILVERSTEIN, B. Effects of urinary pH on cigarette smoking. Journal of Experimental Psychology: General 106(1): 13-19, March 1977.

(84) SCHACHTER, S., SILVERSTEIN, B., PERLICK, D. Psychological and pharmacological explanations of smoking under stress. Journal of Experimental Psychology: General 106(1): 31-40, March 1977.

(85) SCHUBERT, D.S.P. Arousal seeking as a central factor in tobacco smoking among college students. International Journal of Social Psychiatry 11(3): 221-225, Summer 1965.

(86) SCHUMAN, L.M. Patterns of smoking behavior. In: Jarvik, M.E., Cullen, J.W., Gritz, E.R., Vogt, T.M., West, L.J. (Editors). Research on Smoking Behavior. NIDA Research Monograph 17. U.S. Department of Health, Education, and Welfare, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute on Drug Abuse, DHEW Publication No. (ADM) 78-581, December 1977, pp. 36-65.

(87) SCHWARTZ, J.L. Insights into the smoker's profile. Journal of School Health 40: 127-131, March 1970.

(88) SCHWARTZ, J.L., DUBITZKY, M. Requisites for success in smoking withdrawal. In: Borgatta, E.F., Evans, R.R. (Editors). Smoking, Health, and Behavior. Chicago, Aldine Publishing Company, 1968, pp. 231-247.

(89) SIMON, W.E., PRIMAVERA, L.H. The personality of the cigarette smoker: Some empirical data. International Journal of the Addictions 11(1): 81-94, February 1976.

(90) SMITH, G.M. Personality correlates of cigarette smoking in students of college age. Annals of the New York Academy of Sciences 142 (Article 1): 308-321, March 15, 1967.

(91) SMITH, G.M. Personality and smoking: A review of the empirical literature. In: Hunt, W.A. (Editor). Learning Mechanisms in Smoking. Chicago, Aldine Publishing Company, 1970, pp. 42-61.

(92) SPEVACK, M., PIHL, R.O. Nonmedical drug use by high school students: A three-year survey study. International Journal of the Addictions 11(5): 755-792, October 1976.

(93) SROLE, L., FISCHER, A.K. Smoking behavior 1953 and 1970: The midtown Manhattan study. In: Dunn, W.L., Jr. (Editor). Smoking Behavior: Motives and Incentives. Washington, D.C., V.H. Winston and Sons, 1973, pp. 255-265.

(94) STOKES, J.P. Personality traits and attitudes and their relationship to student drug using behavior. International Journal of the Addictions 9(2): 267-287, April 1974.

(*95*) STRAITS, B.C. The discontinuation of cigarette smoking: A multiple discriminant analysis. In: Zagona, S.V. (Editor). Studies and Issues in Smoking Behavior. Tuscon, University of Arizona Press, 1967, pp. 79-81.

(*96*) THOMAS, C.B. The relationship of smoking and habits of nervous tension. In: Dunn, W.L., Jr. (Editor). Smoking Behavior: Motives and Incentives. Washington, D.C., V.H. Winston and Sons, 1973, pp. 157-170.

(*97*) TOMKINS, S. A modified model of smoking behavior. In: Borgatta, E.F., Evans, R.R. (Editors). Smoking, Health, and Behavior. Chicago, Aldine Publishing Company, 1968, pp. 165-186.

(*98*) U.S. PUBLIC HEALTH SERVICE. Smoking and Health. Report of the Advisory Committee to the Surgeon General of the Public Health Service. U.S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control. PHS Bulletin No. 1103, 1964, 387 pp.

(*99*) U.S. PUBLIC HEALTH SERVICE. State Legislation on Smoking and Health: 1976. U.S. Department of Health, Education, and Welfare, Public Health Service, Center for Disease Control, Bureau of Health Education, National Clearinghouse for Smoking and Health, December 1976, 73 pp.

(*100*) WARNER, K.E. The effects of the antismoking campaign on cigarette consumption. American Journal of Public Health 67 (7): 645-650, 1977.

(*101*) WATERS, W.E. Smoking and neuroticism. British Journal of Preventive and Social Medicine 25(3): 162-164, August 1971.

(*102*) WEATHERLEY, D. Some personality correlates of the ability to stop smoking cigarettes. Journal of Consulting Psychology 29(5): 483-485, October 1965.

(*103*) WEST, D.W., GRAHAM, S., SWANSON, M., WILKINSON, G. Five year follow-up of a smoking withdrawal clinic population. American Journal of Public Health 67(6): 536-544, June 1977.

(*104*) WHITESIDE, T. Smoking still. New Yorker 50(39): 121-151, November 18, 1974.

(*105*) WIGGINS, J.S. Personality structure. In: Farnsworth, P.R., Rosensweig, M.R., Polefka, J.T. Annual Review of Psychology 19. Palo Alto, California, Annual Reviews, Inc., 1968, pp. 293-350.

(*106*) WYNDER, E.L. Interrelationship of smoking to other variables and preventive approaches. In: Jarvik, M.E., Cullen, J.W., Gritz, E.R., Vogt, T.M., West, L.J. (Editors). Research on Smoking Behavior. NIDA Research Monograph 17. U.S. Department of Health, Education. and Welfare, Public Health Service, Alcohol, Drug Abuse, and Mental Health Administration, National Institute on Drug Abuse, DHEW Publication No. (ADM) 78-581, December 1977, pp. 67-97.

19. MODIFICATION OF SMOKING BEHAVIOR.

National Institute on Drug Abuse

Contents

Introduction

Since the health consequences of smoking became more evident in the early 1960's, the development of techniques to aid smokers to quit have proliferated. The methods have ranged widely from gimmicks and over-the-counter cessation aids to formal programs and clinics (*368, 376*). Thus, the concerned professional or layman with an interest in assisting smokers in the process of cessation may find it very difficult to decide which intervention strategy is best or most useful. The social relevance of the topic has focused much of the effort in the field toward clinical presentations of what logically appeared to be the best withdrawal techniques or strategies rather than toward careful research to define what strategy, method, or program is most effective in producing long-term successes or positive changes in smoking behavior. Remarkably, a wide variety of interventions has been offered and recommended to the public, but outcome data needed for critical appraisal of them are scarce.

The task of evaluating the relative efficacy of programs and techniques has been very adequately done in numerous past and recent reviews (*24, 26, 29, 40, 171, 200, 224, 226, 230, 245, 366, 368, 376, 413*). Therefore, this review can be selective in order to allow discussion of critical topics and encourage new developments in the field. The reader is referred to the other available reviews to obtain a more detailed discussion of topics that are here given brief treatment.

Methodological Issues

Any reviewer of the literature on strategies to modify smoking behavior is faced with the difficult task of sorting through outcome research that is permeated by many methodological flaws and deficiencies (*24, 26, 224, 226, 366, 368, 376*). Despite the facts that smoking behavior offers an objectively measurable target behavior, that potential treatment participants are numerous, and that the normal treatment context affords the opportunity for both good internal and external validity (*24, 200, 226, 393*), a number of methodological inadequacies continues to plague the field (*26, 29, 226, 368, 376, 413*). Therefore, the methodology and design problems that most commonly limit the appraisal of existing outcome data will be briefly summarized. Anyone concerned with smoking withdrawal programs or research, however, should refer to other comprehensive evaulations of these issues presented by Bernstein (*24*), Schwartz (*366, 376*), Lichtenstein and Danaher (*226*), and the National Interagency Council on Smoking and Health's (NICSH) *Guidelines for Research on the Effectiveness of Smoking Cessation Programs* (*272*).

The most pervasive problem in the evaluation of outcome data from smoking cessation programs is the validity of the treatment results. Almost all clinics and research studies have relied primarily upon

unverified self-reports of smoking as their critical dependent measure. Unfortunately, the verbal or written requests for estimates of number of cigarettes currently smoked per unit of time depend upon the participant's accuracy and honesty (*226*), are subject to nonspecific demand characteristics (especially during and after treatment) (*226*), and appear to be highly influenced by digit-bias (that is, given in multiples of 5 or 1/2 pack units) (*423*). One study collecting global estimates under different conditions on the same day found questionable reliability (*423*). Thus, studies based only on global, unverified self-reports of smoking behavior must be viewed with skepticism.

Because of these factors, the rate measure based on such global estimates tends to be more an ordinal than a ratio variable (*396*). Nevertheless, rate-per-unit-of-time data often have been preferred over the dichotomous abstinent-nonabstinent or percent-reduction categories, which clearly require the use of less powerful nonparametric statistical analyses (*226, 393, 396*). The use of self-monitoring recording has been recommended in various forms (*109, 198, 226, 250, 272*) and commonly used in many studies to enhance both the reliability and psychometric qualities of the rate data. However, the procedure is known to be reactive (*198, 250*), is still susceptible to the demand characteristics (*198, 226*), and tends to underestimate the "real" baseline or follow-up rate (*109, 198, 226, 250*).

Studies not relying on smoking rates as the primary dependent measure have commonly utilized various and often undefined success-failure categories to minimize the problems of self-report data (*24, 366*). Standard categories have been suggested to avoid ambiguity (*272*); however, the primary evaluation of treatment-results based on abstinence data can be recommended for several reasons. First, abstinence is the primary goal of almost all smokers seeking treatment (*24, 25, 40, 171, 226, 366*). Second, follow-up data on smokers have indicated that most smokers who fail to attain abstinence eventually return to baseline smoking rates (*24, 26, 171, 251*). Third, analyses of rate data can yield statistically significant treatment effects even with a clinically insignificant proportion of participants abstinent at follow-up (*251, 366, 376*). Fourth, abstinence reports are less susceptible to nonspecific demand characteristics and the reactivity of self-monitoring (*226*). Nevertheless, when derived from reliably collected self-monitoring data, cigarettes-per-day rate data or the more precise percentage-or-baseline (current smoking ÷ pretreatment smoking rate x 100) variable (*199, 200, 226*) can be very helpful as secondary measures for testing finer theoretical questions with parametric statistical techniques (*24, 200, 226, 272*). Because treatment will often produce a marked, positive skewness in the distributions of rates (that is, greatly increased frequency of rates at or near zero), care should be taken to test the homogeneity of variance and to apply transforma-

tions as necessary before utilizing analysis-of-variance procedures, especially with cell frequencies of unequal size (*71, 292, 445*).

Optimally, self-report data on smoking should be validated by an objective measure. False reporting has now been documented in both children (*99, 154, 262*) and adults in cessation programs (*47, 82, 178, 283*). Natural-environment informants or observers have been recommended and used in many studies, but the systems are reactive, difficult to maintain, and, owing to possible collusion, have questionable validity (*47, 226*). Biochemical tests for objectively measuring smoking exposure are clearly more desirable. Measurements of blood carboxyhemoglobin (COHb) (*61, 192, 320, 330, 397, 427*) and thiocyanates (SCN^-) in biologic fluids (*18, 54, 75, 83, 238, 299, 300, 444*) have been demonstrated to be reliable indicators of smoking behavior. Concentrations of carbon monoxide (CO) in alveolar air is directly proportional to blood COHb concentrations (*61, 320, 330, 397*) and has been recommended as a simple validating tool (*208*). However, CO concentrations have a very short half-life (*330, 397*) and show high diurnal variability (*61, 258, 330*). Thus, SCN concentrations that have a biologic half-life of approximately 14 days (*299*) are more suited for validation of self-reports (*47, 54, 423, 424*). Determinations of serum SCN^- have been more common (*47, 54, 83, 423*), but tests of urine or saliva are also possible and may be more practical in many clinical settings (*18, 99, 262*). Unfortunately, COHb levels are affected by various environmental exposures (*192, 397, 427*) and SCN^- concentrations can be elevated by diet (*47*). Singly, however, they provide a crude measure of smoking rate (*423, 424*) with adequate discrimination between smokers and nonsmokers; together they appear to provide a very powerful test of abstinence (*423, 424*).

In summary, researchers should be aware that uncorroborated self-reports may lead to an overestimation of success, especially in situations where subjects are under social pressure to quit or to report quitting. The addition of objective biological assays can help to validate self-report data and improve the ability to assess outcome, using the self report as a low-cost, easily obtainable, dependent measure.

In addition to the problem of questionable validity of self-reports that faces all researchers, various design deficiencies also plague the field (*24, 200, 226, 272, 304, 366, 367, 376, 398*). First, attributions of causality of outcome results to independent treatment factors are virtually impossible without systematic designs, including appropriate experimental controls (*24, 56, 391*). Initial demonstrations of efficacy may be evaluated relative to commonly expected norms of success (*245, 304*); such clinical demonstrations must then be replicated versus appropriate control conditions, especially attention-placebo controls (*24, 26, 200, 226, 230, 245, 251, 272, 304, 366, 367, 376, 398*). Few procedures or programs developed in clinical settings have progressed

to experimental validation (*24, 40, 245, 304, 366, 367, 376, 398, 413*). Moreover, Straits (*398*) has suggested that the strength of laboratory research involves testing more complicated questions than treatment efficacy. Factorial designs enable one to evaluate specific treatment effects as well as more complex multidimensional and interactional effects and thus permit the simultaneous testing of several theoretical issues (*398*).

Systematic treatment evaluations must also include comprehensive and adequate follow-up of participants (*24, 26, 171, 272, 366, 368, 376*). Almost all treatments are able to show dramatic post-treatment effects, but rapid relapse in most participants has been the norm (*170, 171, 251, 366*). Therefore, no treatment can be adequately evaluated without long-term follow-up data. Recidivism tends to be the greatest during the first 3 to 4 months after treatment and relatively slight after 6 months (*170, 171*), but a 1-year follow-up remains highly recommended (*272, 366, 368, 376*).

Comprehensiveness of follow-up is as important as length, if not more so. Schwartz (*366, 368, 376*) has strongly emphasized that all participants, including early-treatment dropouts, should be used in computing treatment effectiveness. Additional analyses of subjects completing most treatments are useful to clarify theoretical issues (*24, 226*); however, the relative efficacy of the procedure should be judged on the stricter standard (*272, 366, 368, 376*). Follow-up results based only on participants who respond or who are readily available are especially suspect (*24, 272, 366, 368, 376*).

The final issue that commonly affects outcome data from smoking-modification studies involves the replicability and generalization of results. Programs and studies with reportedly very similar procedures have produced highly variable patterns of results (*24, 26, 40, 171, 200, 226, 230, 366, 376, 413*). This, it seems, is due in part to the variability introduced by small samples and population differences (*24, 171, 226, 272*) and the inadequacies of theoretical models guiding the descriptions of treatment variables (*24, 272, 306, 398*). In an effort to minimize these deficiencies, the NICSH *Guidelines* (*272*) stress the need to describe completely the recruitment and selection of participants, their characteristics, and the specifics of each aspect of treatment. Keutzer, et al. (*200*) have also discussed the problems of uncontrolled variability from group treatment and inexperience of the therapist or experimenter.

Thus, conclusions regarding the relative efficacy of treatments can be reliably made only when methodological deficiencies are at a minimum (*272*). The quality of the data has improved markedly since the early reviews (*24, 200, 366*), but almost all studies remain deficient in some respect (*368, 376*). Many programs have collected little or no objective follow-up data, and the lack of methodological rigor compromises the results of many others that have. Therefore, based

upon current data, the replicability and general utility of almost all procedures can be only tentatively assessed.

Review of General, Nonspecific Interventions

A variety of interventions has been developed and offered with the primary goal of aiding a group of smokers to become nonsmokers rather than testing how the procedures may work (*398*). Various reviewers have analyzed the data on this type of intervention, which includes public service and proprietary withdrawal clinics, individual or medical counseling, and large scale coronary prevention trials. Except for the coronary prevention trials, the clinical-treatment focus of these interventions has resulted in multiple uncontrolled clinical replications, often without adequate outcome data (*24, 40, 171, 200, 245, 366, 368, 376*). Additionally, the vast public health campaign of recent years should be considered as a special class of general, nonspecific interventions both to prevent smoking onset and to stimulate cessation (*24, 40, 200*).

Public Health Educational Campaigns

The public health campaign against cigarettes has produced notable changes in public awareness of the health consequences of cigarette smoking (*175, 269, 271, 422*). It appears that the dramatic changes noted in adult smoking, especially among middle-aged males and certain professional groups (*86, 100, 121, 271, 421*), can be attributed largely to the effectiveness of information and educational campaigns since 1964 (*130, 270*). Moreover, Warner (*428*) has estimated that the effect of specific "events," such as the 1964 Surgeon General's Report, on cigarette consumption (mean number of cigarettes consumed per day) may appear small and transitory, but that the cumulative effect of persistent publicity appears to have reduced consumption by 20 to 30 percent below its predicted 1975 level.

More specifically, O'Keefe (*284*), in a study on the impact of television anti-smoking commercials during the late 1960's, revealed changes in attitudes and reported reductions in consumption but little direct impact on smoking cessation. Forty-two percent of those motivated to quit felt the commercials acted as an incentive, but only 1 percent of the ex-smokers credited the commercials with helping them quit. Similar minor effects were noted in a smaller trial with anti-smoking posters (*5*). Ryan (*353*) reported the results of an entire community's attempt to quit in 1970. Thirty-seven percent of the adults attempted to quit, and 14.2 percent of the males and 3.9 percent of the females were still reporting abstinence 7 months later, with higher socioeconomic groups being more successful. The Avdel smoking project (*98*) also seemed to have produced small but meaningful changes in both smoking attitudes and behavior with a

worksite campaign. These specific and general results of the public health campaigns appear very similar to other British (*343*) and worldwide experiences (*130, 301*).

Public Service and Proprietary Clinics

It is interesting to note that Bernstein's (*24*) comment that the educational campaigns have affected research and clinical activities more than smoking behavior still seems valid. Public service and proprietary programs have proliferated since 1964. Schwartz and Rider (*376*) have provided a summary of the published and unpublished data on these types of programs. Many such smoking-withdrawal clinics offered by voluntary agencies have been intermittent and rarely evaluated. The group program of the American Cancer Society (ACS) (*2, 3, 160*) and the 5-Day Plans of the Church of the Seventh Day Adventists (*252, 253, 254*) have, however, remained very active in providing public service treatments to smokers. Unfortunately, while the two programs together have probably helped more smokers than any other organized effort (*245, 368, 376*), only limited published outcome data are available for consideration.

The 5-Day Plan has become standardized and involves five consecutive $1^1/_2$- to 2-hour sessions focusing on immediate cessation, and dietary, physical, and attitudinal changes to reduce withdrawal effects (*252, 254*). Because of its clinical focus, almost all evaluations have been without controls (*117, 146, 147, 148, 213, 252, 253, 254, 267, 298, 366, 376, 403, 412*), with good immediate abstinence rates of approximately 60 to 80 percent, but with an approximately 50 percent relapse by 1- to 3-months post-treatment. Unfortunately, clinical claims of abstinence among 33 to 40 percent of participants beyond a year post-treatment (*146, 147, 148, 253*) are markedly discrepant from other clinical demonstrations (*213, 267, 298, 361, 412*). Guilford's comparative study of the 5-Day Plan (*137, 138*) found abstinence rates of 16 to 20 percent at 1 year that may not differ from unaided attempts (*137, 138, 412*). Nevertheless, the program appeared to be more successful with males (*137, 138, 267, 403*) and when higher expectation of success was reported by participants (*361*). Results of all studies are based on unverified self-reports, often only from subjects completing all treatments (*366, 376*).

Available long-term abstinence outcome data on the ACS group programs (*2, 3*) also appear to be somewhat disappointing. The one available evaluation of the ACS groups, which focus on insight development, group support, and self-selected cessation techniques, was conducted on 29 clinics in Los Angeles from 1970 to 1973 (*318*). Telephone follow-ups were completed on 354 subjects selected from a random sample of 487 of the original 944 participants. Abstinence rates based on the total random sample were 41.7 percent at post-treatment, and 30 percent at 6-month, 22 percent at 12-month, and 18 percent at

18-month follow-up points (*245, 318, 378*). In the subsample group of 354 subjects who were contacted (*318*), 28.4 percent of the males and 20.3 percent of the females reported abstinence.

Other clinics with similar or more elaborate formats have reported fairly equivalent outcome data (*63, 81, 82, 114, 158, 178, 213, 274, 286, 289, 433, 438, 440, 448*). The Smoking Withdrawal Study Centre in Toronto (*81, 82, 378*) used comprehensive educational groups with 472 smokers and obtained successful abstinence in 28.6 percent of all participants at 1-year follow-up, with 33.9 percent of the men and 20.8 percent of the women being successful. However, carboxyhemoglobin (COHb) assessments revealed that 22 of the 107 (20.6 percent) reported ex-smokers had levels over 5 percent, which strongly suggested smoking. A 5 percent quit rate was noted among a no-treatment control group. In a population based sample, Isacsson and Janzon (*178*) were able to produce abstinence during an intensive 6-week program among 31 of 51 participants (60 percent), with 17 (33 percent) remaining nonsmokers at 8- to 9-month follow-up. Abstinence was verified by COHb determinations. West and his colleagues (*433*) followed up 559 smoking-cessation clinic participants 5 years later and found 17.8 percent of the contacted sample reporting abstinence. Approximately two-thirds of those who had quit during the clinic had returned to smoking, while only 8 percent of the unsuccessful participants were reporting abstinence at follow-up. Older males who had lighter smoking habits and more stable environments appeared to be most successful. Research clinics (to be discussed in more detail elsewhere in this report), offering similar treatment formats, have reported similar 15 to 20 percent long-term abstinence among participants (*341, 373, 374, 380, 381, 382*).

In light of these data on public service and research withdrawal groups and clinics, the claims of more impressive results by proprietary programs must be viewed with caution (*116, 245*). Schwartz and Rider (*376*) reviewed a variety of unpublished data on commercial methods, but only one published evaluation of a commercial method is currently available. In this study (*194*), records of 553 participants of the SmokEnders program in 1971 were examined and a $3\frac{1}{2}$- to 4-year follow-up was attempted on the 385 (70 percent) who were not smoking at treatment termination. Only 167 (43.4 percent) were contacted; of these, 57 percent of the males and 30 percent of the females were not smoking. Schwartz and Rider (*376*) noted, however, that, even if the smoking rates of those contacted at follow-up accurately represent the total successful sample, the long-term success based on all participants (including treatment dropouts) would be about 27 percent rather than the reported 39 percent. As the men and women were reported to have been about equally successful at treatment termination, the higher follow-up success rate for males would still seem valid.

In viewing the data from many clinics relative to the 16 to 19 percent success at 1-year follow-up noted in Guilford's (*137, 138*) and Schwartz and Dubitzky's (*373, 374*) unaided control groups, the impact of many programs appears to have been minimal. Bernstein's (*24*) conclusion still seems valid: clinics can serve a very useful purpose when more effective modification techniques are developed for general distribution, but uncontrolled use of nonvalidated notions cannot refine those procedures. The attempts to analyze more carefully the clinic format has produced some enlightening data (*81, 82, 137, 138, 178, 318, 341, 361, 373, 374, 380, 381, 382, 433*). Long-term results imply that males in these clinics fare better than females during maintenance (*81, 82, 137, 138, 267, 341, 376, 403, 433*). Moreover, the comprehensive follow-up and physiological validating of some studies (*81, 82, 178, 373, 374*) highlight how misleading early success based on self-reports can be. The placebo effect noted in control groups highlights the fact that many of the treatment effects of clinics remain undefined (*373, 374*). More effort should be made, therefore, to evaluate on-going clinical activities so that researchable hypotheses can be illuminated for further controlled study (*24, 394*).

Individual and Medical Counseling

Smoking-cessation counseling by professionals in private practice is known to exist, but published data on its efficacy are very rare. A report on two psychotherapist-led groups suggests that long-term therapy may help some smokers (*39*); however, the cost of such treatment would seem prohibitive (*245*). In controlled studies of the type of individual and group counseling formats that could be easily and less expensively disseminated, Schwartz and Dubitzky (*373, 374*) and the American Health Foundation (*380, 381, 382*) produced 1-year abstinence rates ranging from 13 to 30 percent with no clear superiority for individual or group therapy. While individual counseling styles seemed to affect initial success and dropout rates, there were no differences in effectiveness during follow-up (*186, 431*).

Since smokers have become almost uniformly aware of the health risks of smoking (*269, 271, 422*), they view the physician as an important person in the quit-smoking decision (*271*). However, only about 25 percent of smokers surveyed in a national telephone interview reported having been advised by their physician to quit (*271*). Almost all physicians are convinced of the health consequences of smoking and have made dramatic changes in their own smoking (*121, 421*), but many seem reluctant to confront their smoking patients until serious effects are present (*55, 338*). Nevertheless, numerous studies of ex-smokers have shown that linking the increase of symptoms, such as coughing or breathlessness, to smoking was a major precipitant for unaided quitting (*51, 128, 150, 152, 190, 294, 389, 390, 399, 400, 418, 419*).

Rose (*338*) and Lichtenstein and Danaher (*227*) have reviewed the issue of physician counseling and its efficacy. In general, it appears that physicians have been discouraged from this role (*338*) and are effective as counselors only when dramatic symptoms are present (*227*, *338*). Several uncontrolled studies, done primarily in England, have shown varying success. Early studies in this country showed minimal effects (*244*, *322*). Studies abroad, on the other hand, have evaluated several important aspects of the process. Porter and McCullough (*312*) produced only 5 percent abstinence at 6 months in a briefly-counseled group, while 4 percent quit in a randomly defined uncounseled group. Handel (*153*) reported more impressive results from one brief session with 17 of 45 (38 percent) males and 6 of 55 (11 percent) females reporting abstinence at 1-year follow-up. When patients presented current respiratory symptoms, Williams (*443*) and Burns (*51*) found a higher response to brief counseling. Burns (*51*) reported 35 of 66 (53 percent) males and 9 of 28 (32 percent) females reporting completely stopping 3 months after the visit. Similarly, Williams (*443*) found that, of 204 patients routinely counseled, 59 of the 160 (37 percent) who could be contacted at 6-month follow-up were reporting abstinence, with males and females being about equally receptive.

Some of the variability of response may be due to individual physician styles. Pincherle and Wright (*302*) followed up a total of 1,493 business executive smokers for 1 to 2 years after a regular physical where smoking-cessation advice was given. Thirteen percent reported quitting and 11 percent indicated a reduction in rate of 30 percent or more; however, when the results were analyzed across various physicians giving the message, success (quitting or 30+ percent reduction) rates varied from 35 percent to 17 percent. In a similar follow-up of antismoking advice given during annual physicals, Richmond found 118 of 543 (22 percent) quit for at least 1 year; 15 subsequently relapsed, leaving a long-term success rate of 19 percent (*329*). Unfortunately, no physician-counseling study has utilized techniques to validate self-reported behavior change.

Considering the brief nature of the contact and the lack of specific maintenance follow-up, the reported rates of abstinence seem encouraging. A study by Raw (*319*) has suggested that both a physician's message and counseling by a health professional in a white coat were important in producing cessation, also suggesting that health professionals other than physicians should become more involved. Peabody (*291*) reported that with a well-developed program, 25 percent of smokers will quit after the initial counseling, 25 percent will quit after several attempts, 20 percent will eventually stop with difficulty, and only 30 percent will never respond. These expectations may be high for a general patient population, but cessation data on special groups of patients with current medical problems related to smoking are encouraging.

Patients hospitalized with their first myocardial infarction (MI) provide a dramatic example of this. Thirty to fifty percent of the smokers in this group permanently stop smoking after only routine advice (*4, 11, 68, 157, 338, 430, 432, 442*). Follow-ups on hundreds of such patients reveal that relapses back to smoking are uncommon, with 50 percent quit rates often maintained for 1 or more years (*11, 68, 338, 430, 432*). When more intensive counseling and active follow-up support were undertaken in a study by Burt and associates (*52*), 70 of 114 (61 percent) of cigarette smokers and 9 of 11 (82 percent) of cigar and pipe smokers stopped smoking after hospitalization, and only 19 (15 percent) of the smokers made no changes. At the 1-year follow-up, 9 of the immediate quit group (11 percent) and 13 of 22 (59 percent) who quit later relapsed, leaving 79 of 125 smoking (cigarette, pipe, or cigar) patients reporting abstinence (63.2 percent) with 27 (21.6 percent) having reduced. Among 120 patients given conventional advice and not followed up in the special clinic, only 27 of 98 (27.5 percent) of the smokers were reporting abstinence and 27 (27.5 percent) reporting reduction at the 1-year follow-up.

Thus, physicians and other health professionals have great opportunities for anti-smoking counseling. Both Rose (*338*) and Lichtenstein and Danaher (*227*) warn, however, that the private practitioner should avoid unrealistic expectations and underestimations of the time required. Various guidelines have been offered on the office management of cigarette smoking (*113, 115, 166, 291, 307, 309, 402*); Lichtenstein and Danaher (*227*) provide a comprehensive format and suggestions. Clearly, health care professionals can play a dramatic role by being nonsmoking models, by linking current symptoms to smoking, and by aiding smokers in the decision to quit alone or with additional help. But as Rose (*338*) and Lichtenstein and Danaher (*227*) have pointed out, additional research is needed to test techniques applicable for office-guided cessation programs.

Large-Scale Coronary Prevention Trials

Middle-aged men judged at risk but not exhibiting coronary heart disease (CHD) provide a special challenge for smoking counseling (*336, 337*). Since cigarette smoking together with serum cholesterol and blood pressure levels are considered the major risk factors for CHD (*36, 420*), preventive trials have attempted to reduce the incidence of CHD in study samples by using a multifactor approach. The Coronary Prevention Evaluation Program (*391, 392*) was an initial 7-year feasibility test of this approach among 519 coronary-prone men aged 40 to 59 at intake. Only 116 of the original 191 smokers remained active in the study, and more emphasis was given to nutritional counseling than to smoking counseling. Nevertheless, 43 of the 116 (37.1 percent) remaining smokers eventually stopped smoking.

Subsequently, other trials were initiated in Europe (*449*). Wilhelmsen (*439*) established a comprehensive cessation program for use in a field trial in Sweden (*441*), but long-term results are not available. In a controlled trial of the effects of anti-smoking advice among 1,470 coronary-prone London civil servants (*324*), 51 percent of the 714 randomly assigned to anti-smoking clinics stopped smoking by the end of 1 year. Only 31 percent were reporting complete abstinence, as many converted to pipes and cigars (*338*). In general, the preliminary results of the European multifactor prevention trials are only moderately successful, with abstinence in 16 to 28 percent of the smokers after 1 year (*449*).

In 1972 the Multiple Risk Factor Intervention Trial (MRFIT) was initiated in this country (*265, 266*). One of the largest and most ambitious of the multicomponent efforts to influence cigarette smoking behavior among middle-aged men, this smoking intervention attempt is occurring within a broad 6-year coronary prevention program also intended to reduce serum cholesterol and blood pressure levels in over 6,000 men aged 35 to 57 at increased risk of coronary disease (*410*). Initial intense intervention involving multicomponent group or individual sessions produced abstinence in approximately 43 percent of the smokers by the first annual examination (*280*). Biochemical assessments are being made to validate the self-report data. Continued intervention and maintenance contacts have produced successful cessation in other participants who had not formerly quit and in participants who had returned to smoking (*280*).

Two studies have focused on total populations rather than selected high-risk groups. The North Karelia Project (*204, 316*) has been providing a comprehensive community program since 1972 to reduce the very high rate of cardiovascular disease in eastern Finland. By the end of the first year of intervention, the proportion of males aged 25 to 59 in the North Karelia district who smoked decreased from 54 percent to 43 percent, while female smoking rates have remained at about 11 to 13 percent throughout the 5 years of treatment. These encouraging changes in male smoking behavior were maintained, with the 5-year follow-up survey reporting 42 percent of the adult men still smoking.

More specific data are available on the field study conducted by the Stanford Heart Disease Prevention Program. An extensive 2-year, mass-media campaign (*234*) was presented to two California communities to persuade the general public to modify eating and smoking behaviors in order to reduce cardiovascular risk. A third community served as control (*101, 235*). Face-to-face behavioral counseling (*101, 247, 258*) was offered to two-thirds of the high-risk subjects in one of the media communities. Three years after the program started, the proportion of smokers had decreased by 3 percent in the control community, by 8 percent in the media-only community, and by 24 percent in the media-plus-counseling communities (*101, 248, 259*). Fifty

percent of the high-risk smokers receiving face-to-face counseling, but only 11 percent receiving just media, had quit (*101, 248, 259*). Thiocyanate monitoring was performed to validate self-reports.

When the risks of smoking are made more immediate and salient, and both skills and support to change are provided, meaningful reductions are possible. The multifactor trials reveal that when smokers are sufficiently educated regarding their risks, they respond much like the post-MI patient and quit immediately and relapse less than would be predicted. The most successful multifactor trials have involved expensive face-to-face intervention techniques and extensive follow-up contacts (*280, 410*) or costly and well-conceived behavioral and media programs (*101, 204, 235, 247, 316*). Hence, more work is needed to translate the skills developed from these research trials into office practice and public health campaigns (*227, 338*). It should be noted that the effective programs involved face-to-face intervention techniques which were both intensive and expensive.

Controlled Experimental Research on Intervention Strategies

A wealth of research data relevant to the modification of smoking behavior has been produced. Early controlled research tended to produce unimpressive results (*24, 200, 366*). Schwartz and Dubitzky (*373, 374*) conducted an exemplary study of what appeared to be the best treatment options available in the late 1960's (*24, 200, 366*). Initial results suggested that group or individual therapy had moderate effects on smoking; but, by the end of a 1-year follow-up, not one of the seven experimental conditions was superior to the no-contact or minimal-contact controls (*373, 374*). Recent progress has begun to highlight both what strategies may be more effective and why they may work. Because these data have been comprehensively evaluated and discussed in recent reviews (*26, 29, 226, 245, 368, 376*), this section will emphasize primarily the major trends in this research history.

Drug Treatments

The psychopharmacology of smoking and its relationship to smoking behavior and cessation are discussed in some length elsewhere in this report and in recent reviews (*46, 136, 181, 183, 349*). While research (*349, 359, 360*) continues to suggest that there are pharmacological determinants for smoking, the identification of chemical agents either to substitute for smoking or to minimize withdrawal symptoms has been frustrating and difficult (*136, 181, 183*).

Early research on Lobeline as a nicotine substitute was equivocal (*24, 200, 366*). The utilization of the substitute in a clinic format seemed to at least enhance short-term effectiveness (*93, 341*), but the double-blind study by Davison and Rosen (*77*) indicated that Lobeline was no more effective than an appropriate placebo. More recently, a nicotine

chewing gum has been developed and tested as a cessation aid (*41, 102, 103*). Double-blind studies using the gum in cessation clinics suggested that it is significantly more effective than placebos (*41, 185, 283, 352*), but, beyond the control of withdrawal symptoms (*364*), its effects appeared to be a small component in the overall success (*352*).

Combinations of drugs to reduce withdrawal symptoms have been used in various clinics (*180, 341, 438, 440*); however, the double-blind study by Schwartz and Dubitzky (*373, 374*) of meprobamate with and without individual or group therapy suggested that the placebo, if anything, was more effective. While all treatment conditions were initially superior to questionnaire and screened no-treatment controls, the prescription-only and prescription-plus-individual-counseling had lower (8.3 percent and 13.9 percent) abstinence rates at 1-year follow-up than the controls (16.7 and 19.4 percent) (*373, 374*).

Other chemicals have been tested in Europe with some initial success (*136, 363*), but additional evaluations are needed (*136, 376*). Rosenberg (*340*) reported initial success in reducing consumption in a double-blind study of an antismoking chewing gum that caused an unpleasant taste when tobacco was subsequently smoked. The gum's efficacy as a cessation aid was not tested. Current data suggest that the usefulness of pharmacological cessation aids has yet to be unequivocally demonstrated. While aids such as nicotine gum may be useful in the control of withdrawal symptoms in some smokers, current research suggests that they would need to be combined within a broader program to produce and maintain abstinence (*136, 352*).

Hypnosis

Clinicians have claimed from 42 to 86 percent of their clients treated with hypnotherapy were abstinent at 6- to 12-month follow-up (*66, 67, 143, 278, 358, 395, 429, 450*). Unfortunately, these claims have not been substantiated in controlled research. The early research was chaotic and methodologically poor, leading Johnston and Donoghue (*189*) to conclude that "there is almost no good research evidence attesting to the effectiveness of hypnosis in the elimination of smoking behavior" (p. 265). Moreover, Spiegel, a leading proponent of self-hypnosis, claimed that the actual success rate may be closer to 20 percent long-term abstinence (*387, 388*). Orne (*285*) considered both the theoretical foundations and research data for hypnosis and concluded that its effects can best be categorized as a placebo response which leads to nontraumatic cessation through both the mystique of the procedure and the hypnotic suggestions.

The data from several recent studies do not refute these conclusions. Pederson and associates (*295*) found that 9 out of 16 (54.3 percent) of the subjects in a hypnosis-plus-counseling group were reporting abstinence at 10-month follow-up as compared to 12.5 percent for counseling-only or waiting-list control groups. As there was only 8

percent abstinence for a group treated with hypnosis only, they concluded that hypnosis can enhance the effects of group counseling; alone, it may be insufficient as a cessation procedure. When Shewchuk and associates (*382*) allowed smokers attending clinics to choose group therapy, individual therapy, or hypnosis, 193 of 571 (34 percent) chose hypnosis. The group therapy-reported abstinence rate (49 percent) was significantly superior to those of both hypnosis (38 percent) and individual counseling (33 percent) at treatment termination. By 1-year follow-up, however, all three conditions showed marked relapse, leaving only 17 to 21 percent of the participants reporting abstinence. While assignment to conditions was self-selected and nonrandom, the failure of hypnosis to replicate clinical claims remains important.

Barkley and associates (*18*) found that group hypnosis did not significantly differ from an attention-placebo control in mean smoking rates at any point during treatment or follow-up, but it had more subjects claiming abstinence at the 12-week follow-up point (4 of 8 vs. 1 of 9). At the 9-month follow-up, only two of eight (25 percent) of the hypnosis subjects were reporting abstinence versus none for the control. Francisco's (*105*) unpublished dissertation appeared to have reached a similar conclusion. It has been suggested that a 15 to 20 percent success rate for hypnosis may reflect the expected proportion of subjects highly susceptible to hypnosis (*297*).

Social Psychological Approaches

Higbee (*159*), Leventhal (*216, 217, 218, 219*), and Rogers (*332*) have reviewed most of the data from field and laboratory studies conducted to test responsiveness to persuasive communication regarding cigarette smoking. While most studies on smoking have produced attitude changes without marked or lasting reductions in smoking behavior (*181, 182, 231, 239, 244, 303, 321, 401*), this area of research has clarified several basic aspects of the smoking cessation process. The results and implications of these studies have been summarized by Leventhal (*216, 217, 218, 219*) and Rogers (*332*).

Janis and Hoffman (*181*) demonstrated the facilitating effects of daily telephone contacts that persisted well into follow-up despite termination of the contacts. Unfortunately, mean-rate reductions rather than abstinence rates were reported. Rogers and associates (*333, 334*) have recently documented the long-term impact of several communication strategies on smoking behavior. They reported significantly higher abstinence for high-fear versus low-fear messages in a college sample at 3-month follow-up (22 percent vs. 7 percent), and in a community sample at 1-year follow-up (18.8 percent vs. 0 percent).

Suedfeld's unexpected results with a single exposure to 24-hour sensory deprivation (SD) are also impressive (*405, 406, 407*). In a pilot study with five subjects, four quit after treatment and were reporting abstinence for 1 to 3 months afterwards (*406*). In a controlled study

(*407*), almost all SD subjects were reported to be abstinent at treatment termination, and 10 of 37 (27 percent) appeared to remain so at 12-month follow-ups when only 4 of 35 (11.4 percent) of control-condition subjects were reporting abstinence. Recently, Suedfeld and Best (*405*) piloted a combination of SD with a complex behavioral program involving aversive smoking and reported abstinence in four of five subjects for over 8 months.

This latter finding is supportive of Leventhal's (*216, 219*) conclusion that attitude change without a meaningful plan for action will not produce behavioral change. Hence, additional integrations of attitude and behavior change procedures seem worthy of investigation.

Social Learning and Behavior Modification Approaches

Research based on experimental and social learning theories (*12, 14, 106, 168, 169, 172*) has produced a wide diversity of controlled studies. Unfortunately, most of the early research on techniques that had been successful with other behavioral problems (*106*) or were derived from the principles of experimental psychology and laboratory research on behavior change proved to be minimally effective in producing long-term changes in smoking behavior. While early reviewers (*24, 200, 230*) acknowledged these discouraging initial treatment results, they concluded that the more empirical approach of these procedures made them the most promising. These hopes have been only partially fulfilled (*243, 451*).

Specifically, many studies have been more concerned with theoretical comparisons based upon evaluations of smoking-rate changes than with developing techniques with documented efficacy based on long-term abstinence data. Techniques were often found to be at least temporarily superior to control conditions, but the effects either vanished during follow-up or no meaningful follow-up was conducted (*25, 53, 59, 64, 70, 107, 132, 135, 139, 155, 197, 199, 201, 206, 207, 209, 212, 215, 220, 221, 242, 255, 260, 273, 276, 280, 281, 287, 317, 377, 384, 394, 408, 409, 426, 434, 435, 436, 437, 447*).

This pattern has been especially common in dissertation research on smoking. Most such dissertation research has been conducted by doctoral candidates and supervised by committees who generally have solid experimental and methodological backgrounds but limited clinical experience with smokers (*225*). Armchair and theoretical analyses of smoking have too often led to experimental and control conditions of some theoretical interest but which typically produced no relative differences among groups at follow-up and weak absolute results as measured by abstinence rates (*225, 376*). Furthermore, graduation pressures usually lead to insufficient follow-ups of only 1 to 3 months (*225*). The number of unpublished doctoral dissertations of this type document how much well-meaning effort has been devoted to the production of largely inconclusive results (*10, 20, 34, 35, 38, 60, 69, 87,*

88, 96, 118, 123, 125, 127, 134, 146, 161, 187, 188, 191, 196, 236, 249, 268, 277, 292, 315, 328, 342, 357, 365, 385, 386, 411).

Overall, the methodology of the research based on learning-theory approaches has been improving (*26, 226, 376*). Most studies have utilized appropriate designs and controls, follow-ups are becoming longer, and, most encouraging, validation of self-reported abstinence has become more common. Confirmations by informants in the participant's natural environment have been the mainstay (*8, 21, 22, 27, 28, 31, 32, 59, 64, 71, 85, 123, 141, 142, 197, 202, 206, 210, 229, 240, 242, 251, 279, 292, 313, 362, 394, 446*). However, carbon monoxide monitoring (*71, 206, 351*), threatened or actual urine nicotine analyses (*308, 409*), a bogus marketing survey procedure (*94*), and attempted (*80*) or actual (*48, 246*) thiocyanate analyses have now been reported. Although the outcome data on most procedures have been quite variable, the stricter methodology of these studies has encouraged continued refinement of interventions. More recently, effective multicomponent programs have begun to develop from this earlier research. The wealth of studies will be discussed briefly, therefore, with special emphasis given to those research trends that have produced programs with documented effectiveness. More detailed discussions of the literature are available in past (*24, 200, 230, 366*) and recent (*26, 29, 226, 245, 368, 376, 413*) reviews.

The research in this area can be grouped loosely into two broad, but not mutually exclusive, categories: (1) behavioral self-control strategies utilizing high participant involvement and (2) aversion strategies designed to reduce the probability of the smoking response (*226*). However, the most effective programs have tended to be multicomponent interventions which combine certain strategies from both categories.

Self-Control Strategies

Stimulus Control

The basic philosophy of behavioral self-control treatments has been to provide the subject first with increased awareness of the target behavior and controlling stimuli and then with specific self-management skills to control the target behavior (*13, 14, 193, 241, 314, 414, 415*). Therefore, self-monitoring of individual smoking behaviors has been a fundamental element in all behavioral self-control programs. As a sole treatment, self-monitoring has rarely produced more than temporary treatment effects (*60, 87, 109, 250, 251, 288, 365, 411*) and has been classed with the nonspecific treatment factors common to almost all behavioral programs (*251*). Self-monitoring has usually been combined within stimulus control treatments to make subjects aware of the specific environmental and internal cues associated with smoking urges and behaviors.

These stimulus control programs have been based on learning-theory formulations (*168, 169, 172*) of smoking behavior that suggested cessation is difficult because smoking is prompted by such a variety and range of cues. Subjects were taught to reduce the strength of these cues either by eliminating smoking from an increasing number of situations or by making time intervals the only controlling cue (*24, 26, 226*).

While this process theoretically should, with rare exceptions (*311, 344, 345*), make cessation easier, most subjects were reported to have difficulty reducing below 10 to 12 cigarettes per day (*8, 10, 23, 59, 104, 139, 221, 242, 313, 377*). It has been suggested that, when most smokers reached that reduced level, each cigarette became more reinforcing and difficult to give up (*104, 243*).

Most studies involving a variety of stimulus control and other self-management techniques were shown to be at best only temporarily superior to control conditions. These studies have produced, in general, the common pattern of temporary reduction but rapid relapse and long-term abstinence rates that did not differ from those expected from nonspecific treatments (*10, 23, 60, 69, 87, 104, 125, 132, 139, 146, 155, 188, 191, 196, 197, 199, 221, 242, 260, 264, 273, 277, 279, 280, 328, 355, 365, 377, 385, 386, 411, 435*). Even when applied within more complex, multicomponent programs, the stimulus control-based treatments often produced only moderately encouraging findings (*48, 104, 155, 255, 273*). Some encouraging applications have been noted (*44, 45, 308, 416*), however, especially when the programs develop from systematic research and the programs offer behavioral training in a wide range of skills (*42, 310*).

Contingency Contracting

One specific technique that has produced some encouraging data involves the depositing of money for later disbursement based on attainment of specified goals. Early research on the technique was equivocal (*24, 200, 224, 230*), but several studies have produced impressive results. Elliot and Tighe (*95*) reported 84 percent abstinence at treatment termination, with 4 of 11 (36 percent) in two other groups followed up 15 to 17 months after treatment. However, the treatment also involved public pledges, stimulus control techniques, and group support.

Winett (*446*) found that 50 percent of the subjects in contingent repayment condition were abstinent, validated by informant reports, at 6-month follow-up, but only 23.5 percent of those in noncontingent repayment were abstinent. Multiple case studies by Axelrod and associates (*6*) and a study by Rovner (*342*) were also encouraging. Brengelmann (*44, 45*) has reported notable success in recent studies utilizing contingency contracting within a treatment-by-mail program. Forty-seven percent of those responding to the 15-month follow-up