Affect, Expectancies, Urges, and Smoking: Do They Conform to Models of Drug Motivation and Relapse?

Thomas H. Brandon
State University of New York at Binghamton

David W. Wetter and Timothy B. Baker
University of Wisconsin—Madison

Social-learning models of drug motivation and relapse often include the constructs of affect and drug expectancies. Most research has taken a molar approach to examining relations between these constructs and level of drug use. An experiment examined the roles of affect and expectancies in multiple measures of situation-specific motivation to smoke tobacco. Undergraduate smokers (n = 101) received either a positive or negative mood manipulation (false feedback on an intelligence test). Self-reported urge was influenced by both negative affect and expectancies for positive reinforcement from smoking. Actual consumption was related only to smoking expectancies and only among abstaining smokers. Affect by expectancy interactions were also found. Findings support a limited role of affect and expectancies in smoking motivation. Poor coherence among the motivational indexes challenges the assumptions of existing models of drug motivation.

Several recent social-learning theories of drug motivation and drug relapse share key constructs. Two constructs in particular appear repeatedly as theoretical predictors of drug motivation or self-administration: affective state (negative affect in particular) and outcome expectancies. In general, the models posit that motivation to use drug (measured either by self-reported urge or actual drug use) increases as a function of (a) a negative affective state, and (b) positive expectancies about the consequences of drug use, including the amelioration of negative affect.

One such model (Cox & Klinger, 1988) posits that an alcoholic individual makes a decision to drink when positive affect expectancies of drinking outweigh expectations for not drinking. Another motivational model of relapse to drug use (Niaura et al., 1988) views both urges and positive drug expectancies as resulting from an affective imbalance or contextual cues for drug use, or both. Marlatt (1985) described a relapse model that included affect (as a potential high-risk situation) and expectancies as important elements. That constructs such as affect and expectancies appear in models of both ongoing drug use and drug relapse reflects the assumption that motivational influences are likely to remain potent even after drug use has initially ended.

Affect and Drug Motivation

Evidence for affect as a causal agent in the motivation to smoke derives from self-reports collected with smoking motivation questionnaires, epidemiological studies showing covariance between affective disorders and smoking, and findings that the majority of relapse episodes occur during negative affect states (for reviews, see Brandon, 1994; Carmody, 1989; Hall, Muñoz, Reus, & Sees, 1993). Although such correlational studies suggest a relation between affect and drug motivation, experimental studies are less clear. For instance, whereas experimental stressors generally increase smoking rates (Dobbs, Strickler, Maxwell, 1981; Pomerleau & Pomerleau, 1987; Rose, Ananda, & Jarvik, 1983; Schachter, Silverstein, Kozlowski, Herman, & Liebling, 1977), it is unclear that this stress effect is mediated by affective change. Affect is consistently related to self-reported urges across different addict groups in experimental settings (Childress, McLellan, Natale, & O'Brien, 1987; Litt, Cooney, Kadden, & Gaupp, 1990; Payne, Schare, Levis, & Colletti, 1991; Sherman, Morse, & Baker, 1986; Sherman, Zinser, Sideroff, & Baker, 1989). However, urges tend to be unrelated to other measures of drug motivation (Tiffany, 1990), so the significance of this relation is unclear.

Expectancies and Drug Motivation

Research has shown that positive expectancies regarding drug effects are related to global measures of drug consumption (Brandon & Baker, 1991; Brown, 1993; Copeland, Brandon, & Quinn, 1995; Wetter et al., 1994). There has been little research, though, that examines the situation-specific impact of expectancies on drug motivation (see Leigh, 1989), and the research that exists is contradictory (e.g., Cooney, Gillespie, Baker, & Kaplan, 1987; Corcoran & Parker, 1991; Fromme & Dunn, 1992). That is, there is little evidence linking particular expectancies of drug effects with motivation to use drug within a specific, relevant situation. Such evidence is needed to

Thomas H. Brandon, Department of Psychology, State University of New York at Binghamton; David W. Wetter and Timothy B. Baker, Department of Psychology and Center for Tobacco Research and Intervention, University of Wisconsin—Madison. David W. Wetter is now at the M. O. Anderson Cancer Center, University of Texas at Houston.

Preparation of this article was supported by American Cancer Society Grant JFRA389.

Correspondence concerning this article should be addressed to Thomas H. Brandon, Department of Psychology, Box 6000, State University of New York at Binghamton, Binghamton, New York 13902-6000. Electronic mail may be sent via Internet to brandon@bingemb.cc.binghamton.edu.

1 Although there has been controversy over the terms craving and urge (Kozlowski & Wilkinson, 1987), in this article we use the words interchangeably to refer to the self-reported subjective desire for a drug.
delineate, for example, the process by which a stressor leads to drug relapse.

The principal goal of the present study was to investigate, in a controlled laboratory setting, the relations among affective state, smoking expectancies, and motivation to smoke within a particular motivational context, namely provision of positive versus negative (distressing) information. Both experimental and correlational approaches were used to examine these relationships. The specific questions we addressed as follows:

1. Do diverse measures of smoking motivation cohere?
2. Do expectancies predict urge and self-administration?
3. Does affective state predict urge and self-administration?
4. Do affect and affect-related expectancies interact to predict urge and self-administration?

The first question addresses the common assumption that the motivation to use drug is unitary, and that one should see agreement among the construct indicators (cf. Tiffany, 1990). In the absence of agreement, smoking motivation must be viewed as multicomponential, with no adequate, single indicator. In this study, we used the following indicators to index motivation to smoke: self-reported urge to smoke, completion of a task that made smoking available, number of puffs taken, and amount of smoke administered as assessed via breath carbon monoxide level.

The next two questions are straightforward examinations of the relation between the constructs of interest and smoking motivation. The fourth question arises from the hypothesis that expectancies may moderate the relationship between affect and drug motivation (Baron & Kenny, 1986). Specifically, affect should motivate smoking only if participants believe that smoking can be used to regulate affect or cope with affective states. In this study, we manipulated smoking status (withdrawing vs. continuing smokers) and performance feedback (success vs. failure information) in part to produce increased variance on the affective measures. Both smoking withdrawal and stressful information increased negative affect (Zinser, Baker, Sherman, & Cannon, 1992), and increased variance in negative affect should increase the likelihood of detecting meaningful covariation in relevant measures.

Method

Experimental Design and Overview

The experiment used a 2 x 2 factorial design. The two factors were Smoking Status (withdrawing vs. continuing smokers) and Performance Feedback (success vs. failure) on the Block Design subscale of the Wechsler Adult Intelligence Scale (WAIS; Wechsler, 1955). We manipulated smoking status because we believed that withdrawal would increase smokers' affective reactions to the performance feedback and would model the relapse process. The withdrawal condition also offers a closer approximation to natural smoking relapse episodes, which usually begin very early in the quit attempt while withdrawal symptoms are present (Kenford et al., 1994). Nevertheless, at least one model (i.e., Baker, Morse, & Sherman, 1987) posits different relationships between affect and drug motivation in continuing versus withdrawing drug users. The smoking status manipulation allowed us to test this theory. The second factor was intended as a positive versus negative affect manipulation. This manipulation allowed us to examine experimentally the causal relationship between affect and measures of smoking motivation.

Participants

Participants were 122 smokers who were students from introductory psychology classes earning extra credit points for research participation. Inclusion criteria were a smoking rate of at least 10 cigarettes per day (one-half pack) and an initial alveolar carbon monoxide (CO) level at the evening session of at least 10 ppm. Of the 122 participants who attended the evening session and met these criteria, 4 participants failed to attend the individual session the following week. Two each had been assigned to the continuing and withdrawing conditions. Withdrawing smokers were required to report abstinence and have a CO level at the individual session that was lower than their initial CO level. Five participants failed to meet this criterion. Continuing smokers were required to maintain CO levels above 10 ppm. Twelve participants failed to do so. (Several participants said that the smoking study motivated them to attempt to quit.) In all, 7 withdrawing smokers and 14 continuing smokers did not complete the experiment, leaving 101 participants (24-26 participants per condition).

Participants' mean age was 20.1 years. They smoked a mean of 16.8 cigarettes per day for 3.7 years. Mean score on the modified Fagerstrom Tolerance Questionnaire (see below; Fagerstrom, 1978) was 3.9. Mean initial CO level was 20.0 ppm. Of the 101 participants, 51 were men. Two-way analyses of variance (ANOVAs) were calculated on these descriptive variables to verify equivalence across conditions. The only difference was that participants assigned to the continuing condition had a higher initial CO level than those assigned to the withdrawing condition (21.84 ppm vs. 18.16 ppm), F(1, 97) = 4.81, p < .05.

Instruments

The SCQ (Brandon & Baker, 1991) requires participants to rate the probability and desirability of 50 possible consequences of smoking. The cross products of these ratings yields the subjective expected utility (SEU) of the consequences (Brandon & Baker, 1991). We used two versions of the questionnaire that differed only in the instructions. The distal version (SCQ-D) instructed participants to respond in the manner that they think about cigarettes in general, whereas the proximal version (SCQ-P) instructed participants to respond to how they were thinking at the moment. In this study, we examined only the two scales that we expected to be related to smoking motivation: Positive Reinforcement-Sensory Satisfaction and Negative Reinforcement-Negative Affect Reduction.

Fagerstrom Tolerance Questionnaire. The standard measure of nicotine dependence (Fagerstrom Tolerance Questionnaire; Fagerstrom, 1978) was modified so that all questions were multiple choice.

Data from participants in the failure feedback conditions were also included in the studies reported in Wetter, Brandon, and Baker (1992).
Positive and Negative Affect Schedule (PANAS). The PANAS is a 20-item Likert-type measure that yields two factor-derived orthogonal scales: positive affect and negative affect (Watson, Clark, & Tellegen, 1988). Participants were instructed to describe their mood over the past week as a measure of general affective level.

Withdrawal Rating Form (WRF). The WRF is a 25-item 7-point Likert-type measure of common nicotine withdrawal symptoms (Shiffman & Jarvik, 1979). It yields a total score, as well as scores on craving, psychological discomfort, sedation–stimulation, physical symptoms, and appetite scales.

Mood Adjective Check List (MACL). The MACL (Nowlis, 1965) is a self-report affect measure. Participants rated their current affect by endorsing 36 adjectives on a 7-point Likert scale. Subscales include Aggression, Anxiety, Fatigue, Sadness, Surgency, Elation, Sociability, Vigor, and Skepticism. The first four scales also made up a general negative affect scale, and the next four a general positive affect scale. The MACL was used as a check of the mood manipulation.

Attribution questionnaire. The attribution questionnaire was administered after participants completed each experimental task (a word association test and the block design task). Only the latter administration was scored as a check on the feedback manipulation. Participants first rated their performance on the task using a 10-point scale ranging from 1 (total failure) to 10 (total success). Additional questions assessed participants’ attributions for their emotional response; the results have also been reported elsewhere (Wetter, Brandon, & Baker, 1992).

Urge scale. A three-item self-report measure of urge was constructed from items imbedded in the SCQ-P, the MACL, and the attribution questionnaire. Urge was assessed in this subtle manner so as to keep participants unaware that the goal of the experiment was to manipulate urge. The questions asked participants to rate their desire for a cigarette, their craving for a cigarette, and the probability that they would smoke if they could. Urge scores were derived by averaging the z-scores of the three items. The coefficient alpha reliability of this scale was .90.

Procedure

Group session. Participants were told that they were participating in a study of “how smokers think.” They completed a smoking status form and provided COa samples. Participants who met the inclusion criteria then completed the SCQ-D and the PANAS. Last, they completed two other questionnaires included to investigate hypotheses unrelated to the present report (see Wetter et al., 1992). Participants were then scheduled for individual sessions the following week and were randomly assigned to the continuing or withdrawing conditions. Those in the withdrawing condition were instructed to abstain from smoking for 24 hr before their individual session. Continuing participants were instructed to smoke at their normal rate. Finally, one cigarette was collected from each participant.

Individual session. Before this session, participants were randomly assigned to the positive affect or negative affect condition (success vs. failure performance feedback). Figure 1 summarizes the procedures at the individual session. On arrival at the session, participants were administered a COa test and the WRF. They then were administered an oral word association test that included smoking-related words followed by the attribution questionnaire assessing their perceived performance on the word association test. These two instruments were included to divert suspicion from the mood manipulation. The mood manipulation (described below) followed. Participants then completed the MACL as a check of their affective response to the false feedback followed by the SCQ-P and the attribution questionnaire.

Nicotine self-administration was assessed by allowing the participant to smoke a cigarette that had been collected at the group session. Participants were told that they could smoke once they completed a task that required the participant to trace with a pen along the line of several circles and other shapes. Completion time of a similar task has been used as an index of behavioral activation or “go” motivation (Bachorowski & Newman, 1990). The assumption was that participants who were highly motivated to smoke their cigarette would complete the task quicker and commit more errors than less motivated participants. After completing the tracing task, participants smoked their cigarette through a flow transducer that simultaneously recorded smoking topography on a Grass Model 7A polygraph and a personal computer. This apparatus was used so that we could collect smoking topography measures such as latency to first puff, number of puffs, and puff volume that might reflect smoking motivation (e.g., Griffiths, Henningfield, & Bigelow, 1982; Payne et al., 1991). However, we found that the flow transducer measured puff volume unreliably. Therefore, we limited the smoking topography measures to latency to first puff and total number of puffs. Participants were told that they could smoke as much of their cigarette as they liked. When participants finished smoking, the experimenter administered a cigarette rating.
form and the debriefing questionnaire. Then another CO₂ sample was taken to estimate the amount of smoke ingested. Finally, the experimenter debriefed participants and provided information about quitting smoking.

Mood manipulation: Failure feedback. After participants completed the WRF, they were told that they would next receive a test of spatial problem-solving ability from a “standard IQ test.” Participants were given the standard instructions for the Block Design subscale of the WAIS. They were also told that to motivate them to work as fast as they could, they would earn extra money based on their performance. Participants were given six quarters and told that they would gain or lose quarters based on their performance.

All participants gained quarters on WAIS Block Designs 2 and 3, but then lost quarters on the six most difficult Block Designs. The experimenter also made scripted condescending comments after each trial, such as “Are you sure you’re working as fast as you can?” After the final trial, participants were told to count up their earnings (50 cents) and sign a receipt form. This form was in fact a counterfeit that was intended to induce negative social comparison. Above the participant’s name were 10 names of other ostensive participants and the money that each had apparently earned, which averaged $2. Thus, participants were led to believe that they had performed more poorly than had any previous participant.

Mood manipulation: Success feedback. The success manipulation followed the same general procedure as the failure manipulation. However, participants were initially given four quarters before being administered the six easiest Block Design trials, for which they earned additional quarters. When they signed the receipt form for their $2.50 earnings, they saw that they had earned more money than the previous participants, who appeared to average only about 75 cents.

Results

Analytical Plan

After verifying the effectiveness of the experimental manipulations, each of the questions listed in the introduction were examined in turn. All factorial analyses used a three-way design, with Smoking Status, WAIS Feedback, and Gender as the factors. A priori ANOVAs were conducted using the traditional alpha level of .05. A more conservative alpha of .01 was used for zero-order correlations to control for chance associations.

Manipulation Checks

Smoking status. The first experimental manipulation was to either the withdrawing or continuing smoking conditions. As expected, continuing smokers had higher CO₂ levels than withdrawing smokers on arrival at the individual session (19.51 ppm vs. 6.76 ppm), \( F(1, 93) = 131.15, p < .001 \). Withdrawing smokers also scored higher on the total WRF (4.26 vs. 3.81 on the 7-point scale), \( F(1, 93) = 24.35, p < .001 \), and on the craving, psychological discomfort, and appetite subscales of the WRF.

Feedback-affect manipulation. The second experimental manipulation was the success versus failure feedback on the WAIS Block Design task. For this manipulation to be successful, participants had to believe the feedback, and the feedback must have altered their affective state. As expected, on the 10-point performance rating scale of the attribute questionnaire, failure participants tended to rate their performance as failing (\( M = 3.20 \)), and success participants rated their performance as successful (\( M = 8.54 \)), \( F(1, 93) = 268.30, p < .001 \). No difference was found between the smoking status conditions. No participant guessed that the WAIS feedback was false, either on a debriefing questionnaire or during oral debriefing. Finally, on the 0-6 MACL skepticism scale, participants averaged 1.99, with no significant difference between conditions. In summary participants appeared to believe the WAIS feedback.

Checks of group equivalency revealed that withdrawing participants reported slightly greater trait negative affect, assessed with the PANAS at the baseline group session (2.18 vs. 1.93), \( F(1, 97) = 4.81, p < .05 \). Because this difference could have arisen only by chance and was not related fundamentally to the group manipulation, we used analysis of covariance (ANCOVA) to partial the influence of baseline affect from the postmanipulation affect scores. The positive and negative affect scales of the MACL were used to assess postmanipulation affective state. Three-way ANCOVAs (Smoking Status x Feedback Manipulation x Gender) were calculated with the positive and negative affect MACL scales as dependent variables and the respective baseline PANAS scales as covariates. Success participants scored higher than failure participants on the positive affect MACL scale when the positive affect PANAS scale was used as the covariate, \( F(1, 92) = 13.73, p < .001 \). In addition, failure participants scored higher than success participants on the negative affect MACL scale when the baseline negative affect PANAS scale was covaried out, \( F(1, 92) = 4.54, p < .05 \). Correlations between the MACL scales and participants’ ratings of their performance on the block design also suggest that the manipulation was effective. Performance ratings were correlated with both the positive affect scale, \( r(100) = .393, p < .001 \), and the negative affect scale, \( r(100) = -.229, p < .05 \). In summary, it appears that the mood manipulation had a modest, but reliable, effect on participants’ affective state. No significant difference in affect was found for smoking status or gender, nor was any interaction found.

Do Diverse Measures of Smoking Motivation Cohere?

We examined five measures of smoking motivation across three domains: one measure of self-reported urge (the urge scale), two measures of “eagerness” to smoke (number of errors made on the circle-tracing task before smoking\(^1\) and latency to first puff), and two measures of actual consumption (number of puffs taken and change in CO₂ due to smoking). Table 1 shows the intercorrelations among these measures. The two measures of eagerness were significantly correlated, as were the two measures of consumption. However, measures from the different domains were uncorrelated with one another, with the single exception of urge with tracing errors. This indicates an overall lack of coherence across smoking motivation indexes, yet significant coherence within subdomains.

\(^1\) Errors were counted independently by two laboratory assistants. Their tallies correlated .96, so the mean of the two counts was used.
To simplify later analyses, given the correlations within the pairs of eagerness measures and consumption measures, the measures in each pair were standardized and averaged to produce single eagerness and consumption scores. The coefficient alpha reliabilities of these two indexes were both .62. Later analyses of smoking motivation were performed using only the urge, eagerness, and consumption indexes.

Do Expectancies Predict Urge and Self-Administration?

Because expectancies were not directly manipulated in this experiment, this question can be addressed only through correlational analyses. Correlations were calculated between the SCQ (both distal, SCQ-D, and proximal, SCQ-P, versions) and the three motivational indexes. When all participants were used in the analysis, the only significant correlation was between the positive reinforcement scale of the SCQ-P and urge, \( r(99) = .284, p < .01 \). Next, continuing and withdrawing smokers were examined separately. The magnitude of the correlations between positive reinforcement expectancies and urge remained the same for both groups of participants (.28 and .31, respectively), but did not reach significance because of the reduced sample size. Expectancies did not predict either of the other motivational indexes among continuing smokers. However, among withdrawing participants, failure feedback produced greater urge among withdrawing smokers and the success feedback should produce greater urge among continuing smokers. However, among continuing participants, failure feedback produced greater urge than success feedback, \( F(1, 46) = 5.00, p < .05 \), and no difference was found among withdrawing participants.

To examine whether smoking expectancies predicted consumption among withdrawing smokers directly, independent of urge, we calculated partial correlations between the three predictive SCQ scales and the consumption index, with urge scores partialled out. As indicated on Table 2, all three scales remained predictive (all \( ps > .34 \), all \( ps < .05 \)). Thus, expectancies were related to self-administration directly, without mediation by urge.

### Does Affect Predict Urge and Self-Administration?

To examine the causal relation between affect and urge, we compared the positive and negative feedback conditions on urge ratings. To control for urge levels before the feedback manipulation, we performed ANCOVAs with the urge scale of the WRF as the covariate, thereby assessing the effect of the manipulation on urge. This required separate analyses of continuing and withdrawing smokers. The model of Baker et al. (1987) predicts that the failure feedback should produce greater urge among withdrawing smokers and the success feedback should produce greater urge among continuing smokers. However, among continuing participants, failure feedback produced greater urge than success feedback, \( F(1, 46) = 5.00, p < .05 \), and no difference was found among withdrawing participants. ANOVAs were calculated to assess the effect of the experimental manipulations on self-administration measures. No main effects or interactions were found on the eagerness or consumption measures.

To examine further the relation between affect and smoking motivation, we performed correlational analyses between the positive and negative affect scales of the MACL and the eagerness, consumption, and urge scales. No significant correlations were found between affect and the two self-administration scales (i.e., the eagerness and consumption indexes). Multiple regression revealed a significant relation between negative affect and urge, even when the urge score from the WRF had been partialled out to reflect change in urge due to the affect manipulation, \( pr = .31, F(1, 98) = 10.23, p < .01 \). This finding was maintained when baseline negative affect from the PANAS was also partialled out, \( pr = .29, F(1, 97) = 8.80, p < .01 \). No interaction was found between negative affect and smoking status condition. These results indicate that change in negative affect was related to change in self-reported urge regardless of withdrawal state.

### Do Affect and Affect-Related Expectancies Interact in the Prediction of Smoking Motivation?

Two types of interactions with theoretical significance were examined: Interactions between negative affect (MACL) and negative reinforcement expectancies and between positive affect and positive reinforcement expectancies. Interactions were tested using hierarchical regression, in which the product of the affect and proximal expectancy variables was entered into the regression equation after the variables themselves had been entered (Cohen & Cohen, 1983).

#### Urge

To examine interaction effects in predicting change in urge score, we used postmanipulation urge as the dependent

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### Table 1

**Intercorrelations Between Measures of Smoking Motivation**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Urge</th>
<th>Tracing errors</th>
<th>Latency to smoke</th>
<th>Number of puffs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eagerness</td>
<td></td>
<td>.274*</td>
<td>-.124</td>
<td>.212</td>
</tr>
<tr>
<td>Latency to smoke</td>
<td>-.124</td>
<td>-.466**</td>
<td>-.075</td>
<td>-.027</td>
</tr>
<tr>
<td>Consumption</td>
<td>.212</td>
<td>.030</td>
<td>-.075</td>
<td>.039</td>
</tr>
<tr>
<td>Number of puffs</td>
<td>.212</td>
<td>.030</td>
<td>-.075</td>
<td>.039</td>
</tr>
<tr>
<td>CO\textsubscript{a} change</td>
<td>.039</td>
<td>.040</td>
<td>-.027</td>
<td>.448**</td>
</tr>
</tbody>
</table>

Note. CO\textsubscript{a} = alveolar carbon monoxide.

*\( p < .01 \)  **\( p < .001 \)

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### Table 2

**Correlations Between Smoking Consequences Questionnaire (SCQ) Scales and Smoking Motivation Indexes (Withdrawing Participants Only)**

<table>
<thead>
<tr>
<th>SCQ scale</th>
<th>Urge</th>
<th>Eagerness</th>
<th>Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive reinforcement</td>
<td>.261</td>
<td>-.013</td>
<td>.362†</td>
</tr>
<tr>
<td>Negative reinforcement</td>
<td>.175</td>
<td>-.095</td>
<td>.420‡‡</td>
</tr>
<tr>
<td>Proximal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive reinforcement</td>
<td>.306</td>
<td>.125</td>
<td>.123</td>
</tr>
<tr>
<td>Negative reinforcement</td>
<td>.107</td>
<td>-.108</td>
<td>.384‡</td>
</tr>
</tbody>
</table>

*\( p < .01 \)  †\( p < .05 \) when controlling for urge. ‡\( p < .01 \) when controlling for urge.
variable and first entered the premanipulation urge score from the WRF. When the entire participant sample was examined, no interactions were revealed. Multiple regression did reveal, however, that negative affect and positive reinforcement expectancies contributed unique variance to urge ($\beta$s = .24 and .28, $p$s < .05 and .01, respectively), together explaining 14% of the variance ($p < .001$). When withdrawing participants were analyzed separately, we found a significant interaction between the MACL positive affect scale and the positive reinforcement scale of the SCQ-P ($\beta$ = .32, $p < .05$). The greatest urge was associated with high scores on positive affect and high expectations for positive reinforcement. The interaction between negative affect and the negative reinforcement scale of the SCQ-P approached significance ($\beta$ = .26, $p < .10$). High negative affect and high negative reinforcement expectancies were associated with the greatest urge. No significant interactions were found among continuing smokers.

**Self-administration.** We performed similar analyses to examine interaction effects with the two self-administration indexes as dependent variables. Only one significant interaction was found. Among continuing smokers, consumption was predicted by interactions between negative affect and the negative reinforcement scale of the SCQ-P ($\beta$ = -.37, $p < .01$). The nature of this interaction differed from predictions in that negative affect was positively associated with consumption only if participants held low expectancies for negative reinforcement from smoking. When participants held high expectancies, there was no relationship between negative affect and consumption.

We also examined whether affect and expectancy measures covaried. This would be consistent with some of the motivational models (Cox & Klinger, 1988; Marlatt, 1985; Niaura et al., 1988). No significant correlations were found.

**Discussion**

This study examined the relation between affect and outcome expectancies and the motivation to smoke. In addition, we addressed whether smoking motivation measures cohered with one another, suggesting the presence of a unitary construct.

Manipulation checks indicated that the two experimental manipulations (smoking status and affective state) were sound. We now consider each of the guiding questions in turn.

**Do Diverse Measures of Smoking Motivation Cohere?**

We found almost no covariance between measures of self-reported urge, eagerness to smoke, and smoke consumption. Moreover, these hypothetical indexes of smoking motivation tended to be associated with different predictor variables. For example, urge was best predicted by affect, whereas consumption was best predicted by expectancies. The relationship between expectancies and self-administration was not mediated by urge, as would have been predicted by Marlatt's (1985) model. A similar dysynchrony across different response modes thought to reflect smoking motivation (i.e., self-report, physiological, and behavioral) has been reported by others (Niaura, Abrams, Pedraza, Monti, & Rohsenow, 1992; Tiffany & Hakenewerth, 1991). The lack of relationship between urge and self-administration appears consistent with models of drug motivation that view the two variables as somewhat functionally independent (Tiffany, 1990) and inconsistent with models that view self-reported urge as functionally integrated with self-administration behaviors (e.g., Baker et al., 1987; Heather & Stallard, 1989; Marlatt, 1985; Niaura et al., 1988). It is also possible that other factors are causing a response dysynchrony, such as different response thresholds, response reactivity, or other measurement artifact (Baker & Brandon, 1990). An analogy may be made to the low correlations between verbal, behavioral, and somatic measures of fear (Lang et al., 1983). It is also possible that our sample was too homogeneous with regard to smoking motivation. A sample comprising both novice and heavily dependent smokers might yield less dysynchrony among measures.

**Do Expectancies Predict Urge and Self-Administration?**

Both positive and negative reinforcement expectancies predicted consumption among withdrawing smokers. This was found with both proximal expectancies collected at the time of the experiment and distal expectancies collected a week earlier. Although several studies have found that expectancies were related to molar and global levels of alcohol or cigarette use (e.g., Brandon & Baker, 1991; Brown, 1993), this study is the first to find that affect-related expectancies predicted drug consumption in a given situation. This finding is consistent with models that assign expectancies a proximal causal role in drug use or relapse (Cox & Klinger, 1988; Niaura et al., 1988). More research is needed to determine if expectancies are consistently more predictive among withdrawn versus continuing smokers.

Whereas both positive and negative reinforcement expectancies predicted consumption, only the positive reinforcement scale completed just before the smoking trial (the "proximal" form) predicted urge self-report. Moreover, there was no evidence that the relation between expectancies and consumption was mediated by urge.

**Does Affective State Predict Urge and Self-Administration?**

Both experimental and correlational results revealed a relationship between affective state and cigarette urge, adding to findings by Payne et al. (1991), Sherman et al. (1989), and others (e.g., Zinser et al., 1992). Evidence for a causal role of negative affect on urge—based on the experimental manipulation—was found only among continuing smokers. This may reflect a ceiling effect among withdrawing smokers, who had higher urge scores before the manipulation.

In contrast to the experimental finding, correlational analyses revealed a relation between negative affect and urge across all participants. No relationship was found between affect state and eagerness or consumption indexes, which is inconsistent with several earlier studies that found increased smoking in response to stress or negative affect (Dobbs et al., 1981; Payne et al., 1991; Pomerleau & Pomerleau, 1987; Rose et al., 1983; Schacter et al., 1977). We designed our affect manipulation to
be less obvious to participants than is usual in such studies. Our more modest findings might reflect less experimenter demand or simply a weaker manipulation.

**Do Affect and Expectancies Interact to Predict Urge and Self-Administration?**

When urge self-report was the dependent variable, there was some evidence that both positive and negative reinforcement expectancies moderated the influence of affect. This relation was found only among withdrawn smokers, however. When self-administration was the dependent variable, we found no theoretically significant interaction between affect and expectancies. Therefore, there was modest support for the hypothesis that expectancies moderate the relation between affect and urge, at least among withdrawn smokers.

**General Conclusions**

The main findings of this research are as follows:

1. Putative measures of drug motivation were not highly related to one another. However, there were meaningful subcategories of measures: urge, eagerness to smoke, and smoke intake (consumption).

2. Expectations of smoking reinforcement predicted smoke consumption in withdrawn smokers. However, measures of affect and urge were largely unrelated to smoke intake.

3. Affect and self-reported urge were significantly associated with one another across all participants.

4. There was modest support, among withdrawn smokers, that expectancies of reinforcement from smoking moderated the relation between affect and urge. There was no evidence that affect was related to self-administration measures even when using reinforcement expectancies as a moderator.

There are potential limits on the generalizability of this study. Although participants were dependent smokers (i.e., they experienced nicotine withdrawal symptoms), they smoked less than older, more experienced smokers. Older smokers may also hold different, more specific expectancies about smoking (Copeland et al., 1995). Also, participants in the withdrawing condition were not actually attempting to quit, nor did most express even a desire to quit. It is also possible that the consumption measures used were not the best analog of natural relapse. A dichotomous measure of whether or not a participant decides to smoke when given the option may have yielded different results (see Cox & Klinger, 1988). Finally, these participants were tested while they were experiencing the first 24 hr of nicotine withdrawal. The influence of affect and expectancies on motivation to smoke may change as ex-smokers progress to later stages of abstinence.

The above findings provide some support for models of drug motivation that include roles for affect and drug expectancies. However, the data suggest that these variables do not influence drug motivation in a straightforward manner. First, interrelations among variables may be present, or at their greatest, only among highly motivated participants (i.e., those in withdrawal). The tendency for measures to cohere more strongly in highly motivated participants has been found in both addict and nonaddict populations (e.g., Baker et al., 1987). Nevertheless, most current models, including Baker et al. (1987), assume greater coherence among these variables. The general lack of coherence challenges the idea that these diverse measures reflect the same underlying construct. This is a more fundamental problem for the theory than the mixed findings regarding the specific directional predictions. Second, urge and state affect self-reports may tend to covary, and expectancy measures and drug consumption–intake measures may tend to covary, but there may be little relation between the two pairs of measures. This may be because affect measures (especially state affect) and urge measures are, by nature, highly situationally specific. Expectancies and self-administration assessments may necessarily involve stable beliefs and attitudes and automatized self-administration behaviors acquired through countless prior exposures to drug and drug information (Tiffany, 1990).

Third, even though significant relations among variables were found, relations were generally weak. For instance, the two best predictors across all participants—negative affect and expectancies of positive reinforcement—together explained only 15% of the variance in urge and failed to explain significant variance in consumption. Clearly the models are underidentified.

This study provides support for the constructs of negative affect and outcome expectancies having roles in the motivation to smoke in a given situation. In particular, the molecular analysis of the role of expectancies in consumption augments existing evidence of a more molar relationship between expectancies and general level of substance use. Conversely, the situation-specific contributions of affect and expectancies appear to be quite limited. The challenge remains to find a model with constructs that together can explain greater variance in situational drug use and drug relapse.

**References**


Received March 8, 1995
Revision received June 30, 1995
Accepted July 12, 1995