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MASSSED TRIAL PRACTICE COMBINED WITH A
"RITUALIZED" ALTERNATE RESPONSE IN THE
REDUCTION OF CIGARETTE SMOKING.
A COMPARATIVE STUDY.

Hélène Grégoire

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ABSTRACT

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MASSSED TRIAL PRACTICE COMBINED WITH A "RITUALIZED"
ALTERNATE RESPONSE IN THE REDUCTION OF CIGARETTE
SMOKING. A COMPARATIVE STUDY.

A rapid smoking aversion technique and a ritualized relaxation response were examined under masssed trials alone and in combination for their effectiveness in reducing smoking behavior. The 57 subjects were divided into 6 groups and run for 6 weekly sessions. The groups were as follows (1) Relaxation-Satiation-Smoke (R-S-Sm) which began with a training in relaxation for the first 3 weeks, followed by 6 consecutive days of masssed practice rapid smoking. Finally, subjects continued to rapid smoke during the fifth and sixth week of treatment; (2) Relaxation-Satiation-No-Smoke (R-S-No-Sm) in which subjects did not rapid smoke at subsequent sessions; (3) Satiation-Smoke (S-Sm) practiced rapid smoking throughout the treatment; (4) Satiation-No-Smoke (S-No-Sm) practiced rapid smoking during the first 6 consecutive days of treatment only; (5) Relaxation (R) and (6) a minimal treatment-minimal-contact

control group. A seventh group of 9 unmotivated subjects simply recorded their daily cigarette intake. The results showed a significant reduction in cigarette consumption for all five active treatment groups, with the greatest decrease produced by the two combined techniques (R-S-Sm and R-S-No-Sm). Both satiation and combined groups differed significantly from relaxation and from the two control groups. No significant difference was found between the two modes of massed practice. The results of the long-term follow-up showed that all treatment groups increased their smoking but remained significantly less than baseline rate. The one exception is the S-No-Sm group which returns to baseline smoking. It is argued that a combined approach which modifies both the positive and negative reinforcement consequences of cigarette smoking is superior to a single technique which modifies only one type of reinforcement. The massed sessions may have played an important role in creating stronger conditioned aversion.

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One of the major medical reports to date concerning the health hazards of smoking was presented by the Surgeon General of the Public Health Service (Smoking and Health, 1964). This research based its findings on animal experimentation, clinical and autopsy investigation and epidemiological studies. The latter demonstrated that, compared to nonsmokers, cigarette smokers suffered a 70% higher death rate from coronary artery disease, the leading cause of death in the U.S.A. for that period of time, a 500% higher death rate from chronic bronchitis and emphysema, and a 1,000% higher death rate from lung cancer. The report also stated that the probability of developing such diseases increased directly with the number of cigarettes smoked per day, a low intake such as 10-12 cigarettes a day providing less risk. From the final statement of this report that, "cigarette smoking is a health hazard of sufficient importance in the U.S.A. to warrant appropriate remedial action", it is clear that there is a need for further investigation of that problem to examine either

means of prevention and specific treatments or strict legislation. The goal of any good therapy would be to produce complete abstinence in order to maximize the chances of avoiding these smoking related diseases, or at least to reduce intake to a low consumption of 10-12 cigarettes a day.

In recent years massive advertising campaigns in both Canada and the United States in the press, on radio or television have been used in order to effect change regarding attitudes in relation to smoking, that is, to create negative attitudes towards smoking. In certain areas, special legislation has been passed in the way of heavier taxes on the sale of tobacco. Massive education was undertaken and anti-smoking publicity was conducted through smoking clinics, schools and television in order to encourage abstinence.

How is it that so many millions of people continue to perform a behavior the harmful effects of which have been amply demonstrated? Answering this question demands further research into the psychological nature of this

behavior, the factors that predispose people to acquire and maintain the habit, and the difficulties met by the smoker in his process of quitting. The possibility of developing a physical dependence to nicotine has not been demonstrated because, as suggested by Bernstein (1969), there is no abstinence syndrome in terms of withdrawal symptoms. Some evidence exists that there is at least some general metabolic adjustment and a certain degree of physiological tolerance in heavy smokers; this tolerated amount of nicotine in one's system varies considerably with different individuals. Jarvik (1970) mentioned that most recently smoking has been called "a psychic dependence". According to the Surgeon General's report, it is a "drug habituation, and its beginning and occasional discontinuation is to a large extent psychologically and socially determined". Jarvik's position is that nicotine may play the role of a primary positive reinforcer which stimulates reward mechanisms in the brain, and therefore can maintain the smoking habit. Therefore, the smoking behavior is reinforced.

by the pharmacological effects of nicotine and, the stimuli associated with the act of smoking acquire conditioned reinforcing properties that help to maintain the behavior in strength.

The psychoanalytic speculative views of smoking as an oral compensation like thumbsucking seems unlikely, based on the inability of smokers to successfully switch to nicotine-free cigarettes.

In general the use of nicotine substitutes however, has not yielded successful results.

Substitutes such as lobeline sulfate and others (Keutzer, Lichenstein, and Mees, 1968; Bernstein, 1969) were ineffective in maintaining abstinence, thus weakening the notion that nicotine or nicotine-like substances are the primary ingredients maintaining smoking behavior.

Other research has examined the differences in personality traits between smokers and non-smokers in order to demonstrate that smoking is related to certain personality characteristics.

A variety of measuring techniques have been used to demonstrate that cigarette smokers are more extroverted, more anti-social, more impulsive, and more externally controlled than non-smokers.

These correlations although significant in many cases, have failed to be predictive of successful therapeutic outcome (Keutzer, 1968; Lichenstein and Keutzer, 1969; Best and Steffy, 1971; Bernstein, 1969). Although Coan (1973) with his "six-hour battery" of a smoking inventory found that smokers showed more extraversion, more liberalism and more inclination to favor spontaneity than nonsmokers, he agreed with the fact that we need to know much more about "variables underlying the self-regulation or control of habits and the ones underlying the overall organization or integration of the personality in order to gain insight into the personality factors that are really conducive to the assumption of the smoking habit and to its maintenance in heavy dosages in the presence of compelling arguments for abstention".

Two broad patterns of smoking were found among smokers: a "maladaptive smoking pattern" (characterized by tension, ingrained habits; correlated with high anxiety, lack of organization, lower experienced control) and an "adjustive smoking pattern", (characterized by

greater pleasure and relief from tension, associated with control productivity, and a positive relationship to the environment).

The differing patterns of smoking appeared to reflect to a certain degree differing patterns of living that "predate" the individual's use of cigarette. Therefore, better and larger scale research must be done in order to tailor successful programs or strategies to fit the needs of different kinds of smokers, perhaps a strategy of self-control and one directed toward providing alternate satisfactions.

Having reviewed the literature concerning the nature and personality traits of smokers, along with theoretical statements about the cause of smoking (i.e., the hypothetical aspects of the smoking investigation) we may examine the techniques which have been used to reduce or prevent smoking behavior. Mass-media, smoking clinics and other means of publicity emphasize a well-known fact, the cognitive dissonance state of the smokers. Although some smokers feel the long-term aversive consequences of their habit, the pain and health problems, they still yield to

the short term pleasure of smoking. Dubitzky and Schwartz (1969) demonstrated such a tolerance of the cognitive dissonance state by smokers. A study done by O'Keefe (1971) confirms this finding and adds that only persons already inclined to quit smoking reported that the anti-cigarette commercials had had any effect. This notion leads us to the question of what kind of research should be done in the area of how to effectively manipulate this cognitive dissonance state and effectively help people to stop smoking, or at least make them aware of a possible remedial action.

Some approaches have tried to control variables that either initiate or maintain smoking behavior in a fairly broad aspect. Withdrawal clinics, especially that run by Eyrup (1964), through a combination of techniques like group discussions, information, use of drugs such as nicotine substitutes, primarily Lobeline or other chemical agents, have had a great deal of success in producing short term abstinence. Eyrup (1963) reported an immediate quitting rate of 76%; 97.5 % of

subjects reduced consumption by at least 70% and 96.6% of all subjects reduced smoking by at least one half; at six month follow-ups 44% of the quitters were still non-smokers. Eyrup did state, however, that uncontrolled variables such as suggestion and placebo effect may have at least partially accounted for those impressive results. The well known "clinic" of The Five Day Plan (McFarland, 1964) used a fear arousing (film) technique, a buddy system and medical and religious techniques, etc. for five consecutive days. A three month follow-up showed, according to Guilford (1966) who followed subjects in two Five Day programs, that this group was not significantly different from a no-treatment control group although it had reached 91-100% reduction at the end of the treatment. The efficacy of these approaches must be questioned in light of the follow-up data with respect to the specificity of treatment variables.

A different approach, that of group therapy, used control group or other treatment methods as bases for comparison. In 1969, Dubitzky and

Schwartz (the best controlled evaluation of this approach) by comparing drugs, individual counselling and group counselling found that none of these was statistically better than a no-treatment control group. More recently, Tamerin (1972) identified the psychodynamics of quitting smoking. First, in addition to the Schwartz and Dubitzky's findings that feelings of low-esteem correlated with an inability to stop smoking, it was revealed that anticipation of failure, the fear loss of control and the affective significance of the loss were associated with a subsequent lack of success in quitting. Here again the problem of recidivism common to many studies raised the idea of having long-term support from a non-profit organization modeled on Alcoholics Anonymous. This approach, which stresses support through the use of a buddy as in Janis and Hoffman's study (1971), might be of assistance to smokers anxious to develop stronger anti-smoking attitudes, since the "buddy system" allows more interpersonal attraction and internalization of the group norms. In that study, after a one year follow-up, subjects with a

"high-contact" partner continued to smoke fewer cigarettes.

Drug therapy using deterrents or nicotine substitutes like Bantron^R were classified as ineffective by the Surgeon General's Report (1964) (page 354). A second class of deterrents, suppressants such as Valium and Miltown were tried in order to reduce symptoms of nervousness, fatigue, hunger and irritability or the anxiety which was thought to originate from smoking or, following the cessation of smoking; stimulants such as amphetamine, caffeine and others were also used. These drugs were all evaluated with negative results. Similar conclusions were drawn from a review on hypnosis done by Johnstone and Donaghue (1971) where post-hypnotic effects were temporary.

It follows from these studies and many others (Bernstein, 1969; Keutzer et al., 1968; Johnstone and Donaghue, 1971) that failure to account adequately for the significant behaviour change brought about was due to either (i) the non-specific factors which had created only a temporary cure (suggestion, social pressure,

demand characteristics, placebo effect), (ii) poor design and methodology (therefore making it difficult to generate data in a meaningful way), (iii) failure to include an appropriate control group, (iv) simultaneous manipulation of more than one variable in the same condition, (v) treatment period attrition and/or (vi) loss of follow-up contacts and some failure was due too to the incorrect treatment procedure. In order to validate any theory, it must be possible to test and verify the hypothesis and its predictions under rigorously controlled experimental conditions. Therefore, it is important to look for measurable variables in accounting for the acquisition and maintenance of smoking behavior. One important feature of the smoking behavior is that since a smoker of a pack a day takes about 60,000 puffs a year, all of them accompanied by the same kind of movement and stimuli, it is not surprising that secondary reinforcement becomes very strong (Jarvik, 1970). In a similar view, Hunt and Matarazzo (1970), define smoking behavior in terms of "a fixed behavior pattern

overlearned to the point of becoming automatic and marked by decreasing awareness and increasing dependence on secondary, rather than primary reinforcement". Previously, the Surgeon General's Report called it: "habituation", although Jarvik (1970) mentioned a "psychic dependence" based on primary reinforcement.

An easily testable approach to the smoking problem is offered by the learning theory model where the behavior learned is modifiable by and related to, a "finite number of stimulus classes". Under this approach, first, the "target behaviour" method may be used. The smoking behavior in terms of measurable units (cigarettes smoked) and decrements due to specific treatment conditions may be easily discerned. Second, treatments may be systematically instituted and withdrawn and their individual effects measured so that accurate estimation of their utility may be derived. Third, the relative facility of the implementation of these methods make them most desirable. Therefore the behaviour modification approach to cigarette smoking cessation seem to be the most

feasible and fruitful in this regard (Berstein, 1967; Keutzer et al., 1968; Hunt and Matarazzo, 1970).

Behavior Modification Approach:

Independent of all the previous definitions, the behavior modification approach as a systematic analysis considers the smoking behavior as a chain of events consisting of some triggering stimulus, a smoking act, and its consequences. In order to eliminate this habit, the chain of events must be broken in some way. Treatment could take either of two approaches: (1) the peripheral issue which attempts to change the environmental contingencies or cues reinforcing the smoking behavior like in the self-control procedures of Nolan (1968) and Roberts (1969), like in the stimulus control procedures of Azrin and Powell (1968), Shapiro, Tursky, Schwartz, and Shnidman (1971), or Levinson, Shapiro, Schwartz, and Tursky (1971); altering external variables to the act itself such as changing the subject's attitudes towards smoking (Dubitzky and Schwartz, 1969; Janis and Mann, 1965); or reducing the anxiety leading to

smoking behavior (Kraft and Al-Issa, 1967). (2)

Another type of approach could attempt to change the immediate consequences of smoking i.e., smoking could be punished through electric shock (McGuire and Valence, 1964; Koenig and Masters, 1965; Powell and Azrin, 1968; Ober, 1968) or non-smoking behavior could be rewarded. Again some therapies have attempted to suppress smoking behavior by making the pleasurable feelings associated with smoking unpleasant by using satiation (Resnick, 1968) covert sensitization (Cautela, 1970), or employing any aversive stimuli as punishers. Suppression of smoking behavior implies replacement or substitution by something else, attempts to produce either a reduction of anxiety leading to smoking, or an alternative source of satisfaction to the smoking act (Kraft and Al-Issa, 1967; Koenig and Masters, 1965). This should promote a longer maintenance of abstinence. Therefore, although the smoking behavior has multiple causes, e.g., social, physical, cultural, the most important fact for a learning approach is to study the behavior itself and the variables maintaining it, manipulating the latter in such a way that their reinforcing cues

(internal and external) can be effectively diminished or eliminated in the establishment of a valid treatment (Surgeon General's Report, 1964).

The results of these techniques have varied in their demonstration of successful abstinence. Bernstein (1969) pointed out the presence of non-specific factors such as experimenter bias, suggestion, placebo effect, attention, etc., as factors participating in the behavior change observed. Keutzer, Lichenstein, and Mees (1968) add other considerations such as the limited number and highly selected nature of the subjects used which reduce the predictive value of a treatment. Treatment time is frequently minimal (Rutner, 1967) as if experimenters assumed that subjects can easily learn to stop smoking. The lack of long-term follow-ups and the inadequacy of some of the contingencies meant to be generalizeable outside of treatment sessions, are important considerations in the discussion of the efficacy of any given treatment. These facts may account in part for some of the failures of behavior therapy.

Institution of Environmental Control of Smoking:

The notion that the external reinforcing determinants of behavior can be manipulated has been considered by many authors. Nolan (1968) changed the discriminative stimuli which had previously elicited smoking by forcing subjects to smoke on a specific chair. Sitting in the chair produced time out from various social and environmental reinforcers. Extinction was achieved after 28 days. Roberts (1969) replicated the previous findings by adding to the bathroom SD (discriminative stimulus) a no-reading or talking discriminative stimulus and showed significant results after the first month of treatment. The self-control was noted in both cases as important in achieving the results.

Azrin and Powell (1968) had their subjects use a cigarette-case that automatically locks itself for a predetermined period of time after a cigarette is removed, and demonstrated a decrement up to one half pack per day in 7-13 weeks. A similar yet modified procedure was the gradual reduction technique (Shapiro et al., 1971) where an attempt was made to break the link between

the environmental cues and the smoking response. This technique is based on the concept of a possible transfer of the smoking response to a controllable neutral stimulus and is tailored to each individual's smoking rate. Instead of using equal time intervals, Azrin and Powell (1968) tried a procedure using a random time signalling device and obtained an initial 75% reduction in cigarette smoking from baseline, with a reduction of 43% at six week follow-up. In a similar approach, Levinson et al. (1971) added group support to the use of a time-signalling device. He found a differential effect on the long-range elimination of smoking and on the morale of the group: 3 out of 4 subjects in the timer conditions were abstinent three months later. Although Dubitzky and Schwartz (1969) mention that "even light smoking serves as a constant reminder of the pleasure of cigarettes, thereby making the habit resistant to change", both the Shapiro et al. and Levinson et al.'s studies support the idea of weakening the power of environmental cues, and therefore weakening the previously established reinforcement schedules.

Mloft (1974) suggested self-control or monitoring of one's own behavior accompanied by the rearrangement of the usual routine associated with the smoking act, e.g. breaking the link between a cup of coffee and a cigarette might be one target. It was also helpful to find an alternate source of relaxation to replace the smoking habit, assuming the smoking behavior produces relaxation. Self-monitoring of the subjects' own behavior, like recording or keeping the frequency of the undesired behavior might be a useful tool for disrupting the behavioral chain of smoking. Euler (1974) has reported a 2/3 reduction of cigarette intake using this technique. Previously, McFall and Hammen (1971), wrote about specific factors like motivated volunteering or participations in a structured program that can contribute to temporary behavior change in most smoking treatments. Because of the low drop out rate and the fact that there is no unpleasant emotional effect attached to self-monitoring, it could be used as an adjunct to other treatments. It should be noted that the timing of the self-monitoring in the chain of

behavior may be important.

Rosensky (1974) introduced keeping a written record prior rather than subsequent to cigarette consumption and completely eliminated the smoking behavior of a 49 year-old female. Karoly and Doyle (1974), however, contradicted this finding stating that timing has no appreciable effect independent of the induced expectancy for change. Clearly, controlled and broader experimental work is necessary.

Contrary to the idea of rearranging the usual routine associated with smoking, a study designed to remove familiar smoking cues (Suefield and Ikard, 1974) involved placing subjects in a socially isolated environment for 24 hours. A one year follow-up demonstrated a 10% vs 48% reduction of smoking in controls vs experimental subjects. This therapy seems to work with heavy smokers as well. With the latter group, instructions similar to those used in systematic desensitization were used in addition to rewarding messages to encourage the person to continue.

In an attempt to change the smoking attitudes

and habits of the smoker, the emotional role-playing technique described by Janis and Mann (1965) was used by Lichenstein, Keutzer, and Himes (1969). Each subject portrayed a patient receiving the news from a doctor that he had lung cancer necessitating an operation and cessation of smoking. No significant results were found between subjects and a control group listening to a tape, and the magnitude of the change in smoking rate was small. On the other hand, the problem of cognitive dissonance is met not only at the publicity level but at the treatment level as well. Following Keutzer's opinion that a higher cognitive dissonance state would make for more effective treatment, (although Dubitzky and Schwartz (1969) proved the contrary with the notion of "tolerance" of the cognitive dissonance), Best and Steffy (1971) showed that the timing of the instructions to stop smoking must be set according to the level of this cognitive dissonance in the subjects i.e. subjects with strong feelings of dissonance profit more from the immediate order to quit (low dissonance induction program) while those with low

levels of dissonance need time in order for the dissonance to build up. In addition to this, subjects should be taught means of altering their own level of cognitive dissonance at the follow-up period. That is to say, the cognitive dissonance can be manipulated by a specific treatment e.g. the satiation technique like the one used by Lublin and Joslyn (1968), or Resnick (1968) where the subjects regain control over their behavior by increasing the amount of their own physical and psychological discomfort. This manipulation can be done in a positive way, and other means will be presented in the discussion section of this paper.

Another peripheral attempt at controlling smoking behavior is the model based on anxiety reduction through systematic desensitization by "reciprocal inhibition" (Wolpe, 1958). In this model, successive approximations to an anxiety-evoking (phobic) event and presented to the subject while relaxed, until the event itself is non-anxiety evoking, has been attempted successfully with pervasive phenomena such as interpersonal anxiety in social situations and

used later in smoking study. Koenig and Masters (1965), however, found that systematic desensitization was not significantly different from either supportive counselling or aversive electric shock in the long run, even though all these treatments were successful in the short term and although a significant therapist effect was discovered. In a clinical case study, Kraft and Al-Issa (1967) found in treating five alcoholics with systematic desensitization for their social difficulties, that tobacco intake decreased concurrently. This phenomenon may be evidence for the generalization effect of systematic desensitization, especially due to the very strong pairing of alcohol intake and cigarettes in our society. Wagner and Bragg (1970) hypothesized that maintenance of the smoking habit involves both positive and negative reinforcement at the same time. However a combination of systematic desensitization which decreases the negatively reinforcing aspects of going long periods without a cigarette and covert sensitization which modifies the positively reinforcing

qualities of cigarettes by conditioning an avoidance response, failed to show any significant difference from other groups using (i) relaxation, (ii) counselling and (iii) desensitization alone; but it appears that the combined group of systematic desensitization plus covert sensitization was associated with less increase in smoking when compared with the other treatment procedures at the end of treatment. A more significant maintenance of smoking reduction was shown after a 90 day follow-up. More recently, Levenberg (1974) hypothesized that "anxiety-subjects" would respond more favourably to a treatment like systematic desensitization and that "non-anxiety-subjects" would respond more to an aversion therapy approach. He failed to obtain significant results during treatment although at a post-treatment time rapid smoking procedures had produced better results than systematic desensitization (but no better than an attention placebo). It was thought that the inadequacy of the arousal procedure used to separate "anxiety-subjects" from "non-anxiety-subjects" was the cause of this failure. The use

of booster sessions was nevertheless a great innovation in this therapy. In this vein, the German authors Graessner and Bastine (1973) showed with negative practice (satiation) a reduction to about 80% of the baseline after one week of treatment and 50% at six week follow-up while after the seven week desensitization, consumption was reduced to about 50% and stayed the same at six week follow-up.

Altering Internal Cues:

The procedures previously outlined were based primarily on the assumption that smoking behavior is elicited and maintained through external (i.e. environmental) cues. A different approach is to attempt the elimination of smoking behavior through altering internal or "covert" (e.g. thoughts, fantasies, etc.,) that are important in the elicitation of reinforcing cues to smoking. Homme (1965) describes the use of Premack's principle where "for any pair of responses, the more probable one will reinforce the less probable one", and applied it to the covert behaviours related to smoking. This technique is based on the use of

coverants incompatible with smoking (e.g. the covert operant such as "smoking causes cancer" paired with highly probable behaviors such as a cup of coffee) and thereby increase their frequency in an attempt to reinforce the non-smoking. Keutzer (1968), Wagner and Bragg (1970) also tried this but found no difference from other techniques attempted like: breath-holding, negative practice, systematic desensitization, counselling and relaxation.

In a similar approach, Cautela (1968) with the covert sensitization technique (a variant of Wolpe's (1958) systematic desensitization) in a similar paradigm used both conditioned and unconditioned stimuli with covert stimuli. In this experiment, the subject was asked under relaxation to imagine himself committing the undesired act of smoking and pair this with imaginal aversive stimuli. Tooley and Pratt (1967) used this covert sensitization technique with two subjects in combination with contingency management plus contractual management and obtained abstinence after 17-35 days of treatment. Wagner and Bragg (1970) used

covert sensitization in combination with systematic desensitization and the two techniques separately with less increase of smoking in the combined group.

Sipich, Russell, and Tobias (1974) demonstrated that while covert sensitization is effective in reducing behavior, it was not significantly different in its effects from attention placebo and self-control. Therefore, the effectiveness of covert sensitization seems less a function of the therapy itself than the use of non-specific elements associated with its use. Recently, Barrett and Sachs (1974) criticized and discarded the classical conditioning explanation of covert sensitization (where the CS is a smoking scene and the UCS is the aversive scene) in favor of some cognitive, motivational or non-specific factor. He used several variations of covert sensitization (forward pairing of CS and UCS, backward pairing, backward pairing with 60 second intervals between the pairing, and UCS alone). Since there was no significant difference between any of these conditions, it is possible that the effectiveness

of covert sensitization is based more along motivational lines (i.e., cognitive dissonance perhaps) than on parameters related to conditioning.

Although the covert technique used covert stimuli far removed from the activity itself, the technique may also be used as an adjunct to techniques modifying overt stimuli which elicit or maintain cigarette smoking. A motivated subject who has already made the decision to quit smoking might benefit from such a booster technique and internalize his decision more strongly.

Punishment:

Another line of research which attempts to reduce the frequency of the smoking habit has been the use of punishment. As defined by Azrin and Holz (1966) this is the attempt to reduce the probability of a response as a result of a punishing stimulus made contingent on that response. Several researchers have employed aversive stimuli contingent upon smoking, such as: (i) electrical stimulation (McGuire and Valence, 1964; (ii) drugs producing nausea (Raymond, 1964;

Whitman, 1969); (iii) covert sensitization (Keutzer, 1968); (iv) and other unpleasant stimuli that could be a potential source of punishment (Greene, 1964; Wilde, 1964; Grimaldi and Lichenstein, 1969; Keutzer, 1968).

The use of electric shock has become popular with investigators attempting to reduce cigarette smoking, mainly because it is very controllable and easily delivered. McGuire and Valence (1964) used electric shock alone after inhalation on a cigarette and showed that 6 of 10 subjects at one month follow-up ceased smoking. As mentioned previously, Koenig and Masters (1965) delivered electric shock to the hand on an intermittent basis for 18 separate responses considered part of the behavioral smoking chain. At 6 month follow-up, however, the 25% reduction in cigarette intake did not differ significantly from the two other groups: systematic desensitization and supportive counselling. In a different paradigm, Whitman (1969) used three different treatments: information, aversive conditioning and self-control, in addition to a non-treated control

group. The aversion group received two aversive agents: quinine and shock. During the two first weeks they placed quinine on their tongue after taking the cigarette from the pack and just prior to lighting it. After the second week, subjects self-administered electric shock from a pocket sized aversive stimulator. They shocked themselves three times for every third cigarette. If they still wanted a cigarette, they took the quinine before lighting up. While there was a reduction at the three month follow-up, there was no significant difference between the treatment group and the control group, nor was there any therapist effect. This may have been due to the standardized training of the non-professional therapists.

In the same vein, (i.e., attempts to modify the smoking behavior within its natural context) Powell and Azrin (1968) used a portable cigarette case which delivered a shock to the subject when opened. This technique led to a heavy rate of attrition because subjects preferred not to wear the case in order to avoid the shocks which gradually increased in intensity.

The effect of the shocks lasted as long as the apparatus was in use and returned to baseline after its discontinuation. The rate of smoking decreased as a function of increasing shock.

In another study where subjects self-administered shock through a portable aversive stimulator whenever they desired a cigarette, Ober (1968) remarked on the difficulty encountered by subjects asked to shock themselves. The author found no significant difference between the aversive group, an operant self-control group, a group treated with transactional analysis and a no-treatment control group.

Steffy, Meichenbaum, and Best (1970) showed that aversion procedures rarely produce better than a 60% reduction in cigarette intake by the end of treatment, while other forms of behavior therapy (Keutzer, 1968; Ober, 1968; Lichenstein and Keutzer, 1968) demonstrated a reduction of approximately 75% at follow-up. Experimenting with the aversive technique, Steffy et al. (1970) manipulated cognitive factors associated with smoking and integrated them in an aversive paradigm using electric shock. The integration

of such cognitive factors in the design was supported by the results recently published by a number of behavior therapists (Koenig and Masters, 1965; Lichenstein and Keutzer, 1969; Ober, 1968) which showed that placebo, attention control and other non-specific procedures resulted in improvement rates comparable to those of aversive techniques. Bernstein's analysis of possible confounding elements and the success of the Eyrup (1964) clinic encouraged them to examine the role of cognitive factors in treatment. Steffy et al. (1970) extended the aversive conditioning paradigm to include both overt and covert verbalization describing the smoking act. Here the shock was administered by a therapist but the subject could terminate the shock by stopping smoking. Three experimental conditions were used: overt verbalization - action (i.e. benefit of an actual cigarette); covert verbalization; and overt verbalization - non-action (without benefit of an actual cigarette and without behavior rehearsal). They found that the group which had been shocked for smoking in an escape-avoidance paradigm while covertly

imagining themselves in a smoking situation were smoking less at 6 month follow-up than the overt verbalization groups and the insight control group.

These results follow the same line as the best overall results others have obtained at 6 month follow-up (Lichenstein and Keutzer, 1968) using covert control and placebo conditions. Steffy explained the positive results of the covert verbalization condition in terms of the greater emotional involvement of the subjects who were exposed to a better representation of the implicit stimuli which lead to smoking behavior. This led to more effective aversive conditioning, and the beginnings of post-treatment transfer of training to outside the laboratory.

This kind of emotional involvement is similar to that produced in role-playing which has occasionally produced encouraging results (Janis and Mann, 1965; Mausner and Platt, 1971; Tooley and Pratt, 1967). In fact Tooley and Pratt demonstrated that, to a certain degree, the reduction in Cigarette intake after role-

playing was related to the subjects perceived increase in the benefits of abstinence. This shift in the subjects perception of smoking may be the main determinant of his decision to stop, and provides us with a realistic way of approaching smoking in contrast to covert control techniques. Role-playing allows the subject to feel that he himself is responsible for the successful resistance to the temptation to smoke, and this pride in his own determination serves as positive reinforcement for not smoking. According to Mausner (1971) the temporary reduction of smoking by aversive control is due to the fact that internal contingencies of an aversive nature rarely persist outside the therapeutic setting. It is suggested that behavior therapy might work if it created powerful internal contingencies in which positive reinforcements are linked to the act of refraining from smoking. This leads the ex-smoker to the necessity of finding a real good alternate source of satisfaction for the needs which were fulfilled by smoking.

Chapman, Smith, and Layden (1971) tried to

eliminate cigarette smoking through the use of punishing electric shock combined with self-management training under two different conditions of follow-up therapist monitoring (two-weeks -vs- eleven weeks post-treatment therapist monitoring). Subjects were instructed to abstain by the fifth successive treatment. Among the short term monitoring group only 3 of the 11 subjects remained abstinent at the one year follow-up, whereas in the long-term group 6 of 11 subjects remained abstinent. The authors used an unpunished alternate response, i.e., tea or coffee following the butting of the cigarette. There was frequently rehearsal of an emotional response routine e.g. changing of the discriminative stimuli for smoking, and smoking of the least preferred brand of cigarette. This self-management training attempted to make smoking a "pure activity" (devoid of all associated reinforcers). The treatment contract required a \$100.00 deposit.

Greene (1964) tried to reduce the smoking rate by superimposing white noise, meant to be aversive, over music subjects were listening

to. The aversive agent was contingent on taking a puff from a cigarette. Both experimental and control subjects increased the number of cigarettes smoked. This was attributed to the barely audible clicking of relays in his apparatus which may have had some positively reinforcing or signalling effect on smoking behavior. The use of non-motivated retarded subjects may also have confounded his results.

The "more or less" encouraging results of treatments based on the punishment paradigm may be explained in this way: Bucher and Lovaas (1967) in their critique of punishment therapies have made the point that in order to have a strong aversive effect, the external punishing stimuli must not be too remote from the actual behavior in order to be transferable to the real world. The punishing procedures must avoid the discrimination between the training setting and the outside environment (as in the case of Powell and Azrin, 1968). In terms of Wilson and Davison (1969) the punishing agent must render discomfort in the same modality as the original act. In the light of

García's psychophysiological findings with respect to the "peculiar appropriateness of cues to reinforcers", (e.g. electric shocks seem more appropriate in dealing with problems involving visual and tactile stimuli as in the case of hand washing compulsion (Lazarus, 1968) and inadequate against overeating and alcohol abuse) further research should be oriented toward the gustatory element involved in smoking and the proper nature of a noxious CS stimulus that might be paired to the US element. Remote external punishing stimuli such as white noise may not be effective because their stimulus properties cannot be transferred to a real situation. Most long-term maintenance of improvement may be ascribed to non-specific therapeutic effects combined with intermittent follow-up and support (Chapman, Smith, and Layden, 1971). When covert stimuli are employed as aversive agents it is also important to consider the external stimuli which may have had positive reinforcing properties in maintaining smoking behavior without forgetting the sensory modality of the smoking act itself.

Some authors have attempted to direct their effort to working on an aversive stimulus more similar to the act of smoking itself. Thus, blasts of hot, smoky air were used as a UCS (Wilde, 1964; Franks, Fried, and Ashem, 1966; Grimaldi and Lichenstein, 1969; Lublin and Joslyn, 1968). This was relevant to the taste and olfaction related to smoking and avoided some of the difficulties of the electric shock therapy, specifically the lack of relationship of the UCS to the target behavior and the production of anxiety. Grimaldi and Lichenstein (1969) tried to reduce the high rate of attrition previously noted in the authors cited, and introduced three additional groups (i) a control group (no-smoke or attention placebo group), (ii) a group which received smoke administered non-contingently, and (iii) another one which received smoke contingently as punishment. In comparison to the previous use of aversive procedures, they demonstrated that contingent punishment is of limited value in the control of smoking because no significant difference between the three groups was found.

Even in the study of Lublin et al. (1968), the reduction of smoking might have been a consequence of the forced smoking (satiation) rather than the type of external punishment employed (smoky air).

Another approach based on the Hullian conditioned inhibition principle is called satiation. Dunlap (1932) provided the theoretical basis for repetition or satiation as a therapeutic technique for eliminating an undesirable habit. So, "repeated nonreinforced evocation of effortful behavior may create aversive consequences in the form of pain and fatigue which inhibit responses that will produce discomfort" (Bandura, 1969). In this vein, Ayllon and Michael (1958) developed this technique by using "massed" or "negative practice" when they eliminated a hoarding behavior in an institutionalized patient by saturating him with all the magazines he wanted. Gradually, the positively reinforcing value of the hoarding response was overcome by conditioned inhibition so that the patient started to remove the magazines from his room. Ayllon (1963), in a

similar case managed to eliminate towel hoarding behavior. Walton (1961) treated an 11 year old male patient suffering from spastic movement of the mouth, face, leg and arm with this technique of massed practice and at one year follow-up reported a good general adjustment. In another experiment (1964) he successfully extinguished a nasal explosion tic, and the elimination of this behavior was confirmed by a five month follow-up. Again, because some tics may be conceptualized as drive-reducing conditioned avoidance responses, Rafi (1962) used prolonged mass practice in order to treat a spasmodic movement of the head. He used two hours of continuous practice with a rest of 2-3 weeks. It should be noted that a relaxation technique was introduced at the end of the therapy and encouraged to be practiced at home.

Applying this concept to the treatment of smoking behavior, Resnick (1968) used two groups, one doubling its smoking rate, the other tripling it, during one week of therapy. This produced a significant reduction of cigarette intake at the four month follow-up with 63% of subjects still

abstinent. Although no significant difference between treatments was found, the experimental group were significantly different from the no-treatment control group. Marrone, Merksamer, and Salzburg (1970) had subjects chain smoke for either 20 hours or 10 hours, and obtained a 60% abstinence rate after four months for the former group, replicating Resnick's findings.

Lublin (1968) altered this procedure somewhat, describing two aversive inhalation techniques to counter the smoking habit: the first involved puffing stale warm cigarette smoke from a machine into the face of the subject while he smoked his cigarette; in the second the subject had to puff regularly at a cigarette in time to the ticking of a metronome, inhaling every six seconds on the first cigarette and puffing without inhaling on a second. Both methods appeared to be highly aversive. After a one year follow-up, 40% (31 of 78) of the subjects who completed at least three sessions were abstinent or greatly improved (including 15 abstinent, and 16 subjects smoking less than 50% of baseline).

When the data is re-assessed with the 31% of subjects who left the experiment dropped from the analysis, the abstinence rate is only 15%.

Marston and McFall (1971), using Resnick's (1968) technique tripling the baseline rate of smoking, and Keutzer (1968), using a variation of the technique with negative or massed practice where the subject must take a puff once every twelve seconds, found no significant difference between these methods and other approaches such as gradual reduction or covert control at the follow-up period. Resnick may be criticized on two grounds: (1) his use of rough estimates of smoking instead of an accurately written diary; (2) experimenter bias: subjects were undergraduate students taking one of his courses.

Claiborn, Lewis, and Humble (1972), supported criticism made by Lichenstein (1971) and Sushinsky (1972) when they failed to replicate Resnick's findings. They performed three experiments comparing the "satiation technique against controls for a placebo rationale and altering of stimulus contingencies".

The authors found non-significant treatment differences and it appeared to them and others (Lichenstein, 1971; Marston and McFall, 1971; Mausner, 1971) that Resnick's results might be only a placebo effect. It was suggested that more and better quality data could decide this question.

Taking a more complex approach to the concept of massed practice as originally attempted by Resnick, the authors Schmahl, Lichenstein, and Harris (1972) used the act of smoking every six seconds until the subjects could no longer tolerate it under conditions of warm sticky air or warm mentholated air. An attention placebo control group was also used. All 28 subjects were abstinent after eight sessions, and 16 of 25 subjects were abstinent at six month follow-up. In another study, Lichenstein, Harris, Birchler, Schmahl, and Schwartz (1973), separately compared some of these components: smoky air, smoking plus smoky air, rapid smoking alone, attention placebo group. He replicated the 1972 findings and found no significant difference between the four groups at

the end of treatment; the six month follow-up showed a 60% abstinence rate compared to 64% in 1972; in terms of reduction of cigarette intake the three treatment groups smoked at 20-30% of baseline at six month follow-up whereas subjects in the attention placebo condition returned to approximately 70% of baseline.

Lichenstein (1971) suggested that the relative ineffectiveness of techniques used to modify cigarette smoking may be due to the fact that investigators advance too quickly to the lab, immediately applying techniques on a group basis rather than carrying out the necessary clinical pilot work with individual smokers. Gordon and Hall (1973) in a case study described a combination of the self-control technique (two first sessions) with a satiation procedure (rapid smoking) applied ten days later. Here, the treatment is matched to the client on the basis of the specific variables controlling the behavior. The author found an immediate reduction to one third of baseline with the self-control technique, and a gradual reduction to 0 with rapid smoking. This is good evidence for the

value of a mixed therapy where the subject is "partially" aware of his work in quitting. However, follow-up periods (3-6 months) later revealed a slight regression to baseline.

Levenberg (1974) attempted to tailor the type of "anxiety-subjects" to treatment using an arousal procedure based on the hypothesis that "anxiety-subjects" would benefit more from a therapy dealing with anxiety, such as systematic desensitization, and that "non-anxiety subjects" would benefit more from an aversion therapy, like the Lichenstein et al. (1973) approach. Due to the inadequacy of the arousal procedures he used, he obtained disappointing results; nevertheless, rapid smoking achieved better results than systematic desensitization but no better than the attention placebo control.

In 1975, Best working on the maintenance problem of smoking behavior, used three procedures: (i) a punishment instruction (where post-clinical smoking was punished with stimulus satiation procedures); (ii) treatment focus ("internal subjects" benefit more from satiation techniques -vs- "external subjects" who benefit more from

situational analysis of environmental events that influence or control their individual smoking behavior), and (iii) timing of attitude change, where he attempted to manipulate attitude change either before or after implementing a behavior change. Best, used the internal-External Locus of Control Scale (Rotter, 1966) to characterize his subjects. The last two procedures interacted significantly with client characteristics in determining treatment outcome. Comparing the outcome with McFall and Hammen's (1971) summary of prominent studies in the literature, the one week abstinence rate was 68.6% compared to the usual 20% at end of treatment; the six month abstinence rate was 31.5% in contrast to the typical 13%. Here, a new element was introduced, massing of sessions i.e., daily for three or four consecutive days and then gradually spaced out to twice and then once a week. These results support the principle of tailoring therapeutic procedures to individual differences.

In comparing three aversive treatments (two electric shock conditions and one using

stimulus satiation achieved by rapid smoking), and a placebo attention control, Beavers (1973) showed a significant decrease in the rate of smoking by the end of treatment for all groups. 74% of the subjects reached abstinence or reduced smoking by 50% or more. At the two month follow-up, however, abstinence had decreased to 36%. Subjects scoring higher on the A scale of the Welsh factor of the MMPI did not reach abstinence or 50% of baseline in either of the electric shock groups but were able to do so in the rapid smoking and placebo group. This suggests that the theory of anxiety-proneness may be an important factor in the continuation of smoking, implying that electric shock conditioning may not be the treatment of choice for people with high anxiety levels.

An attempt was made to examine the effect of negative practice with both contingent and non-contingent shocks upon cigarette smoking (Levine, 1974). It has been suggested that the satiation procedure (smoking at a rhythm of 40 beats a minute twice a week for two weeks), since it is "more" aversive when combined with contingent

shocks immediately after each inhalation, may be successful in the initial phase of a program aimed at the reduction of smoking. Only the contingent shock group was significantly different from both the controls and the non-contingent shock group.

Rosberger (1974) combined two procedures: relaxation and satiation with a spaced distribution of trials. He used two types of controls i.e. minimum-treatment-minimum-contact motivated subjects, and non-motivated subjects recording only. In addition to this, relaxation and satiation techniques were used alone. In his experiment, the distribution of trials was twice a week for the first three weeks and once a week for the last three weeks. Results were significant with an end of treatment reduction to 59.32% of baseline for the relaxation technique, 69% for the satiation and 20.65% for the combined approach. This last group approached McFall and Hammen's results and seems quite promising.

Recently, Lando (1975) revised the recent perspective on the aversive control of smoking. He emphasized satiation through the use of smoking

itself as its own aversive agents as opposed to the use of an arbitrary unconditioned stimulus such as electric shock or other unpleasant agent previously described. Moving from the process of doubling or tripling the actual number of cigarettes they now focus on the "rate of puffing" using this new type of satiation. Schmahl and others obtained 100% abstinence at end of treatment and 60% at six month follow-up.

A study replicating this work in 1973 by Lichenstein et al. found that rapid smoking alone is as effective as rapid smoking combined with hot smoky air. Questions may be raised, however, as to the importance of the aversive procedures themselves, since in an earlier study conducted in his lab (Grimaldi and Lichenstein, 1969) he concluded that smoky air is of limited value in modifying chronic smoking behavior. According to Lando (1975), Lichenstein et al. intentionally exploited inter-personal persuasion factors in addition to applying the aversive conditioning. Support for this is given by the 100% initial abstinence rate in their control

group. In Lando's experiment, the massing of trials (i.e. one week of six sessions) consisted of a rapid smoking condition which involved smoking a cigarette at the rate of one puff each six seconds; an excessive smoking condition where subjects smoked at least twice their usual number of cigarettes; and a control condition where subjects followed identical instructions to those in the rapid smoking condition except that the puffs were every 30 seconds. Three new improvements were made: (1) the control and the rapid puffing groups had portable timers in order to facilitate the self-administration of outside trials; (2) records were kept of all cigarettes consumed during treatments and until the follow-up period; (3) breath tests were used to measure the carbon monoxide concentration of the blood in order to check the self-reported smoking level. The results showed that 60% of experimental subjects refrained from smoking by the second week of treatment which is quite encouraging in that subjects doubled the mean initial abstinence rate of 26% reported by McFall and Hammen (1971). But the degree of relapse at follow-up (only 20%

of subjects remaining abstinent) is inconsistent with the findings of Resnick, Lichenstein, and their colleagues.

The development of a conditioned aversion to cigarette smoking has shown varied results. The strongest aversions have been created when the smoking act has been manipulated in order for it to produce aversive properties rather than positively reinforcing properties (i.e., through the use of rapid smoking or satiation).

The idea of using massed sessions was used in the Five-Day-Plan (McFarland, 1964) where subjects met on consecutive nights. It was also used in a Five-Day-therapy group by Lawton (1967) who stated that it was an important factor in the impressive results. Later Lichenstein et al. (1973) carried out a satiation procedure for at least three consecutive days and then spaced sessions as needed for the treatment's maximum effectiveness. The massing idea can be explained in terms of inhibition that usually has detrimental effects upon response strength. Considered as a variation of the extinction procedure, the inhibitory theory leads to the

prediction that extinction of the smoking response will occur more rapidly with massed rather than distributed trials. As exemplified by Kimble (1961) several animal studies lend support to this notion. For example, Rohrer (1947, 1949) in a bar-pressing situation demonstrated faster and more permanent extinction with 132 albino rats under massed trials than spaced trials. The rats were trained to raise a horizontal bar by an upward movement of the head in order to obtain food reward. In Pavlovian terms, under mass trials, the inter-trial intervals are short and relatively little inhibition is dissipated between trials, and consequently extinction should occur more rapidly under the massed condition. All explanations concerning the massing of trials will be discussed later.

Marston and McFall (1971) suggested using the performance of "homework" as a kind of counter-conditioning situation replacing the cigarette habit once the behavior is suppressed by punishment or conditioned aversion. Since smoking is often an observable public behavior,

it is important for subjects to be able to engage in doing something else to compensate for the giving up of smoking, to fill in the behavioral gap where the ritual of smoking used to be. This "homework" is a crucial aspect of the independent variable. This "ritual of smoking" consists of a chain of behaviors (i.e. taking out the pack, opening it, taking out a cigarette and lighting it, etc.). After the use of punishment or an aversive technique, a gap occurs in this repertoire. Even Resnick reported that subjects were allowed to chew gum after the treatment. This alternate response may have accounted in part for Resnick's significant results, apart from the individual effect control (expectation of future treatment) and the use of estimated rates rather than self-monitoring base rates which exaggerated Resnick's findings.

Wagner and Bragg (1970) dealt with the positive and negative aspects of smoking cessation in a combined group using covert sensitization and systematic desensitization. As mentioned previously covert sensitization was

used to suppress the behavior itself whereas systematic desensitization taught the use of relaxation in situations where the subjects imagined wanting to smoke. In 1971, Chapman et al. used tea or coffee drinking as an alternate unpunished response to the extinguishing of a cigarette in their paradigm.

Further evidence includes that of Katz (1973) who demonstrated that the success of a punishment in reducing behavior is known to be related to the availability of a reinforced alternate behavior. He concluded that the effectiveness of punishment in suppressing one response in a concurrent two-response situation occurred when the reinforcement rate for alternate behavior was equal or greater to that obtained from the punished behavior. Therefore punishment should be administered in conjunction with a high rate of reinforcement for desirable alternate behavior in order to achieve and maintain a behavior change.

As previously described, two components seem to be useful in producing the long-term abstinence from smoking: (1) The use of an

aversion treatment paradigm where suppression of the smoking act is achieved and where the act itself acquires aversive properties; (2) Once the suppression of the act has been initiated an alternate response or highly reinforcing response must compensate for the loss of the smoking act. The satiation may produce strong negative associations to the act of smoking, thus rendering the behavior less attractive and desirable and increasing the motivation to quit. The use of natural unconditioned stimuli (as suggested by Wilson and Davison, 1969), introducing aversive consequences contingent on the maladaptive behavior, must occur in the natural environment of the smoker and the treatment must be performed by the smoker himself. The conditioning may become more aversive when performed in massed rather than spaced trials. The product of a stronger aversive effect can facilitate extinction, thereby reducing the subjects discomfort.

In relation to the present study, it is hypothesized that a combination of a satiation technique performed in massed trials plus the

use of a highly positive reinforcing alternate response (a ritualized relaxation procedure) would give the greatest reduction in smoking and produce a lasting abstinence. Here, the smoke of the cigarette itself and the polluted air of the room created nausea which became the negative reinforcer; it produces too a sore throat, dizziness, an unpleasant taste in the mouth. The reinforcing response consisted of a ritual of relaxation that is non-satiating, discrete and easy to perform everywhere. Second, it is hypothesized that the continued practice of the satiation technique after the initial training of one week would strengthen the technique, and boost the effect of the massed practice. In fact, this is supposed to create a higher level of aversion to the smoking act, thus helping the smoker to quit his habit. From this line of reasoning the satiation-smoke condition is predicted to produce a greater reduction in smoking than satiation no-smoke condition.

The group of Relaxation alone was used in fact, as an effective, non-medical alternative to

smoking (Lichenstein and Keutzer, 1969). Since many smokers use cigarettes in an effort to reduce tension, smoking clinics have suggested alternative means of relieving it following the abrupt cessation of smoking, like: tranquilizers, exercise, etc. In this study, with the relaxation technique, the smoker can substitute the relaxed feeling for the anxiety he might ordinarily experience either as a stimulus leading to smoking or as a result of cigarette deprivation.

Seven groups were formed to test these two hypotheses. Six of these groups were taken from a population of subjects motivated to quit smoking. Two groups received satiation only. Two groups received both relaxation and satiation treatment. A fifth group received relaxation alone. The sixth group, the minimal-contact-minimum-treatment control group, was made of motivated subjects who were asked to quit on their own. They were taught several techniques to help them try to cut down their smoking. As suggested by Bernstein (1969) in this "expectation control" condition, subjects did not receive

assurance of later help and were encouraged to count only on their determination to quit. This group controls for motivation, effort to quit, and the recording only. The seventh group was a non-motivated group selected from a group of known smokers and was told that the purpose of the study was to discover how smoking rates vary over time. They were asked to record their daily cigarette intake for the same period of time as the subjects in the other groups i.e., for nine consecutive weeks. None of the subjects in this group was aware that the experimenter was performing smoking research. This group controlled for the use of recording daily intake of cigarettes by non-motivated subjects (Bernstein, 1969; McFall, 1970).

Five main hypotheses were formulated:

(a) The five active treatment groups would achieve significantly lower rates of smoking than the two control groups; (b) The two combined groups separately would show significantly lower rates of smoking than either the relaxation alone, or satiation-smoke or satiation-no-smoke groups, and would maintain this

difference at the follow-up period; (c) No significant difference would be found between the two control groups; (d) The combined relaxation-satiation-smoke group would achieve better results than relaxation-satiation-no-smoke group; (e) The satiation-smoke condition would achieve a lower frequency of smoking than the satiation-no-smoke condition.

Method

Subject Recruitment

Advertisements were made through local paper, posters and local radio, informing the public that a research project entitled "Want to kick the habit?" was to be held at Sir George Williams University and sponsored by the Center for Research on Drug Dependence. Subjects were contacted and eliminated if they mentioned any illness such as asthma, emphysema or cardiac trouble.

Assessment Procedure

During the first group meeting subjects were told the goals of the project and given information concerning our investigation of the relative efficacy of some treatments used without offering too many details that might bias them in any way. Subjects were provided with a recording form on which they were asked to daily note the number of cigarettes they smoked under "normal" non-treatment conditions (to be used later in computing the smoking baseline score) for a week. Subjects kept similar sheets with them for nine weeks (one week of baseline as

described below, six weeks of treatment, two weeks of follow-up), in order to keep track of each cigarette smoked during the day. During the follow-up periods, i.e. sixth week, three month, six month, one year follow-ups, the data were collected in a different manner. Subjects were contacted by phone or mail and were asked to report their average daily consumption. In order to ensure the validity of their self-report, they were told that their urine samples would be collected weekly and analyzed for nicotine content. In fact, no urine analyses were done. They were also told that their weight would be recorded.

Each subject made a deposit of \$25.00 in order to demonstrate the sincerity of his attempt to complete the experimental contract. This was done in order to reduce attrition, a common factor in many studies. The sum was refunded to each subject at the end of the nine weeks under the condition of complete attendance of the sessions and submission of all data. The refund was explained to have no bearing on the act of quitting or reducing cigarette intake. A smoking

history questionnaire (Appendix D) and the Eysenck Personality Inventory Form (Eysenck and Eysenck, 1963) was administered to each subject.

Treatment Group Assignment

Fifty-seven subjects came from a pool of voluntary motivated persons and were randomly assigned to the treatment groups: Satiation-Sm (S-Sm; n=10); Satiation-No-Smoke (S-no-Sm; n=10); Relaxation-Satiation-Smoke (R-S-Sm; n=9); Relaxation-Satiation-No-Smoke (R-S-no-Sm; n=10); Relaxation (R; n=10). The minimal-treatment-minimal-contact control group contained also 8 voluntary motivated subjects. Subjects from the last control group (record only) came from a different population than the others. These were nine non-motivated smokers and selected from a population of persons who had no intention of quitting smoking. They were not informed of the study and of its details. They were asked to fill in the two questionnaires. The rationale explained to them was that the experimenters were interested in smoking rate change over time and wanted them to keep track of

their cigarette intake over a short period.

Treatment Constants

Although the treatment methods differed according to the explicit procedures, all subjects were treated alike with respect to:

1. The total length of treatment i.e. one week of baseline, six weeks of treatment and two weeks of follow-up at which time personal data records of frequency of smoking were collected for the two last weeks and money was refunded. During treatment, subjects were seen individually for periods of about 30 minutes.
2. Opportunity for the personal implementation of treatment: each of the conditions was designed so as to offer the subjects the opportunity to practice the ritual of relaxation or the rapid puffing procedure (for the combined group and relaxation group) in their own home or elsewhere on their own initiative (for the combined groups and the satiation groups).

Treatment Procedure

Group 3: Relaxation (R): Subjects in this group were given training in progressive relaxation (Jacobson, 1938). This was done in

half hour sessions twice weekly for three weeks (sessions were never held on consecutive days). The sessions were carried out in a small, dimly lit room. Subjects reclined on a comfortable lounge chair for the duration of the training session. Approximately 20 minutes of each session was spent practising relaxation. The other ten minutes were used for collecting data sheets, urine samples and weight. Beginning with the second session, subjects were taught the shortened version of the relaxation procedure or "ritual", and this continued for five sessions. Subjects were instructed that in the following weeks whenever they felt like having a cigarette they were to wait a minute or two, and then perform the relaxation "ritual", instead of reaching for a cigarette. This "ritual" then was to cue the heightened state of relaxation achieved during the relaxation session. The subjects were then seen once a week for three weeks in order to obtain the data, urine samples and subjects' weight. They were then asked to record their daily cigarette consumption for two consecutive weeks, at which point they were seen

for the last time. At final sessions, deposits were refunded. They were also told that they would be contacted for follow-up reports in the near future. (Appendix D).

Group 1: S-Sm; Group 2: S-no-Sm

Satiation Groups:

Subjects in these groups were seen on a somewhat different schedule. For the purpose of the massing of trials, treatment sessions took place during six consecutive days for the first week after which subjects came once a week for the following five weeks. Each session lasted one half hour. At the beginning of each session the subject was required to smoke a cigarette (his preferred brand) at a quick rate; one complete inhalation every four seconds, until the cigarette was completed. The rate was maintained by the beat of a metronome which sounded a "click" every second. Every fourth "click" was accompanied by the sound of bells which cued the next inhalation response. The subject was encouraged to complete at least one cigarette in this way. When this was done, the remainder of the cigarette was extinguished and the subject

began a 15-minute rest period. After this period, the subject was instructed to smoke another cigarette in a manner similar to the previous one. The subject was instructed to treat any cigarette that he smoked on the outside as an "experimental" cigarette, i.e. he was to smoke it as quickly as possible, approximating the frequency used in the laboratory. The subject was told not to talk or engage in any activity while smoking a cigarette in this manner. This was practiced for six consecutive days at the rate of one session per day. The two satiation groups differed slightly in that during the following five weeks of sessions the subjects in Group 1 were forced to perform this "laboratory or outside" rushed practice of smoking. In the satiation-no-smoke condition (Group 2) subjects came only for collecting data and urine samples and to be weighed in the last 5 sessions. The only exception allowed for not smoking at the sessions following the six consecutive days of satiation was if the subject stated that he had gone five consecutive days without smoking. In this case subjects were not

forced to smoke. This applies for the satiation-smoke group (and later in the description of treatment for the combined relaxation-satiation-smoke group).

Group 4: R-S-Sm; Group 5: R-S-no-Sm

Relaxation-Satiation Group:

During the first three weeks of treatment, subjects in this group were trained the same way as the relaxation group. During the following week (i.e. the fourth week), each subject received six consecutive days of satiation in exactly the same manner as described previously. Here the extra-treatment procedures were different. At the initial satiation session the subjects were told that from that point on, whenever they felt like having a cigarette, they should use the relaxation or "ritual" as an alternate response instead of reaching for a cigarette. If he still wanted to have a cigarette, the subjects was instructed to smoke it the same way as previously described for the satiation group. The fifth and sixth weeks differentiated Group: R-S-Sm from Group: R-S-no-Sm where in Group: R-S-Sm subjects were forced to smoke as described at the sessions for the fourth and fifth weeks, while in Group:

R-S-no-Sm they were not forced to smoke. Both groups gave their urine samples, weight and data at these fifth and sixth week sessions. There was a two week follow-up for these two combined groups as well as for the two groups of satiation and the relaxation alone group.

Minimal-Treatment-Minimal-Contact Control Group:

(M-T)

As stated previously, subjects in this group came from the same pool as the above three groups and attended the same introductory sessions. Subjects were told that smoking, for most smokers, had become an "automatic" act and that by reporting their daily cigarette consumption and thus becoming aware of their smoking habits, that they would be able to reduce their cigarette consumption. Subjects were contacted by phone each week and asked for their previous weeks's score. This group was designed particularly to control for an individual "effort" and recording of intake as a possible confounding factor in treatment.

Non-Motivated Recording Only - Control Group (R-C):

In this group subjects came from a separate

pool as previously described. At the time of the initial session, they were told that the experimenters were interested in the variability of individuals' smoking rates over time and how this related to certain characteristics of each subject as obtained from a smoking history questionnaire. They were instructed not to change their smoking habits, but to record as carefully as possible their daily cigarette consumption for a period of nine weeks (corresponding to the amount of time the subjects in other groups had to record). These subjects were contacted by phone. This group was designed to control for the reactive effects of record-keeping alone in a non-motivated group of subjects.

Results

The dependent variable used here was the mean daily number of cigarettes smoked per week. Apart from the 66 subjects, seven left during the course of the study and were considered as drop-outs and then eliminated (Bernstein, 1969): one from the S-Sm group, two from the S-no-Sm group, one from the R-S-no-Sm group, two from the R-S-Sm group and one from the M-T group. This procedure was suggested by Bernstein (1969).

A one-way analysis of variance was performed on the baseline intake of the various groups. There was no significant intergroup difference in the smoking rate prior to treatments ($F=1.48$, $df=6/59$, $p > .05$). (See Appendix A, Table 1).

A two-way repeated measures analysis of variance was performed on the data of the seven groups for the period of baseline measures to the end of the two week follow-up. (See Appendix A, Table 2). The analysis shows a group effect ($F=9.02$, $df=6/59$, $p < .01$), a trial effect ($F=80.8108$, $df=6/59$, conservative degrees

of freedom, $p < .01$), a group by trial effect ($F=8.09$, $df=6/59$ conservative degree of freedom, $p < .01$). Figure (1) indicates the mean number of cigarettes smoked as a function of time and condition. A Tukey test was made only on the simple effects of trial only. There was a significant decrease over time in the frequency of smoking from the baseline period to the sixth week of treatment for all active groups except for the two control groups ($p < .01$, $df=8/59$ conservative degrees of freedom).

Since including baseline measures might confound the interpretation of the double interaction, another two-way analysis of variance with repeated measures was performed excluding these (See Appendix A, Table 3). Here, a similar significant effect was found: a group effect ($F=11.65$, $df=6/59$, $p < .01$), a trial effect ($F=21.23$, $df=6/59$, $p < .01$), and a group by trial effect ($F=5.45$, $df=6/59$, $p < .01$). Subsequent Tukey tests were made for post hoc comparisons between pairs of cells. These Tukey yielded similar results as previously found in the two-way repeated measures analysis of variance

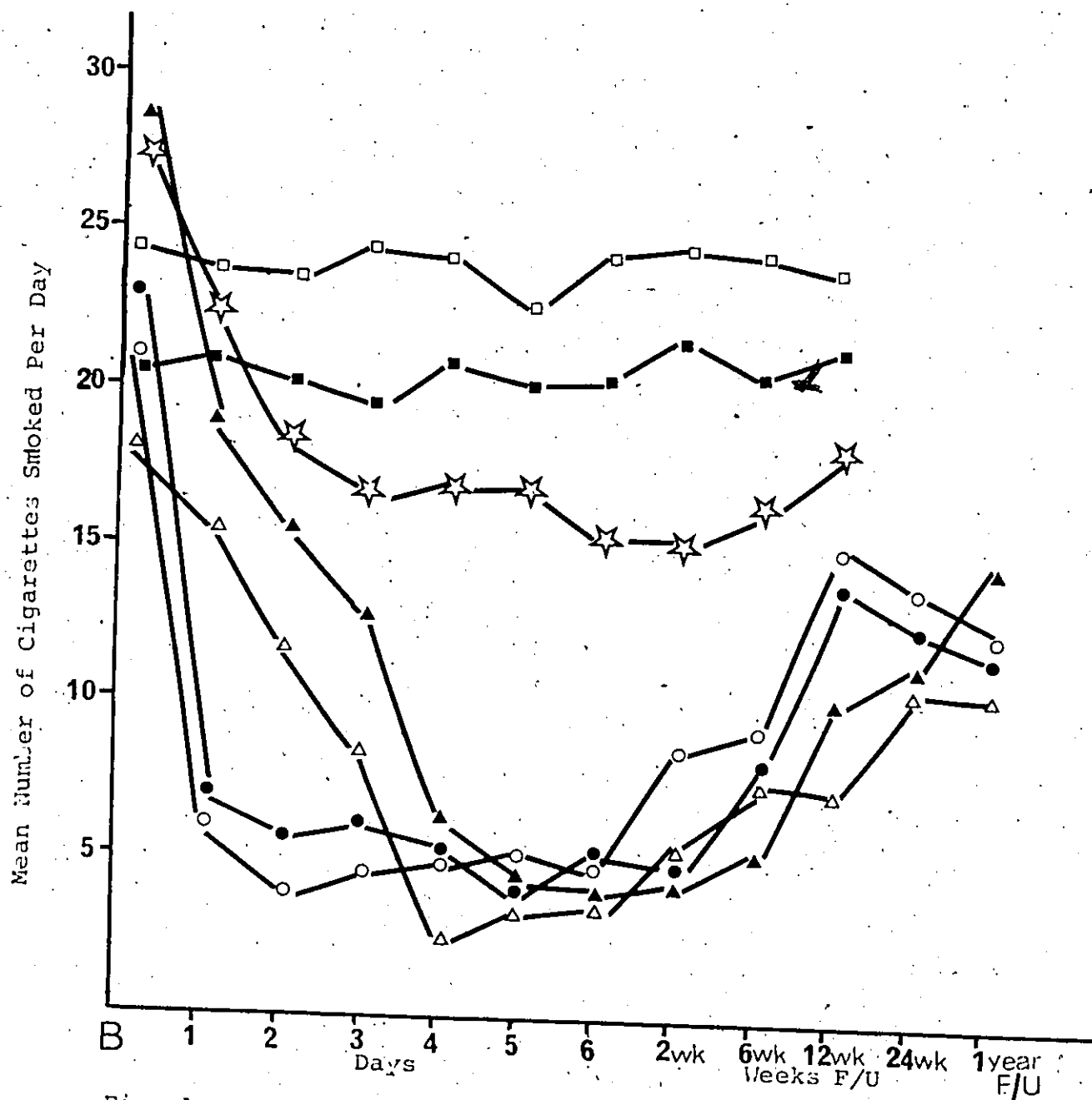


Fig. 1. Mean Number of Cigarettes Smoked Per Day. For All Groups During Baseline, Treatment, and Follow-up.

(Legend: Recording-Only-Control Group
Minimal-Treatment-Minimal-Contact Control Group
Satiation-Smoke Group
Satiation-no-Smoke Group
Relaxation Group
Relaxation-Satiation-no-Smoke Group
Relaxation-Satiation-Smoke Group).

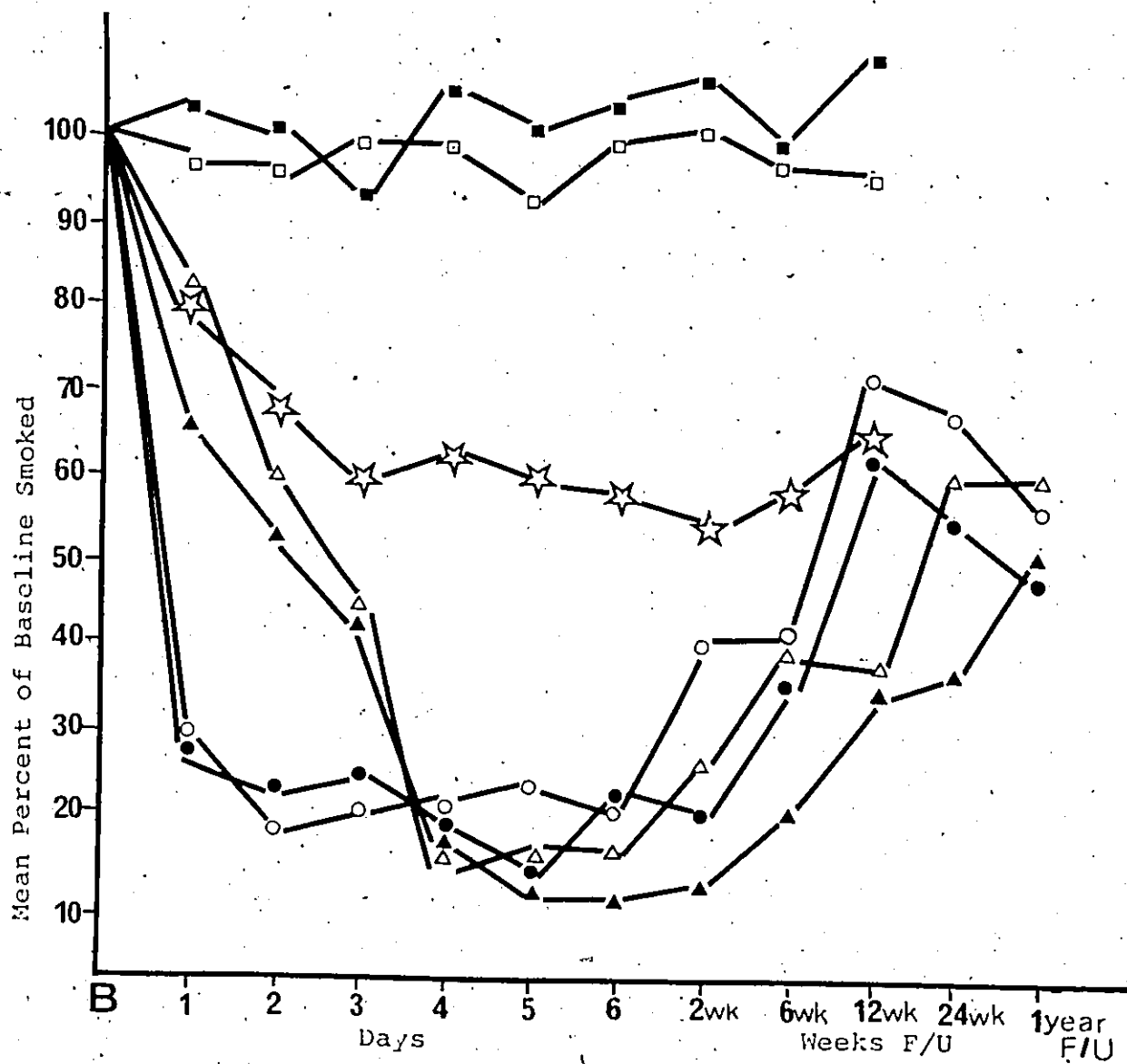


Fig. 2. Mean Percent Of Baseline Smoked For All Groups During Baseline, Treatment, and Follow-up.

(Legend: Recording-Only-Control Group
Minimal-Treatment-Minimal-Contact Control Group
Satiation-Smoke Group
Satiation-no-Smoke Group
Relaxation Group
Relaxation-Satiation-no-Smoke Group
Relaxation-Satiation-Smoke Group).

including baseline, while having occasionally different levels of significance. The Tukey was performed on the simple effect of group at the end of the sixth week of treatment. Except for the R group, the four treatment groups were significantly different from the control groups M-T and R-C, $p < .01$, $df=7/89$ (Figure 1). The two control groups did not fluctuate significantly in their smoking behavior during either the sixth week of treatment or the two-week follow-up. Again each treatment group was found to be significantly better from the R group after the sixth week of therapy ($p < .05$) with a mean of 15.88 cigarettes smoked (57.18% of baseline). Only the R-S-Sm group, however, showed better results than the R group at the two-week follow-up, ($p < .05$, $df=7/89$ with a mean of 15.30 for this last group 55.09% of baseline reduction). The satiation groups' cigarette consumption after the first week of treatment (where there was a marked decrease) was more or less constant except for a rise of approximately 20% at the two-week follow-up in the group of S-no-Sm (Figure 2). This figure refers to the

proportion (%) of change in the dependent variable due to the treatment. It is recorded as the proportion of the daily mean number of cigarettes per week in each group to the respective group during the pretreatment baseline week. The main advantage of a consideration of proportion is that the pretreatment rates of all groups can be common (i.e. 100%) and hence an accurate indication of changes and end results of treatment can be easily determined. The R group dropped to its lowest level (55.09% of baseline) by the two-week follow-up. The combined groups' intake gradually decreased up to the end of treatment. Although there was an approximately 25% decrease for the group R-S-Sm compared to group S-no-Sm at the two-week follow-up, this result did not achieve significance in terms of analysis of raw data. Analyzed in terms of the percentage of baseline scores, however, it is significant ($p < .05$ level).

Post hoc Scheffé comparisons confirmed the impressions gained from the inspection of Figure 1. In fact, the means of the combined groups differed significantly from the means of the

satiation groups only during the first three weeks of treatment, the satiation groups achieving better performance than the combined groups. The combined groups initially showed a steeper slope than the satiation groups (Scheffé, $F=85.42, 57.69, 24.98$ with $df=3/35$, $p<.01$ respectively), but this situation was reversed after the third week of treatment up to the two-week follow-up. An inspection of Figure 1 will confirm that the combined groups achieved a greater reduction by the end of treatment, but this difference did not prove significant.

In order to adjust the post-test means to account for individual differences between the treatment groups, (technique as described in Huck and McLean, 1975) "difference" scores were computed for each subject on the average number of cigarettes smoked from the end of treatment and the two-week follow-up (as compared to baseline). An analysis of variance was done on these "gain" scores, $F=3.99$, $df=4/44$, $p<.01$ (See Appendix A, Table 9). The Tukey revealed that the R group had a lower gain score than the R-S-Sm (gain score of 11.43 and

25.40, $p < .01$) i.e. a smaller difference between the scores and the respective baselines. For the two-week follow-up, the Tukey ($df=4/44$, $p < .05$) gave the same results as previously found in the two-way repeated measures analysis of variance with difference scores of 12.47 and 25.04 respectively. As well, the S-no-Sm differed from R-S-Sm ($p < .05$) with gain scores of 12.96 and 25.04 respectively.

The proportion of smokers smoking less than the safe limit of 10-12 cigarettes a day (as suggested by the Surgeon General's Report 1964) was 90% by the end of treatment, except for the R-S-no-Sm group which scored 100% and the R group with 40%. At the two-week follow-up there was a slight decrease to 80% in R-S-Sm and S-no-Sm groups, 88% in R-S-no-Sm, while the S-Sm group stayed at 90% and the R group 40%. (See Appendix B, Table 4).

The abstinence rates for groups by the end of treatment were: R-S-Sm, 30%; R-S-no-Sm, 22%; S-no-Sm, 40%; S-Sm, 30%; R, 10%; the same percentages were maintained at two-week follow-up except for R-S-Sm which increased to 50%.

In a third step, a one-way analysis of variance was run at the six week follow-up (See Appendix A, Table 4). This yielded a significant between-groups component ($F=5.90$, $df=6/58$, $p < .01$). All five active groups increasing their smoking; the combined approach had the lowest relapse rate (with means of 5.52 (R-S-Sm) and 7.39 (R-S-no-Sm) i.e., 19.11% of baseline and 39.58%) compared to the satiation groups (with means of 8.05 and 8.07 i.e., 34.92% and 41.59% of baseline). The Tukey test revealed that the two satiation and combined approaches were significantly different from the M-T control group ($p < .01$), while only the combined groups were significantly different from control R-C group ($p < .05$). The control groups decreased only slightly from their baseline values, M-T 95.19%; R-C 96.71%.

A Scheffé comparison performed on the two combined approaches together as compared to the combined satiation groups was not significant although Figure 1 shows the relapse rate to be lower in the combined approach. Even though there was approximately 20% less decrease in S-no-Sm

and R-S-Sm conditions, (See Figures 1 and 2) no difference was significant. In terms of gain score analysis, a significant group effect appeared: ($F=2.78$, $df=4/44$, $p < .05$, Table 2, Appendix A). The Tukey revealed no significant intergroup difference, however, although the R group (difference score 11.05) was almost significantly different from the R-S-Sm group's score of 23.36 (p close to .05).

A one-way analysis of variance was performed on the three month follow-up results and yielded a group effect ($F=2.24$, $df=6/58$, $p < .05$), Appendix A, Table 5). The Tukey test revealed a significant difference between the R-S-no-Sm group and the control group M-T ($p < .05$) with a mean of 24.01 for the latter. All treatment groups increased significantly their consumption from the end of treatment to the 3 month follow-up: R-S-Sm, $\bar{X}=10.5$ (36.36% of B); R-S-no-Sm, $\bar{X}=7.22$ (38.67%); S-Sm, $\bar{X}=14.15$ (61.39%); S-no-Sm, $\bar{X}=15$ (71.7%); R, $\bar{X}=18.20$ (65.54%). The M-T control group did not change (94.63%) while those in the R-C condition increased to 103.14% of baseline.

T-tests were also done to compare the rate of smoking at the 3 month follow-up to the baseline rate for each of the five active therapy groups. Since the control groups hardly fluctuated, they were excluded, from the analysis. The differences between the rates were significant ($p < .01$ level), except for the S-no-Sm group (S-Sm: $t=3.37$, $df=9$; R-S-no-Sm: $t=4.28$, $df=8$; R-S-Sm: $t=4.64$, $df=9$; R: $t=3.63$, $df=9$; all $p < .01$). This indicated that subjects were smoking less at this time than during the baseline period.

To determine whether the effect of the treatments lasted from the end of the therapy (sixth week) to the 3 month follow-up, another set of t-tests was performed and yielded a significant difference for the S-Sm condition ($p < .01$) and the S-no-Sm, R-S-no-Sm, and R-S-Sm conditions ($p < .05$). The R group did not reach significance here, implying that this group did not fluctuate very much.

The percentage of smokers smoking under the safe limit of 10-12 cigarettes a day, was as follows: R-S-Sm, 50%; R-S-no-Sm, 77%; S-no-Sm,

50%; S-Sm, 50%; R, 30%. The percentages of quitters were respectively: 50%, 33%, 30%, 20%, and 10%.

From the end of the sixth week of therapy to the three month follow-up, there seemed to be an increase in the number of abstainers in both the combined therapies as compared to a decrease of abstainers in the two satiation groups, while the R group stayed relatively the same over time.

The two last follow-ups were done at six months and one year. The data were collected only for the two combined and the two satiation groups. A one-way analysis of variance on these four groups did not indicate any significant differences. A t-test comparing the change from baseline to this period revealed that, although each group had increased its cigarette consumption since the three month follow-up, the two combined groups and the two satiation groups were still smoking less than at the baseline level. The percentages of baseline were as follows: R-S-no-Sm: 59.53%; R-S-Sm: 38.09%; S-Sm: 53.36%; S-no-Sm: 65.73%. At the one year follow-up, similar results were achieved with percentages of: 58.13%; 50.21%;

48.96%; and 55.44% of respective baselines.

Here both satiation groups had dropped slightly, although the two other combined approaches had increased somewhat.

Looking at the percentages of those who had quit smoking entirely by the one year follow-up, it appears that the R-S-Sm group was 40% abstinent; R-S-no-Sm: 25%; S-no-Sm: 30%; and S-Sm: 33%. The percentages of subjects smoking less than the safe limit of 10-12 cigarettes per day were respectively: 40%; 50%; 60%; and 44%.

It may be said that the combined approaches were the most effective and long-lasting treatments. Figure 1 confirms this, demonstrating both a reduction of cigarette intake and a maintenance of this reduction for at least the first three months. It must be kept in mind, however, that the satiation groups were always close to the combined approaches in their effectiveness.

Discussion

Short Term Effects:

The results of the present study verified partially the hypothesis by demonstrating a short term effect at the end of the sixth week of treatment with significant reductions from baseline for all active treatment groups. The two control groups did not change, while the combined groups were not significantly better than the satiation alone groups.

Only the comparison of the four treatment groups versus relaxation alone proved significantly lower rates of smoking (the relaxation group did not improve as much).

The four active groups achieved significantly greater reductions compared to the relaxation group and the two control groups. In terms of success as defined by McFall and Hammen (1971) i.e. where subjects reach an end of treatment of about 30-40% of baseline, the treatment groups excluding R, surpassed this criterion. The hypothesis that no significant change would occur in either control group was verified.

Long-Term Effects:

At the end of the three month follow-up period despite an increase in cigarette consumption, the combined groups maintained lower intake level (36% of B for R-S-Sm and 38.67% for R-S-no-Sm) compared to the satiation groups and relaxation group but no significant difference was found.

At one year follow-up, it is surprising to see from Figure 1 that four treatment groups (relaxation-satiation-no-smoke, relaxation-satiation-smoke, satiation-no-smoke, satiation-smoke) consume cigarettes at between 48.96% and 58.13% of baseline, reductions which are still significant. The decrease from the three month to the one year follow-up in the two satiation groups can be explained in terms of an artifact created by subjects dropping out during this interval. Therefore, with respect to the combined groups, the hypothesis of greatest reduction compared to the one of other groups at this follow-up period was not significantly supported.

Looking at individual success in terms of abstinence, the short term effect of the therapies

was to produce a higher quit rate among the two satiation therapies (S-no-Sm, 40% of subjects; and S-Sm, 30%) compared to the combined groups (R-S-no-Sm, 22%; and R-S-Sm, 30%). These results approximate McFall and Hammen's result (26% of total subjects achieving abstinence) having the satiation group surpassing the 26%. The percentage of subjects smoking less than the safe limit of 10-12 cigarettes daily (Bernstein, 1969) is roughly the same between four of the treatment groups (excluding R between 90% and 100%). Over the short term, more emphasis seems to be put on the reduction of smoking, especially under the safe limit, than on quitting. Over time, at the three month follow-up, this discrepancy between the two forces i.e., quitting -vs- reducing under safe limit, is diminished. It seems to reach a critical point, a "stuck" point, (Levinson et al., 1971). At three month follow-up, where there is a continued reduction in cigarette intake under the safe limit from the end of treatment in four of the treatment groups excluding R; at one year follow-up, the emphasis seems to be put on the quitting. It should be

kept in mind that both combined therapies retained higher proportion of subjects smoking under the safe limit (R-S-Sm, 50%; R-S-no-Sm, 77%) compared to the satiation techniques (both 50% of subjects remained). But there was a reverse pattern when compared to the end of treatment; increase in the quit rate percentage of subjects for both combined therapies (50%, 33%) and a small decrease for satiation groups (30%, 20%). At that follow-up, the discrepancy in terms of the percentage of subjects quitting or smoking under the safe limit of 10-12 cigarettes a day was reduced and may constitute a decisional point or stage for the smoker. The 13% abstinence rate reported by McFall and Hammen (1971) is far less than that obtained in the present study. Even the one year follow-up results are quite impressive and far better (S-no-Sm, 30%; R-S-no-Sm, 25%; R-S-Sm, 40%; and S-Sm, 33%).

The results of the present study may be attributed to the following factors: massing of trials may have played a role in reducing cigarette consumption because during the first

week of treatment for both satiation groups, subjects achieved their lowest rates of smoking up to the end of treatment. The massing of trials kept the "time" element constantly in the mind of the participant and aided their reductions or cessation of smoking, in addition to making them fully aware of their own smoking patterns during the earliest stage of the treatment. In fact, the subject was forced to do something: either to leave, decrease smoking or quit, since the effort is exhausting. Secondly, even though the type of aversion created by the technique is relevant to the act itself and the use of massed trials that seemed to boost the aversive effect of the technique, we may not have reached the maximum point of aversiveness, the point of maximum intensity. Some subjects may have been relatively tolerant to the aversiveness created by the smoke and smoking itself, and if the length of time of the massing technique was not sufficient this may have lessened the effectiveness of the satiation technique. There should be an external way of checking the subjective experience, a way of

gauging the experience state of aversiveness. Even if subjects decreased their smoking drastically to around 30% of baseline for the first week and 20% around the second week, demonstrating the force of the technique, this effect lasted only up to the end of treatment, vanishing gradually during follow-up periods. This transition should be studied in more detail. The instruction of smoking non-treatment cigarettes the same way as experimental ones (i.e. as rapidly as the subject could) evidently was not followed by the subjects. Reports from them revealed that it was difficult to practice such rapid smoking on social occasions. Not only an increase in intensity of the aversive agent but may be much more massed trials would have been necessary to help them quit. In terms of the cognitive dissonance hypothesis, the massing effect due to the short rest between days reduces the wide gap existing between the conscious wish to stop smoking and the inability to do so by forcing the subject to do something quickly, either because he was rushed by nausea or because he was made aware of being ridiculous. These

intensive satiation sessions interacted with the success of the ritual relaxation technique to produce the rather good "results" of the combined group. In the procedure of satiation, apart from the forced smoking, the fact that the aversion is a continuous process may render it more unpleasant. This is shown by the more or less flat line (Figure 1) of the two satiation groups after massing of trials of the first week, up to the end of treatment where satiation under those conditions seems to have had the effect of maintaining a low level of intake.

On the other hand, the relaxation ritual procedure appeared to have a more lasting, if weaker, effect on the rate of smoking. This is evidenced by the fact that the relaxation group showed greater stability in the smoking decrement when compared to the other experimental groups. From the end of treatment to the three month follow-up, the relaxation group increased from 57.18% to 65.54% of baseline, while the two satiation groups had almost tripled their percentage of baseline consumption of cigarettes by the end of treatment. Thus, relaxation as a

procedure of reinforcing an alternate response appears to be an important stabilizing factor in smoking reduction, and may have played a role in the reduction itself although the two combined groups were not significantly different from the two satiation groups.

Subjects found the relaxation ritual, the act that compensates for not smoking (Hunt and Matarazzo, 1970) simple and socially acceptable. This gave them a good sense of relaxation when needed. Again, perhaps the "topographical congruence model" of Wilson and Davison (1969) can be applied i.e., that the reinforcing aspects of this relaxation were not close enough in their stimulus properties to adequately replace those associated with smoking itself, since most subjects relapsed.

As suggested by Bernstein (1969), and later by Hammen (1971) and Sushinsky (1972), the control groups used were controlling for the non-specific factors affecting the course of a treatment and temporarily changing the behavior. Some of the non-smoking factors could be motivation, expectation of positive outcome, self-monitoring

of the target behavior and attendance in a structured program; therefore, this study used a non-motivated control group recording only their smoking rate without other special instructions. Previously, McFall (1970) and Euler (1974) demonstrated that smoking behavior may be modified by the simple and inexpensive technique of self-monitoring and was shown to be as effective as other more intricate forms of behavior therapy. In this study, the non-motivated smoker group failed to show any significant decrement in smoking behavior, even though some of the subjects reported abhorance of the number of cigarettes they were smoking, when confronted with their own data. This lends further support to the previous stated fact concerning cognitive dissonance, where smokers appear to be able to cope with high states of dissonance, i.e., expressing the desire to stop, but still continuing to smoke (Dubitzky and Schwartz, 1969).

The other control, the minimal-contact-minimal-treatment group, was a group of motivated subjects trying to give up the habit by themselves.

Here as noted by Marston and McFall (1971), the use of such a control group lies in the argument that it is a critical test of the efficiency of a treatment, i.e., its ability to reduce smoking significantly more than most minimal treatment procedures because most specific approaches seem to produce immediate decrements in the habit. It could also be argued that encouraging them to quit on their own by the "cold turkey" method (without expectation of future help) may have decreased their smoking behavior. The results of the present study however, indicate the contrary: the subjects' own efforts were not sufficient to control their smoking behavior unless they were in a well structured program. The results support the hypothesis that most smokers feel that smoking is not under their control (Smith, 1970).

Some aspects of this study need examination and improvements. As previously described, the conditioned aversion paradigm might be further manipulated in order to create a stronger suppression of the smoking response. Some methods potentiate the satiation technique, such

as the use of simulataneously-introduced blasts of hot smoky air (Schmahl et al., 1972; Lichenstein et al., 1973). This present study yielded poorer results than Lichenstein et al. (1973) although we used approximately the same number of active treatment sessions, puffing rate and cigarettes smoked were the same. In our study, six consecutive days were used on all subjects instead of the three days (or more if the subject requested it) in the Lichenstein et al. (1973) study. As well, the present subjects were seen individually. At treatment termination in S-Sm: 30% and in S-no-Sm: 40% of subjects remained abstinent in our study while 100% abstained in the Lichenstein study. At the six month follow-up we had abstinence rates of 10% and 20% compared to 60% in Lichenstein's study. As explained previously by Lando (1975), part of the success of this other experiment may be due to the fact that the experimenters exploited inter-personal persuasion in addition to the aversive conditioning (e.g. control group achieving 100% abstinence). The persuasive techniques used were warmth, expectancy and

encouragement, as mentioned by Lando.

The simple fact of adding a new component to the satiation technique such as massed versus spaced trials (See Rosberger, 1974) may have accounted for the better results we obtained with a similar technique which differed only on the distribution of trials, i.e., massed vs spaced. In the present study, we achieved an end of treatment level of 20.12% of baseline and 20.82% compared to 69.06% of baseline for the satiation groups in Rosberger's study (1974). Even the combined groups were better in this study: 17.84% and 12.05% compared to 20.65% of baseline. The three month follow-up showed a slower relapse rate compared to Rosberger (1974). In terms of abstinence rate, the present study shows that when the spaced versus massed practice of satiation are compared, the last approach is clearly superior in both satiation groups and combined groups even at the long-term follow-up. Therefore, the use of massed trials may have produced a stronger and more lasting conditioned aversion (as shown by the moderate relapse rate at follow-up).

In a more recent experiment, Lando (1975) demonstrated a higher abstinence rate of 64% at two week follow-ups (in the present study 40% and 30%) and 43% and 36% at one month and two months follow-up, while in the present study at the six week follow-up the percentages were quite similar: 30% and 40%. It seems that the difference between the two studies is more marked at the end of treatment. Lando's use of portable pocket timers, systematic record keeping during the follow-up period, the smoking of three cigarettes during the sessions, checking of the self-reports through a methodological innovation, use of carbon monoxide breath test, and use of group sessions may have accounted for the differences between the two studies.

In the present study, most smokers found the period of six consecutive days for the massed trials too short although very helpful, because there was no interlude between sessions, and encouraging because they created a sustained conditioned aversion. This type of immersion, with few interlude between treatment sessions may have created more consciousness of the

nauseating effects of rapid smoking and allowed less time for recovery. This hypothesis counters traditional learning theory principles, but may best be explained by Hullian Learning Theory (Kimble, 1961). It states that every response of an organism "left an increment of reactive inhibition".... and" was assumed to decay with rest" (Kimble, 1961, pg. 282). It was further postulated that this reactive inhibition was a primary negative drive which very closely resembled fatigue. Thus, under this formulation, extinction will occur more rapidly with "massed" rather than "distributed" practice. Under massed trials, reactive inhibition would tend to build in the organism, until extinction occurred. In addition, there was less time for smoking eliciting cues to the reinforcing.

The rationale for the use of an alternate response (in this study, relaxation) has been shown previously (Katz, 1973). In fact, the application of such a technique requires the self-control of behavior. Once the behavior has been suppressed through some aversive agent, it is necessary to compensate for it by adding some

new positively reinforcing element that will re-establish behavioral equilibrium. Since the smoking behavior has been teased out of a crowd of stimuli and situations (covert as well as overt), the question arises as to whether a single response such as relaxation will adequately provide the positive reinforcing properties necessary to replace the smoking act.

A panoply of additional alternate responses should therefore be investigated and made available to subjects free to choose the one appropriate for him, according to his taste and his mood. As suggested by Kopel (1974) it must be some kind of "self-set", self-administered at home or outside the treatment. The alternate source of satisfaction may carry the properties of cigarette smoking i.e., be calming (following the Nesbitt paradox (1973) where it is shown that although smoking produces sympathetic arousal, moderate smokers behave less emotionally during the act of smoking, which is consistent with the subjects' usual reports that they feel less emotional when smoking), it must be performed in situations similar to those where cigarette

smoking is performed and be available at any time. It may involve similar manual manipulations and if possible some sensory activity, or involve the taste, inhaling, smell, handling, or watching of the smoke, and some specific oral gratifications derived from this habit. It is not only the filling of a space but it is to have an alternate reinforcing response that assists the smoker in his process of reducing his consumption. This could take the form of chewing gum (Resnick, 1968) cognitive exercises featuring imagery (Steffy et al., 1970), rewarding messages (Suefield and Ikard, 1974) time structuring activity (Flaxman, 1974) control of discriminative stimuli as suggested by Nolan (1968), Roberts (1969) and maintenance of a diary suggested by Bandura (1969), or anything that increases the awareness of the positive results of non-smoking. The alternate response should be made contingent on the performance of the desired behavior i.e., not smoking.

In this vein, the self-control procedure in the modification of smoking behavior could be a useful tool, minimizing subject drop out and the

unpleasant emotional effects due to the technique of satiation. It must be a method which can be used as an adjunct to other procedures. Some type of contractual agreement (Tooley and Pratt, 1967) public commitment (Flaxman, 1974) may be used in the program not only will bring social pressure upon the subjects but can provide a social structure through which appropriate non-smoking transactions can occur and be reinforced.

One point needs to be carefully assessed: is it the subject's decision to stop smoking. As Mausner (1964) pointed out in Lawton's (1962) papers, the decision to stop smoking is the middle phase in the individual's attempt to control smoking. When the decision is taken before the therapy, the subjects will benefit more from it because they are in a better mood or in a highly decisional frame of mind that must be resolved. This cognitive aspect must be studied in order to check the sincerity of subjects coming in for therapy either under the form of a motivation questionnaire at the pre-treatment level. Again successful therapy must

have two ingredients: a conscious wish to stop on the part of the client and an effective therapeutic tool.

Apart from the cognitive factors involved in the cessation of smoking, social factors must also play a major role. In fact, social pressure either in the form of role playing "games", abstinence clubs ("Voegtlin's clubs" like the one used for alcoholics) and the use of periodic re-conditioning sessions, or any peer reinforcing situation where contact with others might reinforce anti-cigarette feelings by observing other smokers performing the fast puffing, may be very helpful. These booster sessions might be self-administered by the subjects. Sessions such as these were used by Lichenstein (1973) and Lublin and Joslyn (Note 1) but with no systematic attempt to assess their effectiveness. Recently, Levenberg (1974) used them with efficacy but at a relatively small time after therapy: two weeks follow-up. Therefore, research should investigate booster treatments more extensively as recommended by Kopel (1974). These sessions may serve to bridge the three

month period of maximum relapse vulnerability. This way, there would be a more comprehensive human engineering offered to the subjects (Hunt and Matarazzo, 1970, pg. 111) where recreational and social activities may be supportative techniques for the subjects. Following these authors' thinking, modifying habits which are overlearned should be done with overlearning as well, rather than assuming that once a person has stopped smoking he is off-smoking.

In conclusion, the aim of the present study was first to investigate standardized behavioural modification approaches to smoking and secondly to eliminate the habit. The combined approach seems to yield better results although not significantly different from the satiation approaches. The massing of trials in the satiation paradigm combined with relaxation may have been the critical agent responsible for a stronger condition aversion.

It is suggested that further research concerning the potential of the progressive relaxation and booster reconditioning sessions

should be done.

Unlike the response units in the eyeblink or GSR, the stimuli for smoking are infinitely varied. In order to break the conditional link which ties together the sensations and the social, personal, and situational cues of smoking, some additional parameters seem to be important, such as motivation and volition apart from good therapeutic techniques. As an example, the massed trial practice combined with a relaxation technique could be a worthwhile tool: it decreases the smoking behavior through aversive control while the contingent self-application of both positive and negative reinforcers increases the probability of non-smoking and hopefully enhance long-term abstinence.

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APPENDIX A

Table 1

Summary of One-Way Analysis of Variance
of All Groups During Baseline.

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
Total	6345.312	65	97.6201	
Between	834.142	6	139.024	1.48832*
Error	5511.17	59	93.4096	

*p > .05

Table 2
Summary of Two-Way Analysis of Variance of All
Groups During Baseline, Six Weeks of Treatment
and Two-Week Follow-up.

Source	Sum of Squares	Degrees of Freedom	Mean Squares	F
Total	65919.98	527	125.08	
Between	44487.3	65	684.42	
Group	21292.6	6	3548.76	9.02694**
Error	23194.7	59	393.13	
Within	21432.68	462	46.39	
Trial	9192.65	7	1313.24	80.8108**
Group X Trial	5528.48	42	1316.30	8.09997**
Error	6711.55	413	16.2507	

**p < .01

Table 3

Summary of Two-Way Analysis of Variance of All Groups During Six Weeks of Treatment, and Two-Week Follow-up.

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
Total	32289.84	461	70.04	
Between	43174.9	65	664.22	
Group	23414.8	6	3902.47	11.6521**
Error	19760.1	59	334.917	
Within	8875.07	396	22.41	
Trials	1668.01	6	278.001	21.2326**
Group X Trial	2572.10	36	71.4471	5.45685**
Error	4634.96	354	13.0931	

**p < .01

Table 4

Summary of One-Way Analysis of Variance of All Groups at Six-Week Follow-up.

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
Total	7028.05	64	109.8132	
Between	2665.67	6	444.279	5.90690**
Error	4362.38	58	75.2135	

**p < .01

Table 5

Summary of One-Way Analysis of Variance of All Groups at Three-Month Follow-up.

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
Total	9389.07	64	146.70703	
Between	1772.07	6	295.346	2.24887*
Error	7617.18	58	131.331	

*p < .05

Table 6

Summary of One-Way Analysis of Variance on Gain Scores (Difference Scores) of Five Treatment Groups at the End of Treatment (Sixth Week).

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
Total	3930.69	48	81.88	
Between	1046.26	4	261.566	3.44000**
Error	2884.43	44	65.5552	

**p < .01

Table 7

Summary of One-Way Analysis of Variance on Gain Scores (Difference Scores) of Five Treatment Groups at Two-Week Follow-up.

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
Total	4962.84	48	103.392	
Between	1105.29	4	276.323	3.15180*
Error	3857.55	44	87.6715	

*p < .05

Table 8

Summary of One-Way Analysis of Variance on Gain Scores (Difference Scores) of Five Treatment Groups at Six-Week Follow-up.

Source	Sum of Squares	Degrees of Freedom	Mean Square	F
Total	5195.11	48	108.2314	
Between	1050.25	4	262.562	2.78724*
Error	4144.86	44	94.2013	

*p < .05

APPENDIX B

Table 1

Mean Number Of Cigarettes Smoked Per Day For All Groups

During Baseline, Treatment, and Follow-up.

	Base- line	1st Wk	2nd Wk	3rd Wk	4th Wk	5th Wk	6th Wk	2Wk F/U	6Wk F/U	3Mo F/U	6Mo F/U	1Yr F/U
S-no-Sm	20.92	6.17	3.78	4.10	4.23	4.84	4.21	8.26	8.70	15.00	13.75	11.6
S-Sm	23.05	6.68	5.38	5.48	4.58	3.56	4.80	4.57	8.05	14.15	12.30	10.6
R-S-no-Sm	18.67	15.20	11.11	8.47	3.38	3.24	3.33	4.76	7.39	7.22	10.62	10.3
R-S-Sm	28.88	18.78	15.35	12.43	5.73	3.74	3.48	3.78	5.52	10.50	11.00	14.5
R	27.77	22.52	18.50	16.57	16.75	16.68	15.88	15.30	16.34	18.20		
MT-MC	24.79	23.67	23.56	24.38	24.28	22.46	24.07	24.15	24.14	24.00		
RC	20.68	20.88	20.50	19.17	20.98	20.60	20.89	21.07	20.50	21.33		

Legend: (1) S-no-Sm: Satiation-no-Smoke group. (4) R-S-Sm: Relaxation-Satiation-Smoke.
 (2) S-Sm: Satiation-Smoke group. (5) R: Relaxation group.
 (3) R-S-no-Sm: Relaxation-Satiation-no-Smoke group. (6) MT-MC: Minimal-Treatment-
 Minimal-Contact-
 Control group.
 (7) RC: Recording Only Control group.

APPENDIX B

Table 2

Mean Percent Of Baseline Smoked For All Groups

During Baseline, Treatment, and Follow-up.

	Base- line	1st Wk	2nd Wk	3rd Wk	4th Wk	5th Wk	6th Wk	2Wk		6Wk		3Mo		6Mo		1Yr	
								F/U	F/U	F/U	F/U	F/U	F/U	F/U	F/U	F/U	F/U
S-no-Sm	100	29.49	18.07	19.6	20.22	23.13	20.12	39.48	41.59	71.7	65.73	55.44					
S-Sm	100	28.98	23.34	23.77	19.87	15.44	20.82	19.83	34.92	61.39	53.36	48.96					
R-S-no-Sm	100	81.41	59.51	43.37	18.10	17.35	17.84	25.49	39.58	38.67	59.53	58.13					
R-S-Sm	100	65.03	53.15	43.04	19.84	12.95	12.05	13.09	19.11	36.36	38.09	50.21					
R	100	81.09	66.62	59.67	60.32	60.06	57.18	55.09	58.84	65.54							
MT-NC	100	95.48	95.04	98.35	97.94	90.60	97.09	97.41	95.19	94.63							
RC	100	100.97	99.13	92.70	101.45	99.61	101.01	101.88	96.71	103.14							

Legend: (1) S-no-Sm: Satiation-no-Smoke group.

(2) S-Sm: Satiation-Smoke group.

(3) R-S-no-Sm: Relaxation-Satiation-no-Smoke group.

(4) R-S-Sm: Relaxation-Satiation-Smoke group.

(5) R: Relaxation group.

(6) MT-MC: Minimal-Treatment-Minimal-Contact-Control group.

(7) RC: Recording Only Control group.

Table 3

Gain Scores (Difference Score From Baseline) Of Number
Of Cigarettes Smoked Per Day For Five Treatment Groups
During Baseline, End of Treatment and Follow-up.

	Base- line	End of Treatment (6th Week)	2Wk F/U	6Wk F/U	3Mo F/U	6Mo F/U	1Yr F/U
S-no-Sm	20.92	16.68	12.96	12.23	5.92	7.67	9.32
S-Sm	23.05	18.25	18.18	15.00	8.90	12.60	13.95
R-S-no-Sm	18.67	15.34	13.90	11.23	11.39	7.22	7.47
R-S-Sm	28.88	25.40	25.04	23.36	18.37	17.93	14.38
R	27.77	11.43	12.07	11.05	9.19		

Legend:

- (1) S-no-Sm: Satiation-no-Smoke group.
- (2) S-Sm: Satiation-Smoke group.
- (3) R-S-no-Sm: Relaxation-Satiation-no-Smoke group.
- (4) R-S-Sm: Relaxation-Satiation-Smoke group.
- (5) R: Relaxation group.

Table 4

Proportion Of Subjects Smoking Under The Safe Limit
Of 10-12 Cigarettes Per Day. Percentage Of Those
Subjects In Parentheses.

	End of T. 6th Wk.	2Wk. F/U	6Wk. F/U	3Mo. F/U	6Mo. F/U	1Yr. F/U
S-no-Sm	9/10 (90%)	8/10 (80%)	6/10 (60%)	5/10 (50%)	5/10 (50%)	6/10 (60%)
S-Sm	9/10 (90%)	9/10 (90%)	9/10 (90%)	5/10 (50%)	4/10 (40%)	4/9 (44%)
R-S-no-Sm	9/9 (100%)	8/9 (88%)	6/9 (66%)	7/9 (77%)	5/8 (62%)	4/8 (50%)
R-S-Sm	9/10 (90%)	8/10 (80%)	8/10 (80%)	5/10 (50%)	5/10 (50%)	4/10 (40%)
R	4/10 (40%)	4/10 (40%)	4/10 (40%)	3/10 (30%)		

Legend:

- (1) S-no-Sm: Satiation-no-Smoke group.
- (2) S-Sm: Satiation-Smoke group.
- (3) R-S-no-Sm: Relaxation-Satiation-no-Smoke group.
- (4) R-S-Sm: Relaxation-Satiation-Smoke group.
- (5) R: Relaxation group.

Table 5

Proportion Of Subjects Who Achieved Abstinence.
Percentage Of Those Subjects In Parentheses.

	End of T. 6th Wk.	2Wk. F/U	6Wk. F/U	3Mo. F/U	6Mo. F/U	1Yr. F/U
S-no-Sm	4/10 (40%)	4/10 (40%)	4/10 (40%)	3/10 (30%)	1/10 (10%)	3/10 (30%)
S-Sm	3/10 (30%)	3/10 (30%)	3/10 (30%)	2/10 (20%)	2/10 (20%)	3/9 (33%)
R-S-no-Sm	2/9 (22%)	2/9 (22%)	3/9 (33%)	3/9 (33%)	1/8 (12%)	2/8 (25%)
R-S-Sm	3/10 (30%)	5/10 (50%)	5/10 (50%)	5/10 (50%)	5/10 (50%)	4/10 (40%)
R	1/10 (10%)	1/10 (10%)	1/10 (10%)	1/10 (10%)		

Legend: (1) S-no-Sm: Satiation-no-Smoke group.
(2) S-Sm: Satiation-Smoke group.
(3) R-S-no-Sm: Relaxation-Satiation-no-Smoke group.
(4) R-S-Sm: Relaxation-Satiation-Smoke group.
(5) R: Relaxation group.

APPENDIX C

CENTER FOR RESEARCH ON DRUG DEPENDENCE

SMOKING HISTORY QUESTIONNAIRE

NAME..... MARITAL STATUS.....
ADDRESS..... NO. OF DEPENDENTS.....
TELEPHONE NO..... OCCUPATION.....
AGE..... YEARS OF EDUCATION.....
TODAY'S DATE.....

- 1 How old were you when you began to smoke?.....
- 2 How many years have you been smoking?.....
- 3 How many cigarettes do you smoke per day?.....
- 4 Are you more likely to smoke
 - (a) when tense..... or when relaxed.....
 - (b) alone..... or with others.....
 - (c) when working..... or when playing.....
- 5 How long have you considered your smoking a
problem?.....
- 6 Have you attempted to stop smoking before?.....
If yes, how many times?.....
- 7 How long did each attempt last?
 - 1..... 2.....
 - 3..... 4.....
 - 5..... 6.....

- 8 What methods did you use to help you stop smoking? (e.g., cold turkey, cutting down etc.)
.....?
- 9 Do you have any health problems? If so, please elaborate.....
- 10 What times are most convenient for you to come to SGWU?

	Mon.	Tues.	Wed.	Thurs.	Fri.
Morning
Afternoon
Evening

N.B. NO TWO CONSECUTIVE DAYS.

APPENDIX D

Relaxation "Ritual"

The relaxation "ritual" that was taught to subjects in the R-S and R groups consisted of a chain of tensing-relaxing exercises as follows:

1. Clench teeth and push tongue against roof of mouth.
2. Take in deep breath and hold it, almost to the point of it being aversive, then breathe out completely.
3. Breathe deeply twice more.
4. Draw stomach muscles in toward spine.
5. Breathe deeply once.
6. Tighten leg muscles by either squeezing knees together or by making a type of forward and downward movement with muscles of thigh.
7. Breathe deeply, hold it, breathe out.
8. Breathe deeply once more.