

The A-B-C's of Smoking Cessation:
Using Behavioral Strategies to Help Undergraduates Stop Smoking
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Abstract

Despite reports claiming cigarette smoking remains the most preventable cause of premature death in the United States, cigarette use by college students is increasing on campuses nationwide. We investigated the effectiveness of a brief multicomponent smoking cessation program provided for a 21-year-old female (Sue) and an 18-year-old male (Tom) undergraduate student from a midwestern university. The treatment program consisted of self-report functional assessment methodology, schedule-reduced smoking, and functionally derived self-management strategies. The use of a functional assessment device provided descriptions of antecedent-behavior-consequence relationships, thereby engendering idiographic self-management cessation strategies, and a schedule-reduced smoking component was included in order to facilitate the programmed reduction in nicotine intake. Dependent measures included self-report of daily smoking frequency and alveolar carbon monoxide levels. Treatment included four weekly sessions lasting approximately 45 minutes. Though neither participant achieved complete cessation, Sue achieved a 70% reduction in smoking at 6-months follow-up. Tom achieved a 60% reduction in smoking at 14-day follow-up, but reported returning to above pre-treatment smoking frequency at 6-months follow-up. Treating college smokers with a rapid multicomponent program targeting the both the behavioral and pharmacological aspects of smoking behavior may offer reductions in smoking.

Approximately one quarter of U.S. adults are regular users of tobacco (U.S. Department of Health and Human Services, 1996). Despite reports that claim cigarette smoking remains the most preventable cause of premature death in the United States (U.S. Department of Health and Human Services, 1989), cigarette use by college students is increasing on campuses nationwide (Wechsler, Rigotti, Gledhill-Hoyt, 1998). In a recent sample of college students in California who were less than 24-years-old, 20.3% reported smoking cigarettes (Patrick, Covin, Fulop, Calfas, & Lovato, 1997). Of those, 14.3% reported smoking for the first time in college and 44.3% had tried to quit smoking during the previous six months but had failed. Considering the health risks attributable to smoking, smoking cessation programs play an important role in public healthcare because they can be designed to target high-risk groups, such as college students, or those with the highest risk for the dose-dependent morbidity

and mortality associated with cigarette smoking (Fiore et al., 1990).

A variety of methods used to help tobacco smokers achieve and maintain cessation have been evaluated in several studies and may be divided into several categories. These include behavioral methods (e.g., self-control and aversion techniques), pharmacological methods (e.g., nicotine replacement therapy), self-help approaches (e.g., *Freedom From Smoking in 20 Days*, American Lung Association, 1984), hypnosis, acupuncture, mass media and community programs and multicomponent techniques (e.g., behavioral and pharmacological methods)(Glasgow & Lichtenstein, 1987; Pechacek, 1979; Schwartz, 1987; Skaar et al., 1997). Typical cessation rates range from approximately 15-20 %, and treatments that target both the psychological and pharmacological aspects of smoking behavior (i.e., multicomponent techniques) produce

higher abstinence rates than those that do not (Cinciripini et al., 1994). For example, Killen, Maccoby, and Taylor (1984) found 50% abstinence rates at 10.5-month follow-up for participants receiving behavioral skills training and nicotine gum. Multicomponent procedures that have been designed to systematically reduce smoking and nicotine intake provide abstinence rates at 1-year follow-up of $\geq 40\%$ (e.g., Cinciripini et al., 1994, 1995; Foxx & Brown, 1979). These procedures address the two fundamental components of successful smoking cessation: initial cessation and maintenance.

Initial smoking cessation may involve either a gradual reduction of smoking prior to complete abstinence or abrupt abstinence (Cinciripini et al., 1994). While results from studies evaluating the impact of abrupt versus gradual quitting are equivocal (Schwartz, 1987), Cinciripini et al. (1995) found participants who adhered to a schedule of gradually increasing inter-cigarette intervals over a 3 week period (i.e., schedule-reduced smoking) had better long-term abstinence at one year follow-up than participants who gradually reduced on their own or stopped abruptly.

Following the initial cessation phase, an individualized maintenance phase should be incorporated into a treatment program (Schwartz, 1987). Designing a maintenance phase tailored to individual smoking patterns requires the therapist to obtain information on potential interdependent functional relationships between the client's smoking and the contextual cues in their environment via functional assessment (Epstein & Collins, 1977). Such a behavioral approach begins with the premise that smoking has multiple predictors and serves multiple functions (Hunt & Azrin, 1973; Sobell, Sobell, & Sheahan, 1976; Sobell, Toneatto, & Sobell, 1994). A self-report functional assessment occurs when a person delivers a thorough verbal report of a target behavior, the context within which it occurs, and a list of hypothesized causal variables (Haynes 1998). The functional assessment can be used to generate a host of

self-management interventions customized to address specific functional relations. These interventions can range from stimulus control strategies (e.g., reducing smoking in the presence of, or avoidance of certain events that exert the most control over a target response), to contingency management strategies (e.g., engaging in alternative responses which may serve the same function as the target response).

An underlying assumption of a functional assessment of smoking is that smoking is functional, i.e., it serves a function for the individual in the context within which she behaves. Another assumption is that smoking is not a static response emitted within a single set of contingencies. Meyers and Smith (1995) suggest the purpose of a functional assessment (of nicotine consumption) is to identify the chain of events that lead to smoking and to clarify the consequences resulting from smoking. A potential benefit of having the client complete a functional assessment is that they may learn about some of the antecedents and consequences functionally related to their smoking (i.e., controlling variables) and dispel the belief that smoking "just happens." Furthermore, because one of the goals of clinical behavior analysis is to assist the client with identifying the environmental causes of private or implicit events (e.g., thoughts and emotions), Kazdin (1982) states, "Clients' own reports of their behaviors or their perceptions, thoughts, and feelings, may...be relevant for several clinical problems" (p. 35). In the context of self-reporting smoking, reports about emotions may be informative in hypothesizing about sources of stimulus control. For example, "...a self-awareness by some clients of how certain situational factors influence their behavior, emotional states included, may be sufficient for them to act to modify or avoid those situations" (Sobell et al., 1976, p. 130). Skinner (1974) noted the importance of self-reports when applied to self-management and self-modification of one's behavior: "When we don't know why we behave, we are likely to invent causes" (p. 34).

The primary purpose of this study was to evaluate the effectiveness of a multicomponent procedure designed to systematically reduce smoking and nicotine intake, in concert with a procedure designed to maintain reduction (or abstinence), with three undergraduate college students who reported abusing nicotine via cigarette smoking. The multicomponent procedure was comprised of a functional assessment of smoking component, a schedule-reduced smoking component and a maintenance component comprised of functionally-derived self-management strategies. The procedure was applied via four weekly group therapy sessions lasting approximately 45 min in duration. The outcome of the procedure was evaluated by utilizing a within-subject A-B-C-D-A withdrawal design. Dependent measures were self-reported daily frequency of cigarettes consumed and alveolar carbon monoxide (CO) levels collected using a hand-held CO monitor.

Method

Subjects and Setting

Participants were two undergraduate students from a midwestern university who were recruited through public postings of the following notice: "Moderate to heavy cigarette smokers, who are thinking about quitting, wanted for five week smoking cessation study. You will be paid for your participation." Sue was a 21-year-old female junior who lived at home, reported smoking for the past 8 years and who had attempted to quit smoking 5 times on her own using both abrupt cessation and gradual reduction techniques. Tom was an 18-year-old male freshman who reported smoking for 1 year and who had attempted to abruptly quit smoking once on his own. Neither participant had ever used behavior modification techniques, nicotine replacement therapy or hypnosis. Both met the following inclusion criteria: currently enrolled as university students, at least 18 years of age, reportedly in good physical and psychiatric health, and study completion. Participants received \$25.00 cash upon treatment completion. Treatment was comprised of one

orientation and four treatment sessions. Sessions were conducted Fridays from 9:00 a.m. to 10:00 a.m. in a small group room located in the on-campus health clinic. Carbon monoxide assessment measures (described below) were collected throughout the study at various locations on campus, such as the student union, the library and the dormitories.

Dependent Variables

The dependent variables for both participants were self-reported smoking frequency, alveolar carbon monoxide (CO) levels measured in parts per million (ppm) and scores on the Client Satisfaction Questionnaire (Attkisson, 1994). Biological assays of CO in exhaled breath provided a convenient, objective estimate of the frequency of cigarettes smoked (Stitzer & Bigelow, 1985). Levels for nonsmokers are reported to range from 2 to 8 ppm whereas levels for smokers range from 6 to 90 ppm (Frederiksen & Martin, 1979). For this study, a handheld portable CO meter assessed CO levels (Micro Medical Limited, Kent ENGLAND). The unit was calibrated to a known concentration of 50ppm of CO gas at least every seven days.

CO measures were scheduled on at least two separate days between the weekly treatment sessions. When participants missed a scheduled assessment appointment, they were contacted by e-mail or the telephone to reschedule. No feedback concerning the CO measure was provided at any time in order to avoid introducing a procedural confound (e.g., a possible negative psychological impact of a high reading). Procedures for collecting a CO measure included instructing the participant to exhale normally, inhale deeply, and then breath-hold for 20 seconds. The 20-second breath-holding period allowed time for equilibrium of alveolar gas within the lungs. After 20 seconds, the unit displayed a "BLOW" icon and the participant was instructed to put their mouth over a disposable mouthpiece and exhale slowly and completely. The displayed CO level in ppm was recorded.

The Client Satisfaction Questionnaire (CSQ, Attkisson, 1994), comprised of eight items scored on a 4-point Likert-type scale, was administered to participants at the conclusion of the study. Possible scores range from 8 to 32 with higher scores indicating greater satisfaction. This questionnaire was included as an informal measure of social validity.

Experimental Design and General Procedure

The experimental design for this study was a within-series design (A/B/C/D/A) replicated across participants and across the three components of the treatment program (cf. Hayes, 1981).

Pre-treatment baseline (Phase A1).

The baseline phase occurred during the first week of the study. Participants met with the experimenter during an initial orientation session to complete the informed consent form and provide an initial measurement of CO. During the baseline phase, participants were instructed to not alter their smoking as they self-monitored their daily smoking frequency on a 4 x 6 index card. Participants provided two additional measurements of CO during the week. Throughout the baseline phase, no feedback was provided about the CO measurements.

Functional Assessment Component (Phase B). The functional assessment procedure was based in part on that of O'Neill et al. (1997) and was designed to obtain the information that was used later to derive the self-management strategies of the maintenance component. This component occurred during the second week of the study and was comprised of one 45 to 60 minute group session during which participants were provided with the functional assessment tools (available by request). A CO reading was taken during the treatment session with two additional CO readings obtained during the week. Functional assessment tools were a self-report paper-and-pencil questionnaire and a self-monitoring tool, both containing the same items. The questionnaire, completed during

the session after an introduction, required that participants rate the likelihood that certain antecedents and consequences from a list of items were functionally related to their smoking. The self-monitoring tool, provided to participants in the form of a 4" x 6" booklet, was comprised of a list of all the items in addition to several blank data recording cards. Participants were instructed to self-monitor their smoking during at least three 24 hour periods, including one weekend day, according to the following instructions: after smoking a cigarette, record the time of day the cigarette was smoked; while referring to the list of items, recall all the antecedents that occurred prior to smoking the cigarette and then record all the relevant setting factors and predictors from the list of items on the data recording cards; and complete the same procedure for the consequences that occurred after the smoking episode. Antecedents and consequences were derived from previous studies using behavioral strategies in the treatment of smoking or substance abuse (Axelrod, 1991; Cole & Bonem, 1999; Colletti, Supnick, & Payne, 1985; Epstein & Collins, 1977; Ikard, Green, & Horn, 1969; Meyers & Smith, 1995; Sobell et al., 1976; Turner, Annis, & Sklar, 1997). Antecedents to smoking were arranged into a behavioral taxonomy of "setting factors" and "predictors." The antecedent category "setting factors" included the setting events or contextual conditions in which smoking could occur (Morris, 1982) and the establishing operations (EOs) that could momentarily alter the reinforcing effectiveness of smoking (Michael, 1993). The antecedent category "predictors" included the conditional stimuli (CSs) and discriminative stimuli (S^D s) that had the potential to elicit and evoke, respectively, smoking. Consequences of smoking, described in terms of their functional relation to a smoking episode, were arranged according to a behavioral taxonomy of immediate and delayed reinforcing and punishing consequences. "Immediate" and "delayed" refer to the temporal relationship between smoking and a consequence such that an immediate consequence would tend to occur closer in time to smoking than a delayed consequence; the terms "reinforcing" and

“punishing” refer to those events that have the potential to increase or decrease the frequency of smoking, respectively.

Initial Cessation Component (Phase C). This component placed participants’ smoking on a schedule comprised of progressively increasing inter-cigarette intervals to facilitate initial smoking cessation (cf. Cinciripini et al., 1994, 1995). The smoking reduction schedule progressively increased the inter-cigarette interval over a 2-week period until smoking frequency was zero. Schedules were based on an individual’s baseline smoking frequency, the approximate number of hours they smoke per day, and the time they usually smoke the first cigarette of the day. This phase consisted of two sessions conducted 7-days apart. During the first 45 to 60 minute group session, participants reviewed their progress from the previous week, provided a CO measurement, and were given the smoking reduction schedule on 4 x 6 index cards. Participants were instructed to continue self-monitoring their smoking, but were no longer required to identify functional relationships. During the second 45 to 60 minute group session, participants discussed ongoing progress using the schedule, received feedback as appropriate, and provided a CO measurement.

Maintenance Component (Phase D). This maintenance component occurred during the last week of the study and was comprised of functionally derived self-management strategies. During the final 45 to 60 minute group treatment session, participants were given a 4” x 6” booklet containing idiographic self-management strategies derived from their completed functional assessment self-monitoring tools, prompted to rehearse some of the maintenance strategies and provide a CO reading. The strategies were arranged according to the following general categories: stimulus control strategies, manipulating emotional conditions, and constructing replacement behaviors (Skinner, 1953). Stimulus control strategies were antecedent function-altering self-management strategies designed to change the setting factors for

smoking (by instructing participants to change the usual context of behavior), manipulate functionally relevant EOs (by instructing participants to engage in certain preemptive behaviors such as relaxation) and weaken the evocative strength of relevant S^Ds (by instructing participants to put smoking on an extinction schedule and refrain from smoking in the presence of the functionally-relevant S^D).

The maintenance component also contained self-management strategies that were part of a general compilation of self-management strategies designed to induce what can be described as emotional changes. For example, participants were instructed to make such self-statements as, “I feel great now that I don’t smoke,” and, “I’ll use relaxation strategies to help me calm down.” Another plan to induce emotional changes designed to maintain cessation involved instructing participants to increase the salience of certain consequences. For example, both Sue and Tom identified “had a bad taste in my mouth” as a consequence that occurred after they smoked a cigarette. Accordingly, their 4” x 6” booklet contained a cognitive rehearsal technique designed to increase the salience of this punishing consequence by requiring Sue and Tom to picture or imagine the steps involved in smoking a cigarette, placing a focus on the bad taste left in the mouth.

Finally, consequence function-altering self-management strategies designed as constructive replacement behaviors were included to help participants engage in distracting behaviors or behaviors incompatible with smoking. For example, both Sue and Tom identified the item “felt relaxed” as functionally related to their smoking, suggesting that one of the perceived functions of smoking was escape from anxiety-provoking situations. Accordingly, they each were given a list of alternative responses that they can emit in order to “feel relaxed,” such as relaxation strategies, removal of self from stressful situation, etc. As another example, both participants identified “feeling energized” as a perceived function of their smoking. Both participants were provided with self-

management strategies that could produce the same functional outcome as feeling energized, such exercising and eating high fructose

treatment program (phase B). Table 1 shows the setting factors selected by Sue and Tom after completing the functional assessment self-monitoring tool from a list of 17 possible

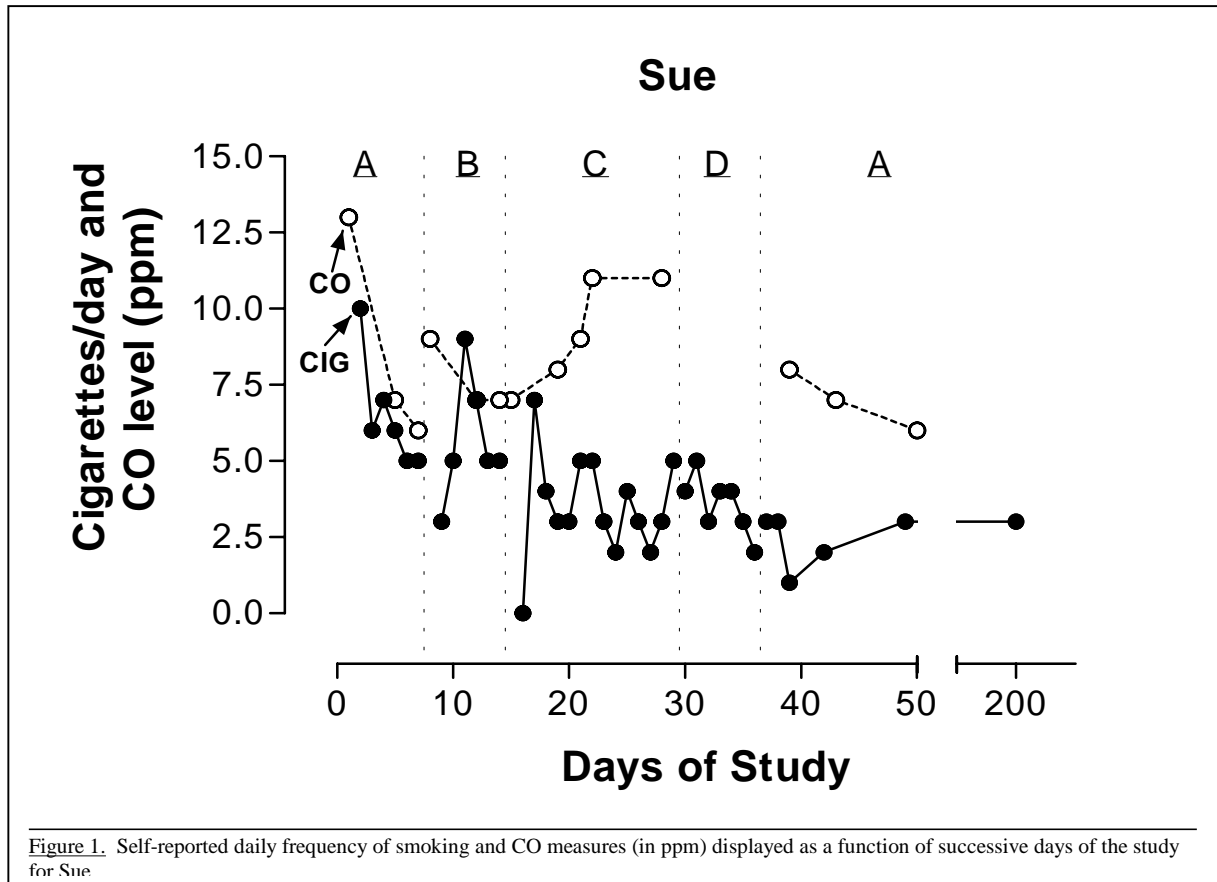


Figure 1. Self-reported daily frequency of smoking and CO measures (in ppm) displayed as a function of successive days of the study for Sue.

shakes.

Post-Treatment Baseline (Phase A2).

The post-treatment baseline (Phase A2) was implemented immediately following completion of Phase D. During a brief assessment session, participants provided a measurement of CO, completed the Client Satisfaction Questionnaire (Attkisson, 1994), and discussed treatment issues and/or concerns. Post-treatment follow-up CO measures were collected at 7 and 14 days. Participants were contacted by telephone during the post-treatment baseline phase to self-report smoking frequency up to 6 months post-treatment.

Results

Tables 1 to 4 present the results from the functional assessment component of the

setting factors. Predictors for smoking selected by Sue and Tom from a list of 30 possible items are shown in Table 2. Tables 3 and 4 show the consequences that were perceived by Sue and Tom as reinforcing and punishing, respectively, from a list of 14 immediate and delayed reinforcing consequences of smoking and from a list of 18 immediate and delayed punishing consequences of smoking.

Figure 1 presents Sue's self-reported daily frequency of cigarettes consumed and the CO readings in ppm taken throughout the study. As illustrated, Sue entered the pre-treatment baseline component (phase A1) smoking 10 cigarettes per day and reported smoking 3 cigarettes per day at 6 months follow-up; CO levels were 13 ppm prior to treatment and 6 ppm at 14 days post-treatment follow-up (neither participant was available at

6 months post-treatment to provide a CO measurement). Her average self-reported frequency during the pre-treatment baseline

Figure 2 presents the mean amount (\pm SEM) of cigarettes consumed by Sue during each treatment component over the 5 phases of

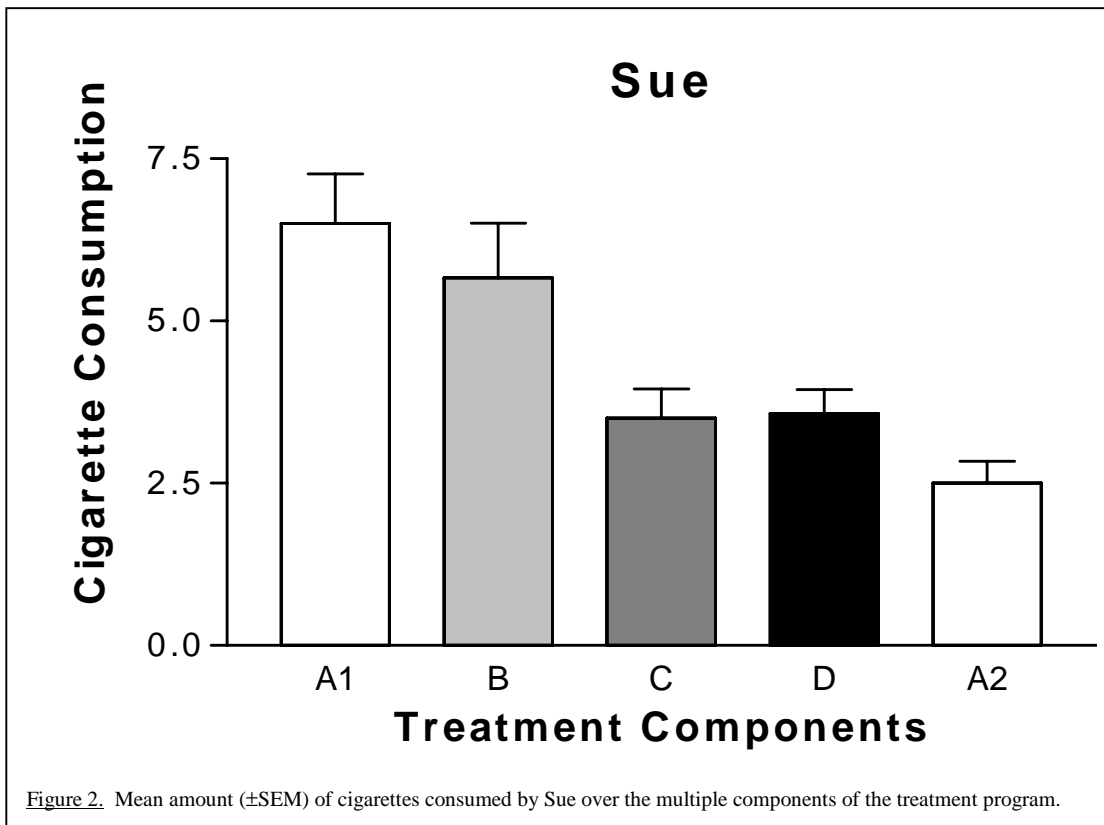


Figure 2. Mean amount (\pm SEM) of cigarettes consumed by Sue over the multiple components of the treatment program.

was 6.5 cigarettes per day, with average CO readings during the same period of 8.7 ppm; the average smoking frequency during the post-treatment baseline (phase A2) was 2.5 cigarettes per day with average CO readings during the same period of 7.0 ppm. The Wilcoxon matched-pairs signed-ranks test (Z) found the difference in smoking frequency between pre- and post-treatment baselines was statistically significant ($Z = -2.207, p = 0.027$). Sue began the functional assessment component of the treatment program (phase B) smoking 5 cigarettes per day; she reported smoking 5 cigarettes per day at the end of the 7 days comprising this phase ($Z = -0.185, p = 0.854$). During both the cessation (phase C) and maintenance (phase D) components of the treatment program, Sue reported smoking significantly less than her baseline cigarette consumption (phase C mean = 3.5 cigs/day, $Z = -2.226, p = 0.026$; phase D mean = 3.57 cigs/day, $Z = -2.214, p = 0.027$).

the study (A1, B, C, D, and A2). As illustrated, analysis of within-treatment changes in smoking consumption shows that the greatest reduction in Sue's smoking compared to all other treatment components occurred during the cessation component (phase C; mean difference in smoking = 2.17 cigs/day).

Similar to Sue, Tom did not achieve smoking cessation (see Figure 3). He entered treatment smoking an average of 13 cigarettes per day (phase A1), with an average CO alveolar level during the same period of 11.67 ppm. At 14-day post-treatment follow-up (phase A2), Tom reported smoking an average of 2.8 cigarettes per day, with average CO readings taken during the same period of 6.67 ppm. The difference in smoking frequency between pre- and post-treatment baselines was statistically significant at 14 days follow-up ($Z = -2.207, p = 0.027$). Whereas Sue maintained a reduction in smoking at 6 months post-

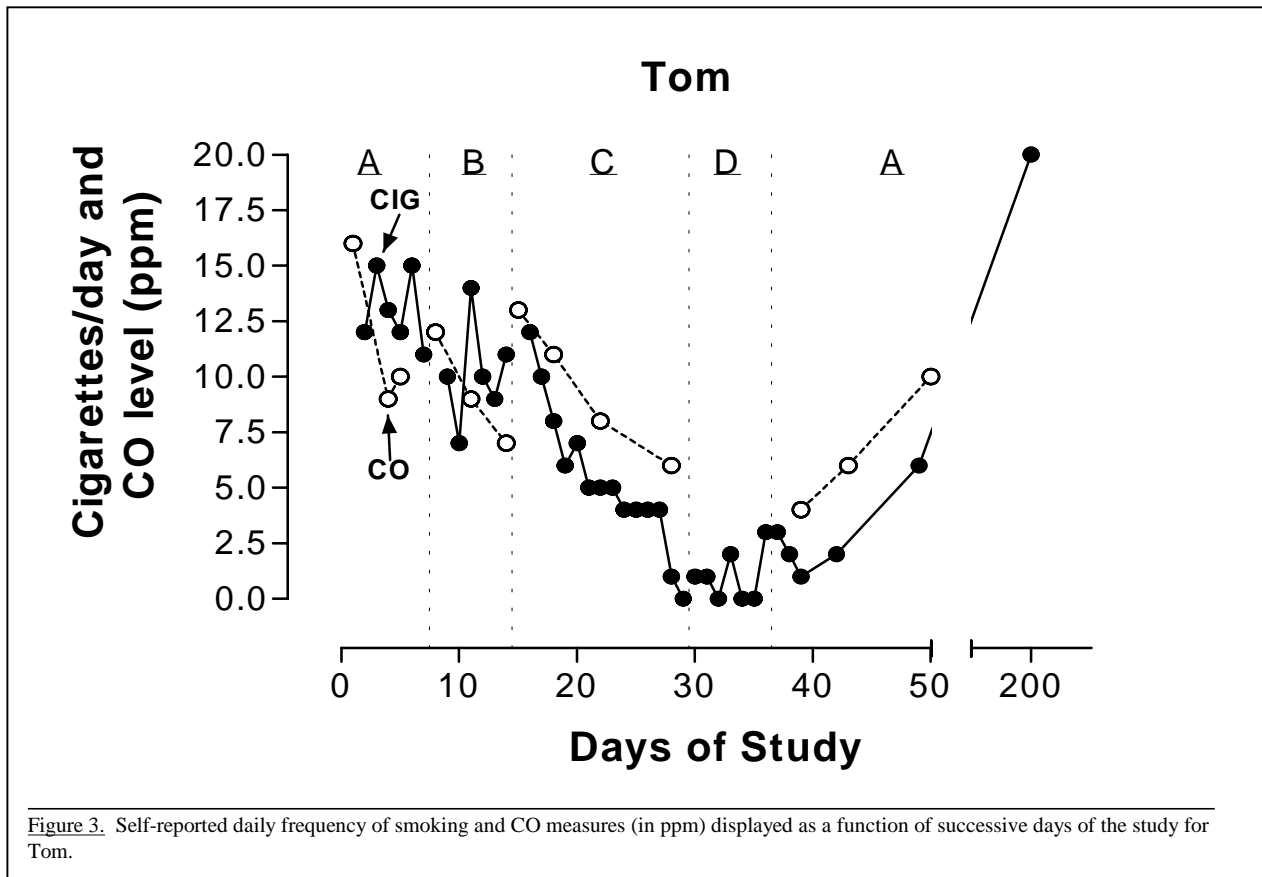


Figure 3. Self-reported daily frequency of smoking and CO measures (in ppm) displayed as a function of successive days of the study for Tom.

treatment, Tom returned to pre-treatment smoking frequency, and at 6 months follow-up reported smoking approximately 30% more than when he entered treatment. The difference in smoking frequency between pre- and post-treatment baselines was no longer statistically significant at 6 months follow-up ($Z = -1.802, p = 0.072$). Tom began the functional assessment component of the treatment program (phase B) smoking 10 cigarettes per day; he reported no change in cigarette consumption at the end of the 7 days comprising this phase ($Z = -1.761, p = 0.078$). During both the cessation (phase C) and maintenance (phase D) components of the treatment program, Tom reported smoking

significantly less than baseline (phase C mean = 5.357 cigs/day, $Z = -2.207, p = 0.027$; phase D mean = 1.00 cigs/day, $Z = -2.207, p = 0.027$).

Figure 4 presents the mean amount (\pm SEM) of cigarettes consumed by Tom during each treatment component over the 5 phases of the study (A1, B, C, D, and A2). As illustrated, analysis of within-treatment changes in smoking consumption shows that the greatest reduction in Tom's smoking compared to all other treatment components occurred during the cessation component (phase C; mean difference in smoking = 4.81 cigs/day).

Client Satisfaction Questionnaire (Attkisson, 1994) scores range from 8 to 32, with higher scores indicating greater satisfaction. Sue's score was 29 and Tom's

component and maintenance component. Two undergraduate students from a midwestern university served as participants. Treatment was provided across four 45 to 60 minute

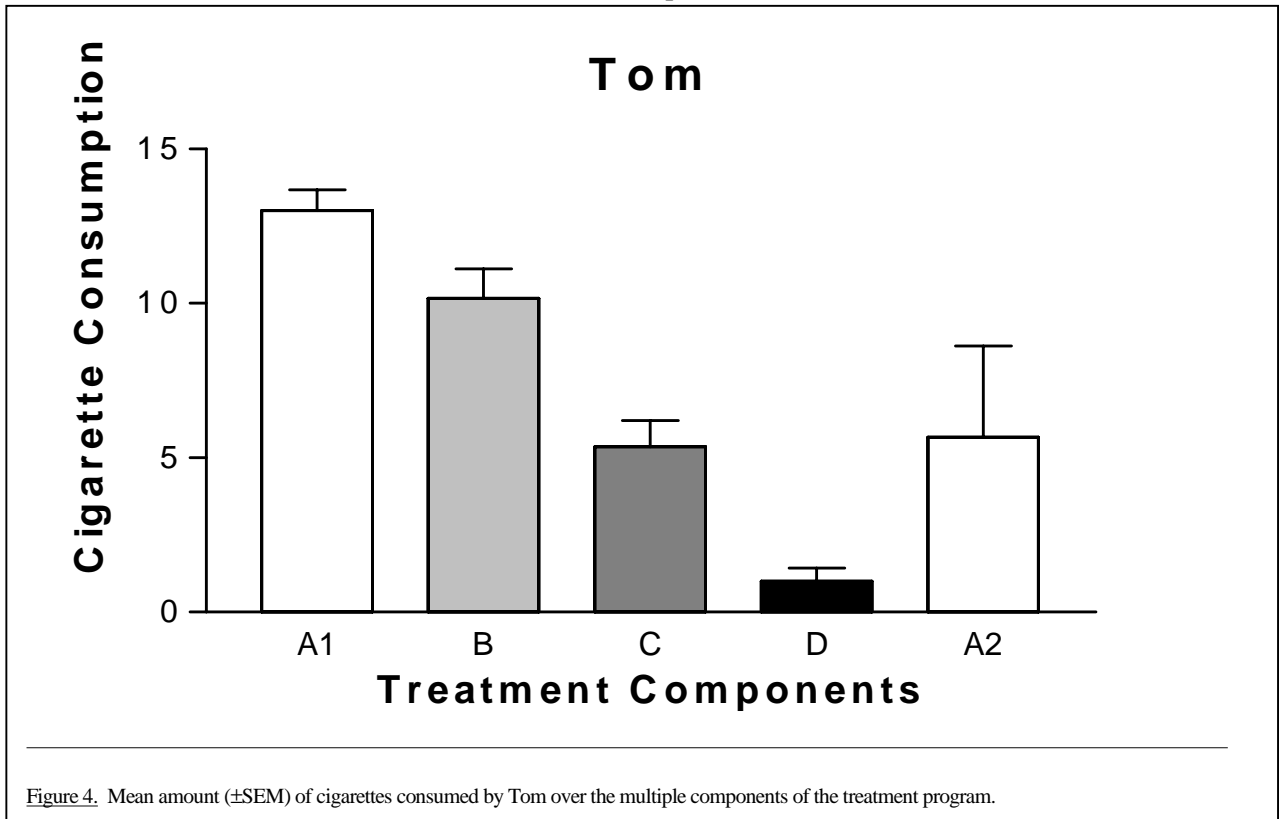


Figure 4. Mean amount (±SEM) of cigarettes consumed by Tom over the multiple components of the treatment program.

score was 26 suggesting both participants were satisfied with the multicomponent treatment program.

Discussion

This study investigated the utility and effectiveness of a brief multicomponent

group sessions. Follow-up data was collected at 6 months post-treatment. Although neither participant achieved complete cessation from smoking, both participants achieved a significant reduction in smoking during the course of treatment with Sue maintaining a 70% reduction in smoking at 6 months follow-up. On the other hand, Tom acquired a 60%

Sue	Tom
Alone	Alone
Socializing with others who are smoking	Socializing with others who are smoking
Socializing with others who are not smoking	Hungry
Hungry	In a bar
In class or work for a long time	In someone else's car
In my car	In my dorm room
In someone else's car	Walking between classes
In my dorm room	

Table 1: Results of Functional Assessment Self-Monitoring Tool: Setting Factors

smoking cessation program comprised of a functional assessment component, a cessation

reduction in smoking at 14 days post-treatment follow-up but resumed pre-treatment smoking

frequency at 6 months post-treatment. In fact, Tom reported smoking approximately 30%

as selecting a cigarette versus selecting a piece of gum to chew.

Sue	Tom
Drinking coffee	Drinking alcohol
Before class or work	Immediately after waking up
After class or work	Studying
Before starting a task	Watching television
After completing a task	After a meal
Immediately after waking up	Relaxing
Studying	Feeling anxious or nervous
Watching television	Feeling lazy or unmotivated
Being offered a cigarette	Feeling sad or depressed
Driving	
After a meal	
Talking on the telephone	
Relaxing	
Feeling anxious or nervous	
Feeling lazy or unmotivated	

Table 2: Results of Functional Assessment Self-Monitoring Tool: Predictors

more than when he entered treatment.

One factor that may explain Tom’s resumption of smoking at such a high level may be his use of alcoholic beverages. For example, Tom reported “in a bar” and “drinking alcohol” as a setting factor and a predictor for his smoking, respectively. The

One of the strengths of this multicomponent treatment program is that smoking is considered a learned behavior, and as such, the overall goal of this program was to *teach* participants how to change their learned behavior. In other words, the treatment program did not begin with an assumption that a participant was “powerless” over the

Sue	Tom
Holding cigarette	Holding cigarette
Smoke in lungs	Smoke in lungs
Exhaling smoke	Exhaling smoke
Distracted from worries	Distracted from worries
Feeling relaxed	Feeling relaxed
Feeling energized	Feeling energized
Feeling more confident in social situations	Feeling euphoric or “high”
Watching television	Feeling more confident in social situations

Table 3: Results of Functional Assessment Self-Monitoring Tool: Reinforcing Consequences

relevance of these results is related to a recent study by Dawson (2000) in which data collected from the 1992 National Longitudinal Alcohol Epidemiology Survey found that drinkers had a 42% reduced chance of achieving smoking cessation. The study also suggests that smoking relapse might be likely to occur under the disinhibiting context of being in a bar, or, alternatively, the use of alcohol might disrupt a quitter’s self-control and contribute to poor decision making, such

behavior, rather, the participant was engaging in an excessive behavior functionally related to certain antecedent and consequent events. Some events set the context for smoking, some events occur prior to smoking, some events occur during a smoking episode, and some occur after a smoking episode. Those events that precede smoking were described as predicting smoking, or setting the occasion for smoking, and were called antecedents to smoking. Events that occur after smoking were

Sue	Tom
Bad taste in mouth	Bad taste in mouth
Did not complete an important task	Laziness
Laziness	Nausea
	Dizziness

Table 4: Results of Functional Assessment Self-Monitoring Tool: Punishing Consequences

described as defining the function of smoking, and may be thought of as maintaining smoking. These events were called consequences of smoking. A unique characteristic of this smoking cessation program is that participants completed a self-report functional assessment in order to identify events perceived as functionally related to their smoking. In turn, functionally-derived self-management strategies were developed to assist with the maintenance of smoking cessation (or reduction).

One limitation of the present study concerns the assessment of participants' compliance with the functionally derived self-management strategies comprising the maintenance component of the treatment program. Although each set of self-management strategies was customized to individual smoking patterns via the functional assessment, no data was collected on their use. Although a check list was provided, and participants were instructed to self-monitor their use of a specific self-management strategy once, two to four times, or more than five times during the week, neither participant completed the check list. Rather, participants reported verbally that they had used the self-management strategies, but were not able to estimate frequency of use. The maintenance component should be modified to allow for easy and rapid self-monitoring of each and every time a self-management strategy is used. Increased self-monitoring may increase compliance in using the self-management strategies to maintain abstinence or reduced smoking.

Other limitations of the current study concern the design and procedure for evaluating treatment effectiveness. First, a control group was not employed. Comparison

of the treatment program to a control group would increase the believability of the results. Additionally, more time could have been spent helping participants to behaviorally rehearse their specific self-management strategies either in a group format, or as individual training sessions.

In summary, the ultimate usefulness of smoking cessation programs which utilize a nicotine reduction phase and rapid functional analysis procedures coupled with maintenance strategies will be assessed in terms of their ability to add value to contemporary models of health care (Cone, 1997). To this end, more research is needed to assess treatment and efficiency outcomes when multicomponent smoking cessation programs such as that used in the current study are compared to potentially more time consuming and costly standardized treatment packages. Treating college smokers with a rapid multicomponent program may offer reductions in smoking. Providing treatment for undergraduate smokers may also contribute to a reduction in the risk of illicit drug use, as tobacco use by adolescents and young adults has been shown to increase the risk of substance use (Best et al., 2000).

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