Relations among Affect, Abstinence Motivation and Confidence, and Daily Lapse Risk among Smokers Trying to Quit

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ABSTRACT OF THE DISSERTATION

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Aims: This study prospectively tested the hypothesis that changes in momentary affect, abstinence motivation, and confidence would predict lapse risk over the next 12-48 hours using Ecological Momentary Assessment (EMA) data from smokers attempting to quit smoking. The moderating effects of high-risk contexts on relations between cognitions (motivation and confidence) and lapse risk were also tested.

Method: 79 adult, daily smokers recorded their momentary affect, motivation to quit, abstinence confidence, and smoking behaviors in near real time with multiple EMA reports using electronic diaries post-quit.

Results: Multilevel models indicated that increases in negative affect predicted greater lapse risk up to 12 hours, but not 24 hours later. Neither positive nor negative affect had significant effects on subsequent cognitions. High levels of motivation appeared to reduce increases in lapse risk that occur over hours. Momentary increases in confidence predicted greater lapse risk over 12 hours in high-risk situations, but not in the absence of potent smoking triggers.

Conclusion: Momentary changes in negative affect, motivation, and confidence, during a quit attempt all had short-term effects on smoking lapse. Negative affect had short-lived effects on lapse risk, whereas high levels of motivation protected against the risk of

lapsing that accumulates over hours. Contrary to expectations, an acute increase in

confidence may increase vulnerability to lapse in the context of potent smoking triggers.

Relations observed among affect, cognitions, and lapse seem to depend critically on the

timing of assessments and the contexts in which the assessments occur.

ACKNOWLEDGMENTS

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Introduction

Most smokers who attempt to quit smoking return to smoking regularly within a few months (Shiffman et al., 2008). This is a critical problem with deadly consequences. Identifying the proximal affective and cognitive processes that lead to lapses may help us predict and ultimately prevent the initial lapses that typically culminate in relapse (Kassel et al., 2003, Gwaltney, et al., 2005b, Piasecki et al., 2002, Shiffman, 2005).

Negative Affect

The role of negative affect[1] in smoking cessation has been extensively studied. Stress and negative affect often precede lapses during cessation attempts (Marlatt & Gordon, 1980; O'Connell & Martin, 1987; Shiffman, 1982; see Kassel et al., 2003 for a review). A modified negative reinforcement drug motivation model proposed by Baker et al. (2004) asserts that escape from or avoidance of negative affect plays a central role in the maintenance of addictive behavior. The model also posits that non-withdrawal aversive affect (e.g., anxiety or distress induced by external events) may trigger the same response (i.e., craving and smoking) that negative affect from withdrawal does. As such, smokers smoke to escape aversive affective states even when these states are not related to withdrawal symptoms (Baker et al., 2004). In fact, many individuals identify smoking as their way of dealing with stressful situations (Brandon et al., 1999; Copeland et al., 1995).

Whether part of withdrawal or prompted by stressful events, negative affect plays a significant role in smoking behavior. Yet, the cognitive pathways linking negative affect to smoking outcomes are little studied and poorly understood. It may be that

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[1] Negative affect (NA) is often defined as a general dimension of subjective distress which subsumes a broad range of aversive affective states including anger, disgust, scorn, guilt, fearfulness, and depression (Watson & Pennebaker, 1989).

negative affect increases smoking risk directly, as asserted by the reformulated negative affect model, and indirectly, by altering smoking-relevant cognitions, such as motivation to quit smoking and confidence in one's ability to quit smoking. Affective distress, for example, may erode one's willingness to work at quitting and confidence that one can cope with the stress of quitting to abstain successfully.

Positive Affect

Recent evidence also points to the importance of positive affect[2] in smoking motivation and behavior change processes, independent of negative affect. For example, recent research (Doran et al., 2008) found that the effect of anhedonia (i.e., diminished capacity to experience pleasure) on heightened urges to smoke post-quit is mediated by decreased positive affect rather than increased negative affect. Looking at only negative affect may lead to an incomplete picture of the process of addictive behavior change.

A model proposed by Fredrickson (2000, 2003) – the broaden-and-build model – suggests that positive affect sparks changes primarily in cognitive activity, rather than directly changing physical action (Fredrickson & Branigan, 2001). The positive affect model asserts that openness to novel experiences and active search for resources promote desired changes (Wagner & Ingersoll, 2008). When a person experiences interest or surprise, his/her attention is broadened and, in turn, he/she is able to consider choices that previously had been disregarded or rejected. Resolution of ambivalence may be facilitated by this increased flexibility in perception which may guide one toward change (Fredrickson & Branigan, 2001).

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[2] Cohen & Pressman (2006) define positive affect as "feelings that reflect a level of pleasurable engagement with the environment, such as happiness, joy, excitement, enthusiasm, and contentment."

The roles of positive affect in health behavior and goal-oriented behavior have been demonstrated in various studies. For example, recent prospective studies showed that positive affect responses to a brief exercise trial were associated with more stable motivation to exercise (Kwan, 2010) and subsequent exercise behavior (Standage, 2010). That is, those who experienced an increase in positive affect during a bout of exercise were more likely to have steady intentions to exercise and actually exercise in the future. Furthermore, increases in positive affect are associated with confidence and performance (e.g., exercise confidence, Ostir et al, 2003; test performance, Nelson, 2010).

Motivation to change a behavior and confidence that one can enact such change are thought to be critical determinants of success in behavior change efforts (Ajzen, 1991; Miller & Rollnick, 2002) and may be mediators of affective influences on behavior. Declines in these change-relevant cognitions may be proximal precipitants of lapses.

Motivation to Quit

In smoking cessation studies, motivation to quit is rarely treated as a dynamic construct, despite the fact that past research showed that motivation levels fluctuate even within a short-term period (e.g., Berman et al., 2010; Lavigne et al., 2009). Using EMA data, Piasecki et al. (2002) showed that smokers' motivation to quit following their quit date was dynamic and that abstainers and relapsers showed different growth patterns of motivation over a 7-week post-quit period.

Despite the conceptual and empirical bases for treating motivation as dynamic, research on real-time relations among affect, motivation to quit, and smoking behavior is lacking. Such research is needed to further understand the effects of motivational drives on smoking behavior in naturalistic environments. Assessing changes in motivation

following changes in affect during a quit attempt may help identify proximal precipitants of smoking lapse. Such information about predictors of motivational lapses that, in turn, predict behavioral lapses may facilitate intervention development. Just-in-time interventions that bolster motivation to quit may reduce lapse vulnerability during a quit attempt, for example.

Abstinence Confidence

The important roles of cognitions, particularly confidence, in intended behavioral change have been the focus of much research (e.g., Bandura, 1977; Shiffman et al., 2005) and the role of confidence in successful smoking cessation has been extensively studied (e.g., Condiotte & Lichtenstein, 1981; Shiffman, 2005). Smoking cessation research and treatments shaped by a social learning model of relapse focus on enhancing confidence and maintaining the perceived importance of quitting (Abrams et al., 2003; Marlatt & Donovan, 2005).

Some smoking cessation research has treated confidence as a dynamic construct. For example, Gwaltney et al. (2005a) assessed abstinence confidence and related constructs using ecological momentary assessment (EMA) and found that heightened cigarette craving and negative affect were related to decreases in confidence, especially in those with low baseline abstinence confidence. The results from this study suggested that relations among affective state, drug motivational states, and momentary confidence are complex. Furthermore, Shiffman (2005) demonstrated that day-to-day changes in abstinence confidence predicted relapse following a first lapse and concluded that negative affect predicted smoking behavior, at least partially, through undermining momentary confidence. Taken together, these findings indicate that changes in quitting

confidence elicited by situational factors (e.g., affective distress) signal increased risk for smoking during a change attempt.

Roles of Motivation and Confidence in a Cessation Attempt

A recent study that examined the efficacy of sustained-release bupropion as a smoking cessation treatment revealed that motivation and confidence mediated the effect of medication on smoking outcomes (McCarthy et al., 2008). Moreover, a controlled laboratory study that aimed to assess how drug motivation influences health beliefs indicated that cigarette craving reduces confidence and intention to quit (Nordgren et al., 2008). Although this was not a smoking cessation study, the finding supports the notion that cognitions related to health behavior are dynamic constructs. Moreover, McCarthy et al. (2008) demonstrated that confidence and motivation to quit smoking changed over the first week post-quit, although only the initial level of post-quit motivation, not the rate of change, was predictive of abstinence in one month. To date, the dynamic nature of motivation to change specific behaviors has been studied primarily by assessing day-to-day changes. The effects of acute motivation change on short-term behavioral outcomes are not well understood, however, and are in need of further study.

Study Hypotheses

I will test a complex set of hypotheses regarding the short-term effects of negative and positive affect on later smoking behavior through changes in motivation to quit and quitting confidence in the context of an attempt to quit smoking, as depicted in Figure 1.

First, EMA data will be used to determine whether negative and positive affect predict change in momentary cognitive variables such as motivation to quit and confidence to quit over the course of hours. I predict that increases in negative affect will

erode motivation and confidence, while positive affect will have the opposite effects on these cognitions. Second, I predict that declines in momentary confidence and motivation will predict increased risk of a smoking lapse (Figure 1).

Finally, I will investigate the extent to which exposure to smoking triggers (i.e., urges/temptations, alcohol consumption, cigarette availability, the presence of smokers, and stressful events) moderate cognition-lapse relations. Past research has demonstrated the powerful effects of smoking cues on smokers trying to quit (e.g., Niaura et al., 1988; Shiffman et al, 1996). For example, Shiffman et al. (1996) found that the combined effects of multiple contextual risk factors make some contexts highly conducive to lapse. Moreover, a recent study (Gwaltney et al., 2005a) showed that the combination of heightened urge and decreased confidence did not always precede lapse episodes, suggesting that other influences such as alcohol consumption or cigarette availability may be linked to lapsing. Similarly, changes in cognitions may be most likely to affect smoking behavior when coupled with other risk factors. As such, I predict that those in high-risk contexts following declines in motivation and confidence will be more likely to lapse than will those in low-risk contexts (i.e., with less exposure to smoking triggers).

In summary, results from the proposed study may add to the literature regarding 1) the time course and mediators of affective influences on smoking lapses; 2) the role of explicit cognitions during a quit attempt, particularly in relations to affect and later smoking; and 3) the extent to which contextual factors moderate the risk of lapse following changes in cognitive variables (e.g., decreases in confidence and motivation). To address these topics, I examined short-term effects of negative and positive affect on later cognitions and smoking behavior using data collected within-subjects in near real-

time. The current study may help clarify the role of momentary cognitions and identify high-risk situations during a quit attempt. Such information may be crucial in developing effective lapse prevention treatments.

Method

Participants

For this study, 95 adult smokers were recruited in central New Jersey via mass media calls for smoking cessation research participants. Participants were screened for the following inclusion criteria: 18 years of age or older, English literacy, smoking a minimum of 10 cigarettes per day for at least 6 months, an expired carbon monoxide (CO) level of 8 parts per million or greater, motivation to quit smoking of at least 6 on a 10-point scale, and willingness to fulfill study requirements. Exclusion criteria included: living with someone enrolled in the study; contraindications to the use of nicotine lozenges (e.g., recent heart attack or heart surgery, heart disease, angina, irregular heartbeat, pregnancy, breastfeeding, past problems using the lozenge); serious psychiatric conditions (i.e., bipolar disorder or psychosis); and current use of other forms of tobacco, smoking cessation treatments, marijuana, or other illegal drugs.

Procedures

All study procedures were approved by an Institutional Review Board. Interested volunteers responding to mass media were first screened for eligibility over the telephone. Eligible individuals were invited to a group orientation session at which they receive a detailed description of the study and written informed consent was obtained. Baseline data collection, CO testing, and electronic diary (ED) training were also performed at the orientation session. All participants in this study received standard smoking cessation treatment including four brief individual counseling sessions based on the Clinical Practice Guideline *Treating Tobacco Use and Dependence* (Fiore et al., 2008) and the *Treating Tobacco Dependence Handbook* (Abrams et al., 2003) and a 12-

week course of nicotine lozenges for use beginning on a target quit day set by the researchers. Participants attended five study visits at weekly intervals beginning one week pre-quit and ending three weeks post-quit. Fifteen minute counseling sessions were offered at the first four office visits and the nicotine lozenges were dispensed one week pre-quit, with instruction to begin lozenge use the morning of the quit day one week later. Individuals who smoked within 30 minutes of waking received 4-mg nicotine lozenges whereas those who waited more than 30 minutes before smoking received 2-mg lozenges (Shiffman, Dresler, & Rohay, 2004). Participants chose their preferred lozenge flavor (cherry or mint). At the pre-quit, quit-day, and three-week post-quit visits, participants performed computer tasks assessing impulsivity including a delay discounting task (Johnson & Bickel, 2002) and a version of the Continuous Performance Test II (Connors, 2000).

Participants carried EDs from day -10 to 21, relative to the quit date. CO testing was conducted at all visits and again 12-weeks post-quit for participants who reported seven-day point-prevalence abstinence at the 12-week follow-up call. Maximum remuneration for attending office visits, including a follow-up call and a follow-up visit, was $130 contingent upon return of the ED after the recording period (if the ED was not returned, $125 was deducted from participants' compensation). Additional monetary rewards from computer-based tasks and ED tasks could amount to a maximum of $545 ($100 at each of the three administrations of the laboratory delay discounting task, $75 while carrying the ED, and a total of $170.40 for completing the modified Conners' Continuous Performance Test II task (CPT-II) (Conners, et al., 2000) in the laboratory and on the ED).

Measures

<u>Baseline Assessment</u>

At an initial group orientation session, participants provided breath samples for carbon monoxide testing and completed the self-report measures described below:

The Fagerström Test for Nicotine Dependence (FTND) consists of 6 items (e.g., "How soon after waking do you smoke your first cigarette?") and has a maximum score of 10. A higher score indicates greater physical dependence on nicotine and a score of five indicates moderate dependence (Fagerström, Heatherton & Kozlowski, 1992). The FTND has fair internal consistency (Cronbach's α = .61) (Heatherton et al, 1991) and high test–retest correlations (r =.85 to .88; Etter et al., 1999; Pomerleau et al., 1994).

The Positive and Negative Affect Scale (PANAS) is a 20-item self-report measure of affective state (10 items assessing positive affect and 10 assessing negative affect) rated on a 5-point scale (ranging from 1 = very slightly to 5 = extremely) during a specified period of time (e.g., past few days, one week). The PANAS has good internal consistency (α = .84 to .90) and validity as a measure of subjective affect (Watson et al., 1988, Crawford & Henry, 2004).

The Wisconsin Smoking Withdrawal Scale (WSWS) is a 28-item scale that taps the central elements of the nicotine withdrawal syndrome. It consists of seven subscales (i.e., anger, anxiety, sadness, concentration, hunger, sleep, and craving). Internal consistencies range from α = .75 to α = .93 for the subscales and α = .90 for the total score (Welsh et al., 1999). Validity analyses also show that the WSWS negative affect scales correlate with the negative affect items of the PANAS (r = .46-.59) and the WSWS scales significantly predict smoking outcomes (Welsh et al., 1999).

The Wisconsin Inventory of Smoking Dependence Motives (WISDM-68; Piper et al., 2004), the Barratt Impulsiveness Scale (BIS-11; Patton et al., 1995), the Center for Epidemiologic Studies-Depression Scale (CES-D; Radloff, 1977), and the Multidimensional Personality Questionnaire (MPQ-BF; Patrick, Curtin, & Tellegen, 2002) were also administered, but will not be discussed further in this paper.

Ecological Momentary Assessment

Participants were asked to carry palmtop computers, or electronic diaries (EDs, Palm Z22 Palmtop Computer, Palm, Inc., Santa Clara, CA) for 31 days, including a 3-day practice period, one week pre-quit and three-weeks post-quit. Each day during this assessment period, participants were prompted at four pseudo-random times throughout the day (the alarms were set at randomly selected times within four equal intervals between the participant's wake-up and bed times and were at least 30 minutes apart). Reports completed at least 15 minutes apart from the previous report were included in the analysis in order to include reports completed (15 minutes) late with the next report completed on time. The prompts signaled participants to complete a brief, modified, version of a delay discounting task before completing reports on negative and positive affect, withdrawal symptoms, craving, restlessness, willingness to work hard at quitting (i.e., motivation to quit), confidence in their ability to quit smoking for good, exposure to smoking cues and triggers, recent strong urges/temptations to smoke, access to cigarettes, and recent smoking, alcohol use, and use of nicotine lozenges. The ED reports took approximately one to three minutes to complete and were time-stamped to indicate starting time and time completed. Each report was followed by a two-minute version of the CPT-II. Participants who completed this task could earn up to $1.20, based on their

correct response rates. This served as an incentive to complete ED reports. The delay discounting and CPT-II tasks will not be discussed further in this paper.

The ED assessed momentary affect and withdrawal symptoms (in the past 15 minutes) using items derived from the PANAS and the WSWS (Appendix B). Past research using factor analyses showed that negative affect and cognitive withdrawal symptoms loaded on one factor, whereas cravings to smoke loaded on another, and thoughts about food did not load on either factor (McCarthy et al., 2008). As such, for the current study, I averaged the following items to create an index of momentary negative affect: "tense or anxious," "sad or depressed," "impatient," "distressed," and "upset." For momentary positive affect, the items, "I have felt enthusiastic," and "I have felt interested" were averaged. The timeframe of these questions was the 15 minutes preceding the prompt and participants rated their agreement on a 5-point scale ranging from 1 (very slightly or not at all) to 5 (extremely) for the PANAS items and 1 (disagree) to 5 (agree) for the WSWS items. The validity of such brief EMA measures of negative and positive affect is supported by previous research showing that stressful event reports predicted an increase in momentary negative affect and a decrease in momentary positive affect (Minami et al., 2011) and that affect ratings change at the outset of a quit attempt (McCarthy et al., 2006, 2008).

In addition, participants' momentary confidence to quit smoking for good and willingness to work hard at quitting were assessed using single 10-point scales where 1 was "not at all" and 10 was "extremely." A past study showed that the answers to "how motivated are you to quit smoking?" had little variability and little relation to later abstinence among adults who participated in a smoking cessation study, whereas the item

"willing to work hard at quitting" was influenced by treatment and predictive of later abstinence (McCarthy et al., 2008). For this reason, motivation to quit was assessed using the "willing to work hard at quitting" item in the proposed study.

Exposure to smoking triggers was also assessed at every report. Participants were asked to report whether or not (Yes/No) they had: experienced a strong temptation or urge to smoke in the past 30 minutes, been with someone who was smoking in the past 15 minutes, had a chance to smoke in the past 15 minutes, experienced a stressful event in the past two hours, or had any alcohol in the past two hours. Similar measures of trigger exposure have also been used in previous research and some of these measures have been shown to be related to abstinence and counseling treatment (McCarthy et al., 2010). A trigger-exposure composite (on a scale from 0 to 5) was created using the sum of the following binary variables: having had a strong temptation or urges, been with smokers, had a chance to smoke, had a stressful event, and had any alcohol. Finally, the number of cigarettes smoked in the last two hours and since the last report was assessed (0-20 cigarettes). First lapse timing was assessed by taking cigarette counts from random reports where available.

Final Sample

For the current study, 79 (83.2 % out of 95 enrolled) participants who attended the quit day visit and reported at least 3 post-quit reports were included in the analyses. Demographic characteristics of the 79 individuals included in the analyses are summarized in Table 2. During the post-quit period, these participants provided 4,646 random report records (an average of 59 reports per person, or 3 out of 4 reports per day in the 21-day post-quit assessment period). There were no differences between the

excluded and included participants in terms of age, gender, minority status, cigarettes smoked per day, years smoking, baseline CO level, or number of past quit attempts (all ps > .05). Due to missing data and lack of variability across reports among some cases, actual sample sizes for the analyses varied from 69 to 71.

Analytic Plan

A series of multilevel random coefficient models was tested using Hierarchical

Linear Modeling (HLM) Version 6.04 software (Raudenbush, Bryk, & Congdon, 2007).

In this study, random reports (i.e., reports of positive and negative affect, confidence to

quit for good, willingness to work hard at quitting, and smoking) made up the first level

of data nested within individuals at the second level. Continuous predictive variables (i.e.,

positive and negative affect, confidence level, and willingness to work hard) were

centered around the grand means prior to entry in the models. As such when all other

predictors are zero, estimated coefficients reflect the probability of lapsing at the overall

average level of cognitive variables and positive and negative affect.

Three sets of models were fit to test the hypothesized relations shown in Figure 1.

First, the direct effects of affect change on smoking behavior 12 (t_1) to 24 (t_2) hours later

were assessed (separately for negative and positive affect), controlling for previous affect

(at t_{-1}) and smoking (both at the last report and to that point in the quit attempt). These are

the *c* paths shown in Figure 1. A Bernoulli distribution was specified, as smoking was

coded as a dichotomous outcome (smoke free = 0, any smoking = 1) in non-linear

models. Second, models of negative and positive affective influences on willingness to

work at quitting and confidence related to quitting up to 12 hours later (between t_0 and t_1)

were fit to the data. These are the *a* paths shown in Figure 1. These models controlled for

previous levels of affect (t_{-1}) and cognition (t_0) and smoking status at the last report and

up to that point in the quit attempt. Third, willingness to work and confidence at t_1 were

added to the *c* path models in order to test the *b* paths hypothesized, controlling for initial

affect, earlier cognitions, and smoking status. Random effects were specified to allow regression coefficients to vary across individuals, as long as doing so improved model fit.

Finally, I tested the hypothesis regarding the moderating influence of exposure to smoking triggers on the link between cognitive variables and smoking lapse (see Figure 1, m_1-m_2 paths). Interaction terms between the trigger exposure composite (between t_1 and t_2) and each cognitive variable (t_1) were included in the models, again controlling for cognitive variables at index in order to assess whether contexts moderate the relationship between momentary changes (vs. absolute level) in hypothesized cognitive mediators and later lapse risk.

Results

Affect and Lapse Risk (c paths)

First, I examined whether affect at the index report, controlling for affect at the previous report, prospectively predicted lapse risk between 0.5 and 24 hours later. Time (in minutes) between the index reports (t_0) and reports at t_2 was included to control for the effect of time on lapse risk. Only the model intercept was allowed to vary across individuals to facilitate model convergence. Results showed that neither negative nor positive affect predicted changes in lapse risk within 24 hours, contrary to my hypothesis. While longer time intervals from the index reports were associated with an increased probability of lapsing as expected, no significant time by affect (positive and negative) interaction effect was observed. That is, the impact of changes in negative or positive affect on later lapse risk did not differ as a linear function of time.[3] Significant level-2 variables for the intercept indicated that those with higher baseline negative affect (assessed by PANAS) and nicotine dependence (assessed by WISDM) had a significantly higher likelihood of lapse.

Although negative and positive affect did not predict a lapse within 24 hours, analyses indicated that affect changes had shorter-lived effects on lapse risk for up to 12 hours (i.e., the interval between reports t_1 and t_2). Two consecutive reports completed within 12 hours were used to test short-term effects of affect while longer effects were

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[3] The time lag between the index and t_2 reports clustered around 6 and 12 hours (a bimodal distribution). This may reflect the differences in the time of day that the reports were completed. The last reports of a day will inevitably have a longer delay till the next report due to suspension of recording during the overnight hours. In order to take this difference into account, an interaction term between a binary variable for time of day (capturing whether a report occurred within 8 hours of waking or more than 8 hours after waking) and the time lag between reports was entered in this model. However, no significant main effect of time of day or interaction effect was observed and these terms were pruned from the final model. Thus, it did not appear as though relations between affect and lapsing depended on the time of day reports were completed or the interaction between this and the interval between reports.

examined using the first and last reports of three consecutive reports completed within 24 hours. A Bernoulli distribution was specified and the same time-varying covariates were entered along with previous negative and positive affect levels. Results revealed that an increase in negative affect at t_1 predicted greater lapse risk in the next report t_2 whereas change in positive affect was not related to change in lapse risk (Table 3).

Affect and Cognitive Mediators (a paths)

Multilevel models were built in which confidence and willingness to work hard (t_1) were regressed on positive and negative affect recorded in the previous reports (t_0) completed within the past 12 hours (at least 15 minutes apart). Previous (t_{-1}) levels of cognitive variables were included as control variables in the model in order to assess changes in cognitive variables following changes in affect. Other time-varying covariates included smoking status since the quit date (t_0), recent smoking (t_1), and time interval between the index (t_0) and second (t_1) reports. No significant interaction effects between time interval and positive or negative affect were found in either the confidence or motivation models.

Motivation

In the *a* path model for willingness to work hard at quitting, the intercept, willingness to work hard at t_0, and recent smoking at t_1, were all allowed to vary across individuals. Results (Table 5) were similar to the confidence model above. Changes in negative affect did not predict a change in willingness at the next report, while an increase in positive affect at the index reports was marginally associated ($p=.051$) with an increase in willingness to work hard at the next report. In addition, while greater baseline willingness to work hard (level 2-individual variable) predicted higher average

willingness post-quit, higher baseline negative affect was associated with lower willingness.

Confidence

The intercept (within-individual average confidence level at t_1) and previous confidence level at t_0 were allowed to vary across individuals in this model. Results (Table 4) indicated that a change in negative affect was not associated with a change in confidence at the next report within 12 hours. Although it did not meet our criterion for statistical significance (p=.054), an increase in positive affect at the index report was positively associated with an increase in confidence level at the next report. Moreover, higher baseline confidence level (level 2) predicted greater average within-individual confidence level.

Cognitive variables and lapse risk (b paths)

Changes in confidence and willingness to work hard at t_1 were simultaneously entered in the model as predictors of lapse likelihood within 12 hours along with the following covariates: recent smoking (t_1), smoking status since quit date (t_0), and time (minutes) between the t_1 and t_2 reports. A Bernoulli distribution was specified for this model and only the intercept was allowed to vary across individuals in order to facilitate model convergence. As in the direct model (*c* paths), higher baseline negative affect and nicotine dependence (level 2- individual variables) predicted greater lapse risk. Greater time elapsed since the previous reports (t_1) and recent smoking (between index and t_1) were also associated with greater lapse risk between t_1 and t_2. Furthermore, exposure to a greater number of smoking triggers predicted an increase in the probability of lapsing within 12 hours, as hypothesized. Inclusion of cognitive mediators did not change the

non-significant relations between affect at index (t_0) and lapse risk at t_2. Separate models

for confidence and willingness revealed similar results found in the unified model in

terms of directions and magnitude of the effects of cognitive variables. As such, I will use

the unified model to discuss the findings.

Motivation

A significant interaction between willingness to work hard at quitting at t_1 and the

time interval between t_1 to t_2 (Table 6) was found. The protective effects of willingness

on lapse risk emerged only as more time elapsed (Figure 3). That is, motivation mattered

less when there was less opportunity to lapse (because less time had elapsed), but became

more protective as greater time (and presumably greater opportunity to smoke) passed.

Results revealed a marginal main effect of changes in willingness on later lapse risk

($p=.071$).

Confidence

Results showed that a change in confidence (t_1) was not associated with a change

in lapse risk within 12 hours, contrary to my hypothesis (Table 6). However, a significant

interaction between exposure to smoking triggers and confidence was found, such that

increased confidence was associated with greater lapse risk only in the presence of

smoking triggers. In the absence of such triggers, there was no significant relation

between confidence and later lapsing (Figure 2).

Discussion

The aim of this study was to prospectively examine the role of abstinence motivation and confidence in relation to earlier changes in negative and positive affect and later smoking behavior in the context of an attempt to quit smoking. This study also tested whether high-risk contexts amplified relations between cognitions and subsequent lapse risk. Results provided mixed support for the model. The direct effect of momentary changes in affect on later lapse risk was observed up to 12 hours, but not 24 hours later. Affect did not have any significant effects on cognitions within 12 hours. There were significant relations between confidence and motivation and later lapse risk, but this depended on context and time elapsed.

Affect and smoking behavior

Results showed that momentary changes in neither negative nor positive affect at index reports (t_0) significantly predicted smoking behavior up to 24 hours later. The relation between momentary changes in affect and smoking behavior did not change as a linear function of time, but did differ in models using a 12- vs. 24-hour timeframe for negative affect. This may indicate that while negative affect predicts smoking within a shorter timeframe (12 hours), the decay of affective influences on smoking is not linear within a 24-hour period. The fact that effects decayed as more time passed is consistent with results from a previous study (Shiffman, 2005) that showed that lapse was predicted by increases in negative affect over hours, not days. Thus, momentary fluctuations of affect may have only fleeting effects on lapse risk. It is possible that the difference is that there was an overnight period in the 24-hour period, whereas there may not have been in the 12-hour period. The 24-hour timeframe was chosen in this study to ensure that three

consecutive reports were used to test the mediational hypotheses because on average, participants completed three of four reports per day. These results add to the literature suggesting that affect has short-lived effects on lapse risk that need to be studied over shorter timeframes.

Affect and cognitive variables

Increases in positive affect were marginally associated with increases in confidence to quit and willingness to work hard at quitting up to 12 hours later. Changes in negative affect had no detectable impact on confidence and willingness. This may suggest that momentary confidence and motivation related to a specific goal such as smoking cessation are more likely to be influenced by positive affect, rather than negative affect. This is consistent with the models of positive affect which assert that positive emotions expand one's openness to new experience and prompts changes in perspectives and cognitions such as motivation to change (Fredrickson & Branigan, 2001, Wagner & Ingersoll, 2008). Increasing positive affect, rather than merely focusing on reduction or avoidance of negative affect may help enhance confidence and willingness to work toward a specific goal. In addition, those with higher baseline negative affect had lower average levels of post-quit willingness to work hard at quitting. Thus, it seems that although trait differences in negative affect may influence average levels of willingness to work toward a goal, acute changes in positive affect have a greater impact on momentary motivation. The effects of positive affect were only marginal, however, and so must be treated as preliminary until further study.

Willingness to work hard at quitting

Motivation to quit was protective against lapse, when adequate time had elapsed. The impact of time elapsed on lapse likelihood diminished following increases in willingness to work hard. High levels of motivation seem to protect against the decay in abstinence probability that occurs over time.

Confidence to quit

An increase in confidence predicted greater lapse risk within 12 hours in the presence of smoking triggers. This may mean that excessive confidence increased subsequent lapse risk in high-risk situations (e.g., drinking, other smokers, urge to smoke), but not in the absence of such risks. This result seems inconsistent with the prevalent notion that abstinence confidence is protective against lapse risk and earlier findings (Gwaltney et al., 2005b, Shiffman, 2005) indicating that lower self-efficacy predicted smoking lapse or relapse over days. However, while these studies prospectively examined relations between dynamic changes in self-efficacy and subsequent lapse/relapse risk, such changes were assessed daily (using average confidence within a day), not hourly within a day. During a quit attempt, a sudden increase in confidence may make one more vulnerable to lapse in a tempting situation. It is possible that an acute increase in confidence reflects complacency, which may lead to high-risk behaviors such as drinking, and in turn, increase vulnerability to lapse. This finding calls attention to the role of contexts in the dynamic relations between cognitions and behavior which may be crucial to improve smoking cessation treatments.

Overall, results supported the importance of motivation and confidence as proximal determinants of lapse risk, but only under certain conditions. The results shed little light on affective influences on quitting-related cognitions, however, except to

suggest that positive affect may have a greater impact than negative affect. It may be that the proposed model would hold over a shorter timeframe, as negative affect seemed to have short-lived effects on smoking behavior.

Limitations

There are several limitations which warrant caution when interpreting the results. The first limitation is the small sample size. We may have limited power to detect "small" effects (Fritz & MacKinnon, 2007). Second, the psychometric properties of the data may be limited; the extent to which brief EMA assessments are sensitive to momentary fluctuations in affect and cognition is unclear, although Shiffman and colleagues have shown that changes in affect and confidence assessed by EMA predicted later smoking behaviors (e.g., Gwaltney et al., 2005b, Shiffman, 2005). Possible reporting biases should be considered since there is no way to identify systematic missing reports. That is, some individuals may have missed reports only when they were in distress, had just smoked, or were in certain environments. The non-experimental nature of this study is another limitation. Since none of the variables of interest (e.g., affect, confidence) was manipulated, the interpretation of causal relations should be tempered. Finally, the best time-frames (seconds, minutes, days, etc.) to study the effects of affect on cognitive variables as well as the impact of cognitive variables on smoking behavior is not clear. However, the results from this study suggest that a shorter timeframe (less than 12 hours) is more suitable for studying relations among affect, cognitions, and smoking. Unfortunately, analyses using shorter timeframes were not possible in this study because participants, on average, completed 3-4 reports per day and sufficient reports for the analysis were not available (three consecutive reports were completed within 12 hours less than 47% of the time). Therefore, the time-frame used in this study may not be optimal for the study of cognitive variables during a quit attempt. Further studies

investigating the acute impact of affects and cognitions on smoking cessation may be needed to better elucidate these relations.

Conclusions

This study examined the dynamic relations among affect, confidence, motivation, and smoking behavior of adult smokers during an attempt to quit smoking. Multilevel models revealed significant relations among affect, cognitions and lapse, but the cognitive mediational hypothesis was not supported. First, the results indicated that increases in negative affect predicted greater likelihood of smoking up to 12, but not up to 24, hours later. Furthermore, enhanced willingness to work hard seems to offset the risk of lapse accumulated over hours. Results also indicated that enhanced confidence can be a liability rather than asset in the face of high-risk contexts (e.g., stressful situations, drinking, or temptation). Affect, confidence, and motivation all influence subsequent lapse risk, but relations with lapse are more complex and nuanced than previously thought. Additional research is needed to identify the optimal timeframes for studying the proximal determinants of lapse risk, and the moderating role of risk exposure needs to be taken into account. Studies of dynamic relations among affect, cognition, and behavior such as this have the potential to provide a better understanding of crucial determinants of behavioral change that may facilitate the development of effective smoking cessation interventions.

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Figure Captions

Figure 1. Three sets of models were fit to test the hypothesized relations among negative and positive affect, cognitions, risk factors, smoking lapse shown in this model; 1) the direct effects of affect change on smoking behavior (*c* paths); 2) the effects of negative and positive affective on willingness to work at quitting and confidence related to quitting (*a* paths); 3) the effects of willingness to work and confidence at t_1 on smoking behavior (*b* paths). Moderating influence of exposure to smoking triggers on the link between cognitive variables and smoking lapse (m_1 -m_2 paths).

Figure 2. Note: Moderating effects of time on relations between abstinence motivation and lapse risk (up to 12 hours). Each line represents different time intervals. The protective effect of increases in motivation on lapse risk is observed only with the longer interval. The coefficients used to create this graph were from the HLM analysis of the *b*-path model, controlling for confidence level at the previous report.

Figure 3. Note: Moderating effects of high risk contexts on relations between abstinence confidence and lapse risk (up to 12 hours). Each line represents a different number of smoking triggers. A momentary increase in confidence predicted greater lapse risk within 12 hours only in the presence of three or more smoking triggers. The coefficients used to create this graph were from the HLM analysis of the *b*-path model, controlling for willingness to work hard at the previous report.

Table1. Demographic characteristics of final sample (N=79).

Variable	Value	n (%)
Sex (N=79)	Female	33 (41.8%)
Race/Ethnicity	Hispanic	3 (3.8%)
(N=79)	White	55 (69.6%)
	African-American	16 (20.3 %)
	Asian, Pacific Islander	6 (7.6%)
	American Indian	1 (1.3%)
	Other	1 (1.3%)
Marital Status	Married	32 (40.5%)
(N=79)	Divorced	10 (12.7%)
	Never married	23 (29.2%)
	Cohabitating	5 (6.3%)
	Separated	4 (5.1%)
	Widowed	5(6.3%)
Education	< High school graduate	1 (1.4%)
(N=79)	High school graduate	17 (21.5%)
	Some college	35 (44.3%)
	College degree	26 (32.9%)
Employment Status	Employed for wages	44 (55.7%)
(N=79)	Self-employed	11(13.9%)
	Unemployed <1 year	10 (12.7%)
	Unemployed >1 year	5(6.3 %)
	Homemaker	2(2.5%)
	Student	9 (1.1%)
	Retired	4 (5.1%)
	Disabled	5 (6.3%)
Household Income	< $25,000	23 (30.3%)
(N=73)	$25,00-$34,999	5 (6.6%)
	$35,000-$49,999	9 (11.4%)
	$50,000-$74.999	16 (20.3%)
	>$75.000	23 (29.1%)
		M (SD)
Age (N=79)		45.24 (11.89)
Age at first cigarette (N=79)		15.24 (3.99)
Cigarettes smoked per day (N=79)		18.90 (7.19)
Previous quit attempts (N=79)		4.53 (11.11)
Baseline CO level (N=79)		22.29 (12.11)
Baseline FTND Score (N=79)		5.21 (1.95)

Table 2. HLM analysis of the effects of changes in negative and positive affect (t_0) on lapse risk over 24 hours (t_2).

Predictor	Coefficient	Standard Error	T-ratio	P-value	Odds Ratio	95% CI	df
Direct effect *c* path							
Mean P (Smoking) *30 min-24hrs from index* [* *]	- 0.958	0.433	- 2.211	0.030*	0.384	(0.162, 0.910)	66
Baseline WISDM	0.060	0.035	2.434	0.018*	1.062	(1.011,0.116)	66
Baseline Negative PANAS	0.075	0.033	2.271	0.026*	1.078	(1.009,1.152)	66
Smoke Free (quit date till index: Y/N)	- 0.976	0.390	- 2.503	0.013*	0.377	(0.176, 0.809)	2,249
Recent Smoking (between index to t_1 :Y/N)	1.036	0.159	6.511	0.000*	2.817	(2.062, 3.847)	2,249
Positive Affect preceded Index (t_{-1})	0.061	0.109	0.566	0.571	0.935	(0.859, 1.316)	2,249
Index Positive Affect (t_0)	-0.079	0.109	-0.725	0.469	1.048	(0.746, 1.144)	2,249
Negative Affect preceded Index (t_{-1})	-0.067	0.106	-0.633	0.527	1.063	(0.761, 1.150)	2,249
Index Negative Affect (t_0)	0.047	0.106	0.444	0.657	1.048	(0.852, 1.290)	2,249
Time Interval (from t_0 to t_2 : in minutes)	0.001	0.000	1.992	0.046*	1.001	(1.000, 1.001)	2,249

**Random coefficient, df = 66, reliability = .789. All other predictors were treated as fixed to facilitate model convergence.

* p<.05

t_{-1} = Report preceded index report
t_0 = Index report
t_1 = Next report within 12 hours of index report
t_2 = Next report within 12 hours of t_1 report (and within 24 hours of index report)

Table 3. HLM analysis of the effects of changes in negative and positive affect (t_1) on lapse risk within 12 hours (t_2).

Predictor	Coefficient	Standard Error	T-ratio	P-value	Odds Ratio	95% CI	df
Direct effect *c* path							
Mean P (Smoking) *30 min-24hrs from index* [**]	- 1.462	0.411	- 3.561	0.001*	0.232	(0.102,0.525)	67
Baseline WISDM	0.055	0.023	2.370	0.021*	1.056	(1.009,1.106)	67
Baseline Negative PANAS	0.063	0.031	2.040	0.045*	1.065	(1.001,1.133)	67
Smoke Free (quit date till index: Y/N)	- 0.548	0.373	- 1.470	0.142	0.578	(0.279,1.200)	2,302
Recent Smoking (between index to t_1: Y/N)	1.185	0.158	7.507	0.000*	3.271	(2.400,4.457)	2,302
Index Positive Affect (t_0)	- 0.085	0.110	-0.778	0.437	0.918	(0.740,1.139)	2,302
Positive Affect (t_1) w/in 12 hours of index	0.150	0.110	1.364	0.173	1.162	(0.936,1.441)	2,302
Index Negative Affect (t_0)	-0.059	0.106	-0.554	0.579	0.943	(0.767,1.160)	2,302
Negative Affect (t_1) w/in 12 hours of index	0.210	0.107	1.962	0.049*	1.233	(1.000,1.521)	2,302
Time Interval (from t_1 to t_2)	- 0.001	0.000	-1.907	0.056	0.999	(0.998,1.000)	2,302

**Random coefficient, df = 67, reliability = .782. All other predictors were treated as fixed to facilitate model convergence.

* p<.05

Table 4. HLM analysis of the effects of changes in negative and positive affect (t_0) on confidence within 12 hours (t_1).

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
_a_ paths					
Mean confidence (t_1) 15 min-12 hrs from index**	5.654	0.124	45.736	69	0.000*
Baseline Confidence	0.259	0.083	3.127	69	0.003*
Smoke Free (quit date till index: Y/N)	0.108	0.040	2.687	3,089	0.008*
Recent Smoking (between index to t_1: Y/N)	- 0.051	0.027	-1.873	3,089	0.061
Index Confidence (t_0)	0.397	0.042	9.452	70	0.000*
Positive Affect preceded Index (t_{-1})	0.016	0.014	1.146	3,089	0.252
Index Positive Affect (t_0)	0.011	0.015	1.925	3,089	0.054
Negative Affect preceded Index (t_{-1})	- 0.006	0.014	- 0.415	3,089	0.678
Index Negative Affect (t_0)	- 0.011	0.015	0.731	3,089	0.465
Time Interval (from t_0 to t_1)	- 0.000	0.000	- 0.668	3,089	0.504

**Random coefficient, df = 70. All other predictors were treated as fixed, with df=3,089, to facilitate model convergence
Reliability: Intercept = .926, t_0 Confidence = .651

* $p<.05$.

Table 5. HLM analysis of the effects of changes in negative and positive affect (t_0) on willingness to work hard within 12 hours (t_1).

Fixed Effect	Coefficient	Standard Error	T-ratio	Approx. d.f.	P-value
a paths					
Mean willingness (t_1) 15 min-12 hrs from index	6.296	0.063	100.50	68	0.000*
Baseline Willingness	0.155	0.050	3.080	68	0.003*
Baseline Negative PANAS	- 0.015	0.007	- 2.299	68	0.025*
Smoke Free (quit date till index: Y/N)	0.068	0.027	2.459	70	0.014*
Recent Smoking (between index to t_1: Y/N)	- 0.044	0.030	- 1.463	3,088	0.148
Index Willingness to work hard	0.416	0.053	7.893	70	0.000*
Positive Affect preceded Index (t_{-1})	- 0.008	0.010	- 0.796	3,088	0.426
Index Positive Affect (t_0)	0.020	0.010	1.945	3,088	0.051
Negative Affect preceded Index (t_{-1})	- 0.002	0.010	- 0.190	3,088	0.850
Index Negative Affect (t_0)	- 0.008	0.010	- 0.801	3,088	0.423
Time Interval (from t_0 to t_1)	0.000	0.000	1.608	3,088	0.148

**Random coefficient, df = 71. All other predictors were treated as fixed to facilitate model convergence

Reliability: Intercept = .926, t_1 Recent Smoking =.484, t_0 Confidence = .651, N=32.

* p<.05.

Table 6. HLM analysis of the effects of changes in confidence and willingness (t_1) on lapse risk within 12 hours (t_2).

Predictor	Coefficient	Standard Error	T-ratio	P-value	Odds Ratio	95% CI	df
b paths							
Mean P (Smoking) 30 min-24hrs from index [**]	- 1.460	0.413	- 3.536	0.001*	0.232	(0.102,0.529)	67
Baseline WISDM	0.047	0.023	2.009	0.048*	1.048	(1.000,1.098)	67
Baseline Negative PANAS	0.068	0.031	2.211	0.030*	1.071	(1.007,1.138)	67
Smoke Free (quit date till index: Y/N)	- 0.530	0.378	- 1.403	0.161	0.588	(0.281,1.234)	2,297
Recent Smoking (between index to t_1: Y/N)	1.004	0.163	6.152	0.000*	2.730	(1.983,3.760)	2,297
Index Positive Affect (t_0)	- 0.017	0.109	- 0.159	0.874	0.983	(0.793,1.217)	2,297
Index Negative Affect (t_0)	- 0.047	0.101	- 0.464	0.642	0.954	(0.782,1.164)	2,297
Time Interval (from t_1 to t_2)	0.002	0.000	4.058	0.000*	1.002	(1.001,1.002)	2,297
Risk Composite (between t_1 to t_2)	0.397	0.094	4.207	0.000*	1.487	(1.236,1.789)	2,297
Index Confidence (t_0)	-0.072	0.132	- 0.547	0.584	0.931	(0.719,1.204)	2,297
Confidence (t_1) w/in 12 hours of index	-0.017	0.134	- 0.128	0.899	0.983	(0.755,1.279)	2,297
Index Willingness to work hard	-0.129	0.181	- 0.712	0.476	0.879	(0.616,1.254)	2,297
Willingness to work (t_1) w/in 12 hours of index	-0.323	0.179	- 0.801	0.071	0.724	(0.510,1.029)	2,297
Confidence (t_1) X Risk (between t_1 to t_2)	0.113	0.048	2.333	0.020*	1.120	(1.018,1.231)	2,297
Willingness (t_1) X Interval (from t_1 to t_2)	- 0.001	0.000	- 2.820	0.005*	0.999	(0.998,1.000)	2,297

**Random coefficient, df = 67, reliability = .770. All other predictors were treated as fixed to facilitate model convergence.

* p<.05.

Figure 1. Model of hypothesized relations among negative and positive affect, cognitions, risk factors, smoking lapse.

POST QUIT

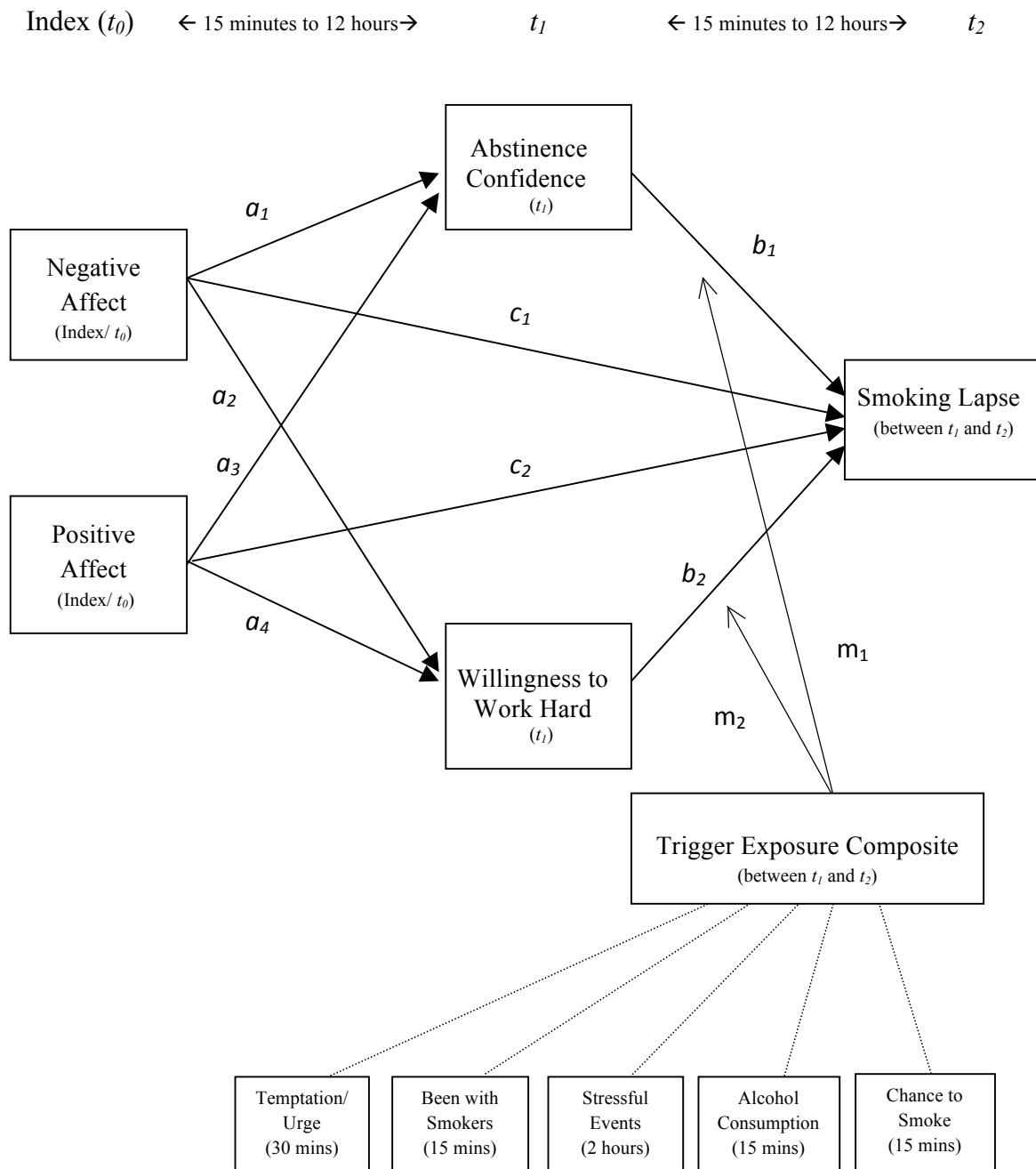Index (t_0)   ← 15 minutes to 12 hours→ t_1 ← 15 minutes to 12 hours→ t_2

Figure 2. Willingness to Work at Quitting X Time Elapsed Interaction Effects in Model of Lapse Risk
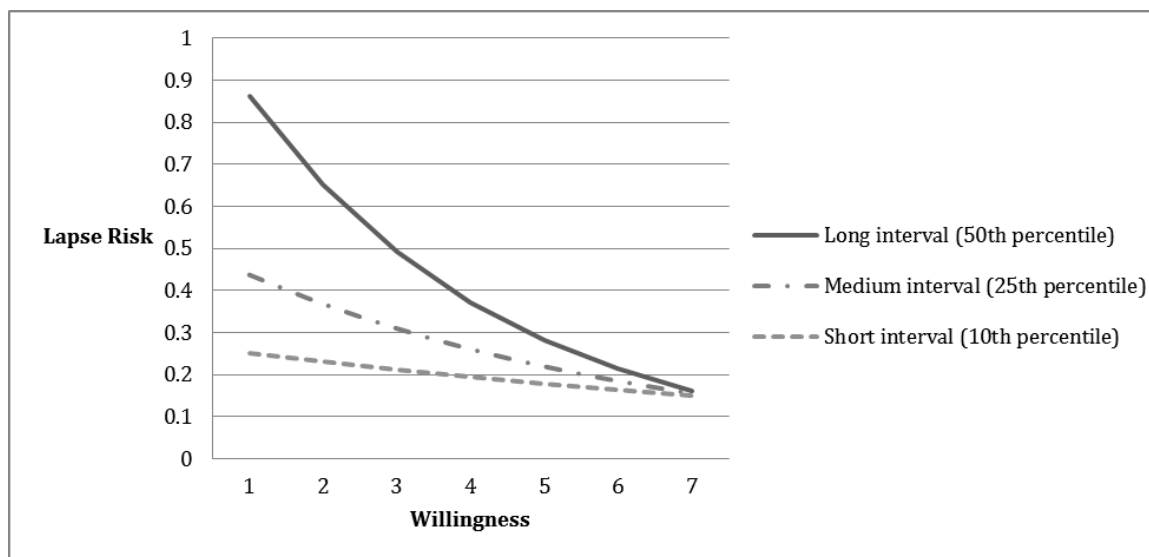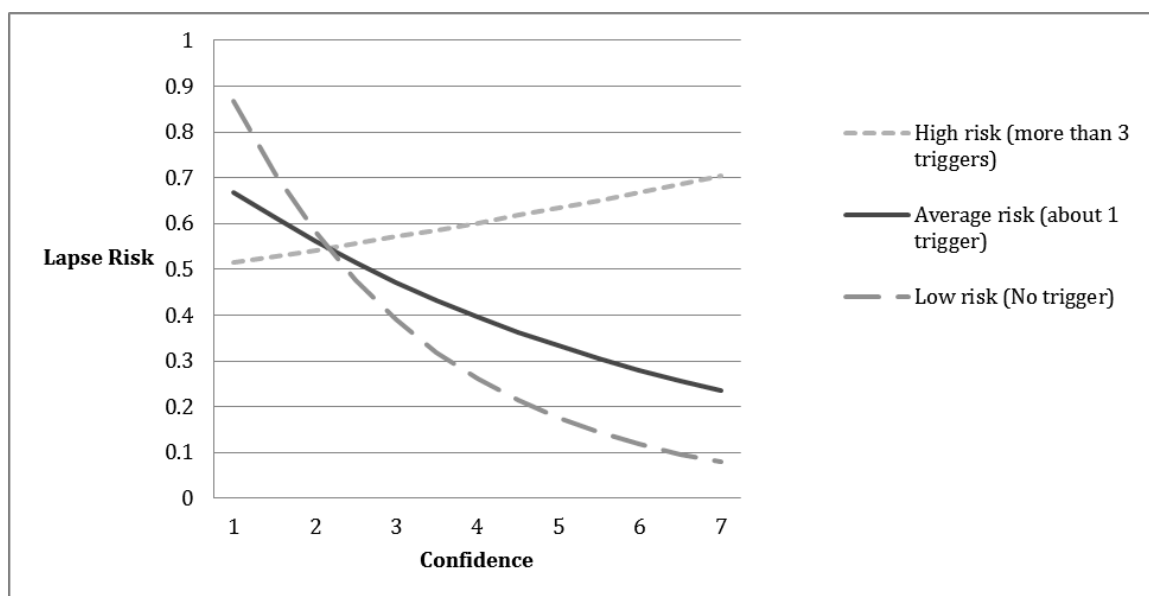
Figure 3. Confidence X Smoking Trigger Exposure Interaction Effect in Model of Lapse Risk

Appendix A

In this appendix, I will describe the rationale for and results of additional analyses.

Delay Discounting

Quitting smoking requires inhibition of impulsive choices that offer immediate rewards but carry significant long-term costs. Making choices that maximize long-term gain may be an important determinant of cessation success. Miller and Rollnick (2002) referred to this as priority for change. If one places more value on the immediate rewards promised by smoking (e.g., affect regulation, stimulation, stress or withdrawal/craving relief) than on the long-term benefits of cessation (e.g., health improvement, avoiding future illness, saving money), then priority for change is low, and smoking is likely.

Delay discounting rate, or the degree to which one discounts or devalues rewards one has to wait for, is a form of impulsive decision making. Past research has demonstrated that successful inhibition of impulsive choices predicts future behavior and performance (e.g., developmental and academic success; Mischel, Shoda, & Peake, 1988), and current smoking status (Reynolds, 2006). This suggests that one's ability to explicitly choose a larger, delayed reward over a smaller, immediate one may be critical in smoking cessation. The relation between delay discounting and smoking cessation success is understudied (but see Goto et al., 2009). In addition, to date, researchers have not tracked changes in impulsive choices during the course of a quit attempt to determine whether such changes precede smoking lapses.

Affective states may influence impulsive choices, such as delay discounting. Distress often demands attention to immediate negative arousal which leads to impulsive responses that challenge long-term goals (Mischel & Ayduk, 2002). During a cessation effort, the priority of a smoker may shift away from quitting to the resolution of more

immediate discomfort such as an aversive affective state or a strong craving. The ability to stay focused on long-term goals during a difficult situation may be crucial for sustained abstinence. Impulsive choice may represent a shift in one's priorities to attend to more immediate, attainable goals rather than more distal ones. On the other hand, states of positive impact may also influence delay discounting. Positive affect may counteract the effects of negative affect on delay discounting through shifting one's attention to distal goals rather than immediate ones.

Study Hypotheses

I hypothesized that within-subject changes in delay discounting would predict proximal increases in lapse risk over the next 12 hours. I also hypothesized that negative affect states would predict increased discounting (e.g., more impulsive choices) in the short-term (up to 12 hours), whereas positive affect would predict less impulsive decision making. Finally, I investigated the extent to which exposure to smoking triggers moderated the impact of momentary delay discounting on later lapse risk. I predicted that an increase in impulsivity would be more likely to increase lapse risk in high risk contexts than in contexts containing few smoking triggers.

Method

Participants and Procedures

The final sample and procedures are as described in the method section of the dissertation.

Measures

<u>Baseline Assessment</u>

The Barratt Impulsiveness Scale (Patton et al, 1995) (BIS-11) is a 30-item, widely used, self-report measure of impulsive personality traits rated on a four-point scale ranging from (1 = "rarely/never" to 4 = "almost always/always") The internal consistency for the BIS-11 total score ranges from 0.79 to 0.83 for various populations (i.e., undergraduates, substance-abuse patients, general psychiatric patients, and prison inmates; Patton et al., 1995).

Delay Discounting Laboratory Task

At the first visit, after completing self-report questionnaires, participants completed a computer-based delay discounting task. Delay discounting was assessed by presenting a series of pairwise choices between a smaller monetary reward that was available sooner (e.g., $10 today) and a larger amount available later (e.g., $100 in a month). A total of 26 series of questions was administered assessing discounting of amounts of $20, $50, $100, and $2500 at delays of 1 day, 1 week, 1 month, 6 months, and 2 years. All dollar amounts were crossed with all delays and six additional series offered a smaller, sooner reward that was not available immediately (e.g., $10 in 12 days vs. $100 in 6 weeks) in order to determine whether there was an immediacy effect on discounting (i.e., whether discounting was steeper when the smaller award was available immediately rather than at a shorter delay than the larger, later reward).

Each series of delay discounting questions began with a randomly selected smaller, sooner reward in 4% increments of the larger reward (e.g., in multiples of $4 when the delayed reward was $100). The smaller rewards presented subsequently in each series were calculated using the algorithm described by Johnson and Bickel (2002). In brief, a participant's choices reset counters representing both the lower and upper limits

of a participant's indifference point, the amount of money available sooner that the participant treated as equivalent to the delayed reward. The series of questions continued (up to 50 individual items) until the difference between the outer upper and lower limits was within 4% of the delayed reward magnitude (e.g., the series stopped for a $100 item when the upper and lower limits of one's indifference point differed by only $4). Participants were informed at the outset of the task that one of their choices would be treated as real and that they would receive the monetary reward they chose (up to $100) at the delay specified. This was intended to encourage participants to take the choices seriously.

Participants' daily delay discounting rates (k) reflecting the rate at which delayed rewards were devalued for each day the rewards were delayed were calculated using the formula: $k = \frac{1}{D}(\frac{V_d}{V_p} - 1)$ where D is the delay in days, V_d is the value of the delayed reward in dollars, and V_p is the value of the present (or smaller, sooner) reward in dollars (Johnson & Bickel, 2002). A participant's pre-quit *average daily k* was calculated by taking the mean of the k values for the immediate $20, $50, and $100 series at delays of 30 days or less. Only these items were used to calculate the *average daily k* that would be used to present delay discounting choices on an electronic diary to better match the magnitude and delay duration of the electronic diary task. This *average daily k* was then used to tailor the delay discounting questions presented on the electronic diary in the week preceding the quit day and the three weeks following the quit day.

Electronic Diary (ED) Assessment

The delay discounting task administered at every ED report comprised eight items. The delayed reward and delay duration varied across reports but remained constant

within reports (i.e., only one series was presented in each report). Larger, later reward

values of $10, $25, $50, $75, and $100 were presented at delays of 1, 3, 5, 7, 14, 21, 30,

or 42 days. Participants were informed that at least one and not more than two of the

delay discounting choices they made on the ED would be treated as real if they responded

to the prompts. Participants who completed at least 75% of the prompted reports received

either $25 in 1 week or $75 in 2 weeks, according to their choices.

A participant's *average daily k* value was used to calculate a tailored initial

smaller, sooner reward value for each series using the formula $V_p = \frac{V_d}{1+kD}$ (Johnson &

Bickel, 2002). For example, if the delayed reward was $50 in 30 days, the smaller, sooner

reward that a participant with an *average daily k* value of 0.01 saw first was $38.46. The

smaller, sooner reward was reset by each choice made by a participant by selecting a

midpoint between minimum and maximum smaller, sooner reward values that were reset

at each choice. The initial value of the minimum was 25% of the V_p calculated as shown

above. The initial value of the maximum was 75% of the V_d, plus the minimum. We

restricted the range slightly because we were concerned that we could not sample the full range

using only 8 items. When a subject chose the smaller, sooner reward, the maximum value

of the next smaller, sooner reward was set to the value of the current immediate reward.

The minimum value of the next smaller, sooner reward remained the same as previous

report. The next amount shown was the midpoint between these two limits. When a

subject chose the delayed reward, the minimum was reset to equal the current immediate

reward. Again, the maximum value of the next smaller, sooner reward remained the same

as the previous report. The midpoint between the minimum and maximum at the 8th and

final question was treated as the indifference point for that report (i.e., lower indifference

points reflect greater discounting, or more impulsive decision-making). The *final k* value obtained from the indifference point of each report was used to estimate the effect of changes in delay discounting on later lapse risk. The difference between the *final k* and initial *average daily k* estimated values was used so that a positive score on this *k difference* variable indicated an increase in impulsivity relative to the individual's baseline discounting rate.

Hierarchical Linear Modeling (HLM) Version 6.04 software (Raudenbush, Bryk, & Congdon, 2007) was used to study dynamic relations among affect, delay discounting rate, and subsequent smoking behavior within individuals. A Bernoulli distribution was specified when a binary smoking variable was the outcome variable. Continuous predictor variables (i.e., positive and negative affect) were centered around grand means prior to entry in the models in order to interpret estimated coefficients as expected values (e.g., the probability or lapsing or increased discounting) at the overall average level of positive and negative affect when all other covariates are zero.

Results

First, we ran descriptive statistics and examined the distribution of ED *final k* values and *k difference* variable (*final k- daily k*). The distribution of *final k* value was positively skewed and leptokurtic while *k difference* was leptokurtic around the mean. Although *final k* values ranged from 0.0014 to 4.13 (*SD*=.223), the majority (75%) of *final k* values obtained from each EMA report fell in a narrow range between .002 and 0.22. Similarly, the difference between *average daily k* and *final k* ranged from -.96 to 3.12 (*SD*=.161), and over 70 % fell in a narrow range between -.02 and 0.2. Moreover, more than 80 % of *final k* values were smaller than individual *average daily k* values. In

other words, the majority of post-quit reports showed decreased discounting and lower levels of impulsivity. A further analysis revealed that participants chose the delayed amount for all eight delay discounting questions in over 56% of the reports.

Multiple transformation strategies tested in an attempt to adjust for skewness and kurtosis in *k difference* values such as the inverse and logarithm transformations did little to improve the distribution. For the following analysis, I recoded the *k difference* variable into a binary variable such that a score of 1 indicated increased discounting rate (greater impulsivity) while 0 indicated no change or decreased discounting rate (same or less impulsivity) from baseline.

Delay discounting and lapse

Within-subject increases in delay discounting were not predictive of increased lapse risk over the next 12 hours ($B = .399$, $SE = .235$, $OR = 1.490$, 95% CI $= [0.940, 2.361]$ $p = .090$). This relation was not moderated by baseline discounting rate (i.e., it did not hold more or less for those who were more impulsive pre-cessation). It also did not differ as a function of trigger exposure (i.e., the interaction between discounting rate change and exposure to high-risk contexts was not significant).

In order to assess relations between changes in affect (negative and positive) and delay discounting, the binary *k difference* variable (t_1) indicating that discounting increased (1) or decreased/ stayed the same (0) was regressed on positive and negative affect recorded in the previous reports (t_0) completed within the past 15-minutes to 12 hours. The binary *k difference* variable at the previous reports (t_0) was included as a control variable in the model. Other time-varying covariates included smoking status since the quit date (t_0), recent smoking (t_1), and the time interval between the index (t_0)

and second (t_1) reports. The intercept was the only parameter that was allowed to vary across individuals in this model for model fit and convergence.

Results indicated that an increase in positive affect was marginally positively associated with delay discounting at the next report within 12 hours ($B = .207$, $SE = 0.109$, $p = .057$), whereas negative affect was unrelated to discounting change ($B = .014$, $SE = 0.118$, $p = .904$). Relations between affect and discounting did not differ as a function of baseline discount rate or time between reports (not shown).

Discussion

This study aimed to examine the dynamic relations among affect, momentary delay discounting, and smoking behavior in the context of quit attempt. Descriptive analyses revealed a troubling lack of variability in the EMA measure for delay discounting used in this study. Examination of the data revealed that, over half the time, participants chose the delayed reward on all 8 items administered in a report, even though the initial reward presented was tailored to an individual's baseline average discounting rate in an effort to promote variability in ED responses and make it easier to pinpoint an individual's momentary discounting rate in just 8 questions. Furthermore, if participants chose the delayed amounts for the first two or three delay discounting questions, they saw minuscule changes in smaller, sooner amount on subsequent choices due to the constraints placed on the range of initial values shown. This may have contributed to the lack of variability in later responses, as participants may have found the changes to small to notice or reconsider their choices.

In light of this lack of variability, I recoded the discounting data into a binary variable capturing whether an increase in discounting occurred, relative to baseline, at

each report. The results of multilevel models with this binary delay discounting variable indicated that an increase in positive affect was marginally associated with greater impulsivity within 12 hours. This mirrors the results for other cognitions in this study that showed marginal effects of momentary increases in positive affect on motivation to quit and abstinence confidence. Thus, positive affect may have small, enhancing effects on motivation, confidence, and impulsivity, although this requires further study given the small size of our sample and the marginal nature of these effects. Further research on the short-term effects of positive affect on cognitions may help elucidate the role of positive affects in cessation success.

Changes in impulsivity did not predict subsequent lapse risk in multilevel models. That is, momentary increases in discounting were not related to lapse risk up to 12 hours later. It is possible that the binary nature of delay discounting variable in this analysis was not sensitive enough to capture changes in one's impulsivity post-quit that might influence lapse likelihood. Alternatively, this null effect could result from selection of the wrong timeframe (i.e., perhaps a much shorter timeframe would be appropriate, as this might capture more immediate, impulsive lapses) or unmeasured or unmodeled moderators (beyond the trigger exposure composite tested here). It may also be that the kind of impulsivity measured by the delay discounting task is not, in fact, closely related to the processes that govern smoking behavior. Additional research is needed to better test relations between momentary impulsive decision making and short-term lapse risk.

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Appendix B

RA Initials: _____   Date: __ __ / __ __ / __ __
                                       M   D   Y

Participant ID#: ___ ___ ___ ___   Participant Initials: _____

CO Reading 1: ___ ___   CO Reading 2: ___ ___

CO Average: ___ ___

_____ **Staff use only. Please do not write above this line.** _____

Please answer the following questions.

FTND

1. How soon after you wake up do you smoke?
   - ☐ Within 5 minutes
   - ☐ 6-30 minutes
   - ☐ 31-60 minutes
   - ☐ After 60 minutes

2. Do you find it difficult to refrain from smoking in places where it is forbidden, e.g., in church, at the library, in a cinema, etc.
   - ☐ Yes   ☐ No

3. Which cigarettes would you hate most to give up?
   - ☐ First one in the morning   ☐ All others

4. Do you smoke more frequently during the first hours after waking than during the rest of the day?
   - ☐ Yes   ☐ No

5. Do you smoke when you are so ill that you are in bed most of the day?
   - ☐ Yes   ☐ No

_____

SHQ

1.   On average, how many cigarettes do you smoke a day?   ____ ____

2.   How long have you smoked at least this much?   ____ ____   ☐ months
                                                                      ☐ years

3.   How motivated are you stop smoking at this time?

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |

Not at all
motivated

Extremely
motivated

4. How old were you when you first tried a cigarette?   ____ ____

5. How old were you when you first started smoking daily / every day?   ____ ____

6. What is the total number of years you have smoked? Do not include any time you stayed off cigarettes for six months or longer.

____ ____

7. Do you smoke menthol cigarettes?   ❑ No   ❑ Yes

8. What type of cigarettes do you smoke?

☐ Regular with filter tip

☐ Regular with no filter

☐ Lights

☐ Ultra lights

☐ Other _____

9. During the period when you were smoking the most, on average, how many cigarettes per day were you smoking?

____ ____

10. Do you live with a spouse or partner who smokes cigarettes?

❑ Yes   ❑ No   ❑ Not currently living with a spouse or partner

11. Do any of the other people that you currently live with, other than a spouse or partner, smoke cigarettes?

❑ Yes   ❑ No   ❑ Not applicable

12. If someone in your household wants to smoke, does he/she have to leave (go outside) to smoke?

❑ Yes   ❑ No

13. How many times have you tried to quit smoking? Only count serious quit attempts.

_____ _____

14. After you started smoking regularly, what is the longest period of time you ever went without smoking?

☐ Less than a day

☐ 1-7 days

☐ 8-14 days

☐ 15 days to 1 month

☐ Between 1 and 3 months

☐ Between 3 and 6 months

☐ Between 6 and 12 months

☐ More than 1 year

15. How long ago was your last serious quit attempt?   _____ _____   ☐ months
                                                                     ☐ years

16. Here is a list of methods some people use to try to quit using tobacco. For each method, please indicate if you have EVER used that method to try to quit.

☐ Cold turkey (quit all at once with no cutting down and no help)
☐ Switched to lower tar or lower nicotine cigarettes
☐ Used special filters/cigarette holders to control the amount of smoke inhaled
☐ Gradually decreased the number of cigarettes smoked or other tobacco products used
☐ Great American Smokeout
☐ Self-help materials (e.g., brochures)
☐ Smoking tobacco cessation group or one-on-one cessation counseling
☐ A program that came with stop smoking medicine (e.g., Committed Quitters, Zyban Advantage Plan)
☐ Cessation telephone hotline (quitline)
☐ Hypnosis or acupuncture
☐ Quit with friends or relatives who were also trying to quit
☐ Nicotine gum
☐ Nicotine lozenge
☐ Nicotine patch
☐ Nicotine nasal spray or inhaler
☐ Zyban, Wellbutrin, or bupropion
☐ Chantix or varenicline

17. Here is a list of some reasons that people decide to quit smoking. Please check each reason that is important in your desire to make a quit attempt <u>NOW</u>.

☐ Health problems you experienced related to smoking or other tobacco use
☐ Cost of cigarettes or other tobacco products
☐ To test your willpower
☐ To be an example to your children
☐ Smoking related illness of friend or relative
☐ Part of adopting a healthy lifestyle
☐ Encouragement of a friend or relative
☐ Restrictions on smoking or other tobacco use at your workplace
☐ Restrictions on smoking or other tobacco use at home
☐ Dislike of being addicted to cigarettes or other tobacco products
☐ For your children's or family's health

18. If you try to quit smoking in the next 30 days, how likely is it that you will be successful?

	0	1	2	3	4	5	6	7	
Not at all likely									Very likely

19. Would you say that your health in general is...?

☐ Excellent

☐ Very good

☐ Good

☐ Fair

☐ Poor

☐ Don't know / not sure

20. In your opinion, how addicted to cigarettes are you?

1	2	3	4	5
Not at all addicted		Somewhat addicted		Extremely addicted

WISDM-68. Below are a series of statements about cigarette smoking. Please rate your level of agreement for each using the following scale:

	1	2	3	4	5	6	7	
Not True of Me At All							Extremely True of Me	

		1	2	3	4	5	6	7
1.	I enjoy the taste of cigarettes most of the time.	1	2	3	4	5	6	7
2.	Smoking keeps me from gaining weight.	1	2	3	4	5	6	7
3.	Smoking makes a good mood better.	1	2	3	4	5	6	7
4.	If I always smoke in a certain place it is hard to be there and not smoke.	1	2	3	4	5	6	7
5.	I often smoke without thinking about it.	1	2	3	4	5	6	7
6.	Cigarettes control me.	1	2	3	4	5	6	7
7.	Smoking a cigarette improves my mood.	1	2	3	4	5	6	7
8.	Smoking makes me feel content.	1	2	3	4	5	6	7
9.	I usually want to smoke right after I wake up.	1	2	3	4	5	6	7
10.	Very few things give me pleasure each day like cigarettes.	1	2	3	4	5	6	7
11.	It's hard to ignore an urge to smoke.	1	2	3	4	5	6	7
12.	The flavor of a cigarette is pleasing.	1	2	3	4	5	6	7
13.	I smoke when I really need to concentrate.	1	2	3	4	5	6	7
14.	I can only go a couple hours between cigarettes.	1	2	3	4	5	6	7
15.	I frequently smoke to keep my mind focused.	1	2	3	4	5	6	7
16.	I rely upon smoking to control my hunger and eating.	1	2	3	4	5	6	7
17.	My life is full of reminders to smoke.	1	2	3	4	5	6	7
18.	Smoking helps me feel better in seconds.	1	2	3	4	5	6	7
19.	I smoke without deciding to.	1	2	3	4	5	6	7
20.	Cigarettes keep me company, like a close friend.	1	2	3	4	5	6	7
21.	Few things would be able to replace smoking in my life.	1	2	3	4	5	6	7
22.	I'm around smokers much of the time.	1	2	3	4	5	6	7
23.	There are particular sights and smells that trigger strong urges to smoke.	1	2	3	4	5	6	7
24.	Smoking helps me stay focused.	1	2	3	4	5	6	7
25.	Smoking helps me deal with stress.	1	2	3	4	5	6	7
26.	I frequently light cigarettes without thinking about it.	1	2	3	4	5	6	7
27.	Most of my daily cigarettes taste good.	1	2	3	4	5	6	7
28.	Sometimes I feel like cigarettes rule my life.	1	2	3	4	5	6	7
29.	I frequently crave cigarettes.	1	2	3	4	5	6	7
30.	Most of the people I spend time with are smokers.	1	2	3	4	5	6	7
31.	Weight control is a major reason that I smoke.	1	2	3	4	5	6	7
32.	I usually feel much better after a cigarette.	1	2	3	4	5	6	7
33.	Some of the cigarettes I smoke taste great.	1	2	3	4	5	6	7

34. I'm really hooked on cigarettes.   1 2 3 4 5 6 7

35. Smoking is the fastest way to reward myself.   1 2 3 4 5 6 7

36. Sometimes I feel like cigarettes are my best friends.   1 2 3 4 5 6 7

37. My urges to smoke keep getting stronger if I don't smoke.   1 2 3 4 5 6 7

38. I would continue smoking, even if it meant I could spend less time on my hobbies and other interests.   1 2 3 4 5 6 7

39. My concentration is improved after smoking a cigarette.   1 2 3 4 5 6 7

40. Seeing someone smoke makes me really want a cigarette.   1 2 3 4 5 6 7

41. I find myself reaching for cigarettes without thinking about it.   1 2 3 4 5 6 7

42. I crave cigarettes at certain times of day.   1 2 3 4 5 6 7

43. I would feel alone without my cigarettes.   1 2 3 4 5 6 7

44. A lot of my friends or family smoke.   1 2 3 4 5 6 7

45. Smoking brings me a lot of pleasure.   1 2 3 4 5 6 7

46. Cigarettes are about the only things that can give me a lift when I need it.   1 2 3 4 5 6 7

47. Other smokers would consider me a heavy smoker.   1 2 3 4 5 6 7

48. I feel a strong bond with my cigarettes.   1 2 3 4 5 6 7

49. It would take a pretty serious medical problem to make me quit smoking.   1 2 3 4 5 6 7

50. When I haven't been able to smoke for a few hours, the craving gets intolerable.   1 2 3 4 5 6 7

51. When I do certain things I know I'm going to smoke.   1 2 3 4 5 6 7

52. Most of my friends and acquaintances smoke.   1 2 3 4 5 6 7

53. I love the feel of inhaling the smoke into my mouth.   1 2 3 4 5 6 7

54. I smoke within the first 30 minutes of awakening in the morning.   1 2 3 4 5 6 7

55. Sometimes I'm not aware that I'm smoking.   1 2 3 4 5 6 7

56. I'm worried that if I quit smoking I'll gain weight.   1 2 3 4 5 6 7

57. Smoking helps me think better.   1 2 3 4 5 6 7

58. Smoking really helps me feel better if I've been feeling down.   1 2 3 4 5 6 7

59. Some things are very hard to do without smoking.   1 2 3 4 5 6 7

60. Smoking makes me feel good.   1 2 3 4 5 6 7

61. Smoking keeps me from overeating.   1 2 3 4 5 6 7

62. My smoking is out of control.   1 2 3 4 5 6 7

63. I consider myself a heavy smoker.   1 2 3 4 5 6 7

64. Even when I feel good, smoking helps me feel better.   1 2 3 4 5 6 7

65. I reach for cigarettes when I feel irritable.   1 2 3 4 5 6 7

66. I enjoy the sensations of a long, slow exhalation of smoke.   1 2 3 4 5 6 7

67. Giving up cigarettes would be like losing a good friend.   1 2 3 4 5 6 7

68. Smoking is the easiest way to give myself a lift.   1 2 3 4 5 6 7

BIS-11 Directions: People differ in the ways they act and think in different situations. This is a test to measure some of the ways in which you act and think. Read each statement and circle the appropriate number on the right side of this page. Do not spend too much time on any statement. Answer quickly and honestly

		Rarely/ Never	Occa- sionally	Often	Almost always/ Always
1	I plan tasks carefully.	1	2	3	4
2	I do things without thinking.	1	2	3	4
3	I make-up my mind quickly.	1	2	3	4
4	I am happy-go-lucky.	1	2	3	4
5	I don't "pay attention."	1	2	3	4
6	I have "racing" thoughts.	1	2	3	4
7	I plan trips well ahead of time.	1	2	3	4
8	I am self-controlled.	1	2	3	4
9	I concentrate easily.	1	2	3	4
10	I save regularly.	1	2	3	4
11	I "squirm" at plays or lectures.	1	2	3	4
12	I am a careful thinker.	1	2	3	4
13	I plan for job security.	1	2	3	4
14	I say things without thinking.	1	2	3	4
15	I like to think about complex problems.	1	2	3	4
16	I change jobs.	1	2	3	4
17	I act "on impulse."	1	2	3	4
18	I get easily bored when solving thought problems.	1	2	3	4
20	I act on the spur of the moment.	1	2	3	4
21	I am a steady thinker.	1	2	3	4
22	I change residences.	1	2	3	4
23	I buy things on impulse.	1	2	3	4
24	I can only think about one thing at a time.	1	2	3	4
25	I change hobbies.	1	2	3	4
28	I spend or charge more than I earn.	1	2	3	4
30	I often have extraneous thoughts when thinking.	1	2	3	4
31	I am more interested in the present than the future.	1	2	3	4
32	I am restless at the theater or lectures.	1	2	3	4
33	I like puzzles.	1	2	3	4
34	I am future oriented.	1	2	3	4

Demo.

1. What is your age? _____ _____

2. Are you male or female? ❑ Male ❑ Female

3. Are you Hispanic/Latino/Latina? ❑ No ❑ Yes

4. Which one or more of the following would you say is your race? (Fill in all that apply)

       ☐ White
       ☐ Black / African American
       ☐ American Indian or Native American
       ☐ Alaska Native
       ☐ Asian
       ☐ Native Hawaiian or Pacific Islander
       ☐ Other Race (please specify: _____)

5. Which one of these groups would you say best describes your race? (Select one)

       ☐ White
       ☐ Black / African American
       ☐ American Indian or Native American
       ☐ Alaska Native
       ☐ Asian
       ☐ Native Hawaiian or Pacific Islander
       ☐ Other Race (please specify: _____)

6. Which one of the following best describes your current marital status?

       ☐ Married
       ☐ Divorced
       ☐ Widowed
       ☐ Separated
       ☐ Never married
       ☐ Not married, but living with a domestic partner

7. What is the highest grade or year of school that you completed?

☐ Never attended school or only attended kindergarten

☐ Grades 1 through 8 (elementary)

☐ Grades 9 through 11 (some high school)

☐ Grade 12 or GED (high school graduate)

☐ College 1-3 years (some college or technical school)

☐ College 4 years or more (4-year college graduate)

8. Please indicate your current work situation. (Fill in all that apply)

☐ Employed for wages

☐ Self-employed

☐ Out of work for less than 1 year

☐ Out of work for more than 1 year

☐ Homemaker

☐ Student

☐ Retired

☐ Unable to work / disabled

9. What is your annual household income from all sources?

☐ Less than $10,000

☐ $10,000-$19,999

☐ $20,000-$24,999

☐ $25,000-$34,999

☐ $35,000-$49,999

☐ $50,000-$74,999

☐ $75,000 or more

Tracking Performance and Decision Making During a Smoking Cessation Attempt

RA Initials: _____ Date: __ __ / __ __ / __ __
                                M   D   Y

Participant ID#: ___ ___ ___ ___

Participant Initials: _____

Visit #: 1   CO Reading 1: ___ ___

# of POPPACs dispensed today: ___ ___ Dose: □ 2-mg □ 4-mg
                                        Flavor: □ Cherry □ Mint

"Have you noticed any changes in your health since we last saw
you?"
❑ No
❑ Yes → Ask for information regarding: the nature, onset and duration, and
   severity of symptoms; what the participant has done to address them; and
   whether steps taken have helped. Record information on Adverse Event
   Form.

NOTES (Record anything unusual about the session):

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you have felt this way, on average, <u>since your last visit</u>.

	Very Slightly or Not At All	A Little	Moderately	Quite A Bit	Extremely
Interested	1	2	3	4	5
Distressed	1	2	3	4	5
Excited	1	2	3	4	5
Upset	1	2	3	4	5
Strong	1	2	3	4	5
Guilty	1	2	3	4	5
Scared	1	2	3	4	5
Hostile	1	2	3	4	5
Enthusiastic	1	2	3	4	5
Proud	1	2	3	4	5
Irritable	1	2	3	4	5
Alert	1	2	3	4	5
Ashamed	1	2	3	4	5
Inspired	1	2	3	4	5
Nervous	1	2	3	4	5
Determined	1	2	3	4	5
Attentive	1	2	3	4	5
Jittery	1	2	3	4	5
Active	1	2	3	4	5
Afraid	1	2	3	4	5

Please answer the following questions based on how you have felt or what you have noticed <u>since your last visit</u>. Answer based on how you have felt <u>in general</u> during this time.

	Strongly Disagree	Disagree	Feel Neutral	Agree	Strongly Agree
Food is not particularly appealing to me.	0	1	2	3	4
I am getting restful sleep.	0	1	2	3	4
I have been tense or anxious.	0	1	2	3	4
My level of concentration is excellent.	0	1	2	3	4
I awaken from sleep frequently during the night.	0	1	2	3	4
I have felt impatient.	0	1	2	3	4
I have felt upbeat and optimistic.	0	1	2	3	4
I have found myself worrying about my problems.	0	1	2	3	4
I have had frequent urges to smoke.	0	1	2	3	4
I have felt calm lately.	0	1	2	3	4
I have been bothered by the desire to smoke a cigarette.	0	1	2	3	4
I have felt sad or depressed.	0	1	2	3	4
I have been irritable, easily angered.	0	1	2	3	4
I want to nibble on snacks or sweets.	0	1	2	3	4
I have been bothered by negative moods such as anger, frustration, and irritability.	0	1	2	3	4
I have been eating a lot.	0	1	2	3	4
I am satisfied with my sleep.	0	1	2	3	4
I have felt frustrated.	0	1	2	3	4
I have felt hopeless or discouraged.	0	1	2	3	4
I have thought about smoking a lot.	0	1	2	3	4
I have felt hungry.	0	1	2	3	4
I feel that I am getting enough sleep.	0	1	2	3	4
It is hard to pay attention to things.	0	1	2	3	4
I have felt happy and content.	0	1	2	3	4
My sleep has been troubled.	0	1	2	3	4
I have trouble getting cigarettes off my mind.	0	1	2	3	4
It has been difficult to think clearly.	0	1	2	3	4
I think about food a lot.	0	1	2	3	4

CES-D

Below is a list of the ways you might have felt or behaved recently. Please tell me how often you have felt this way <u>since your last visit.</u>

	Rarely or none of the time (less than 1 day)	Some of the time (1-2 days)	Much of the time (3-4 days)	Most or all of the time (5-7 days)
I was bothered by things that usually don't bother me.	0	1	2	3
I did not feel like eating; my appetite was poor.	0	1	2	3
I felt that I could not shake off the blues even with help from my family or friends.	0	1	2	3
I felt I was just as good as other people.	0	1	2	3
I had trouble keeping my mind on what I was doing.	0	1	2	3
I felt depressed.	0	1	2	3
I felt that everything I did was an effort.	0	1	2	3
I felt hopeful about the future.	0	1	2	3
I thought my life had been a failure.	0	1	2	3
I felt fearful.	0	1	2	3
My sleep was restless.	0	1	2	3
I was happy.	0	1	2	3
I talked less than usual.	0	1	2	3
I felt lonely.	0	1	2	3
People were unfriendly.	0	1	2	3
I enjoyed life.	0	1	2	3
I had crying spells.	0	1	2	3
I felt sad.	0	1	2	3
I felt that people dislike me.	0	1	2	3
I could not get "going."	0	1	2	3

The following statements might be used by a person to describe her/his attitudes, opinions, interests, and other characteristics. Each statement is followed by two choices. Read the statement and decide which choice best describes you. Then mark your answer. Please answer every statement, even if you are not completely sure which answer is right for you. Read each statement carefully, but don't spend too much time deciding on the answer.

1	It is easy for me to become enthusiastic about things I am doing	❏True	❏False
2	I am quite effective at talking people into things	❏True	❏False
3	Some people say that I put my work ahead of too many other things	❏True	❏False
4	I have occasionally felt discouraged about something	❏True	❏False
5	I usually like to spend my free time with friends rather than alone	❏True	❏False
6	Often I get irritated at little annoyances	❏True	❏False
7	Many people try to push me around	❏True	❏False
8	Often when I get angry I am ready to hit someone	❏True	❏False
9	I like to stop and think things over before I do them	❏True	❏False
10	I am often nervous for no reason	❏True	❏False
11	I might enjoy riding in an open elevator to the top of a tall building under construction	❏True	❏False
12	I don't like to see religious authority overturned by so-called progress and logical reasoning	❏True	❏False
13	I can be deeply moved by a sunset	❏True	❏False
14	My table manners are not always perfect	❏True	❏False
15	I enjoy being in the spotlight	❏True	❏False
16	I set very high standards for myself in my work	❏True	❏False
17	When I am unhappy about something ❏ I tend to seek the company of a friend ❏ I prefer to be alone		
18	My mood often goes up and down	❏True	❏False
19	I know that certain people would enjoy it if I got hurt	❏True	❏False

20	When someone hurts me, I try to get even	❏True	❏False
21	I am more likely to be fast and careless than to be slow and plodding	❏True	❏False
22	It might be fun and exciting to be in an earthquake	❏True	❏False
23	Strict discipline in the home would prevent much of the crime in our society	❏True	❏False
24	When listening to organ music or other powerful music, I sometimes feel as if I am being lifted into the air	❏True	❏False
25	I have always been extremely courageous in facing difficult situations	❏True	❏False
26	I often feel happy and satisfied for no particular reason	❏True	❏False
27	I often keep working on a problem even if I am very tired	❏True	❏False
28	I am usually happier when I am alone	❏True	❏False
29	I suffer from nervousness	❏True	❏False
30	People often try to take advantage of me	❏True	❏False
31	I admit that I sometimes enjoy hurting someone physically	❏True	❏False
32	Basically, I am a happy person	❏True	❏False
33	I often prefer to "play things by ear" rather than to plan ahead	❏True	❏False
34	Of these two situations, I would dislike more ❏ Having a pilot announce that the plane has engine trouble and it may be necessary to make an emergency landing ❏ Working in the fields digging potatoes		
35	The best way to achieve a peaceful world is to improve people's morals	❏True	❏False
36	Sometimes thoughts and images come to me without any effort on my part	❏True	❏False
37	At time I have been envious of someone	❏True	❏False
38	I live a very interesting life	❏True	❏False
39	People find me forceful	❏True	❏False
40	I am a warm person rather than cool and distant	❏True	❏False
41	I often find myself worrying about something	❏True	❏False

42	People often say mean things about me	❏True	❏False
43	I see nothing wrong with stepping on people's toes a little if it is to my advantage	❏True	❏False
44	When faced with a decision I usually take time to consider and weigh all possibilities	❏True	❏False
45	I usually do not like to be a "follower"	❏True	❏False
46	I would enjoy trying to cross the ocean in a small but seaworthy sailboat	❏True	❏False
47	I am opposed to more censorship of books and movies because it would go against free speech	❏True	❏False
48	If I wish, I can imagine (or daydream) some things so vividly that it's like watching a good movie or hearing a good story	❏True	❏False
49	My opinions are always completely reasonable	❏True	❏False
50	Every day I do some things that are fun	❏True	❏False
51	When I work with others I like to take charge	❏True	❏False
52	People say that I drive myself hard	❏True	❏False
53	I am too sensitive for my own good	❏True	❏False
54	My "friends" have often betrayed me	❏True	❏False
55	I enjoy a good brawl	❏True	❏False
56	I am very level-headed and usually have both feet on the ground	❏True	❏False
57	Of these two situations, I would dislike more: ❏ Having to walk around all day on a blistered foot ❏ Sleeping out on a camping trip in an area where there are rattlesnakes		
58	It is a pretty unfeeling person who does not feel love and gratitude toward her/his parents	❏True	❏False
59	Sometimes I can change noise into music by the way I listen to it	❏True	❏False
60	If I have a humiliating experience I get over it very quickly	❏True	❏False
61	I have at times eaten too much	❏True	❏False
62	I usually find ways to liven up my day	❏True	❏False
63	In most social situations I like to have someone else take the lead	❏True	❏False

64	I am not a terribly ambitious person	❑True	❑False
65	I am more of a "loner" than most people	❑True	❑False
66	I would be more successful if people did not make things difficult for me	❑True	❑False
67	Sometimes I hit people who have done something to deserve it	❑True	❑False
68	I almost never do anything reckless	❑True	❑False
69	Of these two situations I would dislike more ❑ Being out on a sailboat during a great storm at sea ❑ Having to stay home every night for two weeks with a sick relative		
70	I would prefer to see ❑ Stricter observance of major religious holidays ❑ Greater acceptance of nontraditional families, like single-parent families		
71	I can often somehow sense the presence of another person before I actually see him or her	❑True	❑False
72	I have always been completely fair to others	❑True	❑False
73	People rarely try to take advantage of me	❑True	❑False
74	Most mornings the day ahead looks bright to me	❑True	❑False
75	I am very good at influencing people	❑True	❑False
76	I enjoy putting in long hours	❑True	❑False
77	For me one of the best experiences is the warm feeling of being in a group of good friends	❑True	❑False
78	Occasionally I have strong feelings (like anxiety or anger) without really knowing why	❑True	❑False
79	I would rather turn the other cheek than get even when someone treats me badly	❑True	❑False
80	I often act on the spur of the moment	❑True	❑False
81	Of these two situations I would dislike more ❑ Being at the circus when two lions suddenly get loose down in the ring ❑ Bringing my whole family to the circus and then not being able to get in because a clerk sold me tickets for the wrong night		
82	Higher standards are what this country needs most	❑True	❑False
83	The sound of a voice can be so fascinating to me that I can just go on listening to it	❑True	❑False
84	I have at times been angry with someone	❑True	❑False

85	Most days I have moments of real fun or joy	❑True	❑False
86	I often act without thinking	❑True	❑False
87	When it is time to make decisions, others usually turn to me	❑True	❑False
88	I often keep working on a problem long after others would have given up	❑True	❑False
89	I prefer to work alone	❑True	❑False
90	Minor setbacks sometimes irritate me too much	❑True	❑False
91	People often just use me instead of treating me as a person	❑True	❑False
92	I don't like to start a project until I know exactly how to do it	❑True	❑False
93	Of these two situations I would dislike more ❑ Riding a long stretch of rapids in a canoe ❑ Waiting for someone who's late		
94	I am disgusted by dirty language	❑True	❑False
95	Some music reminds me of pictures or changing patterns of color	❑True	❑False
96	I always tell the truth	❑True	❑False
97	I often feel sort of lucky for no special reason	❑True	❑False
98	I do not like to be the center of attention on social occasions	❑True	❑False
99	I work just hard enough to get by without overdoing it	❑True	❑False
100	I have few or no close friends	❑True	❑False
101	I sometimes get very upset and tense as I think of the day's events	❑True	❑False
102	Some people are against me for no good reason	❑True	❑False
103	I can't help but enjoy it when someone I dislike makes a fool of herself/himself	❑True	❑False
104	I seldom feel really happy	❑True	❑False
105	Of these two situations I would dislike more ❑ Being chosen as the target for a knife-throwing act ❑ Being sick to my stomach for 24 hours		
106	No decent person could ever think of hurting a close friend or relative	❑True	❑False

107	I can so completely wander off into my own thoughts while doing a routine task that I actually forget that I am doing a task and then find a few minutes later that I have finished it	❏True	❏False
108	Sometimes I'm a bit lazy	❏True	❏False
109	Every day interesting and exciting things happen to me	❏True	❏False
110	I am quite good at convincing others to see things my way	❏True	❏False
111	I push myself to the limits	❏True	❏False
112	I am happiest when I am with people most of the time	❏True	❏False
113	I am often troubled by guilt feelings	❏True	❏False
114	I know that people have spread false rumors about me on purpose	❏True	❏False
115	I like to watch a good, vicious fight	❏True	❏False
116	Before I get into a new situation I like to find out what to expect from it	❏True	❏False
117	I perform for an audience whenever I can	❏True	❏False
118	I am not at all sorry to see many of the traditional values change	❏True	❏False
119	I can sometimes recall certain past events in my life so clearly and vividly that it is like living them again, or almost so	❏True	❏False
120	Never in my whole life have I taken advantage of anyone	❏True	❏False
121	In my spare time I usually find something interesting to do	❏True	❏False
122	In social situations I usually allow others to dominate the conversation	❏True	❏False
123	I like to try difficult things	❏True	❏False
124	I prefer not to "open up" too much, not even to friends	❏True	❏False
125	My mood sometimes changes from happy to sad, or sad to happy, without good reason	❏True	❏False
126	I have often been lied to	❏True	❏False
127	Sometimes I just like to hit someone	❏True	❏False
128	I am a cautious person	❏True	❏False

129	Of these two situations I would dislike more ❏ Being in a flood ❏ Carrying a ton of bricks from the backyard to the basement		
130	At times I somehow feel the presence of someone who is not physically there	❏True	❏False
131	I have sometimes felt slightly hesitant about helping someone who asked me to	❏True	❏False
132	My feelings are hurt rather easily	❏True	❏False
133	For me life is a great adventure	❏True	❏False
134	I do not like to organize other people's activities	❏True	❏False
135	I find it really hard to give up on a project when it proves too difficult	❏True	❏False
136	I often prefer not to have people around me	❏True	❏False
137	I often lose sleep over my worries	❏True	❏False
138	When people are friendly they usually want something from me	❏True	❏False
139	When people insult me I try to get even	❏True	❏False
140	I usually make up my mind through careful reasoning	❏True	❏False
141	Of these two situations I would like more ❏ Being seasick every day for a week while on an ocean voyage ❏ Having to stand on the window ledge of the 25th floor of a hotel because there is a fire in my room		
142	People should obey moral laws more strictly than they do	❏True	❏False
143	I have never felt that I was better than someone else	❏True	❏False
144	I always seem to have something exciting to look forward to	❏True	❏False
145	I don't enjoy trying to convince people of something	❏True	❏False
146	I like hard work	❏True	❏False
147	Never in my whole life have I wished for anything that I was not entitled to	❏True	❏False
148	I am rather aloof and maintain distance between myself and others	❏True	❏False
149	There are days when I am "on edge" all the time	❏True	❏False

150	I have had a lot of bad luck	❑True	❑False
151	Sometimes I seem to enjoy hurting people by saying mean things	❑True	❑False
152	I generally do not like to have detailed plans	❑True	❑False
153	It might be fun to learn to walk a tightrope	❑True	❑False
154	High moral standards are the most important thing parents can teach their children	❑True	❑False
155	Sometimes I am so immersed in nature or in art that I feel as if my whole state of consciousness has somehow been temporarily changed	❑True	❑False

Electronic Diary Measures
Random Prompt Questions

1. Subject ID (Pre-filled field)

2. Timestamp (Automatically filled field)

3. Form Type (Pre-quit, post-quit; Automatically filled field)

4. AnsTime time checkbox completed: ED would like you to complete a report now. Check the box below to start a new report.

<u>RIGHT NOW</u>

1. <u>Welcome: Please indicate which of the following 2 options you prefer by tapping the button below your choice. At least 1 of these choices is REAL!</u>
    'Next'

2. <u>Would you prefer? [THIS ITEM IS SHOWN ON EVERY 4TH REPORT ON AVERAGE. ONE OF THESE ITEMS WILL BE TREATED AS REAL AND THE SUBJECT WILL RECEIVE THE AMOUNT SELECTED VIA GIFT CARD OR DEBIT CARD TRANSFER.]</u>
    A. $25.00 in 1 week
    B. "$50 in 2 weeks" OR "$75 in 2 weeks" OR "$100 in 2 weeks"

3. <u>Would you prefer?</u>
    Options derived based on k and value/delay amounts
    <u>A.</u>
    <u>B.</u>

4. <u>Would you prefer?</u>
    Options derived based on response to previous item
    <u>A.</u>
    <u>B.</u>

5. <u>Would you prefer?</u>
    Options derived based on response to previous item
    <u>A.</u>
    <u>B.</u>

6. <u>Would you prefer?</u>
    Options derived based on response to previous item
    <u>A.</u>
    <u>B.</u>

7. <u>Would you prefer?</u>

 Options derived based on response to previous item
A.
B.

8.   Would you prefer?
 Options derived based on response to previous item
A.
B.

9.   Would you prefer?
 Options derived based on response to previous item
A.
B.

10.   Would you prefer?
 Options derived based on response to previous item
A.
B.

11.   Please answer the next questions based on how you have FELT IN GENERAL in the PAST 15 MINUTES.

IN THE LAST 15 MINUTES…

12. I have felt CALM lately. [SHOWN ONLY 20% OF THE TIME]

    1   2   3   4   5
    Disagree   Agree

13. I have felt IMPATIENT.

    1   2   3   4   5
    Disagree   Agree

14. I have been TENSE or ANXIOUS.

    1   2   3   4   5
    Disagree   Agree

15. . I have felt ENTHUSIASTIC

1   2   3   4   5
very slightly   extremely
or not at all

16. FOOD IS NOT PARTICULARLY APPEALING to me [SHOWN ONLY 20% OF THE TIME]

1   2   3   4   5
Disagree   Agree

17. I have felt RESTLESS

1   2   3   4   5
very slightly   extremely
or not at all

18. I have felt DISTRESSED

1   2   3   4   5
very slightly   extremely
or not at all

19. It has been DIFFICULT TO THINK CLEARLY

1   2   3   4   5
Disagree   Agree

20. I have felt HAPPY AND CONTENT [SHOWN ONLY 20% OF THE TIME]

1   2   3   4   5
Disagree   Agree

21. I have trouble getting cigarettes OFF MY MIND

1   2   3   4   5
Disagree   Agree

22. I have felt UPSET

1   2   3   4   5

very slightly   extremely
or not at all

23. My level of CONCENTRATION is EXCELLENT [SHOWN ONLY 20% OF THE TIME]

1   2   3   4   5
Disagree   Agree

24. I have felt SAD or DEPRESSED.

1   2   3   4   5
Disagree   Agree

25. I have been bothered by the DESIRE TO SMOKE a cigarette.

1   2   3   4   5
Disagree   Agree

26. I have felt UPBEAT and OPTIMINISTIC [SHOWN ONLY 20% OF THE TIME]

1   2   3   4   5
Disagree   Agree

27. I have felt INTERESTED

1   2   3   4   5
very slightly   extremely
or not at all

28. I think about FOOD a lot.

1   2   3   4   5
Disagree   Agree

29. I have felt TIRED or FATIGUED

1   2   3   4   5

very slightly   extremely
or not at all

30. How WILLING are you TO WORK HARD at quitting smoking?

1	2	3	4	5	6	7
Not at all						Extremely

31. How CONFIDENT are you that you could quit smoking for good?

1	2	3	4	5	6	7
Not at all						Extremely

32. JUST BEFORE PROMPT-Where were you?

- ☐ Home
- ☐ Work/school
- ☐ Vehicle
- ☐ Restaurant/Bar
- ☐ Public Place
- ☐ Others' Home
- ☐ Outside
- ☐ Other

33. JUST BEFORE PROMPT-What where you doing?

- ☐ Work/school
- ☐ Chores
- ☐ Driving/Riding
- ☐ Telephone
- ☐ Eating
- ☐ Drinking
- ☐ Exercise
- ☐ Leisure
- ☐ Talking
- ☐ Inactive

34. PAST 2 HOURS…- Had anything to DRINK?

- ☐ <u>No</u>
- ☐ Alcohol

□ Coffee
□ Other with caffeine
□ Other without caffeine

35. PAST 15 MINUTES…Have you been with SOMEONE WHO WAS SMOKING?

YES   NO

36. PAST 15 MINUTES …Have you had a CHANCE TO SMOKE?

YES   YES, WITH DIFFICULTY   NO

37. Have you had a STRONG TEMPTATION/URGE to smoke in the last 30 minutes?

YES   NO

38. PAST 2 HOURS… Has a significant STRESSFUL EVENT occurred?

YES   NO

39. If YES to 39. PAST 2 HOURS… What type of event was it?

□ NEW interpersonal stress
□ NEW work/school stress
□ NEW financial stress
□ NEW health stress
□ NEW trauma
□ NEW other stress
□ ONGOING interpersonal stress
□ ONGOING work/school stress
□ ONGOING financial stress
□ ONGOING health stress
□ ONGOING trauma
□ ONGOING other stress

40. If YES to 39. PAST 2 HOURS… How stressful was it?

1   2   3   4   5   6   7
Not at all   Extremely

41. If YES to 39. PAST 2 HOURS… How did you COPE with the stress?

- ☐ <u>Thoughts (distracting/helpful)</u>
- ☐ <u>Behavior (distracting/helpful)</u>
- ☐ <u>Prayer/ meditation/ acceptance</u>
- ☐ <u>Smoking</u>
- ☐ <u>I did not try to cope</u>

42. If anything but "I did not try to cope" on 41. PAST 2 HOURS… How much did coping HELP?

<u>1</u>   <u>2</u>   <u>3</u>   <u>4</u>   <u>5</u>
<u>Not at all   Very Much</u>

43. If anything but "I did not try to cope" on 41. PAST 2 HOURS… How much EFFORT did coping require?

<u>1</u>   <u>2</u>   <u>3</u>   <u>4</u>   <u>5</u>
<u>Not at all   Very Much</u>

44. If "I did not try to cope" on 41.What got in the way of coping?
- ☐ <u>Did not need to cope</u>
- ☐ <u>Did not know how to cope</u>
- ☐ <u>Did not think of coping</u>
- ☐ <u>Did not think coping would help</u>
- ☐ <u>Too tired to cope</u>

45. How many cigarettes have you smoked IN THE LAST 2 HOURS? _____

46. How many cigarettes have you smoked SINCE THE LAST REPORT? _____

47. How many LOZENGES have you used SINCE THE LAST REPORT? _____

48. Press Next to Exit
Then press the house icon and click on the Minicog program icon to complete the letter task.
'Next'

Curriculum Vitae

HARUKA MINAMI

I. EDUCATION

2011– 2012   *Pre-doctoral Clinical Internship.* Alpert Medical School of Brown University, Providence, RI

2007– 2012   *Doctor of Philosophy*, Clinical Psychology, Rutgers University, Piscataway, NJ

2009   *Master of Science*, Clinical Psychology, Rutgers University, Piscataway, NJ

2003   *Bachelor of Arts*, Psychology, New York University, New York, NY

II. PUBLICATIONS

Peer-Review Journal

Minami, H., McCarthy, D. E., Jorenby, D. E., Baker, T. (2011). An ecological momentary assessment analysis of the relations among coping, affect and smoking during a quit attempt. Addiction, 106(3), 641-50.

McCarthy, D. E., Jorenby, D. E., Minami, H., & Yeh, V. M. (2009). Treatment options in smoking cessation: what place for Bupropion Sustained-Release? Clinical Medicine: Therapeutics, 1, 683-696.

Silva, R., Bath, E., Beer, D., Minami, H., Engle, L. (2007). Administrative issue in child psychiatry. Psychiatric Quarterly, 78(3), 199-210.

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Silva, R. R., Gallagher, R., Minami, H. (2006). Cognitive-behavioral treatments for anxiety disorders in children and adolescents. Primary Psychiatry, 13(5), 68–76.

Silva, R. R., Gabbay, V., Minami, H., Munoz-Silva, D., Alonso, C. (2005). When to use antidepressant medication in youths. Primary Psychiatry, 12(9), 42–50.

Witek, M. W., Rojas, V., Alonso, C., Minami, H., Silva, R. R. (2005). Review of benzodiazepine use in children and adolescents. Psychiatric Quarterly, 76(3), 283–297.

Liu, F., Muniz, R., Minami, H., Silva, R. R. (2005). Review and comparison of the long acting methylphenidate preparations. Psychiatric Quarterly, 76(3), 259–269.

Book Chapter

McCarthy, D. E., Baker, T. B., Minami, H., & Yeh, V. (in press). Applications of Contemporary Learning Theory in the Treatment of Drug Abuse. Invited chapter in S. Reilly and T. R. Schachtman (Eds.), Associative Learning and Conditioning: Human and Animal Applications. New York: Oxford University Press.

III. RESEARCH EXPERIENCE

2007 – 2011	**Graduate Assistant** Smoking Cessation Laboratory Rutgers, The State University of New Jersey, Piscataway, NJ Danielle E. McCarthy, Ph.D., Advisor/Supervisor
2006 – 2007	**Research Technician** Child and Adolescent Psychiatry New York University School of Medicine/Bellevue Hospital, NY Raul R. Silva, M.D., Deputy Director/Supervisor
2003 – 2006	**Project Associate** Child & Adolescent Trauma Treatment & Services Consortium Project New York University School of Medicine/Bellevue Hospital, NY Raul R. Silva, M.D., Principal Investigator
2003 – 2003	**Research Assistant** Bellevue Hospital Psychiatric Department, New York, NY Danielle Richarme, M.S., Supervisor
2002 – 2003	**Research Assistant** Motivation Lab New York University Psychology, New York, NY Heidi Grant, Ph.D. & Gabriele Oettingen, Ph.D., Supervisors

IV. CLINICAL EXPERIENCE

Nov 2011 – Feb 2012	Psychology Resident (Addiction Counselor/ Evaluator) Alcohol and Drug Treatment Services Program (Partial Hospital) Butler Hospital Providence, RI
Jul 2011 – Oct 2011	Psychology Resident (Therapist -Individual & Group/ Evaluator) Psychiatric Partial Hospital & Consultation Program Butler Hospital Providence, RI
2009 – 2011	Therapist/Behavioral Health Specialist Behavioral Medicine at Monument Square Family Medicine New Brunswick, NJ

2009 – 2010	Evaluator/Therapist The Program for Addictions Consultation and Treatment Rutgers, The State University of New Jersey, Piscataway, NJ
2009 – 2009	IPT Therapist Interpersonal Psychotherapy Rutgers, The State University of New Jersey, Piscataway, NJ
2008 – 2010	Therapist The Psychological Clinic Rutgers, The State University of New Jersey, Piscataway, NJ
2007 – 2011	Smoking Cessation Counselor/Supervisor for junior counselors Smoking Cessation Laboratory Rutgers, The State University of New Jersey, Piscataway, NJ
2003 – 2006	Clinical Interviewer Child & Adolescent Trauma Treatment & Services Consortium Project New York University School of Medicine/Bellevue Hospital, NY