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The Impact of Personality and Systems Variables on Smoking Cessation and Recidivism: An Extension of the Transtheoretical Model of Change

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THE IMPACT OF PERSONALITY AND SYSTEMS VARIABLES
ON SMOKING CESSATION AND RECIDIVISM:

AN EXTENSION OF THE
TRANSTHEORETICAL MODEL OF CHANGE

BY

DUANE VALENTINE LAPSANSKI

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN
PSYCHOLOGY

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Thesis Abstract

To determine empirically whether the comprehensiveness of the transtheoretical model of change (Prochaska, 1979) would benefit by the inclusion of personality and systems variables, 266 volunteers who had either quit smoking cigarettes in the recent past or were considering quitting in the near future completed the Activity Vector Analysis (AVA) and the Life Experiences Survey (LES), along with a Demographic and Smoking History Questionnaire. One-hundred-forty-one volunteers were self-changers, while 87 were attempting to change with the help of therapy. Six months later, subjects were asked to complete the first two instruments again, along with a Follow-up Questionnaire.

It was hypothesized that the outcome of attempts of alter smoking behavior would be a function of a behavior-specific self-concept, i.e. how Ss view themselves in their role as a "smoker" or "non-smoker"; and secondly, that personality variables would predict the outcome of attempts to change smoking behavior. In regard to systems variables, it was hypothesized that life-event changes would be related to smoking cessation.

Some support was found for accepting the first hypothesis, namely: (1) contemplators in both groups exhibited a higher congruence between basic self-concept and role as smoker than did the recent quitters; (2) the recent quitters in the self-change group exhibited a higher congruence between basic self-concept and the role of non-smoker than did the self-change contemplators; and (3) the therapy subjects exhibited a significantly higher level of anxiety than did the self-changers on the non-smoker AVA pattern shapes. No support was

found for the second and third hypotheses.

Among the results which were not predicted but which appear to be meaningful was the finding that therapy subjects experienced more negative life changes and exhibited a higher level of anxiety. This finding may improve researchers' ability to differentiate people who change on their own from those who seek professional help. Another finding suggests that external events are important in moving a person from the contemplation stage into active change, while internal variables become more salient in the maintenance stage.

It is suggested that a ceiling effect with the AVA and a floor effect with the LES resulted in relatively little differentiation among the groups. Directions for future research are explored.

To
Georgina
My Wife
And
Best Friend

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Prochaska (1979) developed a transtheoretical model of change which was later operationalized by DiClemente (1978) and modified by Prochaska, DiClemente, Crimi, Lapsanski, Martel, and Reid (1982). The intent of the model is to explain how people change, both within and without therapy. It is envisioned that the model will facilitate the development and application of intervention strategies to enable people to initiate and maintain desired changes. The present study seeks to extend the model by including two additional content components, namely personality and systems variables.

A Transtheoretical Model of Change

The model of change proposed by Prochaska (1979) postulates five processes of change operative on two levels, namely the experiential and the environmental. DiClemente (1978) tested Prochaska's theoretically-derived model for its comprehensiveness and utility for analyzing change processes in one specific area of interest, namely the modification of smoking behavior. He found that the model as operationalized enabled trained raters to classify subjects' descriptions of how they changed a target behavior. There were relatively few statements that, in the judgment of the raters, represented elements or processes not included in the transtheoretical model. DiClemente (1978) concluded that his findings lend empirical support for the comprehensiveness of the model.

In the same study DiClemente (1978) operationalized Prochaska's (1979) processes of change for use in studying the cessation of smoking in three groups: Self-Quitters, Aversion Group and Behavioral Management Group. Then he went on to examine the question whether

successful quitters, regardless to which of the three treatment groups they belonged, could be differentiated from recidivists on the basis of the processes of change they used to stop smoking. Thus he asked whether outcome (successful versus unsuccessful) was a function of the process(es) used to bring about the behavior change.

DiClemente (1978) found significant group differences for the processes of Feedback, Self-Liberation, Counterconditioning, Stimulus Control, and Social Management. However, the hypothesis that long-term successes and recidivists would be differentiated by the change processes they used was not confirmed.

In the same study DiClemente (1978) went on to identify three periods or stages of change that maintainers went through as they attempted to modify their smoking behavior. These stages were designated as: (1) the decision stage; (2) the actual quitting or active change stage; and (3) the maintenance stage. He also found an interaction between the stages and the processes of change, indicating that each of the processes was perceived by the subjects as differentially important during each of the three stages of change, $p < .001$.

More recently Prochaska et al. (1982) have added a fourth stage to the model, namely a period of contemplation preceding the decision stage. This research has likewise found an interaction between the stages and the processes of change, with the verbal processes (e.g. Feedback, Education) being perceived as more important in the earlier stages (i.e. Contemplation, Decision), while the behavioral processes (e.g. Counterconditioning, Stimulus Control) were perceived as more important in the later stages (i.e. active change stage, maintenance

stage).

The processes of change, together with the stages of change (Prochaska, 1979; DiClemente, 1978; DiClemente & Prochaska, 1982; Prochaska et al., 1982) are clearly the pivotal points around which the transtheoretical model revolves. It is the contention of the present writer, however, that in order to be a truly comprehensive and maximally useful framework for conceptualizing, explaining, and predicting behavior change, the model should be extended to include two further components.

The first component would focus on the subject undergoing the change. This component would seek answers to such questions as the following: Who is it that is doing the changing? Are persons differentially efficacious in bringing about desired changes in their lives? Are personality variables related to the outcome of attempts to change behavior? That this component is important to consider flows quite naturally from the work of Bandura (1977) on self-efficacy. For Bandura (1977), an efficacy expectation is the "conviction that one can successfully execute the behavior required to produce the outcome" (p. 193). Bandura considers an efficacy expectation to be the best predictor of future behavior, better than an outcome expectation and better even than past behavior. Because self-efficacy can account for behavioral differences among individuals receiving the same type of treatment, this construct, insofar as it focuses on the person undergoing change, seems to invite a reassessment of the importance of personality variables as determinants of behavior.

The second component would add a systems perspective to the transtheoretical model. This component would focus on the concurrent

contextual or systems changes which impinge on the subject as (s)he attempts to change some target behavior. The following are the kinds of questions this component would seek to answer: What, if any, impact do concurrent systems changes have on the outcome of voluntarily-initiated attempts to change a target behavior? Is the outcome of attempted behavior change differentially related to the quantity and/or quality of systems changes experienced by the subject? Can concurrent systems changes be helpful in predicting whether an attempted behavior change will succeed and be maintained?

Because it would be cumbersome, even unfeasible, to study all possible systems changes affecting subjects, a narrower focus seems to be in order. Hence, in this study, systems changes will be operationally defined to mean "life-event changes," a construct that has received a considerable amount of attention in the literature during the previous decade (Dohrenwend & Dohrenwend, 1974; Rahe & Arthur, 1978; Rabkin & Struening, 1976). The present study assumes that life-event changes, as these are specified and measured by currently available questionnaires (Cochrane & Robertson, 1973; Holmes & Rahe, 1967; Sarason, Johnson, & Siegel, 1978) provide an adequate sampling of systems changes.

It seems apparent to the present writer that these two components, namely personality and systems variables, merit inclusion into the transtheoretical model on the intuitive grounds that a comprehensive model of change should take into account both the person undergoing change and the context within which the change is being attempted. These two components would seem to be important determinants of change.

Whether these two components would actually help extend the comprehensiveness and usefulness of the transtheoretical model must, of course, be answered empirically. It was stated earlier that DiClemente (1978) could not differentiate between maintainers and recidivists on the basis of which change processes each group used to stop smoking. The same researcher examined the relationship of demographic and smoking history variables to long-term success. He found that none of these variables differentiated the two groups. On variables collected at follow up, the only important finding was that successes gained significantly more weight. The author concluded that in this study there were very few group differences on demographic and smoking history variables.

Hence the question of predicting the outcome of attempted behavior change, along with its corollary, namely how maintainers can be differentiated from recidivists, remains open to further research. The transtheoretical model, as presently elaborated, seems to be in need of additional content in order to adequately answer these questions. In fact, attempts are already underway to strengthen this aspect of the model. DiClemente (1981) has developed a self-efficacy scale which asked subjects to rate how sure they were they could avoid smoking in each of twelve situations. The scale, filled out by subjects who had quit recently, was able to predict which of these individuals would relapse within five months of quitting. More recently still, Martel (1980), working within Bandura's (1977) theoretical framework, and adapting the work of Marlatt and Gordon (1979), has developed a self-efficacy scale for smoking. This scale, consisting of thirty-five situations that might elicit smoking behavior from persons who quit,

was found to discriminate between long-term quitters and self-quitters who relapsed.

The present study seeks to contribute to our ability to differentiate successful changers from failures by focusing on personality and systems variables. If these variables are significant predictors of change, then empirical support will be provided for their inclusion within the transtheoretical model.

The behavior change which serves as the focus for this study is the same as that investigated by DiClemente (1978) in his successful operationalizing of the model, namely smoking cessation and recidivism.

Identification of Relevant Literature

This project builds upon two related topic areas in the psychological and social science literature. The first is the literature relating personality variables to smoking behavior, its cessation but also relapse. The second is the literature examining the relationship of systems variables to smoking, with some reference to the modification of another addictive behavior, namely alcohol abuse.

Personality Correlates of Smoking Modification and Recidivism

A review of the literature indicates that the relationship of personality variables to smoking and its cessation has been the object of a considerable amount of research. Eysenck (1965 & 1973) studied the dimensions of Extraversion and Neuroticism as these related to smokers' personalities. He proposed that smokers are extraverted persons who function at less than an optimal level of arousal. This view seems to be consistent with observations that smokers drink more coffee than nonsmokers (Thomas, 1973) and that they smoke more when

bored than when aroused (Fuller & Forrest, 1973).

Eysenck's (1965 & 1973) work generated further research using these same variables. Smith (1970), for example, reviewed studies relating smoking and personality characteristics and concluded these studies indicate that smokers are more extraverted and antisocial than non-smokers. However, because the author did not critically evaluate the quality of the studies he reviewed, this conclusion lacks empirical support. In a large modification study Keutzer (1968) found that Extraversion and Neuroticism (EPI), level of anxiety (IPAT) and internal-external control scores were not related to treatment outcome. Bernstein (1970), who studied forty subjects attempting to quit smoking, also failed to find any significant correlations between cessation and such personality variables as suggestibility, I-E, extraversion, and emotionality. Cherry and Kiernan (1976) reported a significant relationship between extraversion, neuroticism and quitting on the part of subjects in a longitudinal study.

In a study involving adolescents, Jamison (1979) found that psychoticism and extraversion were strong predictors of smoking behavior. No relationship between neuroticism and smoking was found. Similarly, Chatterjea, Chattopadhaya, Bhattacheryya and Roy (1979) report a positive correlation between extraversion and high nicotine consumption, while finding no relationship between neuroticism and smoking behavior.

Continuing research using Eysenck's arousal hypotheses continues to generate inconsistent findings. Knott (1979), for example classified his 96 Ss into low-arousal and high-arousal smokers, depending on whether they experienced their greatest desire to smoke in situations

involving boredom, monotony and the like or in situations involving anxiety or excitement. His results indicated that the high-arousal smokers exhibited significantly greater scores on extraversion and neuroticism. Gilbert (1980), however, reports that his Ss' introversion scores were correlated positively with smoking for tranquilization and a greater desire to smoke in stressful rather than non-stressful situations. Findings reported by Stanaway and Watson (1981) do not support the hypothesis that introverts and extraverts would be more likely to smoke in high and low arousal situations respectively. Their data suggest that extraverts were most inclined to smoke for stimulant or for tranquilizing purposes.

Another personality variable which has received considerable attention in the smoking literature is the Internal-External Locus of Control (Rotter, 1966). Several researchers reported that internals are more likely to quit than externals (Foss, 1973; James, Woodruff, & Werner, 1965; Platt, Krassen, & Mausner, 1969). However, other research indicates that this is not a consistent relationship (Bernstein, 1970; Keutzer, 1968). Best (1975) and Best and Steffy (1975) have attempted to tailor different clinical procedures for internals and externals, both to quit smoking, but also to maintain non-smoking behavior. These authors interpret their data as supporting the hypothesis that the impact of treatment is in part a function of pretreatment individual differences. This interpretation is not acceptable, however, since the researchers also point out that the performance of the control group was not significantly different from any of the experimental groups.

Poole, Dunn, Sanson and German (1982) attempted to discriminate subjects who abstained from those who reduced their smoking following the rapid-smoking technique. The groups were not different when individual variables were considered. However, a set of variables did differentiate the groups. Persons who achieved abstinence for six months following treatment were characterized as being "older males who smoke less and have a higher expectation of success in stopping." Abstainers also tended to be "more extraverted and to have more internal locus of control" (p.5).

The marked lack of consistency across studies using the I-E raises serious questions about the reliability and validity of the I-E scale, but also questions about the utility and very existence of this variable. Empirical evidence has been presented by Gurin, Gurin, Lao, and Beattie (1969), Lao (1970), and Mirels (1970) that the I-E scale is not unidimensional. Levenson (1974) has presented evidence for the validity and utility of refining the I-E scale into three dimensions, namely I, P, C (Internal Control, Powerful Others, and Chance Control). To date these scales have not been applied within smoking research.

The MMPI has also received some attention in the literature on smoking, again with inconsistent results. In a study of 245 Ss with substance abuse problems (i.e. obesity, smoking and anorexia), Leon, Kolotkin, and Korgeski (1979) found that smokers showed tendencies toward depression, impulsivity, and somatization. Tappan and Weybrew (1982) investigated the relationship between subtest scores on the MMPI and coronary heart disease risk factors in their sample of 1,015 submariners. Cigarette smoking tended to correlate with traits

positively associated with coronary heart disease risk, such as hypochondriasis, hysteria and the denial of symptoms scale. Soldatos (1980), reported that smokers did not differ from matched non-smoker controls on MMPI personality patterns or drug consumption. The smokers did experience greater sleep difficulty.

Other personality variables have also received some attention in the literature. In a survey of 1,153 White, 18-70 year-old Ss, Harburg (1981) found that a greater number of left-handed individuals both smoke and drink and abstain less from these substances than right-handed individuals. The association was stronger for females than for males, irrespective of age. Kureshi and Husain (1981) report that smokers exhibited significantly higher levels of intropunitiveness and death anxiety than the non-smokers. These results were interpreted as indicative of internalized aggression on the part of the smokers. Sieber (1981) investigated the effects of personality structure on subsequent substance use and found that cigarette consumption was associated with nervousness and sociability.

In a study using adolescents, Lotecka and Lassleben (1981) utilized both inter- and intra-personal communications, as well as a quasi-phenomenological approach to ascertain decisions regarding smoking in a group of 114 high school smokers, ex-smokers and non-smokers. The profile of the high school smoker that emerged was characterized as being more anxious and problematical. In another study of adolescents, Brook, Whitman, and Gordon (1981) investigated the relationship between maternal characteristics and personality dimensions of 39 adolescent male smokers. Sons' personality predispositions found to be associated with smoking were lower impulse

control, lower responsibility and autonomy, and tendencies toward rebellion and interpersonal aggression. The mothers of the smokers tended to be less traditional and affectionate and were less likely to serve as models.

In an interesting piece of research, Chassin, Presson, Sherman, Corty, and Olshavsky (1981) used the semantic differential to assess male and female high school students' real and ideal self-perceptions, perceptions of their ideal date and perceptions of stereotypic male and female smokers and non-smokers, with a view to relating these perceptions to Ss' smoking status and to their intentions to smoke. Subjects characterized smokers of both genders as being "somewhat unhealthy, bad, nervous, foolish, disobedient, not so good at school work, acting big, liking to be with a group, drinking, and interested in the opposite sex" (p. 672). Non-smokers were perceived as significantly different on each of these dimensions except the last. The self-concepts of smokers, as compared to those of non-smokers, were more likely to be classified as "smoker." Also, the perception held by smokers of the ideal date were more likely to be classified as "smoker." On the other hand, non-smokers' perceptions of self, ideal date, and certain aspects of the ideal self were all predictive of behavioral intentions regarding smoking. That is, if these perceptions matched a stereotypic "smoker" profile, then the non-smoker was likely to intend to smoke in the near future. Similarly, if the perceptions matched a "non-smoker" profile, then the non-smoking subject was more likely to plan not to smoke in the near future. The results appear to support an earlier perception study by Polivy, Hackett, and Bycio (1970) which found that smokers in general were rated less attractive

and that smokers preferred other smokers, while non-smokers preferred non-smokers.

With regard to using personality variables as a means of differentiating quitters from non-quitters and maintainers from recidivists, the most reasonable conclusion that can be drawn at present is the one enunciated by DiClemente (1978), namely that the research has produced variable results and much controversy. And even where differences are detectable, there is little empirical evidence that these differences can give direction to developing more effective treatment programs (Hunt & Matarazzo, 1970; Mair, 1970).

The above conclusion might well be used for bolstering the argument that personality variables should be abandoned altogether in studies dealing with the modification of smoking behavior. In the opinion of the present writer, however, this is not the only available course of action. Another route still seems possible, namely approaching and measuring personality correlates in a different way than has been done heretofore. The present study, flowing as it does from pilot work already completed (Lapsanski, 1980), opts for this alternate approach.

A viable lead for operationalizing an alternate route within smoking research was provided by Bandura's (1977) concept of self-efficacy, which is a behavior-specific, yet enduring, cognitive mechanism. Conditte and Lichtenstein (1981) evaluated Bandura's self-efficacy theory in a study of 78 smokers, aged 16 to 70, from two cessation programs. Both treatment programs significantly enhanced the efficacy state of subjects. Efficacy scores from a post-treatment inventory were used to predict which Ss would relapse and how long they would remain abstinent prior to relapse. Results revealed high

correspondence between the smoking situations in which relapsers experienced low self-efficacy and the situation in which relapse first occurred.

As noted above, personality variables have by and large failed to differentiate adequately between quitters and non-quitters, and between maintainers and recidivists. Might not this failure be accounted for by the fact that research has focused on global personality variables or traits? And might it not be possible to differentiate these groups, and to predict future group membership, on the basis of cognitive mechanisms or self-perceptions specific to smoking behavior? Given that one direction personologists have been examining is searching for behavior-specific characteristics, it is reasonable that a similar approach be applied within smoking research.

Following the above train of thought, a pilot study was designed to differentiate a group of long-term self-quitters from recidivists (Lapsanski, 1980). The instrument used for the study was the Activity Vector Analysis (AVA; Clarke, 1956). This adjective checklist yields personality descriptions through the measurement of the self-concept. The reason why this specific instrument was chosen for the study is that besides providing a measure of the general self-concept, the AVA can also be adapted to measure behavior-specific self-concepts. Hence the AVA seemed to be an appropriate instrument for applying and testing, within the field of smoking research, the lead provided by Bandura's (1977) behavior-specific construct of self-efficacy.

The sixty-two subjects taking part in the pilot study completed the AVA twice. The first administration focused on subjects' self concept or basic self. The subjects were asked to indicate which adjectives

they believed described them as persons (i.e. "I really am. . ."). The second administration attempted to measure subjects' behavior-specific self-concept. This time subjects were asked to indicate which adjectives they believed described them as smokers or non-smokers, depending on their current status (i.e. "As a smoker I am . . ."; "As a non-smoker I am . . ."). It was hypothesized that the behavior-specific self-concept of smoker versus non-smoker, but also how this relates to the basic self would differentiate the maintainers from the recidivists.

Before the results of the pilot study are reviewed, some clarification of terms may be helpful. The meaning which the term "behavior-specific self-concept" has in this study is closely related to the concept of "role" in social psychology. A "role" can be defined as "a series of interrelated behaviors appropriate to a given situation and learned through past experience" (Ullmann & Krasner, 1975, p. 89). A "behavior-specific self-concept" here refers to the perception a person has about himself/herself resulting from the continuing performance of some set of interrelated behaviors or "role." For the purposes of this study, a person engaging in that series of behaviors which is commonly labelled "smoking" is here viewed as exercising the "role of smoker." The perception that person has of himself/herself in regard to this specific role (i.e. as "smoker" or "non-smoker") is the behavior-specific self-concept which is of interest to the present study.

The pilot study (Lapsanski, 1980) discovered that a number of AVA measures did differentiate the two groups. One of these measures involved an important variable in the analysis of the self-concept,

namely congruence, which is the correlation between two profiles, in this case the basic self and the role. The congruence score is actually a modified correlation coefficient which is computed using a modified Pearsonian formula (Whisler, 1957; Correlation Tables, 1958).

When two profiles exhibit a congruence of approximately +.70 or higher, consistency in behavior across situations, and consequently less flexibility, would be expected (Merenda & Clarke, 1967). Using the conventional r to z transformation, the correlations between the basic self and the role profiles for each subject were averaged, group means ascertained and tested for group differences, and then the resulting z values were transformed back to r values. It was found that the mean congruence between the basic self and the role of non-smoker for the maintainers was .89, as compared to a mean congruence of .61 between the basic self and the role as smoker for the recidivists, $p < .01$.

This significant difference was interpreted to mean that for the maintainers the role of non-smoker was quite merged (i.e. very congruent) with the basic self, suggesting these persons are not likely to return to smoking. For the recidivists, however, the role of smoker appeared to be much less merged with the basic self, suggesting flexibility of behavior and possible change to a non-smoking status. This interpretation seems reasonable given the fact that these persons had attempted quitting a number of times in the past but failed; many of them were contemplating quitting again.

Another variable examined was the ratio of Vector 4 to Vector 3. In AVA theory the integration of a low Vector 3 (i.e. restlessness/agitation) with a high Vector 4 (i.e.

fearfulness/dependency) has been used as a measure of anxiety (Manual for the Activity Vector Analysis, 1972). In the study here reported, an integration of these two vectors did differentiate the groups, $p < .01$, but only in regard to role and not in regard to the basic self. In their role as smokers the recidivists viewed themselves as significantly more anxious than did the maintainers in their role as non-smokers.

The construct of activity was another measure which was found to differentiate the groups, $p < .05$. A core construct in AVA theory, activity refers to the degree of aliveness, vitality, energy, or responsivity to the environment which an individual exhibits (Clarke, 1967). In their role as smokers the recidivists displayed a markedly lower level of this quality than did the maintainers in their role as non-smokers. It may well be that the recidivists, having attempted to quit a number of times with negative results, experience notable discouragement and helplessness in regard to smoking. This finding seems to corroborate Eysenck's (1965, 1973) view that smokers function at a lower level of arousal than do non-smokers.

Other statistical analyses involved categorizing the profiles of individual subjects (i.e. both the "basic self" profiles and the "role" profiles) into one of six AVA polar patterns. These six polar patterns, which correlate either 0.00 or -1.00 with each other, might be viewed to some extent as personality types. Within AVA theory the six polar patterns serve as reference points for anchoring the other 252 profiles. Each polar pattern, as is true of each of the other profiles, is a four-digit number, each digit referring to the corresponding vector. A value of one represents the low end of the

unipolar vector, while a value of nine represents the high end of a vector (Manual for the Activity Vector Analysis, 1972).

Following categorizations of the two groups into polar patterns, chi square analyses were performed. In regard to the basic self there was no significant difference between groups. But the groups did differ significantly, $p < .01$, in the way the role profiles were distributed in the two groups. Particularly interesting was the finding that persons whose role contained an integration of a low Vector 3 with a high Vector 4 had a 3 to 1 likelihood of being in the recidivist group. This integration, it will be remembered, has been described above as an indicator of anxiety. On the other hand, persons whose role profile contained the opposite integration, namely a high Vector 3 and a low Vector 4, had a 4 to 1 likelihood of belonging to the maintainer group.

The findings summarized above seem worthy of note, in that several AVA measures did differentiate long-term self-quitters from recidivists. Especially interesting is that the observed group differences stemmed from the behavior-specific self-concept, namely the role of smoker or non-smoker, and how this role relates to the basic self-concept. It must be pointed out, however, that the retrospective nature of the pilot study gravely limits the value that can be assigned to these findings. The present study focuses on some of these same AVA measures, but does so in a prospective manner.

Systems Variables and Smoking Cessation and Recidivism

DiClemente (1978) correctly points out that smoking and its cessation are complex behaviors involving individual, social and

environmental elements. In the available literature are found some indications of how systems variables affect smoking behavior. For example, Straits (1970), who analyzed 80 variables from 252 treatment subjects, found that personality and background variables were not important predictors of the outcome of attempts to quit smoking. However, he did find that successes tended to be in interpersonal environments which were less supportive of smoking.

A similar finding was reported by Graham and Gibson (1971), namely that successes had more significant others who did not smoke or who gave up smoking. Beck and Davis (1980) found that attitudes of family members predicted undergraduates' intentions to cut down on the amount of cigarettes smoked and to stop smoking altogether. A retroactive study by Evans and Lane (1981) surveyed 500 participants from 9 smoking cessation workshops to assess the impact of post-workshop factors on continued success or relapse. They found that persons who continued to be abstinent, as compared to relapsers, were significantly more likely to avoid other smokers.

The above studies indicate that the outcome of attempts to stop smoking may well be influenced by the "smoking environment" in which the attempts are made. A few studies, however, have a broader systems focus. Daughton, Fix, Kass, and Patil (1980), for example, assessed the ability of pulmonary rehabilitation patients to stop smoking. They found that marital status was significantly related to subjects' ability to quit smoking prior to hospitalization. Shuman (1977) reports that smoking is currently found more commonly among divorced or separated persons of either gender than their married or single cohorts. Although more male blue-collar workers than white-collar

workers smoke, the opposite relationship holds true for females. Cigarette smoking is also more commonly seen among individuals with less education and among women in higher income groups. These patterns indicate that smoking involves complex social and cultural interactions, but also that smoking may be related to life stress. This last point is of particular interest to the present study.

In their study of 104 heavy-smoking males who participated in a 10-week program to break the habit, Jacobs, Spilken, Norman, Wohlberg, and Knapp (1971) found that several categories of life-events seemed to be associated with relapse. These included such systems variables as loneliness, change of jobs, increased travel, pressures at work or home, as well as personal tragedy or illness of one's self or family. Though these findings are anecdotal and retrospective, they serve to point out the need and worthwhileness of studies which would systematically and prospectively assess the impact of systems variables, and specifically of stress associated with life-event changes, on attempts to quit smoking and on maintenance of non-smoking behavior.

Similar findings were reported in a more recent study by Chatterjea et al. (1979). These authors found that unsatisfactory emotional factors, but also home and social situations, were associated with heavy smoking. Perceptions of high stress in an occupational setting were found to be positively associated with habitual cigarette smoking and coffee drinking in a longitudinal field study conducted by Conway, Vickers, Ward, and Rahe (1981). In a study of antecedents of relapse following smoking cessation, Shiffman (1982) found that most relapse situations were associated with anxiety, anger and depression.

Research conducted on another addictive behavior, namely alcohol abuse, further corroborates the view that systems variables must be considered when attempts are made to change behavior. For example, Marlatt and Gordon (1979) ascertained that social pressure accounted for 25% of relapse situations, while interpersonal conflict accounted for 12% of these situations. Social pressure and interpersonal conflict certainly qualify as significant systems variables. These researchers also found that 43% of relapses were due to "negative emotional states."

Similarly, Reynolds, Rizzo, Gallagher, and Speedy (1981) reported that relaxation, social contact and enjoyment of the taste were the reasons given most frequently for heavy drinking. A higher prevalence of psychosocial problems was found among the heavy drinkers than among moderate or light drinkers. It is plausible to argue that at least some of these emotional states were reactions to systems changes and pressures, e.g. loss of job, change in significant relationship, illness, and the like.

In an innovative piece of research, Edwards, Egert, Guthrie, Hawker, Hensmon, Mitcheson, Oppenheimer, and Taylor (1977) studied the impact of formal treatment as compared to an "advice" group on the modification of alcohol abuse. At a 12-month follow up the subjects were given a checklist and were asked to indicate which factors might have helped them to achieve whatever improvement they experienced. The factors rated as being most important were the following: (1) changes in external reality (e.g. work, housing); (2) the first therapy interview; (3) internal psychic changes (e.g. mood, self-appraisal); and (4) improvement in marital relationship. Factors rated as less

important were changes in physical health and social pressures to stop drinking. Several of these factors seem to be part of what are labelled systems variables in the present study.

Prochaska and Lapsanski (1982) attempted to assess the impact of systems variables on smoking cessation in a prospective and more systematic fashion than was done by the researchers noted above. The instrument used for the study was the Life Experiences Survey formulated by Sarason, Johnson, and Siegel (LES; 1978). This instrument was chosen as being a valid and reliable way of identifying and specifying an adequate sampling of systems variables impinging on persons attempting to change their smoking behavior. Among the systems variables the LES taps are those which Edwards et al. (1977) listed as being associated with improvement, but also those which Marlatt and Gordon (1979), as well as Jacobs, Spilken, Norman, Wohlberg, and Knapp (1971) identified as correlates of relapse.

Another reason for choosing the LES rather than the older and more commonly used Schedule of Recent Experiences (SRE; Holmes & Rahe, 1967) is that the former allows subjects to rate the desirability or undesirability of the life-change in question. This is an important dimension to consider since some recent evidence suggests that physical or psychological difficulties are related to undesirable but not to desirable life-event changes (Mueller, Edwards, & Yarvis, 1977; Vinokur & Seltzer, 1975). More recently still, Cresswell, Corre, and Zautra (1981) reported that life changes which were negatively perceived were more powerful predictors than life changes per se of quality of life among medical hospital employees.

The LES was administered to subjects attending the first session of a Stop Smoking Clinic conducted by a public agency (Prochaska & Lapsanski, 1982). It was hypothesized that the quantity and quality (i.e. desirable versus undesirable) systems changes experienced by the subjects during the six-month period prior to this first session would have a significant impact on subjects' attempts to stop smoking.

At the end of treatment, consisting of six weekly sessions, the subjects were classified as quitters (i.e. those smoking 1% or less of baseline; $n = 20$) or non-quitters (i.e. persons smoking more than 1% of baseline; $n = 15$). It was found that the number of LES items that subjects checked differentiated the two groups, $p < .05$, with non-quitters checking significantly more items, indicating the presence of more life-event changes than was indicated by the quitter group.

A positive change score for each subject was obtained by summing the ratings of life events designated as positive. On this measure the groups also proved to be significantly different, $p < .05$, with non-quitters having a higher positive score. On the negative change score the groups did not differ, $p > .05$. Interesting is that the negative score did not differentiate the groups, while the positive score did so. On the total change score, namely the sum of the negative and the positive change scores, the groups were not significantly different. However, on the difference score, namely the positive change score less the negative change score, the groups were significantly different, $p < .05$, with non-quitters having a higher difference score, indicating a greater positive to negative ratio.

These findings are best interpreted as contradicting the viewpoint expressed in recent literature, namely that only undesirable life-event

changes are associated with stress and psychological difficulties, while desirable changes are viewed as non-stressful and even as being helpful in lessening the impact of negative changes (Brown, 1974; Mechanic, 1975; Sarason, De Monchaux, & Hunt, 1975; Sarason, Johnson, & Siegel, 1978; Vinokur & Seltzer, 1975). If this were so, then it would follow that the group with the higher positive change score, given that the groups were equal on the negative change scores, should be more successful in quitting smoking, since this would be the less stressful condition and this condition might well be associated with successful quitting. In fact the opposite relationship was found, with non-quitters having higher positive change scores as well as a higher positive to negative ratio.

This study lends support to the view that the directionality (desirable versus undesirable) of life-event changes must be considered (Sarason, Johnson, & Siegel, 1978). However, contrary to expectations which flow from this view, it was found that positive rather than negative change scores were predictive of failure. This aspect of the findings lends support to the more traditional view that life-event changes per se, whether these are desirable or undesirable, are stressful (Holmes & Rahe, 1967; Rahe & Arthur, 1978). In the study reported above, the non-quitters were characterized by a greater frequency of systems changes, though many of these were rated by them as positive.

Four months after the end of treatment, subjects were contacted by phone and subsequently classified into maintainers ($n = 8$) or recidivists ($n = 26$) depending on their current smoking status. The LES filled out at the beginning of treatment did not differentiate the

two groups at the four-month follow up. Why LES scores differentiated the groups at the end of treatment but not at the followup is a matter of conjecture. Certainly the low number of maintainers ($n = 8$) does not allow for any confident interpretation. Another possible interpretation is that relapse may be more directly a function of life-event changes which took place during the four months which transpired between the end of treatment and the followup than of the life-event changes which took place during the relatively remote past, namely the six months prior to treatment. It was only this latter group of systems changes that this pilot study assessed.

A review of the published literature, as well as the results of the study summarized above (Prochaska & Lapsanski, 1982) suggest the worthwhileness of a more intensive study investigating the impact of systems changes on smoking behavior. To avoid the weaknesses of the pilot study, it seems important to have a larger sample, but also to readminister the LES at follow up. Moreover, since the transtheoretical model of change seeks to explain how people change both within and without therapy, it seems important to include a sample of self-quitters. The present study investigates these same systems variables, while rectifying these weaknesses of the preliminary work.

It is interesting to note that systems variables, operationalized as life stress and/or life-event changes, have been the object of considerable research (Dohrenwend & Dohrenwend, 1974; Rabkin & Struening, 1976; Rahe & Arthur, 1978). Much of this literature has investigated, with notable success, the relationship between life-event changes and physical illness, for example, sudden cardiac death (Rahe & Lind, 1971), major and minor health changes (Rahe, 1968; Holmes, 1970),

diabetes (Hinkle & Wolf, 1952), and abnormality of pregnancies (Gorsuch & Key, 1974).

Teiramaa (1981) found differential relationships between life events and onset of asthma. Acute cases were associated with dissappointments in personal relationships, subacute cases were associated with changes in work and finances, while cases of insidious asthma were associated most frequently with marriage and arrival of new family members. Other researchers have focused on the relationship of life-events to psychiatric symptomatology, for example, the onset of acute schizophrenia (Brown & Binley, 1968). Day (1981) has reviewed the empirical studies which implicate the stress of life events as precipitating acute episodes of schizophrenia. He concludes that though stressful life events contribute to onset of acute episodes, the evidence is insufficient to make this association a necessary or direct one.

Other researchers report the positive association of stressful life events and the occurrence of depression, anxiety, and tension (Constantini, Braun, Davis, & Iervolino, 1973; Dekker & Webb, 1974; Paykel, Myers, Dienelt, Klerman, Lindenthal, & Pepper, 1969). Fava, Munari, Pavan, and Kellner (1981) replicated the study of Paykel et al. (1969) and found consistent results, namely that certain recent life events contribute substantially to the onset of depression in some patients. Cooke (1981) found a relationship between life stress and the form of depression experienced by his subjects. Coates, Moyer, Kendall, and Howat (1976) report a positive though weak relationship between life-event changes and mental health. Williams, Ware, and Donald (1981) found that social supports predicted improvements in

mental health, while life events and physical limitations predicted a deterioration in mental health.

The presence of "neutralizing" life events, defined as those which negated the impact of earlier threatening life changes, was found in one-third of all remissions from neurotic disorders in a longitudinal study of 310 community residents (Tennant, Bebbington, & Hurry, 1981). Allen, McBee, and Justice (1981) report a link between life-event stresses and emotional dysfunction. They suggest, however, that though life events are important, they are not sufficient determinants of dysfunction. Finally, the significance of life stress in the etiology of child abuse has been investigated by Egeland, Breitenbucher, and Rosenberg (1980).

With the exception of the study reported above (Prochaska & Lapsanski, 1982), there does not seem to be any research investigating the relationship between systems changes, operationally defined as life-event changes, and voluntarily-initiated attempts to change a target behavior. The present study seeks to shed light on this newly-formulated research question.

Purpose and Design of the Present Study

The present study seeks to extend the comprehensiveness and usefulness of the transtheoretical model of change by the inclusion of personality and systems variables. The behavior change which serves as the focus for the study is smoking cessation and maintenance of non-smoking behavior.

Given the rationale presented above and the review of the literature summarized previously, the following classes of variables

have been selected for inclusion in this research:

Demographic and Smoking History Variables. To the demographic category belong such variables as gender, age, education and income. To the smoking history category belong such variables as cigarettes smoked per day, number of attempts to quit, longest quit period, age at which smoking began and years of smoking. These variables provide a description of the subjects in the study.

Personality Variables. The following variables from the Activity Vector Analysis are used to determine the relationship between personality characteristics and smoking cessation and recidivism: congruence between self and role (i.e. "non-smoker" or "smoker"), the ratio of Vector 4 to Vector 3, which is viewed as a measure of anxiety, and the six AVA polar patterns.

Systems Variables. To determine whether systems variables, operationally defined as life-event change scores on the Life Experiences Survey, are related to smoking cessation and recidivism, the following variables were investigated: number of items rated positively, number of items rated negatively, positive change score, and negative change score.

Follow-up Variables. Among the variables ascertained at follow-up were the following: smoking status, date of most recent attempt to quit smoking, and the number of cigarettes smoked daily or weekly.

Since the intent of the transtheoretical model of change is to explain how people change both within and without therapy, the present study includes subjects who attempted to change their smoking behavior by participating in a formalized treatment, but also subjects who attempted to change their habit on their own. Furthermore, since this

study investigates the impact of personality and systems variables not only on initial quitting but also on the maintenance of non-smoking behavior, it was necessary to investigate subjects belonging to more than one stage of change. The stages which were chosen as the focus for this research are the contemplation stage and the active change stage. Hence, four comparison groups are used. Two groups contain self-changers, while the other two groups contain persons attending a formal treatment program, but who are in the same stages of change respectively as are the self-changers.

Even though special efforts were made to reach a broad sampling of the population of smokers, this study is still dependent on volunteer subjects responding to invitations to take part in the research. This accidental sample does have inherent weaknesses when it comes to generalizing, because such volunteers may possibly be unrepresentative of the population of smokers, as McFall (1978) points out. However, because this is a prospective study with repeated measures, the weakness in the representativeness of the sample is offset, at least to some degree, by the richness of the data gathered. Furthermore, since all subjects in this study were volunteers, this dimension affected all subjects equally.

The literature on smoking modification contains disagreements and confusion concerning the criterion measure used in research on smoking (McFall, 1978). Reduction in the number of cigarettes tends to be an unstable and unreliable measure, since it is difficult to collect and appears quite susceptible to distortion in favor of the subject. Abstinence is viewed as the more powerful and reliable outcome measure and hence it is this criterion which was used in the present research.

The subjects who volunteered to take part in this study were asked to complete a written questionnaire. In addition, they were told they would be contacted in about six months' time to fill out a second questionnaire. Filling out the questionnaire and the fact that the subjects knew they were part of a long-term study could have affected the outcome of attempts to stop smoking. Again, this condition affected all subjects equally and thus should not bias the results.

The Questions Addressed in the Present Study

The first question of interest to the study is whether personality variables are related to smoking cessation and recidivism. Flowing from this question are the following hypotheses:

First hypothesis: The outcome of attempts to stop smoking and maintain non-smoking behavior is a function of a behavior-specific self-concept. It is expected that on Activity Vector Analysis measures the following results will be found:

1. the non-smokers will exhibit higher congruence scores between self and role as non-smoker than will the smokers;
2. the smokers will exhibit higher congruence scores between self and role as smoker than the non-smokers; and
3. the anxiety level of the non-smokers will be significantly different from the corresponding scores of the smokers on pattern shapes involving role as smoker and non-smoker, but not on pattern shapes involving basic self.

Second hypothesis: Behavior-specific personality variables are predictive of the outcome of attempts to change smoking behavior. It is expected that subjects' classification into AVA polar patterns will

be predictive of smoking status at follow-up.

The second question addressed in this research is whether specific relationships exist between systems variables, operationally defined as life-event change scores on the Life Experiences Scale, and the outcome of attempts to stop smoking. This question leads to another hypothesis:

Third hypothesis: Systems variables are related to smoking cessation and recidivism. It is expected that the non-smokers will differ from the smokers on LES measures, with the greatest difference being on the negative change score.

The broader question addressed by this study is whether the transtheoretical model of change would be strengthened by the inclusion of personality and systems variables. Though this suggestion has merit on intuitive grounds, the present study proposes to provide an empirical answer.

Method

Subjects

The subjects were 266 volunteers living in urban areas in New England who were in the process of changing their smoking habit. They were classified into one of two groups, depending on the manner they employed to change their smoking.

Self-Changers. These were individuals who did not attend any quit smoking program but were rather attempting to make changes on their own. These persons were recruited through newspaper articles, ads, and public service announcements soliciting participants for the study.

Therapy Subjects. These were individuals who sought professional help when attempting to change their smoking habit. These subjects were recruited from several stop smoking programs conducted by private and public service agencies. Since it is not the purpose of this study to evaluate the effectiveness of these programs, the sponsors will remain unnamed. These programs, conducted by state agencies, hospitals, and churches, were viewed by sponsors as educational efforts to inform people about the dangers of smoking and as opportunities for participants to learn about the process of quitting cigarettes. Typically, participants were expected to attend four to five sessions, each lasting about 1 1/2 to 2 hours, and to pay a modest fee, a portion of which was sometimes refunded if the participant completed the program. The sessions were conducted by a trained professional, generally an ex-smoker, who led discussions, presented lecturettes, and assigned step-by-step tasks to be done outside the session. Films, printed material containing quitting tips and motivational information, and featured speakers were the mainstays of a typical session. In some

cases, simplified relaxation training and information about weight management were provided. Much emphasis was placed on sharing personal experiences in small group settings with a view to building group support. Outside of sessions, the participants were encouraged to contact a "buddy" from the program or even the group facilitator in order to alleviate tensions which might lead to relapse.

The original pool of subjects consisted of 266 participants. Of these, 179 were self-changers, while the remaining 87 were persons attending treatment programs. Because gender and age are considered to be important variables affecting the outcome of attempts to change smoking behavior, it was deemed necessary to equate the self-changers and the therapy subjects on these dimensions. Since age 40 represents a time when many persons become concerned about health and life style issues, it was decided to divide the subjects into three age groups, making the decade containing age 40 a pivotal point separating persons who are considerably younger from those considerably older. This three-fold grouping by age also had the advantage of assuring equal representativeness of subjects with relatively shorter, average, and longer smoking histories.

Table 1 presents the original pool of subjects classified into three categories, namely group (self-change vs therapy), gender (male vs female) and age (under 35, 35 to 45, and over 45). These data were subjected to log-linear analysis, a method which deals with several dimensions of categorical data simultaneously (Fienberg, 1980; Knoke & Burke, 1980).

Table 1

Original Pool of Subjects

GROUP	GENDER	AGE			TOTAL
		< 35	35 - 45	> 45	
Self-Change	Female	54	33	25	112
	Male	34	14	19	67
	Total	88	47	44	179
Therapy	Female	21	13	19	53
	Male	7	16	11	34
	Total	28	29	30	87

The program used was BMDP4F (Dixon, 1981). It was found that S,AG was the simplest model producing a good fit, $G^2(5, N = 266) = 7.56$, $p > .05$; $\chi^2(5, N = 266) = 7.53$, $p > .05$. The AG term in the above model indicates that the two groups were not equal in regard to age. Specifically, the self-change group had a higher proportion of people under 35. To remedy this, random deletions were made from the self-change sample. In total, 38 subjects were deleted: 10 from the female, 35 to 45 cell, 9 from the female, under 45 cell, and 19 from the male, under 35 cell. The corrected data appear in Table 2. Model SA,G is the best fit for the data, $G^2(5, N = 228) = 4.92$, $p > .05$; $\chi^2(5, N = 228) = 4.99$, $p > .05$. The SA term indicates that there is some relationship between gender and age. However, this relationship is the same for both groups. The corrected data appearing in Table 2 are now compatible with a hypothesis of no group differences in regard

to age and gender.

Table 2

Contingency Table of Subjects Following Random Deletion of Self-Changers to Equate the Two Groups on Age and Gender

GROUP	GENDER	AGE			TOTAL
		<35	35 - 45	>45	
Self-Change	Female	45	23	25	93
	Male	15	14	19	48
	Total	60	37	44	141
Therapy	Female	21	13	19	53
	Male	7	16	11	34
	Total	28	29	30	87

The literature on smoking modification views marital status as having a bearing on attempts to alter smoking behavior. Hence it was deemed important that the self-changers and the therapy subjects be relatively equal on this dimension. Table 3 contains the distribution of subjects into five categories relating to marital status. Chi-square analysis resulted in non-significant findings, indicating that the two groups are not significantly different on this dimension, $\chi^2(4, N = 288) = 5.98, p > .05$. Because the expected values of the cells containing the separated and widowed subjects were less than 5, other analyses were also conducted by collapsing categories.

Table 3

Comparison of Self-Change and Therapy Subjects on Marital Status

Group	Marital Status					Total
	Single	Married	Divorced	Separated	Widowed	
Self-Change	26 (11.4)	83 (36.4)	23 (10.1)	6 (2.6)	3(1.3)	141 (61.8)
Therapy	15 (6.6)	61 (26.8)	10 (4.4)	0 (0.0)	1 (0.4)	87 (38.2)
Total	41 (18.0)	144 (63.2)	33 (14.5)	6 (2.6)	4 (1.7)	228 (100)

Note: Percentages are in parentheses.

When the separated and the widowed cells were collapsed, the findings remained non-significant, $\chi^2(3, N = 10) = 5.35, p > .05$. However, the cell containing therapy subjects in this collapsed category was still less than 5. When these cells were collapsed with the divorced cells, the findings still remained non-significant $\chi^2(2, N = 43) = 4.00, p > .05$. Finally when the separated and the widowed categories were deleted, the findings still remained non-significant, $\chi^2(2, N = 218) = 1.80, p > .05$. Hence the groups can be considered equivalent on marital status. Furthermore, it should be noted that newer sampling experiments view the chi-square test as exceptionally robust in handling small expected frequencies (Bradley, Bradley, McGrath, & Gutcomb, 1979), thus liberalizing the traditional requirement propounded by Hays (1963) who recommended that expected values be no lower than 5 on applications involving more than one degree of freedom. Hence, given the robustness of the chi-square test,

the above findings of no group differences on marital status are further strengthened.

Distribution statistics of subjects' demographic and smoking history variables are found in Table 4. Visual inspection reveals remarkable similarity between the self-changers and the therapy subjects. The typical participant in the study is about 40 years old, has spent some time in college or a specialized school above high school, has a personal yearly income between \$10,000 and \$15,000, and a family yearly income close to \$20,000. This typical participant had started smoking at the age of 16 1/2 and has smoked for about 21 years. The number of cigarettes smoked currently or prior to last quit was about 28, thus a little less than a pack and a half a day. During the period when smoking most heavily, a little more than a pack and a half was smoked, i.e. 33 cigarettes. Finally, the typical participant attempted to quit about 3 times in the past, with the longest quit period being between one and three months.

Measures

The present research utilized four assessment devices. A Demographic and Smoking History Questionnaire was used to obtain data on these characteristics of the subjects. The Activity Vector Analysis (AVA) was utilized as a measure of personality. The Life Experiences Survey (LES) was used as a measure of systems variables, operationally defined in this study as life event change scores. Finally, the Follow-UP Questionnaire gathered information about subjects' smoking status, as well as other information pertaining to quitting, maintenance, and recidivism.

Table 4

Comparison of Self-Change and Therapy Subjects on Demographic and Smoking History Variables

Variables	Self-Changers		Therapy Ss		Total Sample	
	<u>n</u> = 141		<u>n</u> = 87		<u>N</u> = 228	
	<u>X̄</u>	<u>SD</u>	<u>X̄</u>	<u>SD</u>	<u>X̄</u>	<u>SD</u>
Demographic						
Age	39.22	11.89	40.54	11.51	39.73	11.70
Education	4.38	1.39	4.18	1.31	4.31	1.36
Income: Self	3.01	1.54	3.70	1.89	3.28	1.71
Income: Household	4.60	2.06	5.44	1.95	4.92	2.05
Smoking History						
Age began smoking	16.43	3.09	16.63	3.72	16.51	3.26
Years smoking	20.87	11.36	22.57	10.60	21.53	11.09
Cigarettes per day	27.47	14.11	28.16	12.38	27.72	13.47
Max. Cigarettes per day	32.32	14.55	34.10	13.66	33.00	14.21
Attempts to quit	3.00*		3.00*		3.00*	
Longest quit period	5.53	2.55	5.20	2.35	5.41	2.48

Note. Ratings of the variables were as follows: Education - 4 = some college or specialized school above H.S., 5 = college graduate; Income - 3 = \$10,000 - \$14,999 a year, 4 = \$15,000 - \$19,999, 5 = \$20,000 - \$24,999; Longest quit period - 4 = 7 to 30 days, 5 = one to three months, 6 = 3 to 6 months.

*Median.

Demographic and Smoking History Questionnaire. This is a questionnaire which requests information about subjects' personal history, such as gender, age, marital status, level of education, personal and family income, as well as information about subjects' smoking history, for example, the age subjects began smoking, highest number of cigarettes smoked per day prior to quitting, current cigarette consumption, number of attempts to quit, methods used to quit, longest previous success, and the like.

This questionnaire also assesses personal goals at the time of quitting (e.g. abstinence versus reduction) and gathers data on health problems at the time of the most recent quitting effort, as well as current health problems. Smoking patterns of significant others prior to quitting and since quitting are also asked. The questionnaire also requests the name of a close relative or friend who is not living with the subject, so as to ensure the possibility of follow-up. This questionnaire was initially developed by DiClemente (1978) and extended for later studies by Prochaska, DiClemente, Crimi, Lapsanski, Martel, and Reid (1982). A copy of this questionnaire is found in Appendix A.

Activity Vector Analysis (AVA). This adjective checklist has been widely used as a measure of self-concept. It has been adapted to yield a measure of an individual's concept of him/herself as a smoker or non-smoker (Lapsanski, 1980).

The AVA is an adjective checklist consisting of non-derogatory adjectives descriptive of human behavior. The version of the AVA used in the present study is Form D, which consists of 81 adjectives. The AVA allows subjects to respond in a way which is characteristic of their behavior and yields personality descriptions through the

measurement of the self-concept. The AVA is analyzed on both a normative and ipsative basis and provides an understanding of the balance of behavioral tendencies within the individual. The scores obtained, based on factor analysis, are compared with scores from 1199 subjects used to standardize Form D of this instrument.

The personality interpretation from the AVA is made through the ipsative integration of four basic unipolar factors, namely dominance, sociability, amiability, and compliance. A fifth measure, derived from the elemental four vectors of behavior, measures the tendency of the individual to be considerate or thoughtless in his/her relations with others. The four-factor model yields 258 specific AVA profiles. A method exists for obtaining Pearson-type correlation coefficients between profiles, thereby making it possible to compare any two profiles in terms of statistical relationship (Clarke, 1956; Manual for the Activity Vector Analysis, 1972).

The details of the construction and the application of the AVA have been published by Clarke (1956). Merenda and Clarke (1959b) studied the four-factor profile reliability of the AVA using five independent groups of subjects retested after a typical interval of 12 months. Average reliability coefficients obtained were as follows: .77 for the Image profiles (i.e. the profile resulting from a combination of the Basic Self and the Role profiles), .75 for the Role profiles, and .72 for the Basic Self profiles. Hasler and Clarke (1968) re-examined the reliability of the AVA and reported average reliability coefficients for the Role profiles to be .82 and for the Basic Self profiles to be .78 for a test-retest interval which was typically one month. These results indicate that the instrument yields profiles that are as

reliable as instruments measuring such dynamic forces as personality and temperament can be.

Several studies have reported on the construct validity of this theoretically-derived instrument. Hammer (1958) found a significant relationship among three sources of information elicited about 38 college students. These sources were (1) "blind analysis" by AVA analysts of subjects' AVA profiles, followed by Q-sorts by the analysts using the AVA profile information; (2) Q-sorts performed by graduate students using biographical data provided by the subjects, and (3) Q-sorts performed by persons who had close social contacts with the respective subjects.

Musiker (1958) found that personality variables measured by the AVA can be meaningfully related to the 10-C Scores on the Guilford-Zimmerman Temperament Scale. Merenda, Clarke, Musiker, and Kessler (1961) administered the AVA and the Kessler Passive-Dependency Scale to a sample of 99 female and 181 male subjects. The resulting relationships between the AVA factors and responses to the KPDS items demonstrated the construct validity for both these instruments. The consistently favorable results of the three studies summarized above attest to the validity of this instrument.

In the present study subjects were asked to complete a three-fold AVA at two different points in time, namely at initial assessment and at a six-month follow up. The purpose of the three-fold AVA was to assess subjects' basic self, role as smoker (i.e. actual or imagined), and role as non-smoker (i.e. actual or imagined) at each point in time. A copy of the three-fold AVA is found in Appendix B.

Life Experiences Survey (LES). This 60-item scale is designed to measure both positive and negative life changes experienced in the recent past (Sarason, Johnson, & Siegel, 1978). Though based on the Schedule of Recent Experiences (SRE; Holmes & Rahe, 1967), the LES has the advantage of differentiating changes which are experienced as positive from those which are experienced as negative.

Test-retest reliability studies have been conducted on the LES (Sarason, Johnson, & Siegel, 1978). The reliability coefficients for the positive change scores were .19 ($N = 34$) and .53 ($N = 58$). For the negative change scores, the coefficients were .56 ($N = 34$) and .88 ($N = 58$). The test-retest correlations for the total change scores were found to be .63 ($N = 34$) and .82 ($N = 58$). As is evident, the reliability of the positive change score is very low, while the reliability of the negative change score and the total score are within the moderate range. In examining the reliability of this instrument, it may be helpful to bear two points in mind. In the first place, the low reliabilities may to some extent be a function of small sample sizes. It is noteworthy that in the case of each of the three scales (i.e. positive, negative, and total change score) the reliability coefficients improve notably with the larger sample size ($N = 58$) as compared to the smaller sample size ($N = 34$). It is possible that with larger N 's the reliability of the instrument would be higher.

Secondly, it is important to consider the nature of the instrument itself. Since this is an instrument intended to measure change over time, it is expected that the upper limit for test-retest reliability with this instrument will be lower than for instruments whose intent is to measure stability of personality traits over time, for example. The

fact that the reliability of the positive change score is so low (i.e. .19 and .53) may be a function, at least in part, of the number of positive changes the subjects experienced in the 5-6 weeks between test and re-test rather than being a function solely of error. The authors themselves state that subjects, "generally seem to report somewhat higher levels of positive than negative change on the LES" (Sarason et al., 1978, p. 936). What can be stated is that at present there appear to be difficulties with the reliability of this instrument. The low reliabilities may be a function of the small sample sizes used to test the reliability and the time lapse between test and re-test, but they may also be a function of the instrument itself. It would be helpful for the authors of the instrument to clarify these issues. They might, for example, carry out a reliability study using a much larger sample size than was done heretofore and also retest subjects within a few days of the first testing in order to better control for life event changes occurring between testings. Such a procedure would decrease a source of error and would indicate more clearly what the reliability of this instrument actually is.

The LES was found to correlate with a variety of relevant dependent measures. For example, for a sample of 76 naval personnel correlations of .46 and .40 were found between the negative change scores and measures of state and trait anxiety respectively, as measured by the State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970). Of 15 correlations computed between the LES scores and scores on five subscales on the Psychological Screening Inventory (PSI; Lanyon, 1970, 1973), three were found to be significant. Two of these were for the LES negative score, namely, .20 and .23, while the third was for the

LES positive score, .28. The LES negative score was also found to correlate significantly with the Beck Depression Inventory (Beck, 1967) .24. Important to note is that although these correlations achieved statistical significance, their practical significance is low. A copy of the LES is found in Appendix C.

Follow-Up Questionnaire. This questionnaire requested information from subjects concerning smoking status at follow-up, but also dates of quitting and relapsing, method used in most recent quit attempt, amounts smoked, and personal goals regarding smoking. A copy of this questionnaire is found in Appendix D.

Procedure

Persons who responded to newspaper and other media invitations to participate in the study indicated their interest by phoning the research laboratory on a toll-free number. A trained telephone interviewer screened callers to ascertain whether they met the criteria for participation, i.e. attempting to change their smoking habit without recourse to professional help and making or planning to make changes within a specific time frame. Persons who met the criteria for inclusion in the study were mailed a packet of printed materials which included the Demographic and Smoking History Questionnaire, the three-fold Activity Vector Analysis, and the Life Experiences Survey. Also included was the Informed Consent Form (see Appendix E) explaining the purpose of the study and inviting participants to contact the researcher if they had questions about their involvement.

Within three weeks 75% of participants returned the completed questionnaires and the signed informed consent form in the stamped,

self-addressed envelope provided. Participants who did not return the questionnaire during this period of time were urged to do so by two subsequent letters and a phone call. This procedure was effective in raising the response rate to 88%.

After the completed questionnaires were received, participants were contacted by telephone and invited to attend an interview at a time and place convenient to them. At the interview trained personnel reviewed the informed consent form and verified that the subjects completed the questionnaires properly. During this meeting, too, the interviewer administered other questionnaires which were part of another study. At the end of the interview the subjects were reminded that they would be contacted by mail in six months and asked to participate in an assessment similar to what they had just completed.

While the self-change subjects were being recruited in the manner described above, the researcher contacted private and public service agencies conducting Stop Smoking programs, explained the nature of the study to staff and asked for permission to attend programs in order to invite the clients to participate. The response on the part of agency personnel was positive. Hence the researcher attended the programs, explained the study and the informed consent form to clients, and invited them to participate by completing and returning a questionnaire which contained the first three measures described above. The participants were told that they would be contacted in six months and asked to fill out similar measures. Participants had the option of returning completed questionnaires by mail or by bringing them to subsequent sessions of the clinic.

At subsequent meetings the researcher was available to answer participants' questions concerning the questionnaires and their involvement in the study. Only 36% of the questionnaires which were distributed at these sessions were actually completed and returned. Since names and addresses of persons who accepted but did not return the questionnaire were not available, it became impossible to contact these persons with continued invitations to participate.

After the completed questionnaires were received, participants were classified into one of four comparison groups depending on the manner used to alter their smoking habit and also depending on their current smoking status. The four comparison groups were defined as follows:

Self-Change Recent Quitters ($n = 67$). These are former regular smokers who have quit on their own and have been abstinent (i.e. smoking 1% or less of baseline) for at least 24 hours, but less than three months.

Self-Change Contemplators ($n = 74$). These are persons who are regular smokers, but are thinking seriously about stopping on their own, without professional assistance, within the next six months.

Therapy Recent Quitters ($n = 59$). These are former regular smokers who have quit with the help of a formal Stop Smoking Program. These persons have been abstinent (i.e. smoking 1% or less of baseline) for at least 24 hours, but less than three months.

Therapy Contemplators ($n = 28$). These are persons who are currently regular smokers, but are thinking seriously of quitting within the next six months with the help of a formal Stop Smoking Program.

After approximately six months, subjects in each of the four comparison groups were mailed a questionnaire and asked to complete the Follow-Up Questionnaire, the Activity Vector Analysis, and the Life Experiences Survey and to return these completed measures in the self-addressed, stamped envelopes provided for this purpose. Participants who failed to return the questionnaires within two weeks were contacted by letter and subsequently by telephone and encouraged to do so. In this way 85% of these questionnaires were completed and returned.

Results

Personality Correlates of Smoking Cessation and Recidivism

A primary question underlying the present study concerns itself with the impact of personality variables on attempts to alter smoking behavior. It was hypothesized that quitters as compared to persons who continue smoking would not differ on global personality characteristics, but would differ on self-perceptions specific to smoking, i.e. behavior-specific self-concept.

To address this question, each subject's three-fold AVA was scored according to the directives of the manual (Manual for the AVA, 1972). Among the values calculated were those which are typically found on the AVA Record Summary, for example, the raw and converted scores for each vector, as well as the pattern shapes and the congruence scores. A pattern shape, it should be noted, is one of 258 specific AVA profiles expressed as a four digit number, for example, PS 4187, in which each digit indicates the relative magnitude of each of the four vectors. For mathematical reasons, each pattern shape must have at least one vector with a value of 1 or at least one vector with a value of 9. Also, the four vector numbers in the pattern shape must total 20. In the example given above, i.e. PS 4187, the number 4 represents the degree and magnitude of Vector 1 (i.e. aggressiveness); the number 1 represents the degree and magnitude of Vector 2 (i.e. sociability); the number 8 represents the degree and magnitude of Vector 3 (i.e. emotional stability), while the number 7 represents the degree and magnitude of Vector 4 (i.e. social adaptability). Congruence scores, on the other hand, are Pearson-type correlation coefficients between two pattern shapes. Correlations between profiles or AVA patterns are

plotted on a mercator projection of the personality sphere (Correlation Table, 1958). Thus, a congruence score makes it possible to compare any two pattern shapes in terms of statistical relationship.

Inspection of record summaries and computer printouts was conducted to determine the elevation and the scatter of the original profiles. Pattern shapes which were based on too few (i.e. < 6) or too many (i.e. > 70) adjectives checked were eliminated from the study as invalid. Scatter was ascertained by inspecting the deviation ratios and graphs of the pattern shapes. It was found that some pattern shapes were too tight, i.e. having deviation ratios < 1.1 . These were rejected as being essentially flat with little or no difference among the four vectors. Other pattern shapes were found to be too loose, i.e. having deviation ratios > 1.85 . These were eliminated because in these profiles a single vector carries too much weight, thus skewing the entire profile. AVA theory, as should be noted, is based on an integration of all four vectors. Profiles in which any one vector is overly dominant are hence inappropriate.

Based on the above criteria, it was necessary to eliminate all three pattern shapes of some subjects. In the case of other subjects, only one or two pattern shapes were thus eliminated. This resulted in uneven numbers of pattern shapes being retained across the three-fold AVA, i.e. 209 AVAs for basic self, 187 AVAs for role as smoker, and 193 AVAs for role as non-smoker. It was only these AVAs which were utilized in the subsequent analyses involving personality variables.

To determine the degree of similarity of the subjects in this study to the population on which the AVA was standardized, the pattern shapes of the three-fold AVA were classified into one of seven categories.

Six of the categories were formed by each of the AVA polar patterns. The polar patterns are pattern shapes in which two vectors contain the number 9 and the two other vectors contain the number 1. The polar patterns thus correlate either 0.00 or -1.00 with each other and provide a location on a three-dimensional sphere around which the other 252 pattern shapes are distributed. In a sense the polar patterns can be viewed as personality types. The relationship among the polar patterns themselves and between them and the other pattern shapes can perhaps be better appreciated by consulting the AVA Pattern Universe, which is reproduced in Appendix F. For the sake of clarity, each of the polar patterns has been circled.

The seventh category was labelled "outside" and consisted of pattern shapes which fell midway between two polar patterns and thus could not be classified as belonging to either one. The observed frequencies of subjects' membership in the seven categories are presented in Table 5, along with the expected frequencies which are based on the standardization population.

For the "self" AVAs, chi-square analysis revealed a significant difference between the sample of subjects and the standardization population, $p < .001$. Specifically, the experimental subjects contain greater numbers of polar patterns 1199 and 1919, as well as significantly fewer numbers of polar patterns 9911 and 9191. The important feature across these differences involves the varying presence of Vector 4. In the first place the experimental sample has present in it a disproportionate number of persons with a high Vector 4. These are persons who can be described as cautious, suggestible, compliant and conforming. In short they can be viewed as

Table 5

Distribution of Ss among AVA Polar Patterns

PS	Self						Outside	
	1199	9119	9911	1991	1919	9191		
f_o	50	28	14	28	40	9	40	<u>N=209</u>
f_e	34.28	23.41	34.48	22.99	25.08	27.17	41.59	<u>N=209</u>

$$\chi^2(6, \underline{N} = 209) = 42.45, \underline{p} < .001$$

PS	Smoker						Outside	
	1199	9119	9911	1991	1919	9191		
f_o	36	40	10	23	36	13	29	<u>N=187</u>
f_e	30.67	20.94	30.86	20.57	22.44	24.31	37.21	<u>N=187</u>

$$\chi^2(6, \underline{N} = 187) = 47.93, \underline{p} < .001$$

PS	Non-Smoker						Outside	
	1199	9119	9911	1991	1919	9191		
f_o	33	27	12	37	37	9	38	<u>N=193</u>
f_e	31.65	21.62	31.84	21.23	23.16	25.09	38.41	<u>N=193</u>

$$\chi^2(6, \underline{N} = 193) = 44.06, \underline{p} < .001$$

dependent-follower types of personalities. Secondly, the experimental sample contains a disproportionately fewer number of persons with a low Vector 4. Such persons can be described as being independent, opinionated, outspoken, even intolerant.

When subjects' perceptions of themselves as smokers were analyzed, the findings were similar, namely a significant difference between the present sample and the standardization population, $p < .001$. In this case the experimental subjects were found to contain greater numbers of polar patterns 9119 and 1919 and significantly fewer numbers of polar patterns 9911 and 9191. The only difference from the previous analysis involving the "self" AVA is that the frequency of polar pattern 1199 decreased, while the frequency of polar pattern 9119 increased. However, Vector 4 continues to play the critical role. The experimental sample again is comprised of a disproportionately large number of persons with a high Vector 4 and disproportionately fewer persons with a low Vector 4. It may thus be said that the subjects by and large view themselves in their role as smokers similarly to the way they perceive their basic selves, i.e. as dependent.

Table 5 also presents the analyses of subjects' perceptions of themselves as non-smokers. Again a significant difference was found between the experimental sample and the standardization population, $p < .001$. Found with less frequency in the experimental sample were polar patterns 9911 and 9191, as was also the case with both the "self" and the "smoker" AVAs. Polar patterns found with a greater frequency in the experimental sample are 1919, which contains a high Vector 4, but also 1991, which contains a low Vector 4.

Assessing the impact of personality on smoking was accomplished by analyzing five variables from the Activity Vector Analysis. Two of these dependent measures involved congruence scores between a subject's basic self and behavior-specific self-concept, i.e. as "smoker" and as "non-smoker." The other dependent variables consisted of the ratio of Vector 4 to Vector 3 computed from subjects' three pattern shapes, i.e. basic self, role as smoker and role as non-smoker. As stated earlier, the ratio of these two vectors has been used as a measure of anxiety, with higher ratios indicating increasing levels of anxiety. These specific AVA variables were chosen for analysis because they produced meaningful results in the pilot work reported earlier.

Table 6 reports group means and standard deviations on each of these five measures across the eight cells in this study. The number of subjects in each cell is indicated in parentheses.

The fact that the number of subjects across cells is unequal is noteworthy, but is not surprising. At the outset of the study, efforts were made to involve as many subjects as possible. This emphasis resulted in unequal numbers of self-changers and therapy subjects volunteering for the study. Each of these groups contained unequal numbers of recent quitters and contemplators. Furthermore, the recent quitters and the contemplators exhibited different rates of success and recidivism during the six month period between the initial collection of data (i.e. Round 1) and the second stage of data collection (i.e. Round 2). In effect, the decision to have data collection at two points in time brought with it the problem of unequal n's.

Table 6

Group Comparisons on Activity Vector Analysis (AVA) Measures from Round 1 Data.

AVA Measure	Self-Change						Therapy SS							
	Rec. Quitter			Contemplator			Rec. Quitter			Contemplator				
	Non-Smoker	Smoker		Non-Smoker	Smoker		Non-Smoker	Smoker		Non-Smoker	Smoker			
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Congruence: Self to Smoker ^a	(40) 1.74	1.23	(12) 1.32	0.85	(15) 1.98	1.07	(48) 1.80	1.18	(14) 1.07	0.71	(31) 1.21	(6) 1.62	(18) 1.82	0.71
Congruence: Self to Non-Smoker ^a	(42) 2.09	1.32	(13) 1.58	1.28	(16) 1.47	1.64	(50) 1.28	1.35	(14) 1.27	0.82	(33) 1.10	(5) 1.79	(17) 1.82	1.14
Anxiety: Self	(46) 1.21	0.33	(15) 1.00	0.28	(19) 1.10	0.29	(52) 1.12	0.26	(16) 1.28	0.32	(35) 1.21	(6) 1.05	(20) 1.29	0.41
Anxiety: Smoker	(40) 1.26	0.36	(12) 1.06	0.44	(15) 1.10	0.30	(49) 1.12	0.27	(15) 1.34	0.30	(31) 1.27	(6) 1.11	(18) 1.24	0.44
Anxiety: Non-Smoker	(43) 1.15	0.33	(13) 1.03	0.37	(16) 1.05	0.28	(51) 1.01	0.27	(14) 1.35	0.27	(33) 1.20	(5) 0.97	(17) 1.28	0.45

Note. Parentheses contain the number of subjects in each cell.

Recent Quitter and Contemplator constitute smoking status at Round 1. Non-Smoker and Smoker constitute smoking status at Round 2.

^aZ-scores are reported.^bRatio of vector 4 to Vector 3.

Two options presented themselves for dealing with the problem of unequal cells. The first and most effective option would have been to eliminate subjects from the study in order to achieve equal n 's. To choose this option, however, would have meant eliminating more than three-fourths of the subjects from the study, since the cell containing therapy group contemplators who became non-smokers was extremely small. Hence this option was rejected in favor of using a statistical procedure in order to correct for disproportionality across cells.

One such procedure used for this purpose is the unweighted-means analysis (Winer, 1971, pp. 445-449). This procedure assumes that the unequal observations across cells is random and is not a function of the variables employed in the study. This method views "each cell in the experiment as if it contained the same number of observations as all other cells..." (Winer, 1971, p. 402). Another procedure used to correct for disproportionality is the least-squares solution (Winer, 1971, pp. 498-505). This latter procedure assumes that the inequality of cell frequencies is "directly related to the size of corresponding population strata..." (Winer, 1971, p. 402) and therefore uses each bit of data independently. In the present study the procedure used for correcting for unequal cell frequencies was the unweighted-means analysis, since the unequal frequencies across cells are viewed as being random and as not reflecting real differences in the population.

The anxiety measures presented in Table 6 are expressed as group means and are based on subjects' ratio of Vector 4 to Vector 3 for each of the three pattern shapes, i.e. self, smoker, non-smoker. The congruence scores were obtained by correlating subjects' AVA for self with role as smoker and non-smoker respectively, transforming the

resulting r values into z scores and then averaging the z scores in each cell. It is these z values which are used in subsequent statistical analyses. Since the congruence scores are actually modified correlation coefficients, the z scores found in Table 6 were transformed back into r scores, in order to make visual inspection and appreciation of differences easier. The resulting r values are presented in Table 7.

Group differences were tested separately for each of the five AVA variables listed above using 3-Way ANOVAs, namely group (self-change vs therapy) by Round 1 smoking status (recent quitter vs contemplator) by Round 2 smoking status (non-smoker vs smoker). The program used for each of these analyses was the BMDP2V. Since the design was completely between groups and all factors were fixed, there was only a single within-subjects error term for each variable. This error term was used to form all the F -ratios resulting from this design, including main effects, 2-Way and 3-Way interactions, as well as simple effects.

Testing for homogeneity of variance was done using the Cochran test (see Winer, 1971, p. 208). This test uses the variances from all the treatment groups and thus is considered to be a sensitive index. It is determined by simply dividing the largest variance by the sum of all the variances, thus:

$$C = \frac{s^2_{\text{largest}}}{\sum s_k^2}$$

The df of this test are equal to $(k, n-1)$, where k represents the number of groups and n represents the number of subjects in each group. Since the cells in this study contained unequal n 's, the

Table 7

Group Comparisons on AVA Congruence Measures from Round 1 Data^a

AVA Congruence Measure	Self-Changers				Therapy SS			
	Rec. Quitter Non-Smoker	Rec. Quitter Smoker	Contemplator Non-Smoker	Contemplator Smoker	Rec. Quitter Non-Smoker	Rec. Quitter Smoker	Contemplator Non-Smoker	Contemplator Smoker
	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$	$\bar{X}$
Self to Smoker	.94 (40)	.87 (12)	.96 (15)	.95 (48)	.79 (14)	.84 (31)	.92 (6)	.95 (18)
Self to Non-Smoker	.97 (42)	.92 (13)	.90 (16)	.86 (50)	.85 (14)	.80 (33)	.95 (5)	.95 (17)

Note. Parentheses contain the number of subjects in each cell.

Recent Quitter and Contemplator constitute smoking status at Round 1. Non-Smoker and Smoker constitute smoking status at Round 2.

^aCorrelations are reported.

harmonic η was used as a substitute. The Cochran test was chosen in preference to the usual Hartley $F_{\max}$ test (see Winer, 1971, p. 206) because the latter uses only the largest and the smallest variances, but ignores the remaining groups. Since 3-Way ANOVAs are used in the present study, the $F_{\max}$ test would have thus eliminated a great deal of information from the homogeneity test.

Testing for homogeneity of variance for the first personality variable, namely the congruence between subjects' basic self-concept and their perception of themselves as smokers, resulted in non-significant findings, $\zeta(8,14) = 0.1902$, $p > .05$. This indicates that the assumption has not been violated.

The results of the 3-Way ANOVA for this variable are presented in Table 8. As expected, no significant differences were found between the self-changers and the therapy subjects. Contrary to expectations, however, the smoking status for Round 2, i.e. smokers vs non-smokers, also proved to be non-significant. Furthermore, the 2-Way interactions and the 3-Way interaction were also found to be non-significant.

The only significant finding for this variable was the main effect involving Round 1 smoking status, i.e. recent quitters compared to contemplators, $F(1,176) = 5.75$, $p < .05$. This significant main effect indicates that the contemplators exhibited a significantly higher congruence between basic self and role as smoker than did the recent quitters. The total variance accounted for by this difference is about 2.5%, i.e. $\omega^2 = .025$. The group means and standard deviations involved in this comparison are presented in Table 9.

Table 8

ANOVA for AVA Congruence of Self to Smoker

SOURCE	SS	<u>df</u>	MS	<u>F</u>	ω^2
Self-Change Group by Therapy Group	2.36	1	2.36	1.98	-
Round 1 Smoking Status	6.87	1	6.87	5.76*	.025
Round 2 Smoking Status	0.14	1	0.14	0.12	-
Group by Round 1 Smoking Status	0.40	1	0.40	0.33	-
Group by Round 2 Smoking Status	1.73	1	1.73	1.45	-
Round 1 by Round 2 Smoking Status	0.17	1	0.17	0.14	-
Group by Rd 1 by Rd 2 Smoking Status	0.06	1	0.06	0.05	-
Within	209.97	176	1.19		

* $p < .05$

Table 9

Comparison between Recent Quitters and Contemplators on AVA Congruence of Self to Smoker^a

Round 1 Smoking Status	<u>n</u>	$\bar{X}^b$	<u>SD^b</u>	<u>r</u>
Recent Quitters	97	1.42	1.13	.89
Contemplators	87	1.82	1.05	.95

^aSignificant Main Effect [$F(1,176) = 5.76$, $p < .05$, $\omega^2 = .025$]^bZ-scores are reported.

The second personality variable analyzed was the AVA congruence between basic self and role as non-smoker. Testing for homogeneity of variance revealed that the data satisfied this assumption, $\chi^2(8,14) = 0.2318$, $p > .05$. The results of the 3-Way ANOVA for this variable are presented in Table 10. On this variable, there were no significant main effects. Hence there were no significant differences in congruence between self-changers and therapy subjects, between contemplators and recent quitters (i.e. Round 1 smoking status), and between smokers and non-smokers (i.e. Round 2 smoking status). Nor were there significant differences in two of the three 2-Way interactions, i.e. group by Round 2 smoking status and Round 1 by Round 2 smoking status. The 3-Way interaction was also found to be non-significant.

Table 10

ANOVA for AVA Congruence of Self to Non-Smoker

SOURCE	SS	df	MS	F	ω^2
Self-Change Group by Therapy Group	0.35	1	0.35	0.22	-
Round 1 Smoking Status	0.21	1	0.21	0.13	-
Round 2 Smoking Status	1.30	1	1.30	0.80	-
Group by Round 1 Smoking Status	8.67	1	8.67	5.33*	.023
Group by Round 2 Smoking Status	0.56	1	0.56	0.34	-
Round 1 by Round 2 Smoking Status	0.49	1	0.49	0.30	-
Group by Rd 1 by Rd 2 Smoking Status	0.02	1	0.02	0.01	-
Within	295.90	182	1.63		

* $p < .05$

The only significant difference found on this variable was the 2-Way interaction involving group and Round 1 smoking status, $F(1,182) = 5.33$, $p < .05$. The total amount of variance accounted for by this difference is about 2.3%, i.e. $\omega^2 = .023$. The means and standard deviations on which this significant difference is based are presented in Table 11, along with the correlations which indicate the degree of congruence for each group involved.

Table 11

Group Comparisons on AVA Congruence of Self to Non-Smoker^a

Group	Round 1 Smoking Status	<u>n</u>	<u>$\bar{x}^b$</u>	<u>SD^b</u>	<u>r</u>
Self-Change	Recent Quitter	55	1.97	1.32	.96
	Contemplator	66	1.33	1.41	.87
Therapy	Recent Quitter	47	1.15	1.08	.82
	Contemplator	22	1.82	1.03	.95

^aSignificant 2-Way interaction [$F(1,182) = 5.33$, $p < .05$, $\omega^2 = .023$]

^bz-scores are reported.

In order to ascertain what accounts for this significant 2-Way interaction, a simple effects test was conducted. The results of this test are presented in statistical form in Table 12. Several significant findings were revealed by the simple effects test. In the first place, the recent quitters in the self-change group exhibited a significantly greater congruence between basic self-concept and role of non-smoker than did the contemplators, $F(1,182) = 7.59$, $p < .01$.

The situation is different for the therapy subjects, however. In this group, it is the contemplators who exhibit a significantly higher congruence between self and role as non-smoker than do the recent quitters, $F(1,182) = 4.14$, $p < .05$.

Table 12

Simple Effects Test for Significant 2-Way Interaction on AVA Congruence of Self to Non-Smoker

SOURCE	SS	df	MS	F
Self-Change over Rd 1 Smoking Status	12.34	1	12.34	7.59**
Therapy over Rd 1 Smoking Status	6.73	1	6.73	4.14*
Recent Quitter over Group	17.04	1	17.04	10.48**
Contemplator over Group	3.99	1	3.99	2.45
Within	295.90	182	1.63	

* $p < .05$

** $p < .01$

Another significant difference involved a comparison between the recent quitters in the two groups of subjects. In this case the recent quitters in the self-change group exhibited a significantly higher congruence between basic self and role of non-smoker than did the recent quitters in the therapy group, $F(1,182) = 10.48$, $p < .01$.

Comparing the contemplators in the two groups resulted in non-significant findings on this variable, $F(1,182) = 2.45$, $p > .05$. Hence the self-change contemplators and the therapy-group contemplators are not significantly different in regard to the congruence of basic

self to role as non-smoker.

The significant 2-Way significant interaction explained above, involving group by Round 1 smoking status, accounts for 2.3% of the total variance, $\omega^2 = .023$. It should also be noted that the Ω^2 was not computed in connection with the above simple effects test because there is as yet no proper procedure for computing this term.

The next personality variable of interest examined was the AVA anxiety measure from the pattern shape assessing basic self-concept. Testing for homogeneity of variance resulted in non-significant findings, $C(8,16) = 0.2080$, $p > .05$, indicating that this assumption was satisfied.

The results of the 3-Way ANOVA for this measure are presented in Table 13. The findings reveal that none of the main effects was significant.

There were no significant differences regarding level of anxiety between the self-change group and the therapy group. When contemplators were compared to recent quitters, i.e. Round 1 smoking status, the results were also non-significant. When smokers were compared to non-smokers, i.e. Round 2 smoking status, no significant differences were found. Two-Way interactions involving group (i.e. therapy vs self-change) and Round 1 smoking status, as well as group and Round 2 smoking status, proved to be non-significant. In addition, the 3-Way interaction involving group by Round 1 by Round 2 smoking status was also non-significant.

The only significant finding on this variable was the 2-Way interaction involving Round 1 and Round 2 smoking status, $F(1,201) = 6.08$, $p < .05$. This significant difference accounts for about 2.4% of

the total variance, $\omega^2 = .024$. The group means and the standard deviations involved in this comparison are presented in Table 14.

Table 13

ANOVA for AVA Anxiety Measure from Self Pattern Shape

SOURCE	SS	<u>df</u>	MS	<u>F</u>	ω^2
Self-Change Group by Therapy Group	0.36	1	0.36	3.66	-
Round 1 Smoking Status	0.04	1	0.04	0.43	-
Round 2 Smoking Status	0.00	1	0.00	0.01	-
Group by Round 1 Smoking Status	0.05	1	0.05	0.51	-
Group by Round 2 Smoking Status	0.29	1	0.29	2.94	-
Round 1 by Round 2 Smoking Status	0.61	1	0.61	6.08*	.024
Group by Rd 1 by Rd 2 Smoking Status	0.01	1	0.01	0.10	-
Within	20.01	201	0.10		

* $p < .05$

The above finding indicates that there is a significant difference in level of anxiety between recent quitters and contemplators as these subjects become non-smokers or smokers at Round 2. In order to ascertain what accounts for this significant difference, a simple effects test was conducted. The results of this test are presented in Table 15.

Inspection of Table 15 reveals that none of the simple effects was significant. This is unusual, but can happen with sample sizes as unequal as is the case with the present design, where the largest cell contains almost three times the number of subjects found in the

smallest cell, i.e. 72 : 25. Thus, though the 2-Way interaction attained significance, it is not possible to determine in what way being a recent quitter or contemplator at Round 1 interacts with becoming a non-smoker or smoker at Round 2 so as to account for the significantly different levels of anxiety between groups. Isolating the source of the significant interaction is problematical, since no breakdown achieved the traditional significance levels.

Table 14

Comparison between Round 1 and Round 2 Smoking Status on AVA Anxiety Measure from Self Pattern Shape^a

Round 1 Smoking Status	Round 2 Smoking Status	<u>n</u>	<u>X̄</u>	<u>SD</u>
Recent Quitter	Non-Smoker	62	1.23	.33
	Smoker	50	1.15	.34
Contemplator	Non-Smoker	25	1.09	.28
	Smoker	72	1.17	.31

^aSignificant 2-Way interaction [$F(1,201) = 6.08, p < .05, \omega^2 = .024$]

The fourth AVA personality variable examined was the anxiety measure from the pattern shapes which assessed subjects' perceptions of themselves as smokers. Testing for homogeneity of variance resulted in non-significant findings, $C(8,15) = 0.1945, p > .05$, indicating that the assumption was not violated.

Table 15

Simple Effects Test for Significant 2-Way Interaction on AVA Anxiety Measure from Self Pattern Shape

SOURCE	SS	df	MS	F
Recent Quitter over Rd 2 Smoking Status	0.17	1	0.17	1.75
Contemplator over Rd 2 Smoking Status	0.11	1	0.11	1.11
Non-Smoker over Rd 1 Smoking Status	0.35	1	0.35	3.56
Smoker over Rd 1 Smoking Status	0.01	1	0.01	0.07
Within	20.01	201	0.10	

The results of the 3-Way ANOVA for this variable are presented in Table 16. Inspection of the results reveals non-significant main effects, non-significant 2-Way interactions and a non-significant 3-Way interaction. This is interpreted to mean that when subjects viewed themselves as smokers, whether actual or imagined, there were no significant differences in levels of anxiety between the self-changers and the therapy subjects, between contemplators and recent quitters, between subjects who were non-smokers at Round 2 as compared to those who were smokers at Round 2, as well as no differences in the interactions of these factors.

The next personality variable of interest was the AVA anxiety measure based on subjects' perceptions of themselves as non-smokers. Testing these data for homogeneity of variance resulted in a significant finding, $\chi^2(8,14) = 0.2662$, $p < .05$. This finding indicates that these data violate the assumption of homogeneity of variance. However, because these data are based on many degrees of freedom and

the number of independent observations for each of the groups is not widely discrepant, the robustness of the F statistic does not preclude the test of the null hypothesis for these data by ANOVA (see Boneau, 1960).

Table 16

ANOVA for AVA Anxiety Measure from Smoker Pattern Shape

SOURCE	SS	df	MS	F	ω^2
Self-Change Group by Therapy Group	0.33	1	0.33	2.69	-
Round 1 Smoking Status	0.25	1	0.25	2.02	-
Round 2 Smoking Status	0.02	1	0.02	0.20	-
Group by Round 1 Smoking Status	0.04	1	0.04	0.36	-
Group by Round 2 Smoking Status	0.11	1	0.11	0.92	-
Round 1 by Round 2 Smoking Status	0.35	1	0.35	2.82	-
Group by Rd 1 by Rd 2 Smoking Status	0.00	1	0.00	0.00	-
Within	22.04	178	0.12		

Table 17 presents the results of the 3-Way ANOVA using data from this dependent measure. Inspection of the results reveals that most of the findings are non-significant. When viewing themselves as non-smokers, whether actual or imagined, contemplators were not different from recent quitters on level of anxiety, and neither were the smokers at Round 2 different from the non-smokers at Round 2. There were no significant interaction effects for group (i.e. self-change vs therapy) by Round 1 smoking status, nor for group by Round 2 smoking status. Furthermore, the 3-Way interaction involving

group, Round 1 and Round 2 smoking status was also found to be non-significant.

Table 17

ANOVA for AVA Anxiety Measure from Non-Smoker Pattern Shape

SOURCE	SS	df	MS	F	ω^2
Self-Change Group by Therapy Group	0.58	1	0.58	4.49*	.017
Round 1 Smoking Status	0.34	1	0.34	2.63	-
Round 2 Smoking Status	0.00	1	0.00	0.00	-
Group by Round 1 Smoking Status	0.05	1	0.05	0.42	-
Group by Round 2 Smoking Status	0.20	1	0.20	1.58	-
Round 1 by Round 2 Smoking Status	0.52	1	0.52	3.99*	.015
Group by Rd 1 by Rd 2 Smoking Status	0.26	1	0.26	1.97	-
Within	23.79	184	0.13		

* $p < .05$

The only main effect that was significant involved a comparison between the self-changers and the therapy subjects, $F(1,184) = 4.49$, $p < .05$. This finding accounts for less than 2% of the total variance, $\omega^2 = .017$. The means and standard deviations for the respective groups are presented in Table 18. These results indicate that when subjects reported their perceptions of themselves in the role of non-smoker, the therapy subjects exhibited a significantly higher level of anxiety than did the self-changers.

The other significant difference (see Table 17) involving anxiety levels based on subjects' perceptions of themselves as non-smokers is

the 2-Way interaction between Round 1 and Round 2 smoking status, $F(1,184) = 3.99$, $p < .05$. This statistically significant finding accounted for 1.5% of the total variance, $\omega^2 = .015$. The means and standard deviations for the respective comparison groups are presented in Table 19.

Table 18

Comparison between Groups on AVA Anxiety Measure from Non-Smoker Pattern Shape^a

Group	<u>n</u>	<u>X</u>	<u>SD</u>
Self-Change	123	1.07	0.31
Therapy	69	1.23	0.44

^aSignificant main effect [$F(1,184) = 4.49$, $p < .05$, $\omega^2 = .017$]

Table 19

Comparison between Round 1 and Round 2 Smoking Status on AVA Anxiety Measure from Non-Smoker Pattern Shape^a

Round 1 Smoking Status	Round 2 Smoking Status	<u>n</u>	<u>X</u>	<u>SD</u>
Recent Quitter	Non-Smoker	57	1.20	0.32
	Smoker	46	1.16	0.48
Contemplator	Non-Smoker	21	1.03	0.26
	Smoker	68	1.07	0.34

^aSignificant 2-Way interaction [$F(1,184) = 3.99$, $p < .05$, $\omega^2 = .015$]

To ascertain what accounts for the significant group difference on this dependent variable, a simple effects test was performed. The results of this test are reported in Table 20. Inspection of the results reveals that none of the simple effects was significant. Again, such a non-significant finding is not very surprising, given the unequal n 's, whereby the largest cell contains more than three times the number of subjects found in the smallest cell. Though the interaction between Round 1 and Round 2 achieved statistical significance, the source of this difference cannot be specified further. Since no simple effects breakdown reached the traditional levels of significance, isolating the source of difference is problematical.

The second hypothesis of interest in the present study postulated that behavior-specific personality variables are predictive of the outcome of attempts to change smoking behavior. It was predicted that smoking status at follow-up would be differentially related to membership in AVA polar patterns, with certain polar patterns exhibiting significantly higher success rates in quitting smoking and maintaining non-smoking behavior than other polar patterns.

To test this hypothesis, the individual pattern shapes on the AVA from each of the three-fold administration were classified into polar patterns. This was done by using the AVA polar tabulation chart, whereby a pattern shape exhibiting a correlation $> .71$ with a particular polar pattern was assigned into that category. Pattern shapes which exhibited a correlation of $.71$ were found to be equidistant between two polar patterns and hence were eliminated from further analyses. It was found that two of the polar patterns, namely

9911 and 9191, were underrepresented, averaging only about 10 subjects each. Since this underrepresentation would have caused extremely low n 's in the respective cells, it was decided to eliminate these two polar patterns from the analyses. Since the self-change and the therapy groups were not expected to exhibit differences on this dependent measure, these groups were collapsed, allowing for higher n 's across cells.

Table 20

Simple Effects Test for Significant 2-Way Interaction on AVA Anxiety Measure from Non-Smoker Pattern Shape

SOURCE	SS	df	MS	F
Recent Quitter over Rd 2 Smoking Status	0.05	1	0.05	0.39
Contemplator over Rd 2 Smoking Status	0.03	1	0.03	0.24
Non-Smoker over Rd 1 Smoking Status	0.44	1	0.44	3.42
Smoker over Rd 1 Smoking Status	0.18	1	0.18	1.40
Within	23.79	184	0.13	

The results of the chi-square analyses used to test this hypothesis are presented in Table 21. As expected, no significant relationship was found between the polar patterns based on the basic self pattern shapes and smoking status, $\chi^2(9, N = 146) = 10.02, p > .05$. Contrary to prediction, however, the relationship between the polar patterns based on the AVA role of non-smoker and smoking status was also found to be non-significant, $\chi^2(9, N = 134) = 5.98, p > .05$. Also found to be non-significant was the relationship between the polar patterns

based on the AVA role of smoker and smoking status, $\chi^2(9, \underline{N} = 135) = 11.50, p > .05$.

Table 21

Distribution of Four AVA Polar Patterns According to Smoking Status

Round 1 Status	Round 2 Status	Polar Pattern ("Self")				Total
		1199	9119	1991	1919	
Rec. Quitter	Non-Smoker	18	8	7	14	47
	Smoker	10	7	6	5	28
Contemplator	Non-Smoker	4	4	8	4	20
	Smoker	18	9	7	17	51

$\chi^2(9, \underline{N} = 146) = 10.02, p > .05$

Round 1 Status	Round 2 Status	Polar Pattern ("Non-Smoker")				Total
		1199	9119	1991	1919	
Rec. Quitter	Non-Smoker	12	9	7	12	40
	Smoker	17	7	11	6	31
Contemplator	Non-Smoker	2	2	5	6	15
	Smoker	12	9	14	13	48

$\chi^2(9, \underline{N} = 134) = 5.98, p > .05$

Table 21 cont'd

Round 1 Status	Round 2 Status	Polar Pattern ("Smoker")				
		1199	9119	1991	1919	Total
Rec. Quitter	Non-Smoker	10	16	3	9	38
	Smoker	6	10	9	10	35
Contemplator	Non-Smoker	3	2	4	5	14
	Smoker	17	12	7	12	48

$$\chi^2(9, N = 135) = 11.50, p > .05$$

Systems Variables and Smoking Cessation and Recidivism

The second question addressed in this research concerns the relationship between systems variables, operationally defined as life-event change scores on the Life Experiences Survey, and the outcome of attempts to alter smoking behavior. It was hypothesized that systems variables are related to smoking cessation and recidivism, so that non-smokers were expected to differ from smokers on the LES measures examined, with the greatest difference being evident on the negative change scores.

To test this hypothesis, four variables from the Life Experiences Survey (LES) were chosen for analysis. Two of these dependent measures involved the number of life-event changes reported by subjects, i.e. the number of items rated positively and the number of items rated negatively. The other two dependent measures involved the summation of ratings assigned by subjects to items rated positively (i.e. +1 to +3) and to items rated negatively (i.e. -1 to -3). Data from Round 1 and from Round 2 were analyzed separately using these dependent measures.

Table 22 presents group comparisons on each of the four dependent measures at Round 1. The problem of unequal numbers of subjects across cells is again evident, as it was in the analysis of personality variables. The statistical procedure chosen for correcting for disproportionality of groups was the same as used previously, namely the unweighted-means analysis. Testing for homogeneity of variance was done using the Cochran test (see Winer, 1971, p. 208), referred to above.

Inspection of Table 22 reveals that the group means are low. Furthermore, inspection of the statistical analysis system indicates that the medians are also low, being 1 for the first and third variables. This results in extreme skewness, which is a function of the difference between the means and the median. In the case of the present data, there is a piling on the low end of the scale, suggesting that a floor effect exists. Hence it should be noted that the assumption of normal distribution is violated by these data, with these variables exhibiting an extremely positive skew. Though these data are not normally distributed, the problem is not insurmountable, since each variable is skewed in the same direction and since the F test has been demonstrated to be very robust in handling violations of normality (see Boneau, 1960).

Group differences were tested separately for each of the four LES variables from Round 1 using 2-Way ANOVAs, namely group (self-change vs therapy) by Round 1 smoking status (recent quitter vs contemplator). The program used for the analyses was the BMDP2V. Since the design was completely between group and all factors were fixed, there was only a single within-subjects error term for each variable.

Table 22

Group Comparisons on Life Experiences Survey (LES) Measures at Round 1

LES Measure	Self Changers				Therapy Ss			
	Rec. Quitters $\bar{n} = 67$		Contemplators $\bar{n} = 74$		Recent Quitters $\bar{n} = 59$		Contemplators $\bar{n} = 28$	
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Number of Items Rated Positively	2.33	2.63	2.03	2.53	2.08	2.15	2.11	2.39
Positive Score	5.25	6.45	4.11	5.10	4.44	4.67	4.50	6.02
Number of Items Rated Negatively	2.49	3.53	3.11	3.59	2.15	2.73	2.14	2.77
Negative Score	4.97	7.61	6.34	8.86	4.51	5.60	4.14	5.85

Testing for homogeneity of variance for the first systems variable, namely the number of items rated positively on the LES, resulted in non-significant findings, $\zeta(4,48) = 0.294$, $p > .05$, indicating that this assumption was not violated. In this case, as is also true for the other three LES variables from Round 1, the means are low, so that subjects' scores are not very discrepant from each other. Also, the shape of the distribution is similar across the dependent measures. These factors enabled the assumption for homogeneity of variance to be preserved, although the data are not normally distributed.

The results of the 2-Way ANOVA for the first variable examined are presented in Table 23. As predicted, no significant difference was found to exist between the self-change group and the therapy group. Contrary to expectations, however, the number of life-event changes rated positively did not differentiate recent quitters from contemplators. Finally, there was no significant interaction effect between group and smoking status.

Next, the ratings (i.e. +1 to +3) for each item designated as positive were summed to yield a positive change score for each subject. Testing for homogeneity of variance on these data resulted in non-significant findings, $\zeta(4,48) = 0.331$, $p > .05$, indicating that this assumption was not violated. The results of the 2-Way ANOVA using the positive change score data are presented in Table 24. This variable, too, failed to differentiate the self-changers from the therapy subjects. Contrary to prediction, recent quitters and contemplators did not differ on this dependent measure. Also, there was no significant interaction effect involving group and smoking status.

Table 23

ANOVA for Number of LES Items Rated Positively at Round 1

SOURCE	SS	<u>df</u>	MS	<u>F</u>	ω^2
Self-Change by Therapy Group	0.33	1	0.33	0.05	-
Rec. Quitter by Contemplator	0.96	1	0.96	0.16	-
Interaction	1.29	1	1.29	0.21	-
Within	1349.98	224	6.03		

Table 24

ANOVA for LES Positive Score at Round 1

SOURCE	SS	<u>df</u>	MS	<u>F</u>	ω^2
Self-Change by Therapy Group	2.19	1	2.19	0.07	-
Rec. Quitter by Contemplator	14.55	1	14.55	0.47	-
Interaction	17.90	1	17.90	0.58	-
Within	6887.36	224	30.75		

The next LES variable examined was the number of items which subjects rated negatively. Testing for homogeneity of variance revealed that this assumption was satisfied, $\zeta(4,48) = 0.318$, $p > .05$. The results of the 2-Way ANOVA for this variable are presented in table 25. The number of negative changes identified as having been experienced by subjects in the six months prior to completing the questionnaire failed to differentiate the self-changers from the therapy subjects, as was expected. Contrary to prediction, however,

this variable also failed to differentiate contemplators from recent quitters. In effect, the number of negative life changes experienced by subjects was found to be unrelated to current smoking status. Furthermore, interaction effects involving group and smoking status were found to be non-significant.

Table 25

ANOVA for Number of LES Items Rated Negatively at Round 1

SOURCE	SS	<u>df</u>	MS	<u>F</u>	ω^2
Self-Change by Therapy Group	21.01	1	21.01	1.96	-
Rec. Quitter by Contemplator	4.53	1	4.53	0.42	-
Interaction	4.82	1	4.82	0.45	-
Within	2400.94	224	10.72		

After the ratings (i.e. -1 to -3) for each negative life event were summed, a negative change score was assigned to each subject. Testing for homogeneity of variance on this variable indicated that this assumption was satisfied, $\zeta(4,48) = 0.389$, $p, > .05$. The results of the 2-Way ANOVA (see Table 26) reveal that no significant difference exists on this variable between the self-changers and the therapy subjects. Contrary to expectation, there is also no significant difference between the recent quitters and the contemplators. Nor is there a significant interaction effect involving group and smoking status.

Table 26

ANOVA for LES Negative Score at Round 1

SOURCE	SS	<u>df</u>	MS	<u>F</u>	ω^2
Self-Change by Therapy Group	84.11	1	84.11	1.53	-
Rec. Quitter by Contemplator	13.51	1	13.51	0.25	-
Interaction	38.98	1	38.98	0.71	-
Within	12287.36	224	54.85		

In order to ascertain whether life-event changes experienced in the recent past (i.e. six months) had an impact on success or recidivism, while controlling for the initial smoking status, the data from the LES gathered at Round 2 were analyzed. The dependent variables examined were the same four that were analyzed at Round 1. Group comparisons on each of these variables of interest are presented in Table 27.

Inspection of the data reveals low group means and low medians, resulting in extreme positive skewness. This suggests a floor effect and indicates that these data violate the assumption of normal distribution. Further analysis revealed that in the case of each of the four variables, the assumption calling for homogeneity of variance was also violated. A $\log(X+1)$ transformation was successful in removing heterogeneity for each of these LES scales, so that it was possible to conduct further analyses using these measures. Since Boneau (1960) demonstrated that the F test is very robust in handling violations of normality and homogeneity, use of the present data appears to be acceptable.

Table 27

Group Comparisons on Life Experiences Survey (LES) Measures at Round 2

LES MEASURE	Self-Changeers						Therapy SS									
	Rec. Quitter			Contemplator			Rec. Quitter			Contemplator						
	Non-Smoker n=43		Smoker n=17	Non-Smoker n=7		Smoker n=55	Non-Smoker n=18		Smoker n=37	Non-Smoker n=6		Smoker n=20				
	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD				
Number of Items Rated Positively	2.12	2.09	1.18	1.24	1.57	2.50	2.40	2.46	3.06	3.92	1.86	2.37	2.83	2.23	1.25	1.29
Positive Score	4.63	5.02	2.12	2.62	4.00	6.86	5.13	5.87	7.00	8.65	3.73	4.59	5.33	4.27	2.40	2.46
Number of Items Rated Negatively	2.04	2.53	2.82	3.38	0.86	0.90	1.67	3.33	2.67	2.81	3.10	3.63	1.00	0.63	4.40	4.78
Negative Score	3.88	4.81	5.82	9.10	2.00	2.52	3.36	8.18	5.11	5.55	5.92	7.65	1.00	0.63	9.90	13.09

Note. Recent Quitter and Contemplator constitute smoking status at Round 1. Non-Smoker and Smoker constitute smoking status at Round 2.

The reason why the assumption of homogeneity of variance was violated by the data from Round 2, but not by the data from Round 1, is probably related to the degrees of freedom, which are influenced by the number of cells involved in comparisons. At Round 2 the number of cells was eight, as compared to four cells at Round 1. Since the test for homogeneity becomes more conservative as the degrees of freedom increase, it is understandable why violations might occur at Round 2 but not at Round 1.

Group differences were tested separately for each of the four LES variables from Round 2 using 3-Way ANOVAs, namely group (self-change vs therapy) by Round 1 smoking status (recent quitter vs contemplator) by Round 2 smoking status (non-smoker vs smoker). Since the data were transformed, Log ANOVAs were utilized in the analyses.

The raw data for the first LES variable from Round 2, namely the number of items rated positively, was found to be in violation of the assumption of homogeneity of variance, $\zeta(8,14) = 0.334$, $p < .05$. Hence these data were subjected to $\log(X+1)$ transformation, which resulted in removal of heterogeneity, $\zeta(8,14) = 0.159$, $p > .05$.

The results of the 3-Way ANOVA for this variable are presented in Table 28. The findings indicate no group differences on this variable between self-changers and therapy subjects. Contrary to prediction, there were no group differences between recent quitters and contemplators, nor between non-smokers and smokers. Likewise, the 2-Way and 3-Way interactions were not significant. It was expected that the number of positive changes would be related to subjects' becoming non-smokers or smokers at Round 2. This expectation did not materialize, however.

Table 28

Log ANOVA for Number of LES Items Rated Positively at Round 2

SOURCE	SS	df	MS	F	ω^2
Self-Change Group by Therapy Group	0.10	1	0.10	1.02	-
Round 1 Smoking Status	0.00	1	0.00	0.00	-
Round 2 Smoking Status	0.22	1	0.22	2.40	-
Group by Round 1 Smoking Status	0.00	1	0.00	0.03	-
Group by Round 2 Smoking Status	0.21	1	0.21	2.24	-
Round 1 by Round 2 Smoking Status	0.05	1	0.05	0.57	-
Group by Rd 1 by Rd 2 Smoking Status	0.23	1	0.23	2.47	-
Within	18.30	195	0.09		

The next variable examined involved the summing of positive ratings (i.e. +1 to +3) resulting in a positive change score, as was also done in the case of Round 1 data. These data, too, violated the assumption of homogeneity of variance, $\zeta(8,14) = 0.320$, $p < .05$. A log (X+1) transformation eliminated the heterogeneity, so that the assumption was satisfied, $\zeta(8,14) = 0.170$, $p > .05$.

The results of the Log ANOVA performed on these transformed data are presented in Table 29. The findings indicate no significance differences between groups on this dependent variable. The self-changers were not significantly different from the therapy subjects. Neither were recent quitters different from contemplators, nor were subjects who were non-smokers at Round 2 different from the smokers at that point in time. In addition, there were no significant

interactions. Contrary to expectations, the intensity of positive changes experienced by subjects had no relationship to their becoming smokers or non-smokers at follow-up.

Table 29

Log ANOVA for LES Positive Score at Round 2

SOURCE	SS	<u>df</u>	MS	<u>F</u>	ω^2
Self-Change Group by Therapy Group	0.19	1	0.19	1.08	-
Round 1 Smoking Status	0.00	1	0.00	0.00	-
Round 2 Smoking Status	0.63	1	0.63	3.54	-
Group by Round 1 Smoking Status	0.04	1	0.04	0.22	-
Group by Round 2 Smoking Status	0.30	1	0.30	1.65	-
Round 1 by Round 2 Smoking Status	0.17	1	0.17	0.96	-
Group by Rd 1 by Rd 2 Smoking Status	0.33	1	0.33	1.83	-
Within	34.95	195	0.18		

The number of items rated negatively by subjects at Round 2 was the next variable of interest. Testing for homogeneity of variance revealed a violation of this assumption, $\underline{C}(8,14) = 0.309$, $\underline{p} < .05$. Heterogeneity was successfully removed by a log (X+1) transformation of the raw data, $\underline{C}(8,14) = 0.188$, $\underline{p} > .05$.

Table 30 presents the results of the 3-Way Log ANOVA for this variable. Inspection of the table reveals no significant difference on this variable between recent quitters and contemplators, and none between non-smokers and smokers. In addition, none of the interactions was found to be significant.

Table 30

Log ANOVA for Number of LES Items Rated Negatively at Round 2

SOURCE	SS	df	MS	F	ω^2
Self-Change Group by Therapy Group	0.48	1	0.48	4.05*	.015
Round 1 Smoking Status	0.26	1	0.26	2.24	-
Round 2 Smoking Status	0.30	1	0.30	2.59	-
Group by Round 1 Smoking Status	0.11	1	0.11	0.91	-
Group by Round 2 Smoking Status	0.06	1	0.06	0.51	-
Round 1 by Round 2 Smoking Status	0.12	1	0.12	1.02	-
Group by Rd 1 by Rd 2 Smoking Status	0.21	1	0.21	1.79	-
Within	22.95	195	0.12		

* $p < .05$

The only significant finding involved a difference between the self-changers and the therapy subjects, $F(1,195) = 4.05$, $p < .05$. The group means and the standard deviations involved in this comparison are found in Table 31. This finding, which accounts for about 1.5% of the total variance, suggests that the subjects participating in treatment experienced more negative life changes than did the self-change subjects during the six months preceding Round 2 data collection.

The final LES variable from Round 2 involved the summation of ratings (i.e. -1 to -3) assigned by subjects to the negative life changes they experienced. Testing these data for homogeneity of variance resulted in a significant finding, $C(8,14) = 0.389$, $p < .05$. A $\log(X+1)$ transformation was successful in removing the heterogeneity

$C(8,14) = 0.197, p > .05.$

Table 31

Comparison between Self-Changers and Therapy Ss on Number of LES Items Rated Negatively at Round 2^a

Group	<u>n</u>	<u>X</u>	<u>SD</u>
Self-Change	122	1.92	2.99
Therapy Ss	81	3.17	3.72

^aSignificant Main Effect [$F(1,195) = 4.05, p < .05, \omega^2 = .015$]

The results of the 3-Way Log ANOVA on the transformed data for this variable are presented in Table 32. No significant differences were found to exist between the self-changers and the therapy subjects, between contemplators and recent quitters (i.e. Round 1 smoking status) and between non-smokers and smokers (i.e. Round 2 smoking status). Likewise, there were no significant interactions involving membership in group, smoking status at Round 1 and smoking status at Round 2. Contrary to expectations, contemplators as compared to recent quitters and non-smokers as compared to smokers did not differ regarding the intensity of negative changes they experienced.

Personality and Systems Variables as Predictors of Smoking Cessation and Recidivism

While producing a number of statistically significant results, the above univariate analyses of personality and systems variables revealed

that there was basically little relationship between these variables viewed separately and subjects' smoking status, whether at Round 1 or at Round 2. It is nonetheless possible that a combination of these variables may have a stronger relationship to the outcome of attempts to stop smoking than did each variable viewed separately. To test this possibility and thus in effect to attempt to discriminate and subsequently to classify subjects as smokers and non-smokers using a combination of personality and systems variables as predictors, the data were subjected to discriminant function analyses. The procedure selected for these analyses was the Wilks-Bryan Multiple Discriminant Function Method and was processed by the direct sub-routine using the SPSS statistical package. The Geisser method was used for the classification analysis, so that the contribution of all variables could be examined.

Table 32

Log ANOVA for LES Negative Score at Round 2

SOURCE	SS	<u>df</u>	MS	<u>F</u>	ω^2
Self-Change Group by Therapy Group	0.49	1	0.49	2.41	-
Round 1 Smoking Status	0.56	1	0.56	2.75	-
Round 2 Smoking Status	0.50	1	0.50	2.45	-
Group by Round 1 Smoking Status	0.06	1	0.06	0.27	-
Group by Round 2 Smoking Status	0.24	1	0.24	1.16	-
Round 1 by Round 2 Smoking Status	0.35	1	0.35	1.71	-
Group by Rd 1 by Rd 2 Smoking Status	0.63	1	0.63	3.09	-
Within	39.79	195	0.20		

Preliminary analyses revealed that Round 1 smoking status was an important discriminator. Hence it was necessary to perform two discriminant analyses based on Round 1 smoking status, i.e. one analysis for the recent quitters and the other for the contemplators. For each analysis, the self change and the therapy groups were collapsed. Following the customary rule of having about twenty subjects for each variable included in the analysis, it was decided to limit the number of predictor variables to four, since there were less than one hundred subjects in each analysis.

The combination of variables selected for the analyses were as follows: LES positive score (X_1), LES negative score (X_2), AVA congruence: self to non-smoker (X_3) and AVA congruence: self to smoker (X_4). The positive and negative LES scores were chosen in preference to the simple number of life changes experienced because the former scores provide subjects' ratings of the impact the life events had on them. Using simply the number of changes subjects experienced would have eliminated some important information, namely subjects' weighting of each change. On the AVA, the congruence scores were selected in preference to the anxiety scores, since the former are more global measures of personality than are the anxiety scores, which are based only on two vectors. AVA polar patterns could not be used in the present analyses, since they are a discrete variable, whereas discriminant function analysis demands that all dependent variables be continuous.

Table 33 reports the means, standard deviations, and mean differences for each of the four variables which were used in combination to discriminate between recent quitters who remained

non-smokers at Round 2 and recent quitters who became smokers at Round 2. The analysis of maximum separation resulted in significant findings, $F(4,91) = 147.67$, $p < .001$ (see Table 34).

Table 33

Recent Quitters' Scores on Predictor Variables

Predictor	Non-Smokers <u>n=53</u>		Smokers <u>n=43</u>		Total <u>n=96</u>		d ^a
	<u>X</u>	<u>SD</u>	<u>X</u>	<u>SD</u>	<u>X</u>	<u>SD</u>	
LES Positive Score	5.34	6.24	4.70	4.85	5.05	5.64	0.64
LES Negative Score	5.00	6.28	5.65	8.49	5.29	7.32	-0.65
AVA Congruence: Self to Non-Smoker ^b	1.93	1.21	1.33	1.19	1.67	1.23	0.60
AVA Congruence: Self to Smoker ^b	1.56	1.16	1.24	1.10	1.42	1.14	0.32

^aMean differences between non-smokers and smokers.

^bZ- scores are reported.

The linear discriminant function which provides the maximum separation between the two groups is as follows: $LDF = .0191285X_1 - .002280X_2 + .376522X_3 + .105555X_4$. The proportional contribution of each of the four variables to the maximum separation between the non-smokers and the smokers is the following: .4 : .04 : 7 : 1. By far the greatest contribution, amounting to 82.7%, was provided by the third variable, namely the AVA congruence of self to non-smoker. The contribution of the fourth variable, namely AVA congruence of self to smoker, amounted to 12.3%. The contribution of the positive and

negative change scores from the LES was minimal, amounting to only 4.5% and .5% respectively.

Table 34

Analysis of Maximum Separation for Recent Quitters

Source	SS	<u>df</u>	MS	<u>F</u>
Function	1.7719	4	0.4430	147.67***
Within	0.2732	91	0.0030	
Total	2.0451	95		

*** $p < .001$

Using the above linear discriminant function, the recent quitters were classified into non-smokers and smokers. The results of this classification system are presented in Table 35. Thirty of 53 non-smokers were correctly classified, resulting in a "hit" rate of 56.6%. The correct prediction of which recent quitters would relapse was somewhat higher, i.e. 30 of 43, or 69.8%. Thus 60 cases out of 96 were correctly classified, resulting in a percentage of 62.5. The prior probability of correct classification is 55.2% and is based on 53 of 96 subjects being actual members of the non-smoker group. Hence the classification system using the four variables listed above represents a modest improvement, i.e. 7.3%, over a priori prediction.

The second discriminant analysis involved data from the contemplators. Table 36 reports the means, standard deviations, and mean differences for each of the variables used to discriminate between contemplators who became non-smokers at Round 2 and those who remained

smokers. The analysis of maximum separation resulted in significant findings, $F(4,78) = 45.55$, $p < .001$ (see Table 37).

Table 35

Classification Results with Recent Quitters

Actual Group	<u>n</u>	Predicted Group Membership	
		Non-Smokers	Smokers
Non-Smokers	53	30 (56.6%)	23 (43.4%)
Smokers	43	13 (30.2%)	30 (69.8%)

Table 36

Contemplators' Scores on Predictor Variables

Predictor	Non-Smokers <u>n=20</u>		Smokers <u>n=63</u>		Total <u>n=83</u>		da
	<u>X̄</u>	<u>SD</u>	<u>X̄</u>	<u>SD</u>	<u>X̄</u>	<u>SD</u>	
LES Positive Score	6.00	7.28	4.16	4.99	4.60	5.63	1.84
LES Negative Score	6.35	7.59	5.59	8.97	5.77	8.62	0.76
AVA Congruence: Self to Non-Smoker ^b	1.65	1.41	1.44	1.28	1.49	1.31	0.21
AVA Congruence: Self to Smoker ^b	1.92	1.02	1.81	1.09	1.84	1.07	0.11

^aMean differences between non-smokers and smokers.

^bZ-scores are reported.

The linear discriminant function which provides the maximum separation between these two groups is the following: $LDF = .0628424X_1 + .0135369X_2 + .1414577X_3 - .0063055X_4$. The

proportional contribution of each of the four variables to the maximum separation between the non-smokers and the smokers is as follows: 4 : .4 : 1 : -.02. By far the greatest contribution, amounting to 74.6% to the maximum separation of contemplators into non-smokers and smokers was provided by the LES positive change score. The contribution of the AVA congruence between self and non-smoker amounted to 19.2%, whereas the LES negative change score was found to have only a negligible contribution, namely 6.6%. The AVA congruence of self to smoker was found to take away from prediction involving contemplators, i.e. - .4%.

Table 37

Analysis of Maximum Separation for Contemplators

Source	SS	<u>df</u>	MS	<u>F</u>
Function	0.3643	4	0.0911	45.55***
Within	0.1549	78	0.0020	
Total	0.5192	82		

*** $p < .001$

The classification results based on the above linear discriminant function involving contemplators are presented in Table 38. Nine of 20 non-smokers were correctly classified, resulting in a 45.0% "hit" rate. Forty of 63 contemplators were correctly classified as smokers, resulting in a 63.5% correct classification. Out of 83 cases, 49 were correctly classified as non-smokers or smokers, providing an overall correct classification of 59.04%. However, since 73 of the 83 contemplators remained smokers at Round 2, the prior probability of

correct classification for this sample is 75.9%. Hence the classification system using the linear discriminant function based on the four variables listed above is less effective than the a priori prediction that all contemplators would remain smokers at Round 2. The reason why the classification system involving contemplators proved to be relatively ineffective is probably related to the imbalance existing in this sample, with more than 3:1 of these subjects remaining smokers at Round 2. This imbalance in the present sample resulted in very high prior probabilities, making it difficult for the classification system here developed to compete.

Table 38

Classification Results with Contemplators

Actual Group	<u>n</u>	Predicted Group Membership	
		Non-Smokers	Smokers
Non-Smokers	20	9 (45.0%)	11 (55.0%)
Smokers	63	23 (36.5%)	40 (63.5%)

In the discriminant analyses involving both the recent quitters and the contemplators, only two of the predictor variables in each case contributed significantly to the maximum separation between non-smokers and smokers, while the contribution of the remaining variables was marginal and, in one case, even took away from the prediction. Hence it was decided to repeat the analyses using only the variables which contributed meaningfully to the discrimination, while eliminating the other variables.

A discriminant analysis was performed on the recent quitters using only the following two predictor variables: AVA congruence of self to non-smoker (X_3) and AVA congruence of self to smoker (X_4). Group data for these variables are found in Table 33. The analysis of maximum separation, which is presented in Table 39, resulted in significant findings, $F(2,93) = 288.56$, $p < .001$.

The following linear discriminant function provides the maximum separation between the recent quitters who remained non-smokers at Round 2 and those who relapsed and became smokers: $LDF = .3930985X_3 + .0987147X_4$. The proportional contribution of each variable to the maximum separation is as follows: 9 : 1.2. The AVA congruence of self to non-smoker provides the greatest contribution, i.e. 87.9%, to the maximum separation between the groups, while the congruence of self to smoker provides the remaining contribution, i.e. 12.1%.

Table 39

Analysis of Maximum Separation for Recent Quitters (2 Variables Only)

Source	SS	<u>df</u>	MS	<u>F</u>
Function	1.6222	2	0.8111	288.56***
Within	0.2614	93	0.0028	
Total	1.8836	95		

*** $p < .001$

Table 40 presents the results of the classification system based on the two predictor variables and the linear discriminant function listed above. Correctly classified were 54.7% of the non-smokers and 62.8% of

the smokers. These results translate into 58.33% of the recent quitters being correctly classified either as non-smokers or smokers at Round 2. The prior probability of correct classification for this sample is 55.2%. Hence this classification system using two predictor variables is only a minimal improvement over a priori prediction.

Table 40

Classification of Recent Quitters (2 Variables Only)

Actual Group	<u>n</u>	Predicted Group Membership	
		Non-Smokers	Smokers
Non-Smokers	53	29 (54.7%)	24 (45.3%)
Smokers	43	16 (37.2%)	27 (62.8%)

Discriminant analysis was repeated on the contemplators using the following two predictor variables: LES positive change score (X_1) and AVA congruence of self to non-smoker (X_3). The means, standard deviations and mean differences for these variables are found in Table 36. The analysis of maximum separation using these predictor variables resulted in significant findings, $F(2,84) = 105.18$, $p < .001$ (see Table 41).

The linear discriminant function providing the maximum separation between contemplators who became non-smokers and those who remained smokers is the following: $LDF = .0699078X_1 + .0909922X_3$. The proportional contribution of each variable to the maximum separation between groups is about 10:.8. The LES positive change score contributed about 92.5% to the separation, while the congruence of self

to non-smoker contributed only about 7.5%.

The results of the classification system based on these two predictor variables are presented in Table 42. Correctly classified as remaining smokers were 72.7% of the contemplators, while only 47.6% of those who became non-smokers were correctly classified. However, the prior probability of correct classification in this case is 79.5%, since 66 of 83 contemplators continued to smoke at Round 2. Hence the present classification system is less effective than a priori prediction.

Table 41

Analysis of Maximum Separation for Contemplators (2 Variables Only)

Source	SS	<u>df</u>	MS	<u>F</u>
Function	0.3939	2	0.1969	105.18***
Within	0.1572	84	0.0019	
Total	0.5509	86		

*** $p < .001$

Table 42

Classification of Contemplators (2 Variables Only)

Actual Group	<u>n</u>	Predicted Group Membership	
		Non-Smokers	Smokers
Non-Smokers	21	10 (47.6%)	11 (52.4%)
Smokers	66	18 (27.3%)	48 (72.7%)

Discussion

The present study sought to provide empirical support for the inclusion of personality and systems variables into the transtheoretical model of change in order to extend the comprehensiveness and utility of this model. In this discussion the major findings of the study will be highlighted and related to the questions at hand.

In regard to personality variables the first striking finding was the significant difference between the subjects participating in the study and the population on which the AVA was standardized. When describing their basic selves and themselves as smokers, the experimental sample had present in it a disproportionate number of persons who can be described as dependent-follower types of personalities and a disproportionately fewer number of persons described as independent and outspoken.

The reason why the experimental sample contains more dependent profiles is probably two-fold. In the first place it should be noted that this study used volunteers. There is reason to believe that volunteers as a group are more conforming and submissive (McFall, 1978). Secondly and more importantly, the experimental sample is composed exclusively of persons who are either currently smoking or who have smoked until the recent past.

The standardization population, on the other hand, is in all likelihood composed of both smokers and non-smokers. At the time Form D of the AVA was standardized, about 50% of U.S. males and approximately 33% of U.S. females were smoking (Adult Use of Tobacco,

1975). Given that 100% of the experimental subjects were or continue to be smokers, the present finding of a disproportionate number of dependent profiles in the experimental sample appears to support the stereotype that smokers are more dependent than non-smokers. Smoking, after all, is an addictive problem and the subjects in this study are persons who smoke or return to smoking with high frequency, so that dependency is present.

When asked to describe themselves as non-smokers, however, the results were quite different. In this case the experimental sample was found to contain polar pattern 1991 with greater frequency than was found in the standardization population. This polar pattern, it will be recalled, contains a low Vector 4 and describes a person who is independent and decisive. Hence this is a finding of some importance. As the experimental subjects respond to the task of imagining themselves as non-smokers, the perceptions of many of these persons are characterized by a sense of independence. This perception is very likely associated with actual or imagined mastery over their smoking habit. For these persons the role of non-smoker carries with it an increased sense of decisiveness, self-determination, and the ability to say no. This is quite different from the perceptions of themselves as smokers, which were characterized by a sense of dependence.

The findings regarding the congruence between basic self and role of smoker or non-smoker are more important and more germane to the questions addressed in this study. It was found, for example, that the contemplators exhibited a significantly higher congruence between basic self and role as smoker than did the recent quitters.

This interesting finding, which was expected and predicted, indicates that for contemplators, i.e. persons who were actually smoking at the time of completing the questionnaire, there was a higher degree of merging between their basic self-concept and their role as smokers than there was for persons who recently quit smoking. This suggests a relationship between external behavior (i.e. smoking vs non-smoking) and cognitive perceptions. For persons who are smoking there is a higher degree of compatibility between self and role as smoker than for persons who are not smoking.

In AVA theory, congruences ranging from .95 to 1.00 are viewed as exhibiting a minimum range of behavior and as lacking flexibility. Congruences between .80 and .94 are regarded as indicating a slight range of behavior with little flexibility, while congruences from .00 to .79 are indicative of a normal range of flexibility (Manual for the AVA, 1972, p. 10-37). Though there is a significant difference between the recent quitters and the contemplators in the present study, the congruence for each group is high. The contemplators, for example, achieved a congruence of .95. It thus appears that their perceptions of themselves in their role as smokers are highly merged with their basic self-concept. It is expected that there is only minimum flexibility regarding this behavior, which appears to them as intimately bound up with who they are as persons. Stopping smoking for these persons is expected to be not only difficult, but is also likely to be experienced as ego-alien.

The recent quitters, on the other hand, achieved a congruence of .89. Having stopped smoking in the recent past, they exhibit somewhat greater flexibility regarding smoking than do the contemplators. For

these recent quitters, smoking is not as closely merged with their basic self-concept as it was for the contemplators. Nevertheless, the congruence is still very high. This suggests that reverting to smoking is possible, even likely.

Group comparisons on congruence scores involving perceptions of self and non-smoker resulted in several significant findings. The recent quitters in the self-change group, for example, were found to exhibit a significantly greater congruence between basic self-concept and role of non-smoker than did the self-change contemplators. Thus, the self-change group exhibits a consistency of findings. Whereas the self-change contemplators exhibited a higher congruence between self and role as smoker than did the self-change recent quitters, the reverse relationship held true for the congruence between self and role of non-smoker, with self-change recent quitters achieving higher congruence scores than did the self-change contemplators. Both these findings were expected and are consistent with the predictions made.

The situation is different, however, with the therapy subjects. These contemplators exhibited a significantly higher congruence between self and role as non-smoker than did the therapy recent quitters. This is a finding that is contrary to expectations and invites an explanation. It may be that these therapy contemplators, participating in group treatment which provides information about the ill effects of smoking and instills motivation to quit, experience positive expectations about changing their smoking behavior. They are probably viewing non-smoking status as desirable and may already be beginning to view themselves as non-smokers, so that the resulting congruence between basic self and role of non-smoker is very high.

At the same time, the therapy recent quitters, being abstinent only from one to several days, are very likely struggling with withdrawal symptoms, fighting impulses to smoke and confronting environmental situations which present temptations to light up and smoke a cigarette. Given this context, it may be that these therapy recent quitters are experiencing self-doubt and discouragement regarding continued success in maintaining non-smoking behavior. This may lead to lower congruence between self and non-smoker as compared to the therapy contemplators who may be enthused about the prospect of quitting and are expecting to become non-smokers.

The recent quitters in the self-change group exhibited a significantly higher congruence between basic self and role of non-smoker than did the recent quitters in the therapy group. The reason for this difference is very likely related to the explanation given above. It will be recalled that therapy subjects completed the questionnaires while attending treatment. These recent quitters were filling out the AVA within a few days or weeks of changing their smoking habit.

It is probable that relatively few self-changers would be completing the questionnaires within days of changing their habit. It is likely that the majority of self-change quitters completed the questionnaires several weeks after stopping smoking. Though the criterion for being classified as a "recent quitter" was the same for each group, i.e. abstinence for at least 24 hours, but less than three months, it is likely that the subjects in the therapy group clustered at the low end of the spectrum, i.e. 24 hours, while the subjects in the self-change group clustered at the high end, i.e. close to three

months.

Such differential clustering may mean that the recent quitters in the therapy group are experiencing withdrawal symptoms and temptations to smoke, leading to discouragement about continued success and thus resulting in a relatively low congruence between basic self and role as non-smoker. The recent quitters in the self-change group, on the other hand, are very likely less concerned about withdrawal symptoms and temptations to smoke. They have likely experienced success for some weeks and probably expect to maintain non-smoking behavior. Their views of themselves as non-smokers are being reinforced, so that they exhibit a high congruence between basic self and role as non-smoker.

Though the congruence scores resulted in several statistically significant findings, it is important to note that these congruence scores were high across groups, both for the role of smoker as well as non-smoker. Whereas in AVA theory and indeed in various studies using the AVA, the congruence scores range from correlations of +1.00 to -1.00, the congruence scores in the present study clustered in the mid .90's, with only a few correlations in the .80's. Hence a ceiling effect is apparent which results in relatively little discrimination among groups.

Although various efforts were made to explain the nature of the task to the subjects, apparently they found the task of discriminating their basic self-concept from their role as smokers or non-smokers too difficult to accomplish. For many subjects the perception of basic self was very similar to their perceptions of themselves as smokers and themselves as non-smokers. Perhaps what contributed to the difficulty of the task was the nature of the AVA itself. Since the AVA consists

of non-derogatory adjectives, it was probably difficult for subjects to relate these adjectives to the images of smoking which people attempting to quit might have, e.g. coughing, bad breath, shortness of breath and the like.

It is possible, too, that the high congruences across groups may in fact be reflective of what the subjects are experiencing. Since they have smoked in the recent past or are currently smoking and since some subjects have quit smoking in the recent past, while others are attempting to quit currently, it is likely that the subjects simultaneously and in varying degrees want to continue smoking but also to quit. In the midst of this ambivalence, the subjects are likely uncertain which role they will finally adopt, so that at present they view both smoking and non-smoking status as highly congruent with their basic selves. As behavior change occurs and is maintained, it is expected that congruence scores would stabilize and be reflective of smoking status. Hence the finding that congruence scores were high across groups may lend support to findings reported by other researchers, namely that contemplators exhibited high scores on both the "pros" and the "cons" of smoking, and that both "pros" and the "cons" decrease over time (Velicer, DiClemente, Prochaska, & Brandenburg, in press).

Other personality variables examined involved the anxiety scores from each of the three AVAs. The anxiety scores from the self AVA proved to be largely non-significant, as was predicted. It was expected that differential levels of anxiety would be found across groups in regard to behavior-specific roles, i.e. AVA for smoker and non-smoker, but not in regard to the basic self-concept.

However, none of the findings involving the anxiety scores from the smoker pattern shape was found to be significant. What was expected on this variable were significant differences on levels of anxiety between contemplators and recent quitters, between smokers and non-smokers at Round 2, as well as a significant interaction effect involving Round 1 smoking status and Round 2 smoking status. None of these predictions materialized.

When anxiety scores from the non-smoker pattern shape were examined, the therapy subjects exhibited a significantly higher level of anxiety than did the self-changers. This finding, which was unexpected and contrary to prediction, is probably a function of the respective groups' distance in time from the quit date. It is likely that the therapy subjects, having as a group quit more recently than the self-changers, are still experiencing some withdrawal symptoms and are thus reporting higher arousal and discomfort levels as they consider what it means to them to be non-smokers and as they view themselves undergoing the process of becoming non-smokers.

It was expected that anxiety level based on subjects' behavior-specific role as non-smokers would result in differences between contemplators and recent quitters, differences between subjects who were smokers at Round 2 as compared to those who were non-smokers at Round 2, as well as significant interaction effects involving Round 1 and Round 2 smoking status. Of these expected differences, the only prediction that held true was the interaction effect. However, this finding was barely significant and the source of difference could not be isolated.

The first hypothesis underlying this study postulated that the outcome of attempts to stop smoking and maintaining non-smoking behavior was a function of a behavior-specific self-concept. The analysis of the five dependent variables examined lends the following support for accepting this hypothesis: (1) contemplators in both the self-change and the therapy groups exhibited higher congruence between basic self-concept and role as smoker than did the recent quitters; (2) the recent quitters in the self-change group exhibited higher congruence between basic self-concept and the role of non-smoker than did the self-change contemplators; and (3) a significant interaction between Round 1 and Round 2 smoking status involving levels of anxiety based on AVA role as non-smoker. These findings offer some support for accepting the hypothesis that there is a relationship between attempts to stop smoking and self-concept. The findings suggest that self-concept is somehow involved, but how and to what extent is unclear.

Though the above results achieved statistical significance, it is tempting to view them as quite meaningless because their practical significance, as measured by the Omega², is small. After all, each accounted for only about 1.5% to 2.5% of the total variance. It is important, however, not to dismiss these or other variables too quickly just because their practical significance is small. In the first place, the focus of the present study is not so much on immediate, practical application of the findings, but rather on model building. The knowledge concerning behavior change generally and smoking cessation specifically which is found in the current scientific literature is limited and at times inconsistent. What helps to

determine the importance of particular variables is not only effect size as measured by Ω^2 or other statistics but also consistency of findings over time. Hence, rather than rejecting self-concept as a component in a model of change, it is reasonable to continue further studies using different methodologies or measures in order to determine whether similar findings appear with consistency.

Furthermore, it is important to note that the specific behavior examined in this study, namely smoking, has been clearly implicated in lung cancer, heart disease, emphysema and other diseases, and is viewed as the most preventable cause of death in industrialized nations. Hence it is reasonable to argue that whatever factor might contribute to helping people stop smoking is important, even though its contribution may be quite small, when viewed from the perspective of Ω^2 or other effect-size estimators.

In this connection it is useful to consult the binomial effect size display (BESD) which was introduced by Rosenthal (1983). The BESD addresses the question, "What is the effect on the success rate of a new treatment?" and displays the change in success rate which is attributable to a new treatment or procedure. For example, an effect size that accounts for 10% of the total variance increases the success rate from 34% to 66%. An effect size that would account for only 3% of the total variance increases success rate from 42% to 58%. The effect sizes in the present study accounted for about 1.5% to 2.5% of the total variance. This is associated with an increase in success rate from about 44% to about 56%. Though the effect sizes in the present study appear small, they nonetheless appear to be meaningful. If a variable or procedure were shown to increase by 12% the ability of

subjects to quit smoking and thus to be associated with an eventual decline by 12% in death from smoking, such a variable or procedure would not be considered insignificant. The effect sizes in the present study are within this range.

It should be remembered, too, that an underlying assumption of the Omega² is that 100% of the variance can be accounted for. In his excellent and relevant exposition of statistical power analysis, however, Cohen (1977) points out that the behavioral sciences typically account for much less than 100% of the total variance. Indeed, his operational definitions of small, medium and large effect sizes are correlations of .10, .30 and .50 respectively. Thus, if the practical upper limit of expected effect sizes is about .50, accounting for about 25% of the total variance, the effect sizes reported in the present study, ranging as they do around 2%, are not as insignificant as may first appear.

The second hypothesis postulated that behavior-specific personality variables are predictive of the outcome of attempts to change smoking behavior. The results, however, indicated that subjects' classification into polar patterns based on their perceptions of themselves as smokers or non-smokers was not related to the outcome of their attempts to change their smoking behavior. Each of the polar patterns was equally successful or equally unsuccessful, as the case may be, in changing smoking behavior or in relapsing. Behavior-specific personality variables, as defined in this study, were unable to predict the outcome of attempts to alter smoking behavior. Hence the second hypothesis is rejected.

The third hypothesis postulated that systems variables are related to smoking cessation and recidivism. The results, however, indicated that life changes, whether these were considered discretely or weighted as to intensity of impact, were not related to smoking status. Whether subjects experienced more or fewer life changes and whether these were experienced as having a pleasant or unpleasant impact was found to be unrelated to whether subjects had actually quit smoking in the recent past or were still smoking but thinking seriously about quitting or became smokers or non-smokers at Round 2. It was predicted that the number and intensity of life changes, and particularly those which were rated as negative, would differentiate recent quitters from contemplators and smokers from non-smokers at Round 2. It was expected that recent quitters would exhibit more positive changes and/or fewer negative changes. These predictions, however, were not confirmed.

In regard to systems variables, the only significant finding was one which suggested that therapy subjects experienced more negative life changes than did the self-change subjects. Though this difference between these groups was neither predicted nor anticipated, it is a finding of some importance. Previous research using demographic and smoking history variables has failed to differentiate persons who quit on their own from those who enter therapy. It should be noted, too, that in the present study therapy subjects exhibited a significantly higher level of anxiety on the AVA than did the self-changers when these groups reported their perceptions of themselves in their role of non-smoker.

These two findings, namely that therapy subjects experienced more negative life changes and exhibited a higher level of anxiety,

corroborate each other and seem to point to the view that what leads persons into therapy are higher levels of stress and distress. As long as the level of discomfort is relatively low, people probably attempt behavior changes on their own. As levels of tension increase, it seems that people with greater frequency search out outside help. Though differences between self-changers and therapy subjects were not predicted, these fortuitous findings are accepted as possibly improving researchers' ability to differentiate these groups. Further investigation along these lines appears merited.

Though systems variables failed to differentiate contemplators from recent quitters and smokers from non-smokers in the present study, it would be premature to dismiss the importance of systems variables on behavior change. Such questions as, "What are the reasons why people smoke?" and "To what factors do people attribute their smoking?" continue to be important and need to be examined. Current research (Norcross, Prochaska, & Hambrecht, in review) indicates that people attribute their distress and mental problems largely to interpersonal factors, i.e. problems with one's family, dissapointments with parents and siblings, not receiving enough affection from people, lack of sources of happiness, and lack of happiness in interpersonal relations. Might not these same interpersonal factors help explain why people smoke or why they relapse?

In their model of relapse, Marlatt and Gordon (1979) ascertained that interpersonal conflict accounted for 12% of relapse situations. They also found that 43% of relapses were due to "negative emotional states," such as anger and boredom. However, these researchers did not specify the source of these emotional states. It may well be that the

sources of these negative states stem from relationship problems, such as those specified above. Hence it would be useful to examine the impact of these interpersonal factors on smoking cessation and recidivism. Shiffman (1982) points out that 61% of his subjects' relapses occurred in the presence of other people. Other researchers indicate that ex-smokers whose family members or friends continue to smoke are more likely to relapse (Eisinger, 1971; Tongas, et al., 1978).

The Life Experiences Survey certainly includes some interpersonal factors, e.g. divorce, death of spouse, etc. However, the frequency of these events is low, so that groups could not be differentiated because of a floor effect. What seems to be needed is more specificity regarding the kinds of systems variables that are likely to have an impact on smoking cessation and recidivism. It would seem that subjects' interpersonal styles, amount of IP conflict, amount of reinforcements from significant others and the like and how these factors relate to day-by-day levels of stress on subjects would have a more direct bearing on subjects' attempts to alter smoking behavior than such low baseline events as divorce, marriage, etc., which are assessed by the LES. An instrument other than the LES is needed to investigate the impact of systems variables, particularly interpersonal factors, on attempts to stop smoking and maintain non-smoking behavior.

When personality and systems variables were used in combination via discriminant analyses, it was found that these variables were not very effective in discriminating between groups and in classifying recent quitters and contemplators into non-smokers and smokers. Whether these variables were subjected to univariate analyses or whether they were

used in combination, their relationship to smoking status and their predictive power as to the outcome of attempts to stop smoking and maintaining non-smoking behavior was low.

What was found via discriminant analysis was that the greatest contribution, amounting to 82.7%, to the maximum separation of recent quitters who remained non-smokers at Round 2 from those who relapsed was provided by the AVA congruence between self and non-smoker. In the case of the contemplators, however, the greatest contribution, amounting to 74.6%, was provided by the LES positive change score.

These findings, which were not predicted and not expected, suggest that external events, i.e. life event changes, are important in moving a person from the contemplation stage into active change. Once action occurs and behavior change takes place, however, it appears that internal variables, e.g. self-concept, become more salient in order to maintain the change undertaken. This perspective is compatible with and indeed corroborates the transtheoretical model of change, which holds that different factors affect people at different stages of change.

The broader question underlying the present research addressed the issue whether the transtheoretical model of change would be strengthened by the inclusion of personality and systems variables. The findings offer only slight empirical support for including these variables.

The implications for further research and for expanding the transtheoretical model of change that flow from this study are the following:

1. There is some evidence to suggest that self-concept is somehow involved in behavior change, probably in helping people to maintain changes already undertaken.

2. Systems variables appear to be important in moving persons from contemplation to active change. Given its floor effect, the LES was not helpful in differentiating groups undergoing behavior change. The added problem with the LES, as noted above, is the low reliability of this instrument, particularly in regard to the positive change score. It should be pointed out, however, that the scale with higher reliability, i.e. the negative change score, was no more effective in discriminating groups than was the positive change score. What would be helpful in future research would be to eliminate the LES in favor of an instrument which would assess subjects' day-to-day stresses stemming from interpersonal sources, with a view to relating these IP stresses to subjects' attempts to alter behavior and maintain desired behavior change.

3. One of the factors which seems to differentiate self-changers from therapy changers appears to be the level of distress experienced, with people experiencing higher levels of distress seeking therapy rather than attempting to change on their own. Further research is needed to determine whether this finding holds up and to ascertain what other factors differentiate people who change on their own from those who enter therapy.

Given the small effect sizes in the present study, as measured by the Ω^2 , the immediate, practical implications of these findings is minimal. However, these findings do contribute to the development of the transtheoretical model of change, insofar as they help eliminate

some directions for further research which appear not to be fruitful and point to a number of areas where further research would be useful.

After reviewing the above discussion, it appears useful to place the current research and indeed the transtheoretical model of change itself within a broader historical context. Researchers investigating the areas of health and disease rightly point out that advances in medicine have made dramatic advances in detecting and curing disease and have significantly increased the life expectancy of Americans since the turn of the century (Halper, 1980). Thanks to antibiotics and other medical interventions, such infectious diseases as tuberculosis, pneumonia and typhoid, among others, are no longer the feared and fatal scourges of humanity they were as recently as several decades ago.

What is also becoming clear, however, is that these largely controllable infectious diseases are now being replaced by chronic disorders, such as cancer and heart disease, as the major health concerns of the current decades. A growing body of data, furthermore, links these chronic disorders with such lifestyle issues as smoking, high-fat diets and obesity, as well as lack of regular exercise (Halper, 1980). Hence it appears that if the health of Americans is to continue improving what will be increasingly important in the coming years will be for people to take increased control of their behaviors and habits by throwing away cigarettes, improving their nutrition, and maintaining regular exercise. Rather than waiting for medical technology to discover a "magic bullet" to control these chronic conditions, an unlikely prospect, it is much wiser and cost-effective for people to alter their lifestyles with a view to preventing these diseases.

It is within this context of disease prevention that the transtheoretical model of change can make exciting contributions. The model, after all, seeks to explain how people alter behaviors, maintain desired changes, or relapse, both within and outside of therapy. The processes of change, the levels of change and the stages of change, which are at the heart of the model, can be applied to such lifestyle issues as smoking, obesity, poor nutrition, and lack of exercise, which are among the major causes of chronic disease, disability, and death in the industrialized world. Further research and model building, as has been attempted in the present research, along with applications of the model to target behaviors with specific populations, appears not only warranted but highly desirable.

APPENDIX A

Demographic and Smoking History Questionnaire

0 1 2 1 1	Col (1-5)
ID _____	(6-9)
Grp _____	(10)

I. IDENTIFICATION

Please PRINT the requested information in the given spaces.

1. Name (11) (21) (11-30)
 First Last
2. Address (31) (31-50)
 Number and Street
- (51) (70) (51-75)
 Town State and Zip

0 2 0 1 1	(1-5)
ID _____	(6-9)

3. Phone # (11) (21) (11-30)
 Home Business
4. Social Security # (31) (31-39)

- Today's Date (40) (40-45)
 Month / Day / Year

5. Names and addresses of two relatives or friends who do not live with you and who would know where to contact you over the next two years.

- i. Name _____ Phone: Home _____
 Address _____ Business _____
- ii. Name _____ Phone: Home _____
 Address _____ Business _____

0 3 0 2 1 (1-5)

ID _____ (6-9)

Grp _____ (10)

II. PERSONAL HISTORY

Please fill in the right-hand margin with the code numbers that are next to the answers that best suit you. For example, in question number 1, fill in the blank space with a "1" if you are female and a "2" if you are male.

Where there are no code numbers, please print the requested information. For example, question number 6 asks your occupation. Just write in what you do instead of writing a number.

1. Your sex: Female = 1 Male = 2 _____ (11)

2. Your Birthdate: _____ (12-17)
month / day / year

3. Your Racial Background: White = 1 Black = 2 Oriental = 3 _____ (18)
Spanish Surname = 4 Other = 5

4. Your Marital Status: Single = 1 Married = 2 Divorced = 3 _____ (19)
Separated = 4 Widowed = 5

5. What is the highest educational level you have completed?
- 1 Eight grades or less
2 Some high school
3 High school graduate
4 Some college or specialized school above high school
5 College graduate
6 Some postgraduate work
7 Graduate degree (M.A., M.S., M.D., Ph.D., L.L.D., etc.)
- (20)

6. What is your occupation? _____ (21-22)

7. If you are married, what is the highest educational level your spouse has completed?
- 1 Eight grades or less
2 Some high school
3 High school graduate
4 Some college or specialized school above high school
5 College graduate
6 Some postgraduate work
7 Graduate degree (M.A., M.S., M.D., Ph.D., L.L.D., etc.) _____ (23)

8. If you are married, what is the occupation of your spouse?

9. What is your approximate gross yearly income?

1 Less than \$5,000 a year	5 \$20,000 - \$24,999 a year
2 \$5,000 - \$9,999 a year	6 \$25,000 - \$29,999 a year
3 \$10,000 - \$14,999 a year	7 \$30,000 or more a year
4 \$15,000 - \$19,999 a year	

_____ (26)

If you are married, what is your spouse's income?

1 Less than \$5,000 a year	5 \$20,000 - \$24,999 a year
2 \$5,000 - \$9,999 a year	6 \$25,000 - \$29,999 a year
3 \$10,000 - \$14,999 a year	7 \$30,000 or more a year
4 \$15,000 - \$19,999 a year	

_____ (27)

10. With whom are you presently living? (Check all that apply.)

- Spouse (28)
- Your own children (29)
- One or both parents (or guardians) (30)
- Your own grandchildren (31)
- One or both grandparents (32)
- One or both in-laws (33)
- Brother(s) (34)
- Sister(s) (35)
- Other relatives (aunts, uncles, cousins, etc.) (36)
- Children of others related to you through blood or marriage (37)
- Friends/roommates (of either sex) (38)
- Children of others *not* related to you through blood or marriage (39)
- Alone (40)
- Other(s) (Who? _____) (41)

0 4 0 3 1	(1-5)
ID _____	(6-9)
Grp _____	(10)

III. SMOKING HISTORY

1. How old were you when you started smoking cigarettes regularly?

Years of Age: ____ (11-12)

2. How many years have/had you been smoking cigarettes regularly?
(Exclude periods of time when you had quit.)

Years: ____ (13-14)

3. During the period when you were smoking the most, about how many cigarettes a day did you usually smoke?

Cigarettes per day: ____ (15-17)

4. If you smoke daily, on the average, how many cigarettes do you now smoke?

Cigarettes per day: — — — (18-20)

If you do not smoke daily, on the average, how many cigarettes do you now smoke each week?

Cigarettes per week: — — — (21-23)

5. Describe the typical use of cigarettes by the people listed below *when you were growing up* (i.e., when you were about 5 to 18 years old). Use the following alternatives:

- 1 = did not smoke cigarettes
- 2 = light smoker who had periods of abstinence
- 3 = continuous light smoker
- 4 = heavy smoker who had periods of abstinence
- 5 = continuous heavy smoker
- 6 = not applicable

- Your father (24)
- Your mother (25)
- Your closest sister (26)
- Your closest brother (27)
- Another family member who had a big influence on you; e.g., aunt, grandfather, uncle, etc.
(Who?) (28)
- Another adult you looked up to; e.g., teacher, sports coach, policeman, doctor, minister, etc.
(Who?) (29)

6. To the best of your knowledge, describe the present use of cigarettes by the people in your life listed below. Use the following alternatives:

- 1 = does not smoke cigarettes
- 2 = smokes an occasional cigarette, but less than 5 a day
- 3 = smokes 5 to 10 cigarettes a day
- 4 = smokes 11 to 20 cigarettes a day
- 5 = smokes 21 or more cigarettes a day
- 6 = not applicable

- Your spouse (30)
- Your best friend of the same sex (31)
- Your best friend of the opposite sex (32)
- Your closest associate at your place of work (33)

7. Since you started smoking cigarettes, how many times have you tried to stop?

1 Never	6 Five times
2 Once	7 Six to ten times
3 Twice	8 Eleven to twenty-five times
4 Three times	9 More than twenty-five times
5 Four times	

_____ (34)

8. What is the longest period of time you quit smoking?

1 Never quit	7 Six months to one year
2 Less than twenty-four hours	8 One year to two years
3 One to six days	9 Two years to five years
4 Seven to thirty days	10 Five years to ten years
5 One to three months	11 Ten years to fifteen years
6 Three to six months	12 Fifteen years or more

_____ (35)

9. If you have ever quit smoking, what was the date of your most recent attempt to quit smoking (as accurately as you can remember)?

— — / — — / — —
month / day / year

(36-41)

10. If you have ever quit smoking, on the average, how many cigarettes per day were you smoking before your most recent attempt to stop smoking?

Cigarettes per day: — — — (42-44)

11. Did you use any particular method or technique in your most recent attempt to quit smoking?

- 1 None
- 2 I quit on my own by gradually cutting down
- 3 I quit on my own "cold turkey"
- 4 Voluntary program (Five Day Plan, American Cancer Society)
- 5 Commercial program (Schick, SmokEnders, etc.)
- 6 I did not try to quit
- 7 Other (Describe) _____

_____ (45)

12. What problems, if any, did you experience while trying to quit? (Check all that apply.)

- Did not try to quit..... (46)
 Weight gain (47)
 Increased appetite (48)
 Constipation (49)
 Diarrhea (50)
 Nausea (51)
 Headaches (52)
 Drowsiness (53)
 Fatigue (54)
 "Dullness" (55)
 Insomnia (56)
 Other sleep disturbances (57)
 Inability to concentrate (58)
 Irritability (59)
 Restlessness (60)
 Anxiety (61)
 Craving for tobacco (62)
 None (63)
 Other (Please specify _____) (64)

05031
ID _____

(1-5)

(6-9)

13. if you have ever tried to quit smoking, describe the typical use of cigarettes (to the best of your knowledge) by the people in your life during your *most recent* attempt to stop smoking. Use the following alternatives:

- 1 = did not smoke cigarettes
 2 = smoked an occasional cigarette, but less than 5 a day
 3 = smoked 5 to 10 cigarettes a day
 4 = smoked 11 to 20 cigarettes a day
 5 = smoked 21 or more cigarettes a day
 6 = not applicable

- Your spouse..... (11)
 Your best friend of the same sex (12)
 Your best friend of the opposite sex (excluding spouse) (13)
 Your closest associate at your place of work (14)

14. What is your current status as a cigarette smoker?

- 1 I used to smoke cigarettes regularly, but quit *at least* six months ago.
- 2 I used to smoke cigarettes regularly, but quit *between* three and six months ago.
- 3 I used to smoke cigarettes regularly, but quit *less than* three months ago.
- 4 I smoke cigarettes now, but have tried at least once in the past year to quit smoking.
- 5 I smoke cigarettes now, and have *not* tried to quit smoking in the past year. In addition, I have no plans to try to quit in the next year.
- 6 I smoke cigarettes now, and have *not* tried to quit smoking in the past year. However, I am seriously thinking about quitting in the next year.

_____ (15)

15. At this time what is your personal goal in regards to smoking?

- 1 To stay off cigarettes forever.
- 2 To not smoke for a limited period of time.
- 3 To be able to control how much I smoke.
- 4 To quit smoking someday, but not now.
- 5 To continue smoking.
- 6 To stop smoking now.

_____ (16)

16. Have you changed your brand of cigarettes in the past year? (If you have quit, did you change your brand during the last year of smoking?)

1 Yes

2 No

_____ (17)

17. Indicate the average number of times you have used the following in the past two weeks by checking the appropriate box.

	1 Not at All	2 2 to 3 times per month	3 Weekly	4 2 to 7 times per week	5 1 to 5 times per day	6 6 to 10 times per day	7 11 to 20 times per day	8 More than 20 times per day	
A. Pipe (Pipesfull)									(18)
B. Cigars or Cigarillos									(19)
C. Chewing Tobacco									(20)
D. Snuff									(21)
E. Other Forms (such as tobacco-free cigarettes, marijuana)									(22)

18. Here are some statements made by people to describe what they got out of smoking cigarettes. Recall the last six months during the time you smoked. Answer each question in terms of how often you felt this way when smoking.

	1 Never	2 Seldom	3 Occasionally	4 Frequently	5 Always	
A. I have smoked cigarettes in order to keep myself from slowing down						(23)
B. Handling a cigarette has been part of the enjoyment of smoking						(24)
C. Smoking cigarettes has been pleasant and relaxing						(25)
D. I have lit up a cigarette when I felt angry about something						(26)
E. If I should run out of cigarettes I would find it almost unbearable until I get them						(27)

	1 Never	2 Seldom	3 Occasionally	4 Frequently	5 Always	
F. I have smoked cigarettes automatically without even being aware of it						(28)
G. I have smoked cigarettes to stimulate me, to perk myself up.....						(29)
H. Part of the enjoyment of smoking a cigarette has come from the steps I have taken to light up						(30)
I. I have found cigarettes pleasurable.....						(31)
J. When I have felt uncomfortable or upset about something, I have lit up a cigarette						(32)
K. I have been very much aware of the fact when I was not smoking a cigarette						(33)
L. I have lit up a cigarette without realizing I still had one burning in the ashtray						(34)
M. I have smoked cigarettes to give me a "lift"						(35)
N. When I have smoked a cigarette, part of the enjoyment has been watching the smoke as I exhale it ...						(36)
O. I have wanted a cigarette most when I was comfortable and relaxed						(37)
P. When I had been feeling "blue" or wanting to take my mind off cares and worries, I smoked cigarettes						(38)
Q. I would get a real gnawing hunger for a cigarette when I hadn't smoked for a while.....						(39)
R. I have found a cigarette in my mouth and not remembered putting it there						(40)

APPENDIX B

Activity Vector Analysis

1 4 0 8 1

ID _____

Grp _____

(1-5)

(6-9)

(10)

VI. SELF-PERCEPTION

A. Place an X before every word which you honestly believe is descriptive of you. Draw a line through any word you do not understand. Be honest with yourself — remember, no one is perfect.

I really am ...

1 matter-of-fact	28 amusing	55 analytical	(11-13)
2 good mixer	29 leisurely	56 calm	(14-16)
3 stable	30 tranquil	57 theatrical	(17-19)
4 lenient	31 gregarious	58 unselfish	(20-22)
5 anxious	32 fussy	59 forceful	(23-25)
6 graceful	33 aggressive	60 frank	(26-28)
7 bold	34 tense	61 admirable	(29-31)
8 ingenious	35 willing	62 composed	(32-34)
9 appealing	36 attractive	63 defensive	(35-37)
10 cautious	37 apprehensive	64 romantic	(38-40)
11 smooth	38 enterprising	65 brave	(41-43)
12 patient	39 enchanting	66 opinionated	(44-47)
13 fearful	40 practical	67 polished	(48-50)
14 punctilious	41 hesitant	68 compliant	(51-53)
15 competitive	42 courageous	69 considerate	(54-56)
16 sociable	43 meek	70 innocent	(57-59)
17 relaxed	44 prudent	71 direct	(60-62)
18 charming	45 deliberate	72 interesting	(63-65)
19 gentle	46 delightful	73 agreeable	(66-68)
20 self-conscious	47 devout	74 serene	(69-71)
21 industrious	48 argumentative	75 impetuous	(72-74)
22 personality-plus	49 quiet	76 just	(75-77)
23 shy	50 dependent	77 tactful	(11-13)
24 decisive	51 magnetic	78 dominant	(14-16)
25 skeptical	52 easy-going	79 poised	(17-19)
26 mature	53 submissive	80 accommodating	(20-22)
27 solemn	54 determined	81 witty	(23-25)

1 5 0 8 1

ID _____

(1-5)

(6-9)

B. Now place an X before any word which you honestly believe would be descriptive of you as a smoker — whether you smoke or not. Imagine yourself as a smoker and complete this phrase:

As a smoker I really am ...

1 matter-of-fact	28 amusing	55 analytical	(44-46)
2 good mixer	29 leisurely	56 calm	(47-49)
3 stable	30 tranquil	57 theatrical	(50-52)
4 lenient	31 gregarious	58 unselfish	(53-55)
5 anxious	32 fussy	59 forceful	(56-58)
6 graceful	33 aggressive	60 frank	(59-61)
7 bold	34 tense	61 admirable	(62-64)
8 ingenious	35 willing	62 composed	(65-67)
9 appealing	36 attractive	63 defensive	(68-70)
10 cautious	37 apprehensive	64 romantic	(71-73)
11 smooth	38 enterprising	65 brave	(74-76)
		17081	(1-5)
		ID _____	(6-9)
12 patient	39 enchanting	66 opinionated	(11-13)
13 fearful	40 practical	67 polished	(14-16)
14 punctilious	41 hesitant	68 compliant	(17-19)
15 competitive	42 courageous	69 considerate	(20-22)
16 sociable	43 meek	70 innocent	(23-25)
17 relaxed	44 prudent	71 direct	(26-28)
18 charming	45 deliberate	72 interesting	(29-31)
19 gentle	46 delightful	73 agreeable	(32-34)
20 self-conscious	47 devout	74 serene	(35-37)
21 industrious	48 argumentative	75 impetuous	(38-40)
22 personality-plus	49 quiet	76 just	(41-43)
23 shy	50 dependant	77 tactful	(44-46)
24 decisive	51 magnetic	78 dominant	(47-49)
25 skeptical	52 easy-going	79 poised	(50-52)
26 mature	53 submissive	80 accommodating	(53-55)
27 solemn	54 determined	81 witty	(56-58)

B. Now place an X before any word which you honestly believe would be descriptive of you as a non-smoker — whether you smoke or not. Imagine yourself as a non-smoker and complete this phrase:

As a non-smoker I really am . . .

1 matter-of-fact	28 amusing	55 analytical	(30-33)
2 good mixer	29 leisurely	56 calm	(34-36)
3 stable	30 tranquil	57 theatrical	(37-39)
4 lenient	31 gregarious	58 unselfish	(40-42)
5 anxious	32 fussy	59 forceful	(43-45)
6 graceful	33 aggressive	60 frank	(46-48)
7 bold	34 tense	61 admirable	(49-51)
8 ingenious	35 willing	62 composed	(52-54)
9 appealing	36 attractive	63 defensive	(55-57)
10 cautious	37 apprehensive	64 romantic	(58-60)
11 smooth	38 enterprising	65 brave	(61-63)
12 patient	39 enchanting	66 opinionated	(64-66)
13 fearful	40 practical	67 polished	(67-69)
14 punctilious	41 hesitant	68 compliant	(70-72)
15 competitive	42 courageous	69 considerate	(73-75)
16 sociable	43 meek	70 innocent	(76-78)
<div style="border: 1px solid black; padding: 5px; display: inline-block;"> <u>1 6 0 8 1</u> (1-5)
ID _____ (6-9) </div>			
17 relaxed	44 prudent	71 direct	(11-13)
18 charming	45 deliberate	72 interesting	(14-16)
19 gentle	46 delightful	73 agreeable	(17-19)
20 self-conscious	47 devout	74 serene	(20-22)
21 industrious	48 argumentative	75 impetuous	(23-25)
22 personality-plus	49 quiet	76 just	(26-28)
23 shy	50 dependent	77 tactful	(29-31)
24 decisive	51 magnetic	78 dominant	(32-34)
25 skeptical	52 easy-going	79 poised	(35-37)
26 mature	53 submissive	80 accommodating	(38-40)
27 solemn	54 determined	81 witty	(41-43)

APPENDIX C
Life Experiences Survey

0 7 0 6 2 (1-5)

ID _ _ _ _ (6-9)

VI. THE LIFE EXPERIENCES SURVEY

Listed below are a number of events which sometimes bring about change in the lives of those who experience them. Please indicate whether you have experienced any event since filling out the last questionnaire by checking "Yes" or "No" after the item.

For each item you check "Yes," please indicate the extent to which you view the events as having either a positive or negative impact on your life at the time the event occurred. Circle the appropriate number on the right side of the page. If it had no impact, circle "4."

Since filling out the last questionnaire, have you experienced ...

Extremely Negative
Moderately Negative
Somewhat Negative
No Impact
Slightly Positive
Moderately Positive
Extremely Positive

1. Marriage	Yes ☐ No ☐	1 2 3 4 5 6 7	(11-13)
2. Detention in jail or comparable institution	Yes ☐ No ☐	1 2 3 4 5 6 7	(14-16)
3. Death of spouse	Yes ☐ No ☐	1 2 3 4 5 6 7	(17-19)
4. Major change in sleeping habits (much more or much less sleep)	Yes ☐ No ☐	1 2 3 4 5 6 7	(20-22)
5. Death of close family member			
a. Mother	Yes ☐ No ☐	1 2 3 4 5 6 7	(23-25)
b. Father	Yes ☐ No ☐	1 2 3 4 5 6 7	(26-28)
c. Brother	Yes ☐ No ☐	1 2 3 4 5 6 7	(29-31)

Extremely Negative
 Moderately Negative
 Somewhat Negative
 No Impact
 Slightly Positive
 Moderately Positive
 Extremely Positive

13. Changed work situation (different work responsibility, major change in working condi- tions, working hours, etc.)		Yes ☐ No ☐	1	2	3	4	5	6	7	(65-67)
14. New job		Yes ☐ No ☐	1	2	3	4	5	6	7	(68-70)
									0 8 0 6 2 (1-5)	
									ID _ _ _ _ (6-9)	
15. Serious illness or injury of close family member:										
a. Father	Yes ☐ No ☐	1	2	3	4	5	6	7	(10-12)	
b. Mother	Yes ☐ No ☐	1	2	3	4	5	6	7	(13-15)	
c. Sister	Yes ☐ No ☐	1	2	3	4	5	6	7	(16-18)	
d. Brother	Yes ☐ No ☐	1	2	3	4	5	6	7	(19-21)	
e. Grandfather	Yes ☐ No ☐	1	2	3	4	5	6	7	(22-24)	
f. Grandmother	Yes ☐ No ☐	1	2	3	4	5	6	7	(25-27)	
g. Spouse	Yes ☐ No ☐	1	2	3	4	5	6	7	(28-30)	
h. Other (Specify)	Yes ☐ No ☐	1	2	3	4	5	6	7	(31-33)	
16. Sexual difficulties		Yes ☐ No ☐	1	2	3	4	5	6	7	(34-36)
17. Trouble with employer (in danger of losing job, being suspended, demoted, etc.)		Yes ☐ No ☐	1	2	3	4	5	6	7	(37-39)

			<i>Extremely Negative</i>	<i>Moderately Negative</i>	<i>Somewhat Negative</i>	<i>No Impact</i>	<i>Slightly Positive</i>	<i>Moderately Positive</i>	<i>Extremely Positive</i>	
18. Trouble with in-laws	Yes ☐ No ☐	1	2	3	4	5	6	7		(40-42)
19. Major change in financial status (a lot better off or a lot worse off)	Yes ☐ No ☐	1	2	3	4	5	6	7		(43-45)
20. Major change in closeness of family members (increased or decreased closeness)	Yes ☐ No ☐	1	2	3	4	5	6	7		(46-48)
21. Gaining a new family member (through birth, adoption, family member moving in, etc.)	Yes ☐ No ☐	1	2	3	4	5	6	7		(49-51)
22. Change of residence	Yes ☐ No ☐	1	2	3	4	5	6	7		(52-54)
23. Marital separation from mate (due to conflict)	Yes ☐ No ☐	1	2	3	4	5	6	7		(55-57)
24. Major change in church activities (increased or decreased attendance)	Yes ☐ No ☐	1	2	3	4	5	6	7		(58-60)
25. Marital reconciliation with mate	Yes ☐ No ☐	1	2	3	4	5	6	7		(61-63)
26. Major change in number of arguments with spouse (a lot more or a lot less arguments)	Yes ☐ No ☐	1	2	3	4	5	6	7		(64-66)

Extremely Negative
 Moderately Negative
 Somewhat Negative
 No Impact
 Slightly Positive
 Moderately Positive
 Extremely Positive

-
27. Married Male: Change in wife's work
 outside the home (beginning work,
 changing to a new job, etc.) Yes ☐ No ☐ 1 2 3 4 5 6 7 (67-69)
-
28. Married Female: Change in husband's
 work (loss of job, beginning new job,
 retirement, etc.) Yes ☐ No ☐ 1 2 3 4 5 6 7 (70-72)
-
29. Major change in usual type and/or
 amount of recreation Yes ☐ No ☐ 1 2 3 4 5 6 7 (73-75)
-
30. Borrowing more than \$10,000
 (buying home, business, etc.) Yes ☐ No ☐ 1 2 3 4 5 6 7 (76-78)
-
- 0 2 0 6 2 (1-5)
 ID _ _ _ _ (6-9)
-
31. Borrowing less than \$10,000
 (buying car, TV, getting school
 loan, etc.) Yes ☐ No ☐ 1 2 3 4 5 6 7 (10-12)
-
32. Being fired from job Yes ☐ No ☐ 1 2 3 4 5 6 7 (13-15)
-
33. Male: wife/girlfriend having
 abortion Yes ☐ No ☐ 1 2 3 4 5 6 7 (16-18)
-
34. Female: Having abortion
 Yes ☐ No ☐ 1 2 3 4 5 6 7 (19-21)
-
35. Major personal illness or injury
 Yes ☐ No ☐ 1 2 3 4 5 6 7 (22-24)
-

Extremely Negative
Moderately Negative
Somewhat Negative
No Impact
Slightly Positive
Moderately Positive
Extremely Positive

36. Major change in social activities, e.g. parties, movies, visiting (increased or decreased participation)	Yes ___ No ___	1	2	3	4	5	6	7	(25-27)
37. Major change in living conditions of family (building new home, remodeling, deterioration of home, neighborhood, etc.)	Yes ___ No ___	1	2	3	4	5	6	7	(28-30)
38. Divorce	Yes ___ No ___	1	2	3	4	5	6	7	(31-33)
39. Serious injury or illness of close friend	Yes ___ No ___	1	2	3	4	5	6	7	(34-36)
40. Retirement from work	Yes ___ No ___	1	2	3	4	5	6	7	(37-39)
41. Son or daughter leaving home (due to marriage, college, etc.)	Yes ___ No ___	1	2	3	4	5	6	7	(40-42)
42. Ending of formal schooling	Yes ___ No ___	1	2	3	4	5	6	7	(43-45)
43. Separating from spouse (due to work, travel, etc.)	Yes ___ No ___	1	2	3	4	5	6	7	(46-48)
44. Engagement	Yes ___ No ___	1	2	3	4	5	6	7	(49-51)

Extremely Negative
Moderately Negative
Somewhat Negative
No Impact
Slightly Positive
Moderately Positive
Extremely Positive

45. Breaking up with boyfriend/
girlfriend Yes ___ No ___ 1 2 3 4 5 6 7 (52-54)

46. Leaving home for the first
time Yes ___ No ___ 1 2 3 4 5 6 7 (55-57)

47. Reconciliation with boyfriend/
girlfriend Yes ___ No ___ 1 2 3 4 5 6 7 (58-60)

Other recent experiences which have had
an impact on your life. List and rate.

48. _____
Yes ___ No ___ 1 2 3 4 5 6 7 (61-63)

49. _____
Yes ___ No ___ 1 2 3 4 5 6 7 (64-66)

50. _____
Yes ___ No ___ 1 2 3 4 5 6 7 (67-69)

APPENDIX D
Follow-up Questionnaire

0 1 0 1 2 Col
(1-5)
ID _ _ _ _ (6-9)

I. IDENTIFICATION

Please PRINT the requested information in the given spaces.

1. Name (11) (21) (11-30)
 First Last
 (31)
2. Address (31-50)
 Number and Street
 (51) (71)
 Town State and Zip (51-75)
- 0 2 0 1 2 (1-5)
 ID _ _ _ _ (6-9)
3. Phone # (11) (21) (11-30)
 Home Business
4. Social Security # (31) (31-39)
 (40)
5. Today's Date (40-45)
 Month Day Year

0 3 0 3 2 (-5)

ID _ _ _ _ (6-9)

II. SMOKING HISTORY

1. What is your current status as a cigarette smoker?

1. I used to smoke cigarettes regularly, but quit at least six months ago.
2. I used to smoke cigarettes regularly, but quit between three and six months ago.
3. I used to smoke cigarettes regularly, but quit less than three months ago.
4. I smoke cigarettes now, but have quit smoking for at least 24 hours at least once in the past year.
5. I smoke cigarettes now, and have not quit smoking in the past year for at least 24 hours.

_____ (11)

2. CURRENT SMOKERS ONLY: Are you seriously thinking about quitting in the next year?

1. Yes
2. No

_____ (12)

3. Have you started smoking again since you completed the first questionnaire?

1. Yes
2. No

_____ (14)

The date I started smoking again was _____

Month Day Year

(15-20)

4. Have you quit smoking for at least 24 hours since you completed the first questionnaire?

1. Yes
2. No.

_____ (21)

The date of my most recent attempt to quit smoking was _____

Month Day Year

(22-27)

5. If you quit, did you use any particular method or technique in your most recent attempt to quit smoking?

1. None
2. Voluntary program
3. Commercial program
4. Didn't try
5. On own
6. Other (Describe)

_____ (28)

6. If you presently smoke, on the average, how many cigarettes do you now smoke daily?

____ (29-31)

If you do not smoke daily, on the average, how many cigarettes do you now smoke each week?

____ (32-34)

7. At this time what is your personal goal in regards to smoking?

1. To stay off cigarettes forever.
2. To not smoke for a limited period of time.
3. To be able to control how much I smoke.
4. To quit smoking someday, but not now.
5. To continue smoking.
6. To stop smoking now.

____ (35)

8. If you quit smoking for at least 24 hours since the last questionnaire, did you quit on your own?

1. Yes
2. No

____ (36)

9. Indicate the average number of times you have tried the following by writing in the appropriate code number. The code is as follows:

- 1 = Not at all
- 2 = Weekly or less often
- 3 = 2 to 7 times per week
- 4 = 1 to 5 times per day
- 5 = More than 5 times per day

A. Pipe (pipesfull)

____ (37)

B. Cigars or cigarillos

____ (38)

C. Chewing tobacco

____ (39)

D. Snuff

____ (40)

E. Other forms (such as tobacco-free cigarettes, marijuana)

____ (41)

APPENDIX E
Informed Consent Form

SMOKING STUDY
INFORMED CONSENT FORM

I understand that:

1. The purpose of this study is to discover how people have changed their smoking behavior and how successful they are in maintaining that change.
2. I will be asked to fill out written questionnaires about my smoking behavior. My answers to questions will provide the investigator with the following information:
 - a) General information about myself and my family.
 - b) Past experiences that may have changed my life.
 - c) How I see myself when I am smoking and when I am not smoking.
3. I will be contacted in six months and asked to fill out similar questionnaires.
4. All information gathered in the study will be kept confidential. Questionnaires will be coded by numbers and the identity of the respondent kept separate by the principal investigator and his staff. Any material I furnish that may be published will be referred to anonymously.
5. This research could yield important data to help people change their problem behavior for the better. My participation in the study may help me to quit smoking or to stay off cigarettes. On the other hand, it may be of no direct benefit to me at all.
6. I am a volunteer and may withdraw from the study at any time. I can refuse to answer any questions that I do not wish to answer.
7. The information I give is very important and my honest responses to the questions are essential. I may contact Dr. James Prochaska or Duane V. Lapsanski at any time if I have any questions about the research. (401-792-2994)
(203-753-7212)

A. Certification of person explaining the proposal:

I have explained the above items to _____ and
(Name of person giving consent)

believe that _____ understands each of these items.
(he/she)

Signature of Investigator

Date

B. Certification of Participant:

I have read and understand the above statements concerning voluntary participation in Dr. James O. Prochaska's study of smoking behavior, and I hereby consent to participation.

Signature of Participant

Date

APPENDIX F
AVA Pattern Universe

AVA PATTERN UNIVERSE

PROJECTED MAP OF THE SPHERICAL UNIVERSE OF AVA PATTERN SHAPES

U S C O N S U M E R P R O D U C T S

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