RELAPSE PREVENTION AND SMOKING CESSATION

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Abstract—A multicomponent smoking relapse prevention treatment based on Marlatt and Gordon's (1980) model of the relapse process was developed and evaluated. Behavior-analytic methods were used to develop assessment instruments, training situations, and coping responses. The prevention components were presented in the context of a basic broad-spectrum stop-smoking program, and were compared with the basic program plus discussion control, and the basic program alone. Smoking-related dependent variables generally did not differ between groups at any time from pre-treatment to 12 month follow-up. Only the subjects in the relapse prevention condition improved problem-solving and social skills needed to cope with high-risk situations. These subjects also tended to take longer to relapse and smoke fewer cigarettes at the time of relapse. Subjects above the median level of competence on measures of social skill at post-treatment remained abstinent significantly longer. Maintenance of non-smoking was found to be related to the degree of competence with which individuals deal with high-risk situations. Results are discussed in relation to models of compliance with therapeutic regimens.

Recent behavioral methods of smoking cessation produce significant quit rates by the end of treatment (Pechacek, 1979). Unfortunately, resumption of cigarette use typically occurs after the treatment is withdrawn (Lichtenstein, 1982). While several studies have incorporated maintenance components in their treatments, they have produced mixed results (Colletti & Stern, 1980; Pomerleau, Adkins, & Pertschuk, 1978; Relinger, Bornstein, Bugge, Carmody, & Zohn, 1977). Previous investigations, however, have not evaluated incremental effects of adding maintenance components (Lichtenstein, 1982), and have not been based on models of the relapse process.

A cognitive-behavioral model of relapse has been developed by Marlatt and his colleagues (Marlatt & Gordon, 1980; Cummings, Gordon, & Marlatt, 1980). This model suggests that effective coping while encountering high-risk for smoking situations reduces the probability of relapse. Based on this model of relapse, Marlatt and Gordon (1980) propose a relapse prevention treatment involving: (a) specific social skills training aimed at improving coping in high-risk situations, (b) global problem-solving training to promote generalization of self-efficacy, (c) altering positive expectancies about future cigarette use, (d) cognitively restructuring the meaning of the initial relapse by viewing relapse as a decision and as an event which calls for active use of problem-solving skills, and (e) developing behavioral contracts which describe exactly what to do if a slip occurs.

This study is a portion of a dissertation conducted at Wayne State University by the first author under the direction of the second. Portions of this study were presented at the annual meeting of the American Psychological Association, Anaheim, CA, August, 1983.

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Two recent studies (Brown & Lichtenstein, 1980; Brown, Lichtenstein, McIntyre, & Harrington-Kostur, 1984) have applied treatment components derived from Marlatt and Gordon's model, although no significant differences between treatment groups were found at follow-up. Furthermore, neither study assessed whether clients acquired effective coping behaviors. A third study (Hall, Rugg, Tunstall, & Jones, 1984) found a significant effect for relapse prevention training, but did not measure social skills thought to prevent relapse.

The purpose of this research was to evaluate the effectiveness of a multicomponent treatment hypothesized to reduce relapse following smoking cessation. This treatment was based on the model of relapse outlined by Marlatt and Gordon (1980), and was presented in the context of a broad-spectrum stop-smoking treatment (Pomerleau & Pomerleau, 1977; Pomerleau et al., 1978). Relapse prevention skills to be used in high-risk situations were developed empirically and their acquisition verified. Since a major component of the relapse prevention treatment involved social skills training, it was hypothesized that the experimental group would show better coping skills than control groups after treatment. It was also hypothesized that the experimental group would demonstrate greater maintenance of behavior change on follow-up than control groups, as seen in measures of abstinence, smoking rates, and exhaled air carbon monoxide.

**METHOD**

**Problem-Solving Test**

The Problem-Solving Test (PST) was developed as an assessment instrument, items from which were also used in training coping skills in the Experimental treatment. The 22 high-risk situations making up the PST were developed empirically using a behavior-analytic method (Goldfried & D'Zurilla, 1969).

Fifty-four situations were first constructed which could be grouped into the three high-risk categories that account for 80% of relapses (Marlatt & Gordon, 1980): (a) intrapersonal negative emotional states, (b) interpersonal conflict, and (c) social pressure. In addition, situations requiring positive assertions were developed in order to assess the generalization of treatment effects to situations unrelated to those used in training. Fifteen situations were developed for each of the three high-risk categories, and nine for the positive assertion category. As assessed by five advanced clinical psychology graduate students, the situations were reliably grouped into the appropriate categories. Raters' degree of agreement was calculated using Fleiss' exact version of Cohen's *Kappa* (Conger, 1980; Fleiss, 1971), $K'm = .87$, $p < .01$.

The difficulty of coping effectively with the situations described in each of the 54 initial items was rated on a seven-point scale by 50 volunteer smokers enrolled in community stop-smoking clinics. Based on median difficulty, eighteen situations were selected to make up the PST including the five most difficult situations from each of the high-risk categories and the three most difficult positive assertion situations. Situations on which judges showed disagreement were excluded. Differences in difficulty ratings between situation types were significant, $F(3,147) = 67.89$, $p < .01$. Interpersonal conflict, social pressure, and intrapersonal negative emotion situations were more difficult than the positive assertion situations ($p < .01$). The intrapersonal negative emotion situations were also more difficult than social pressure situations ($p < .05$).

The PST also contained four additional situations, including two examples of appropriate coping responses (see below), and two for practice. These four situations
were taken from the original pool of 54 and included two of each of social pressure and interpersonal conflict situations.

Since a major aspect of the study involved training clients to cope with high-risk situations, it was necessary to develop guidelines for training and assessment of responses to these situations. This was done by the "competent subgroup" method (Goldfried & D'Zurilla, 1969; Twentyman & Zimering, 1979). Ten ex-smokers were solicited through advertisements. These subjects averaged 37 years in age ($SD = 6.23$), had 17 years of education ($SD = 2.66$), smoked 24 cigarettes per day prior to quitting ($SD = 6.47$), smoked for 13 years ($SD = 5.08$), tried to quit 3 times ($SD = 1.73$), and had been abstinent for eight years ($SD = 4.87$). This group of ex-smokers was then administered the PST. Their responses were recorded and evaluated by five clinical psychology graduate students. Raters used a three point scale (competent, incompetent, neither) to judge the effectiveness of the responses in dealing with the situations. Raters also specified what led them to make a "competent" or "incompetent" evaluation. Agreement among raters was determined by using an intraclass correlation, yielding a correlation of .38. The responses which had been judged as competent by three of the five judges (with no judge giving an incompetent rating for a response), and the rationales given by the raters were used to develop examples and guidelines for effective coping behavior in high-risk situations. The examples and guidelines were used in the Experimental treatment (see below) to train coping skills hypothesized to reduce relapse.

A scoring manual was developed which used the evaluations and principles derived from the successful ex-smokers' responses to describe the problem posed by each PST situation, guidelines for competent responses, and examples of actual responses with suggested ratings. The manual was used by five research assistants to score clients' taped responses to the PST on a seven-point Likert-type scale assessing competence. Assistants were regularly supervised to minimize drift of ratings. Twenty-five percent of the PSTs were randomly selected in order to assess reliability ($r = .73$).

**Treatments**

Three treatment conditions were used: Control ($N = 16$), Enhanced Control ($N = 14$), and Experimental ($N = 15$). Each of these treatments presented a basic broad-spectrum smoking cessation package (Pomerleau & Pomerleau, 1977; Pomerleau et al., 1978).

**Basic treatment package: control group.** The Control group met once weekly for six consecutive weeks, with sessions lasting from one and one-half to two hours. Subjects were expected to quit smoking by the fifth session ("Quit Day").

**Enhanced control group.** The Enhanced Control group augmented the basic package used by the Control group with discussions of eleven problem situations. These included nine high-risk situations from the PST (three from each high-risk type), one difficult situation of the clients' own choosing, and one imagined relapse episode. The high-risk situations were randomly selected from the PST and presented in random order during the course of treatment. Two high-risk situations were discussed during sessions two through five. During the sixth session, the last standard high-risk situation, a situation chosen by the clients, and a relapse situation were discussed.

**Experimental group.** The Experimental treatment added an active cognitive-behavioral skills training program aimed specifically at preventing relapse and minimizing its duration to the basic treatment package. Skills training used the same sit-
uations as the Enhanced Control group, but clients in the Experimental group were provided instruction, modeling, behavioral rehearsal, feedback and coaching of coping behaviors derived from responses of the successful ex-smokers assessed initially (cf. Bellack & Hersen, 1979; Curran & Monti, 1982).

In addition to specific training in coping behavior, clients were trained in the use of general problem-solving skills (D'Zurilla & Goldfried, 1971; Goldfried & Davison, 1976). Subjects in the Experimental group were also asked to identify personally relevant high-risk situations, develop alternative reinforcers to counteract feelings of deprivation, alter their expectancies about the positive effects of smoking, and sign a behavioral contract outlining specific coping responses they would engage in should a relapse occur. Portions of the final session were devoted to discussion of the abstinence violation effect (AVE), and restructuring the meaning of an initial relapse by education and interpreting it as an isolated slip which presented the opportunity to use problem-solving skills.

Therapists
Nine advanced clinical psychology graduate students served as therapists. Each therapist ran one group, and only one therapist conducted a group. None of the therapists had previous experience conducting stop-smoking groups. Therapists were guided by detailed, comprehensive treatment manuals, modeling and rehearsal of treatment techniques prior to each session, and de-briefing following each session.

Procedure

Subjects. Fifty-six individuals completed the intake interview. Five dropped out before the first group meeting, five more dropped out after the first session, and a sixth left the group after the second session. Forty-five clients completed the treatment. Clients paid a small fee and deposited a sum of money, half of which was returned at the completion of the sixth session. The remaining deposit was returned at the three-, six-, and twelve-month follow-ups.

When enough intakes had been completed to ensure an adequate group size, the clients were randomly assigned to one of the treatment conditions. The number of clients in a group varied from 3 to 8. Three groups were run in each of the three conditions.

Pre-treatment assessment. Pre-treatment assessment consisted of an interview, smoking questionnaire, the PST, and a measure of exhaled air carbon monoxide (CO). Samples of exhaled air CO were measured using an Energetics Science Ecolyzer (Series 2000) and a standard sampling procedure (Ramsey, 1967). Sources of artifact were controlled for (Horan, Hackett, & Lindberg, 1978; Hughes, Fredriksen, & Frazier, 1978) and ambient CO levels were always less than five parts per million.

Post-treatment assessment. Immediately after the end of the sixth session, clients were re-administered the CO test. The PST was administered within one week of the last session.

Follow-up assessments. Three months following the end of the treatment CO and PST measures were taken again. Clients who were smoking were asked to self-monitor for three days and mail these data back to the clinic. Subjects also filled out a questionnaire patterned after the follow-up version (Chaney, O'Leary, & Marlatt, 1978) of Marlatt's (1976) Drinking Profile. At six- and twelve-month follow-ups, clients were asked to provide a sample of exhaled air and to self-report and self-monitor smoking rates.
### Table 1. Smoking-Related Data—Data Organized by Treatment Condition

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pre-Treatment</th>
<th>Post-Treatment</th>
<th>3 months</th>
<th>6 months</th>
<th>12 months</th>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Control</td>
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<td>5.3</td>
<td>19.2</td>
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<td>12.8</td>
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<tr>
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<td>10.9</td>
<td>15.9</td>
<td>17.4</td>
</tr>
<tr>
<td>SD</td>
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<td>8.0</td>
<td>8.9</td>
<td>12.4</td>
<td>12.8</td>
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<tr>
<td>Experimental</td>
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<td>18.1</td>
<td>21.1</td>
<td>20.3</td>
</tr>
<tr>
<td>SD</td>
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<td>13.7</td>
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<tr>
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<td>10.3</td>
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<td><strong>Exhaled Air CO (ppm)</strong></td>
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<td></td>
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**RESULTS**

*Smoking Variables: Analysis by Groups*

Pre-treatment demographic and smoking related data were analyzed, and no differences between groups were found. Subjects averaged 36 years old ($SD = 9.88$), had 16 years of education ($SD = 2.63$), had smoked 10 years ($SD = 9.19$), and had tried to quit five previous times ($SD = 10.45$). On a scale of one to five, their average confidence to quit was four ($SD = 1.08$), and their confidence to remain off cigarettes was four ($SD = 1.24$). Self-reported smoking rate was 28 cigarettes per day ($SD = 9.77$), self-monitored rate was 23 cigarettes per day ($SD = 9.59$), and CO level was 42 ppm ($SD = 17.28$).

Subjects significantly reduced their smoking by the end of treatment as seen in self-reported rates, $F(4,168) = 39.25, p < .001$, self-monitored rates, $F(4,168) = 24.27, p < .001$, and exhaled air CO levels, $F(4,168) = 23.86, p < .001$ (Table 1). The Time by Groups interaction for CO levels was significant, $F(8,168) = 2.29, p < .05$. Simple effects tests showed that groups were different at post-treatment, $F(2,42) = 3.80, p < .05$, with the Enhanced group showing significantly higher levels of CO than either the Control or Experimental group.
Control, Enhanced, and Experimental groups did not differ at any follow-up point with respect to self-reported smoking rate, self-monitored smoking rate, CO level, number abstinent (Table 2), number who quit, or number who relapsed. Post hoc tests using self-reported rates, self-monitored rates, and CO showed significant increases in these measures between post-treatment and three-month follow-up, except for the Enhanced group. While Enhanced subjects showed poorer outcome than other subjects at post-treatment, they were relatively more able to maintain their behavior through follow-up. Significant changes in these variables did not occur after the three-month follow-up for any group.

Number of days between stopping and relapse was not significant: Experimental ($M = 21.4, SD = 19.2$), Control ($M = 16.2, SD = 14.4$), and Enhanced ($M = 11.6, SD = 20.4$). Number of cigarettes smoked after the first one at the time of relapse did not differ between groups: Experimental ($M = 0.75, SD = 1.04$), Control ($M = 2.38, SD = 3.70$), and Enhanced ($M = 2.17, SD = 2.40$). Perceived ability to remain off cigarettes after smoking the first one during a relapse did not differ between groups.

### Smoking variables: analysis by competence level

An interesting question is whether subjects who are more competent in dealing with high-risk situations are also more able to avoid relapse. Subjects were split into two groups at the median post-treatment level of competence in dealing with high-risk PST items. Comparisons of demographic and pre-treatment smoking-related data revealed no significant differences between these two groups. Post-treatment abstinence rates (Table 2) were not significantly different. Significant changes over time were found for self-reported rates, $F(4,172) = 38.41, p < .001$, for self-monitored rates, $F(4,127) = 24.63, p < .001$, and for CO levels, $F(4,172) = 23.27, p < .001$.

When groups based on the median split were compared, they did not differ at any follow-up point with respect to self-reported rates, self-monitored rates, CO, number abstinent, number who quit, or number who relapsed. Post hoc tests using self-reported rates, self-monitored rates, and CO showed significant decreases from pre- to post-treatment, and increases from post-treatment to three-month follow-up, except when this comparison was made for subjects below the median using CO as the dependent variable. Significant changes in these variables did not occur after the three-month follow-up for any group.

When number of days between stopping and relapse was analyzed for subjects split at median post-treatment competence, subjects above the median ($M = 26.7, SD =$...
Relapse prevention and smoking cessation

20.2) took significantly longer to relapse than those below the median \(M = 7.1, \ SD = 7.4; t(26) = 3.40, p < .01\). These two groups did not differ with respect to perceived ability to remain off cigarettes after smoking their first one during a relapse, or in the number of additional cigarettes smoked after the first one at the time of relapse.

**Problem Solving Test**

In order to evaluate the generalization of the social skills training, the PST situations were divided into one of three types: (a) high-risk situations which were trained in the Experimental group treatment, (b) high-risk situations which were not trained, and (c) positive assertion situations which were neither trained nor related to high-risk situations.

Analysis of competence for the trained situations showed a significant effect for Time, \(F(2,84) = 4.04, p < .05\). Competence increased at post-treatment, then decreased at follow-up. Levels of competence differed across situations, \(F(2,84) = 14.87, p < .001\), with the highest levels of competence being seen in social pressure situations, followed by negative affect, and interpersonal conflict situations. The Groups by Time interaction approached significance, \(F(4,84) = 1.79, p < .10\). Experimental subjects improved their competence by post-treatment but relapsed at follow-up, while competence changed little in other groups (see Figure 1).

Analysis of competence for untrained, related situations in the Experimental group showed a significant effect for Time, \(F(2,84) = 7.38, p < .001\), with subjects showing a pattern of results similar to that seen with trained situations. The Time effect was also significant for untrained, unrelated situations in the Experimental group, \(F(2,84) = 3.57, p < .05\), with subjects showing a pattern of results similar to that seen with trained situations. These similar patterns of results indicate that training effects generalized.

![Diagram](image)

Fig. 1. Competence in coping with high-risk situations as measured by the Problem-Solving Test.
This study investigated whether a cognitive-behavioral relapse prevention treatment would reduce the relapse rates among subjects who were quitting smoking. Experimental subjects averaged five days longer to relapse than Control subjects, and 10 days longer than Enhanced subjects. Experimental subjects also averaged less than half the number of additional cigarettes smoked at the time of relapse compared to Control and Enhanced subjects. While not statistically significant, these findings suggest that the Experimental treatment postponed relapse and enabled subjects to exert more control over their smoking immediately following relapse. Both of these outcomes are consistent with Marlatt's model of the relapse process.

A major question of interest was whether subjects who coped better with high-risk situations (independent of treatment assignment) would also stay off cigarettes longer. Subjects above median competence at post-treatment averaged 27 days before relapse compared to 7 days for subjects below the median, a statistically significant difference suggesting that effective coping skills enable a person to avoid or postpone relapse (cf. Shiffman, 1982, 1984).

The Experimental treatment, in contrast to Control and Enhanced treatments, significantly affected subjects' competence for coping with high-risk situations. In addition, most Experimental subjects were above median post-treatment competence in contrast to the Control and Enhanced subjects, most of whom were below. Unfortunately, the improved levels of coping were not maintained at follow-up. If coping skills can be maintained at a high level, smoking rates may remain low, and abstinence rates would be correspondingly higher. Future research should attempt to promote maintenance, by planned extended contacts or through the rehearsal of relapse-prevention skills in-vivo (Kelly, 1982).

Relapse was usually followed by resumption of regular smoking, even for Experimental subjects who were trained to cope with relapse and the AVE. That portion of the Experimental treatment which informed subjects what to do if a relapse occurred, however, was relatively brief. It may be necessary, therefore, to extend the length of this treatment element over several sessions.

In summary, the data provide only modest support for the original hypothesis that the relapse prevention package would promote maintenance of non-smoking. While some of the data, in particular the number of days before relapse and number of additional cigarettes smoked at the time of relapse, show trends consistent with the hypotheses, it cannot be concluded that Marlatt's model was well-supported by the results. The data suggest that using coping skills in situations likely to precipitate relapse tends to postpone the occurrence of relapse and to diminish its intensity when it does occur. Future treatments should devote additional time to intervening in the processes which operate at the time of relapse to decrease their chances of leading to a pattern of regular smoking.

Clients may possess adequate coping skills but not use them because they believe they will not work, or because factors related to compliance are stacked against the client. Relapse, then, may involve a failure of compliance to treatment recommendations to stop smoking and to continue using relapse prevention skills over a lengthy period of time (Best & Bloch, 1979).

Treatment characteristics associated with greater compliance (Haynes, Taylor, & Sackett, 1979) and strategies to improve compliance (Epstein & Cluss, 1982) should be taken into account when developing stop-smoking interventions. This perspective on smoking cessation implies that relapse, maintenance and compliance are all facets of
Relapse prevention and smoking cessation

the same problem. It also suggests that those who are involved in designing stop-smoking treatments should anticipate these “resistances” and include them as a focus of treatment.

REFERENCES


