

## RESTRICTED ENVIRONMENTAL STIMULATION THERAPY AND AVERSIVE CONDITIONING IN SMOKING CESSATION: ACTIVE AND PLACEBO EFFECTS

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**Summary**—An aversive smoking treatment, either alone or followed by 24 hr of restricted environmental stimulation therapy (REST, lying on a bed in a dark, silent chamber with occasional smoking-related messages presented over an intercom), was administered to 74 smokers. The subtractive expectancy placebo technique, where an active treatment is described as inert, was used to evaluate the role of the expectancy placebo component. The combined treatments were more effective than aversive conditioning alone, but less so than REST by itself. Expectancy contributed substantially to the success of the aversion treatment through the 6-month follow-up, and less so to the early success of REST. These components faded by the end of 12 months. The implications for designing follow-up periods for studies in this area are obvious. The results also supported hypotheses that Ss who undergo REST are less likely to relapse once they have quit smoking, and that other REST Ss who do not quit show success in controlled (reduced) smoking. For the first time, REST did not potentiate another treatment with which it was combined, perhaps because this particular other treatment is not in itself of proven effectiveness. The results also show that the impact of REST does not depend on the client's expectations concerning its effects. Data concerning smoking behavior and attitudes, some of which predicted treatment success, are also presented.

### INTRODUCTION

After several decades of research and clinical application, the field of smoking intervention still presents more problems than solutions. One of the most recent reviews echoes the conclusions of those that started appearing in the 1960s:

“Cigarette smoking is . . . one of the most resistant problems to modify permanently. There is as yet no dependable behavioral technology for the treatment of dependent cigarette smokers.” (Lichtenstein and Mermelstein, 1984, p. 695)

In particular, a low rate of maintenance of post-treatment gains (high relapse rate) appears to characterize most outcome studies; conclusions based on short-term follow-ups are generally misleading, since there is dramatic recidivism during the first year after treatment (Hunt, Barnett and Branch, 1971; Hunt and Bepalec, 1974; Lichtenstein and Rodrigues, 1977; Lichtenstein and Mermelstein, 1984).

This is not to deny that improvements in smoking treatment have been made. As the reviewers cited above have noted, procedures have become much more sophisticated, with multimodal approaches being developed as the complex nature of smoking behavior has been recognized. While some vaunted techniques (e.g. hypnosis, acupuncture) still await adequate objective evaluation, others have been so evaluated and their place in the therapist's repertoire has been more or less established. For example, the general superiority of behaviorally-based procedures over psychotherapeutic ones, both in rigor and in effectiveness, has been well-documented (Keutzer, Lichtenstein and Mees, 1968; Raw, 1978).

One category of frequently used behavioral techniques can be labeled aversive strategies (Lichtenstein and Mermelstein, 1984). In the current study, two approaches of this sort were combined to provide an aversive conditioning package. One was satiation smoking, in which the client is instructed to increase drastically the number of cigarettes smoked over a specified period of time. This technique dramatizes the psychophysiological discomforts induced by cigarette smoke. Although there were some positive results when the method was first introduced, later studies have failed to replicate these findings consistently (Pechacek and McAlister, 1980). The

other was covert aversive conditioning, also known as covert sensitization (Cautela, 1970). In this procedure, clients are taught to visualize (imagine) themselves going through the sequence of taking out, lighting and smoking a cigarette and at the same time to imagine, quite realistically, becoming nauseated and vomiting. This version of cognitive behavior modification relies on the conditioned association of smoking with nausea to make the former aversive and thus to extinguish it. In addition, positive affect can be obtained by imagining relief from nausea as one decides not to smoke (or to stop smoking) the cigarette. As with satiation smoking, evaluations of this technique have failed to demonstrate lasting positive effects (Barbarin, 1978; Gotestam and Melin, 1983; Lichstein and Sallis, 1981). Some reviewers have indicated that, although these two techniques were ineffective by themselves, they could have some value as components in a multimodal treatment package; however, even that application is of dubious potency (Lando, 1982).

Previous research [reviewed in Suedfeld (1984a)] had shown that restricted environmental stimulation therapy (REST) potentiates the effectiveness of other smoking cessation methods, but the methods previously combined with REST were also powerful in themselves. The current study investigates whether REST would have the same effect on a set of procedures which by themselves had not been shown to work well. Accordingly, aversion was combined with REST. Another major purpose of the combination was to have a second procedure to make an assessment of placebo effects possible.

The use of REST in smoking cessation was the first, and is still the most thoroughly investigated, application of this procedure to habit modification (Suedfeld, 1984a). The typical method is to have the client lie on a bed in a completely dark, soundproof chamber for up to 24 hr, with food, water and toilet facilities available within easy reach (e.g. Suedfeld and Ikard, 1974). In some studies, the client is allowed to walk around in the room, or auditory stimulation is permitted. In others, messages designed to facilitate smoking cessation are presented periodically during the session. The technique has also been combined with more traditional intervention methods, usually behaviorally oriented ones such as self-monitoring, satiation smoking and self-management programs.

Over a dozen studies have been published using REST in this context. Unlike much of the literature, they tend to use clearly defined control treatments, random assignment of clients to treatment groups, and at least 6- to 12-month follow-ups. The results have been very positive. Average reduction and abstinence rates are at or above the upper ranges of those obtained through the use of other interventions (i.e. 25–35% abstinence after 1 yr, with mean reduction rates approximating 40–50%). One important aspect of the procedure is its economic aspect, since it requires only a single 24 hr session, with very little professional time or cost involved.

The potentiating effect of REST combined with other treatments is even more striking: after 1 yr, 53% abstinence for REST and messages combined with a behavioral package (Best and Suedfeld, 1982); 47% for REST and hypnosis (Barabasz, Baer, Sheehan and Barabasz, 1984); 88% at 6 months for REST, messages and a social support maintenance network (Tikalsky, 1984).

Aside from high effectiveness and cost-effectiveness (Suedfeld, 1980), REST as a smoking intervention tool has two interesting characteristics. One is that its major impact may be on long-term maintenance. Best and Suedfeld (1982), among other workers, reported that immediate posttreatment effects were comparable to those obtained with other techniques; the relapse rate, however, was consistently much lower. Second, the method does not address itself only to abstinence. A relatively high proportion of those clients who do not succeed in quitting smoking, or who do so only temporarily, manage to maintain their smoking behavior at a substantially lower level than before treatment (Deaton, 1983; Suedfeld and Ikard, 1974). Controlled smoking at a low rate, while not as good as abstinence, is certainly preferable to complete relapse (Frederiksen, Peterson and Murphy, 1976). It is not a highly probable outcome of most intervention techniques, whose participants tend to show either abstinence or a return to pretreatment smoking rates (usually the latter).

In spite of the data supporting the use of REST in this area, which have been fairly consistent across controlled studies performed in different laboratories by several investigators (see Suedfeld, 1984b; Suedfeld and Kristeller, 1982), the technique has not been widely adopted for clinical use. While questions have been raised—and answered—about various aspects of the procedure, one that concerns us in this paper is related to the issue of nonspecific or placebo effects. It has been suggested (e.g. Bernstein and McAlister, 1976) that because the REST situation is quite novel and

dramatic, it elicits high client expectations as to its potency; and that these expectations, rather than any active component of the treatment, can be credited for the positive results.

From a purely pragmatic viewpoint, of course, this issue is irrelevant. If REST is an unusually good placebo treatment, its success is still a fact and would justify its use. Scientifically, however, the argument needs to be assessed. In previous studies, effort has been expended to minimize the dramatic aspects of the REST procedure and to reduce positive expectancy by emphasizing the experimental nature of its use in smoking intervention. For example, clients were specifically told that the research team did not know whether the treatment would be effective, and was primarily interested in finding out whether it was or not (rather than demonstrating that it was). The neutrality of the researchers was repeatedly stressed during contacts with each client (Suedfeld and Ikard, 1974).

Nevertheless, a more rigorous test of active vs inert components of the REST effect appears to be desirable before continued research and clinical application. In the current study, such a test is applied for both aversive conditioning and REST. The approach chosen was the subtractive expectancy placebo technique (Suedfeld, 1983a), which avoids several problems of traditional expectancy placebo manipulations. By administering a treatment but describing it as inert, the researcher avoids the necessity of withholding treatment from some clients; designs the study so that the demonstration of placebo effects does not depend on null results; and does not face the problem of proving that an intervention in fact has no active component (a notoriously difficult task, particularly with behavioral methods).

## METHOD

### *Subjects*

The study was part of an ongoing research project on smoking cessation and other health psychology topics, for which Ss are recruited through announcements in the mass media and through personal referrals from physicians, clinics and previous participants. Minimal criteria for participation included smoking at least 20 cigarettes/day for at least 5 yr. Both sexes and a wide range of ages, educational and socioeconomic levels etc. were included in each treatment group. For the current study, 80 volunteers were randomly selected from our list, with 20 assigned to each of the four groups. Mean age was 35 yr with a range from 21 to 67; mean age at which they had started smoking was 16 yr with a range from 11 to 33.

### *Design*

The four treatment conditions were as follows.

*AV.* This group received only aversive conditioning (see below). The rationale for the procedure was explained as making the smoking experience unpleasant; if the client no longer enjoyed smoking he or she would then be able to abandon the habit. This result would be obtained by covert aversive conditioning, then satiation smoking for 1 day, followed by a repetition of the conditioning procedure.

*AV-REST.* This group received the same orientation as the previous one. In addition, clients were informed that another treatment technique would be used immediately after the second conditioning session. This treatment was REST, which would remove them from environmental cues that trigger smoking, give them a chance to think in depth about the problem and their need to quit, and provide messages that would help them stop smoking.

*AV-rest.* The information given to this group was the same as for the first. However, they were told that because the satiation smoking and the nausea engendered during covert conditioning were psychologically and physiologically stressful, the procedure included a recuperation period of 24 hr in a relaxation room. Some material about smoking would also be presented during this time to relieve the boredom. It was made clear that this period was not considered part of the treatment.

*av-REST.* These clients were told that they would be treated by REST and messages (described as for AV-REST). But in order to make them aware of what smoking did to their body, they would first have a demonstration procedure. This procedure was the aversive conditioning-satiation smoking combination, which in this case was clearly defined as not part of the treatment itself.

Since considerable data have been collected in our laboratory on the effects of the REST-message

treatment, using the same staff, procedures, environment and S pool, it was considered unnecessary to include a group receiving that manipulation only. However, a group which had undergone the identical form of the REST treatment in a study run almost concurrently with this one (Suedfeld and Baker-Brown, 1985) can be considered an appropriate comparison.

### *Procedure*

*Orientation.* In a preliminary intake session each volunteer was interviewed to make sure that he or she met the criteria for participation. Personal information was collected and a number of questionnaires were administered. The clients were given the schedule of further appointments and follow-ups, and an informed consent form describing the various procedures and time commitments to which the client would be agreeing. It was made clear that we could not actually specify the ones that would be applied in each case, since assignment to groups had not yet been made. Various self-report measures were also administered to collect demographic, attitudinal and behavioral data.

*Self-monitoring.* All clients were required to maintain a smoking record for 1 week prior to the first aversion session. They recorded each cigarette smoked, the day and time, circumstances etc. The record was examined with a clinical psychologist, who discussed with the client any patterns found, situations in which the client seemed particularly likely to smoke, and so on. Immediately after this, the aversion conditioning session was administered by the same clinician.

*Aversive conditioning.* The script followed by the clinician was modeled after standard procedures in this area. Clients were instructed to use all senses when imagining a scene. After imaginal training (three practice examples), they were led through an imagined sequence of events combining feeling the need for a cigarette and all of the steps involved in smoking it with an increasing feeling of discomfort and nausea, culminating in a very realistic scene of throwing up. Putting out the cigarette led to increasing relief. Three such scenes were used, the specific details being based on high-risk situations identified in the client's self-monitoring booklet. In the second aversive conditioning session, 24 hr later, six sequences were used. Of these, three were entirely aversive while three permitted the escape-positive covert reinforcement outcome.

*Satiation smoking.* During the 24 hr interim between the two aversive sessions, clients were instructed to smoke twice as many cigarettes as they normally would. They were also told that if this became too stressful, they could adjust the number, as long as a substantial increase was achieved.

*REST.* This procedure was identical to that used in previous studies. The client lay on a comfortable bed in a completely dark, sound-reducing room (Industrial Acoustics Corp. chamber), with water and liquid diet food available *ad libitum* through plastic tubes fastened near the pillow. A chemical toilet was located near the foot of the bed. A thorough familiarization with the room, both illuminated and darkened, preceded the actual session. Clients were instructed to remain fairly still on the bed and not to make unnecessary noise. They were told that a monitor would be next door listening through the intercom at all times, in case they needed something or wanted to ask a necessary question. They were also shown how to leave the chamber if they wanted to terminate the session early; this requires merely that they get up, go to and open the door, and walk out. All questions were fully answered before the lights were turned off and the 24 hr session began.

*Postsession interview.* After the end of the REST session (or, in the case of the AV group, the second conditioning session), clients filled out some questionnaires and participated in an interview concerning their experience in the program, their expectations for the future etc. The importance of cooperating in giving full and honest follow-up data was stressed, using the argument that it was crucial not to perpetuate the use of an ineffective technique (the possible result of false positive responses) as well as to avoid abandoning what might be an effective one (the possible outcome of not responding to follow-up or of giving false negative information).

*Follow-ups.* Scheduled follow-ups consisted of mailed forms and telephone calls every month during the posttreatment year. For various reasons, not every client was actually reached each month, or exactly on the anniversary of treatment completion. In addition to these responses, clients were asked to come to the laboratory twice during the follow-up period for a personal interview and a measure of exhaled CO. While self-reported smoking rate may in fact be a better

measure (Pettiti, Friedman and Kahn, 1981), combining this index with a biochemical one may serve to increase self-report accuracy (King, Scott and Prue, 1983); this was the major purpose of including the periodic CO samples.

## RESULTS

Six of the 80 participants were lost during follow-up (became unreachable by mail or telephone) and were not replaced. Final *ns* were 19 each for the AV and AV-REST groups and 18 each for AV-rest and av-REST. The final group consisted of 41 women and 33 men. In some cases, particular clients could not be reached for specific monthly follow-ups; their smoking data were replaced by the grand mean for the entire group. This was done only for clients whose follow-ups were resumed at a subsequent period.

### Smoking reduction

Baseline smoking rates, shown in Table 1, did not differ significantly across groups [ $F(3,66) < 1$ ].

Mean reduction in self-reported smoking rate varied as a function of treatment group, time posttreatment and the interaction (see Tables 1 and 2). At the 3-month follow-up [overall  $F(3,70) = 7.99$ ,  $P < 0.0001$ ], Newman-Keuls comparisons showed that AV was significantly less effective than AV-REST or AV-rest. The latter were not significantly different from each other. AV-REST was significantly more effective than av-REST. At 6 months ( $F = 3.97$ ,  $P < 0.02$ ), AV led to less reduction than either AV-REST or AV-rest. By 9 months, the overall difference only approached significance ( $F = 2.28$ ,  $P < 0.09$ ) with no significant differences on paired comparisons. There were no significant differences at 12 months.

Table 1. Smoking rates and reduction

Group	Mean baseline rate (cig./day)	Mean (SD) % reduction, follow-up month			
		3	6	9	12
AV	31.5	32.5 (34.6)	32.9 (28.4)	43.5 (33.8)	37.1 (32.5)
AV-REST	37.3	85.7 (24.0)	67.5 (35.8)	36.8 (33.2)	39.7 (24.5)
AV-rest	36.1	71.1 (35.1)	67.3 (31.2)	64.8 (32.7)	54.6 (37.4)
av-REST	32.6	54.8 (44.2)	53.0 (44.9)	45.0 (36.6)	41.6 (33.5)

Table 2. Summary of ANOVA

Source	<i>df</i>	MSe	<i>F</i>	<i>P</i> <
Group	3	1751.7	3.43	0.025
w	70	3133.5		
Time	3	4628.7	8.90	0.001
Gp × Time	9	2534.5	4.87	0.001
w	210	520.1		

Figure 1 shows the pattern of reductions. After a highly dispersed set of success rates immediately after treatment, considerable convergence took place. The AV-rest group showed the most

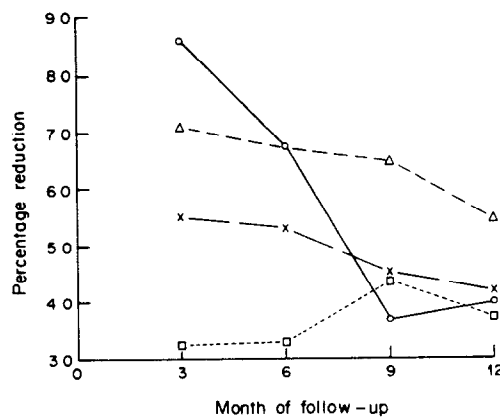


Fig. 1. Mean reduction in smoking rate. □---□, AV; ○—○, AV-REST; △---△, AV-rest; x—x, av-REST.

reduction at the 1-yr follow-up (almost 55%), with the other three groups relatively close to each other at about 40%. This can be compared with the mean of 51% reduction at 1 yr for the REST-only comparison group mentioned earlier [the 24 hr, distributed message group of Suedfeld and Baker-Brown (1985)].

It should be noted that there was a large temporary expectancy effect for the aversive package. Comparing the treatment group where the positive placebo effect was allowed to operate (AV-REST) with a group that was treated identically except that the expectancy component of aversion was counteracted (av-REST), we found that the former had much better mean reduction rates at the 3- and 6-month follow-ups: 86% and 68% as compared to only 55% and 53%; however, this effect had disappeared by the 9-month follow-up. A parallel comparison showed a smaller expectancy effect for REST at 3 months, AV-REST mean = 86% and AV-rest = 71%. In this case, the effect was no longer apparent at 6 months.

Abstinence data at the end of 1 yr showed 5 clients (28%) from the AV-rest group to have been abstinent during that period, compared to 1 (6%) from each of the other conditions. The comparison REST-only group from the previous study had 36% abstinence at the equivalent point. Controlled smoking occurred among the REST Ss: with abstainers removed from the data, the reduction rate for the three groups receiving REST was 33.9%. The analogous rate in AV was 27.8%. AV also had the worst rate of relapse (i.e. Ss who had become abstinent and then begun smoking again), 37%. As in other studies, Ss who had gone through a REST procedure and quit smoking were much less likely to start again (6.8% for the other three groups combined).

#### *Smoking behavior and attitudes*

Among situations in which it was difficult not to smoke, the highest ranked one was 'after meals' (mentioned by 96% of the Ss). It was followed by 'with tea or coffee' and 'with drinks' (both 92%), 'while watching TV' and 'while on the phone' (88%) and 'while walking' (84%). Other situations mentioned by over half the Ss included relative inactivity (waiting, driving, reading) and the presence of smoking cues (being offered a cigarette, being with others who smoked, and being in an empty room with a 'No Smoking' sign).

Most frequently mentioned as ways to refrain from smoking for a short period was 'threatening yourself' (87%). Lower in frequency were such actions as remembering the hazards of smoking, distracting oneself with an interesting activity and 'reminding yourself not to smoke'.

Negative physiological reactions to smoking included a stale taste in the mouth (95%), shortness of breath (89%) and sore throat (70%). About 45–55% of the Ss had experienced such relatively serious problems as dizziness, nausea, chest pain, headaches and uncontrollable coughs. It is interesting to note that the most important reason for wanting to quit was physical fitness (87%), followed by shortness of breath (74%) and lung cancer (72%). Cancer in general, emphysema, sickness in general and throat cancer were each mentioned by over half the Ss, with much lower percentages indicating other pulmonary and cardiovascular dangers. Among personal concerns other than health, the most frequently named was smelly hair and clothes (87%), waste of money (77%) and bad breath (74%). Frequently mentioned social concerns were offending others with smoke (80%), setting a poor example for children (58%) and risking the health of nearby people (50%).

#### *Predictor variables*

Predictors of treatment outcome were not obvious among our measures. The association between baseline smoking rate and eventual outcome (percentage change at 12-month follow-up) was minimal,  $r = 0.04$ . Most of the pretreatment demographic and attitudinal measures did not significantly predict treatment outcome. These included age at treatment, length of time as a smoker, number of physiological reactions to smoking that the S had experienced, the number of situations in which it was difficult not to smoke, perceived control over own life and the degree of liking for smoking. The age at which the S began smoking was marginally correlated with smoking reduction at the 12-month follow-up,  $r = -0.15$ ,  $P < 0.10$ ; the older the individual had been, the less the reduction. Significant predictors were the number of ways the S had previously used to try to quit ( $r = 0.26$ ,  $P < 0.02$ ) and the three Subjective Stress Scale ratings. Interestingly, the first of these (administered at the original interview) correlated positively with eventual smoking

reduction ( $r = 0.28$ ,  $P < 0.03$ ) while the others, given just before and just after the treatment, correlated negatively (respectively,  $r = -0.25$  and  $-0.28$ ,  $P < 0.05$  and  $0.03$ ).

## DISCUSSION

The data confirmed that the aversive treatment package by itself was of limited usefulness. To illustrate, the AV group's mean reduction of 37% on the 1-yr follow-up may be contrasted to 51% for the REST-only comparison group. When REST and aversion were combined, the results tended to be slightly better than for the aversive procedure alone but substantially worse than for REST alone: the one exception was when REST was subjected to the subtractive expectancy placebo manipulation so that it was described as a recovery period rather than as a treatment *per se*. Early follow-ups showed a marked positive expectancy effect in the results of aversion; however, this faded by the 9-month follow-up. A similar, although considerably smaller, initial expectancy effect for REST lasted only to the 3-month follow-up. Once again, the need to incorporate follow-up contacts beyond 6 months is obvious.

This is the first time that REST in combination with other treatments showed smaller success rates than REST alone. Even accepting that the low effectiveness attributable to the aversive package merely confirms previous disappointing findings with aversion approaches, it is difficult to explain why aversive conditioning should actually diminish the potency of the REST treatment, or why this interference effect should disappear when REST is disguised as an adjunct experience instead of being presented as a treatment.

Why should the AV-rest treatment have been the most successful? One possibility is that Ss in this group, who were essentially told that the treatment was completed before they went into the chamber, entered the REST experience more relaxed than others. We may have had unintended expectancy effect here; by describing REST as a period of recuperation, the expectation of reduced stress may have been substituted for the expectation of receiving an active treatment. As a result, these Ss may have been less defensive, more open to the effects of the environment and the messages, and perhaps less susceptible to reactance. These factors may also explain the significant negative correlation between subjective stress just before and just after treatment on the one hand and eventual success in modifying one's smoking on the other.

The nonsignificance of differences among treatment groups at the 1-yr follow-up is unusual in the REST-smoking literature (cf. Best and Suedfeld, 1982; Suedfeld, 1983b). In interpreting this negative finding, one must remember that all four of the treatment groups received aversive conditioning, and three of the four also received REST. Since their treatments were so similar, it is not surprising that their long-term effects also converged. This can be compared to other findings concerning long-term convergence, which have been cited in arguments against a strategy of dismantling the elements of multimodal interventions and in favor of global assessment strategies (Lando, 1982). Perhaps the most important aspect of the phenomenon here is that ancillary aspects of the treatment, such as expectancy, had at most a temporary influence on the outcome.

One purpose of this study was to investigate the extent to which REST effects on smoking are 'merely' consequences of expectancy of success. While this does not matter pragmatically—i.e. as long as clients quit, whether they do so because REST is an active treatment or because it is an unusually potent placebo procedure is unimportant—it obviously has serious scientific and theoretical implications. The data indicate that the outcome of the treatment is not dependent on expectancy. The AV-rest group, which received a counterplacebo orientation to the REST treatment, did better than the AV-REST group and was about as successful in reducing smoking as was the REST-only comparison group. In addition, the results of this study confirmed earlier hypotheses and preliminary findings concerning the effectiveness of REST in producing controlled smoking in some participants, and in obtaining low relapse rates among those who do succeed in becoming abstainers.

The smoking behavior and attitude items did not yield any major surprises, although the relatively low degree of emphasis on the negative cardiovascular sequelae of smoking was unexpected. The frequently mentioned items may be useful as focal targets for either mass campaigns or individual treatment programs that incorporate attitude change in smoking prevention or cessation. They can also be used to identify high-risk occasions for relapse prevention training and guidelines for self-control in times of temptation.

The most interesting predictor variables were the three Subjective Stress Scale ratings. Apparently, high stress at the time of the intake interview and low stress just before and after treatment were associated with success. This pattern cannot be explained without further investigation, and requires a clearer breakdown between treatment components. The finding that people who had begun smoking at a relatively early age were more successful was unexpected and should also be followed up.

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