THE EFFECT OF SMOKING AVAILABILITY ON URGE, MOOD, AND REACTION TIME

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ABSTRACT

Classical conditioning is one mechanism responsible for the maintenance of smoking behavior. In addition to environmental, sensorimotor, or emotional cues, certain cognitions (e.g. when a person believes they can smoke next) may also influence reactivity to smoking related cues and overall smoking motivation. The purpose of this study is to elucidate the linearity (or curvilinearity) of the relationship between smoking availability and self-reported urge, self-reported mood, and reaction time. After collecting baseline measurements, 85 (59 male, 26 female) non-treatment seeking, regular, heavy (M=15 cigarettes/day) smokers were randomly assigned one of three conditions: smoke in 20 minutes, smoke in 3 hours, and smoke in 24 hours. Planned comparisons revealed that the 24 hour condition had the greatest decrease in positive mood compared to the other conditions. The linearity of this relationship is discussed. The analyses also indicated that the 24 hour group had significantly greater reaction time than the 3 hour condition, with a trending curvilinear relationship. Treatment implications of smoking availability as an important cognitive factor in drug-use behavior are discussed.

Keywords: Smoking availability, Drug-use opportunity, Urge, Craving, Cue-reactivity, Mood, Reaction time, Smoking

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INTRODUCTION

Tobacco smoking is the leading preventable cause of disease, disability, and mortality in the United States (WHO, 2011). Nevertheless, approximately 20% of adults in the United States smoke cigarettes (CDC, 2009). Among smokers who make an attempt to quit, the large majority are unable to maintain long term abstinence (Cohen et al., 1989). Greater knowledge of the mechanisms that maintain smoking behavior and promote relapse is necessary to inform the development of improved smoking cessation therapies.

Learning theorists posit that classical conditioning is an important factor underlying the development and maintenance of drug-taking behavior, including cigarette smoking. It is believed that exposure to stimuli/cues that have been paired with nicotine, the primary pharmacologically active ingredient in cigarette smoke, result in conditioned responding in smokers that increase smoking motivation and behavior (Rose, 1996). Various types of stimuli have been conceptualized as smoking-related conditioned stimuli including environmental stimuli (e.g., a pack of cigarettes, seeing someone else smoking) (Juliano & Brandon, 1998; Carter & Tiffany, 2001, Wertz & Sayette, 2001), the sensorimotor aspects of smoking (e.g., handling a cigarette, sensations in mouth and throat) (Rose, Behm, Westerman, Bates, & Salley, 2003) and emotions (e.g., stress) (McKee et al., 2010). A substantial body of research investigating smokers reactions to cues, or cue reactivity, has demonstrated that exposure to smoking associated cues increases self-reported urge to smoke (Juliano & Brandon, 1998; Carter & Tiffany, 2001; Wertz & Sayette, 2001), smoking behavior (e.g. number of cigarettes consumed, total number of puffs, duration of puff, and inter-puff-interval) (Payne, Schare, Levis, & Colletti, 1991), and certain physiological responses (e.g. skin conductance, heart rate, and sweat gland activity) (Carter & Tiffany, 1999). Reactivity to smoking related cues among recent

quitters has also been shown to predict relapse to smoking (Waters, Schiffman, Sayette, Paty, Gwaltney, & Balabanis, 2003).

Similar to conceptualizing emotional states, like stress, as conditioned stimuli that elicit smoking behavior, cognitions or certain beliefs have also been conceptualized as moderators of reactions to smoking stimuli (Lazev, Herzog, & Brandon, 1999) or may act as conditioned stimuli in their own right (Juliano & Brandon, 1998). A factor that has been investigated as an important component of cue reactivity is the drug taker's knowledge that the drug is available for use. This cognition is called smoking availability, also known as drug use opportunity, which is the belief of if and when a person thinks they can smoke. As described in more detail below, it has been demonstrated that reactivity to smoking-associated stimuli is enhanced when smokers believe that there will be an opportunity to smoke. As described in detail below, knowledge that a drug is available for use has been shown to affect self-reported urge, affect, and physiological reactions to cues (Juliano & Brandon, 1998; Carter & Tiffany, 2001; Droungas, Ehrman, Childress, & O'Brian, 1995; Wertz & Sayette, 2001a; Wertz & Sayette, 2001b; Sayette, Lowenstein, Krichner, & Travis, 2005).

Research on Smoking Availability

It has been shown that when smoking is considered "available," self-reported urge is greater than when smoking is considered "unavailable" (Juliano & Brandon, 1998; Carter & Tiffany, 2001; Droungas, Ehrman, Childress, & O'Brian, 1995; Wertz & Sayette, 2001a; Wertz & Sayette, 2001b; Bailey, Goedeker, & Tiffany, 2009). The definition of "available" and "unavailable" varies from study to study. Mostly, "available" refers to the ability to use the drug within the experimental session, which is also referred to as "local availability;" however, at what time during the experimental session fluctuates between studies. "Unavailable" is usually

described as not being able to use their drug of choice until after the experimental session ends, which is also referred to as "distal availability;" however, the time that each experimental session lasts also varies.

Droungas and colleagues (1995) were some of the first researchers to directly manipulate smoking availability in an experimental setting. They randomly assigned participants to a group that could smoke following a cue-reactivity session or to a group where they were not allowed to smoke. Only those who thought smoking was available reported a greater desire to smoke when presented with smoking-related cues compared to baseline and compared to neutral or unpleasant cues. They also recording actual smoking behavior and found that the smoking available group smoked faster after the smoking cues compared to the neutral cues.

In 1998 Juliano and Brandon expanded upon this finding by manipulating smoking availability to understand how cognitive cues influenced reactivity to smoking versus non-smoking stimuli. They found that smokers who were instructed that smoking would be available soon (20 minutes) reported stronger urges than those who were instructed that smoking would not be available for 3 hours. In addition, they also found that the smoking availability instructions interacted with reactivity to smoking stimuli such that only smokers who thought smoking was available soon reported increases in self-reported urge in the presence of smoking stimuli. Their manipulation had no effect on positive or negative affect. One additional measure included in this study was reaction time, based on the idea that response time can function as a behavioral measure of cognitive reactivity to smoking stimuli and that self-reported urge should be associated with increased reaction times (Tiffany, 1990). Juliano & Brandon found that reaction time increased in the presence of smoking stimuli only for those who were told smoking was unavailable. This research focused on both local and distal availability.

Carter and Tiffany (2001) utilized a cue-availability paradigm to determine the effects of local cigarette availability on cue-reactivity. On each trial, heavy smokers were exposed to either a lit cigarette or a cup of water behind a clear locked box set into the wall and were given a 0%, 50%, or 100% chance of getting the cue. Overall, craving for cigarettes was stronger than craving for the water cue. There was a significant interaction between cue type and probability on craving and positive mood, such that for the cigarette trials both craving and positive mood became significantly larger as the probability of getting the cue increased (from 0% to 100%), while craving and positive mood during the water condition remained the same regardless of probability. Negative mood significantly decreased as cigarette availability increased, with no changes in negative mood during any of the water conditions. These findings relate to previous research that indicate if smoking is available, then self-reported urge to smoke increases. Interestingly, this study looks only at three probability levels of local availability (having a 0, 50, or 100% chance being able to smoke immediately). By doing so, this paradigm lacks real world applicability. Very rarely are smokers in situations where they have a 0, 50, or 100% chance to smoke immediately, as in Carter and Tiffany's manipulation. Facing a probability of being able to smoke is more likely to occur when thinking about future smoking opportunities (i.e. distal cigarette availability situations).

Additional studies manipulated local smoking opportunity to determine its effect on attentional bias in smokers (Wertz and Sayette, 2001a). Participants in this study abstained from smoking for 12 hours before their session. They were randomly assigned to one of three conditions in which they either would, would not, or might be allowed to smoke during the hour-long experimental session. Then all participants completed the Emotional Stroop task. All of the conditions had interference with the smoking-related words compared to the neutral words, but

smoking availability modulated the degree of interference. Those who thought they would be able to smoke during the session showed the most interference (Wertz & Sayette, 2001a). Opportunity to smoke instructions also had an effect on self-reported urge, but was only significant when light smokers were excluded from the analysis. The direction of the finding is similar to the attentional bias finding such that the 'smoking is available' group reported significantly higher urges than the 'smoking is not available' group. The 'maybe available' group fell in the middle. Interestingly urge scores were uncorrelated with interference on the Emotional Stroop task across conditions (Wertz & Sayette, 2001a).

Expanding upon this finding, Wertz and Sayette (2001b) reviewed the effects of availability on self-reported urge across a number of studies. Not all of the studies included in their review directly manipulated smoking availability or drug use opportunity. Therefore, an indirect measure of smoking availability/ drug use opportunity was used. The review compared studies in which users were not seeking treatment, and therefore would expect to be able to use their drug of choice after the experiment ended (usually within an hour), with studies that used treatment-seeking drug users who would not expect to be able to use their drug. They found that non-treatment seeking users ('available' condition) reported large urges averaging 69.2% of the scale maximum, while treatment seeking users who did not anticipate their drug to be available ('unavailable' condition) reported urges averaging 37.2% of the scale maximum. This indirect measuring of smoking availability is consistent with their experimental findings that those who perceive drug-use as available have greater urge ratings than those who do not perceive the drug as available.

Recent studies have expanded on previous research by including manipulations of distal availability, utilizing brain imaging techniques, as well as studying smoking availability in

ecologically valid settings (i.e., Bailey, Goedeker, & Tiffany, 2009; Wilson, Sayette, Delgado, & Fiez, 2005; Wilson, Sayette, Delgado & Fiez, 2008; Wilson, Sayette, & Fiez, 2011; Dar et al., 2010). In 2009, Bailey, Goedeker, and Tiffany used the same cue-availability paradigm from the 2001 study to manipulate both local and distal smoking availability. Smokers were divided into two groups, one group had participants smoke as usual, and another group of participants were instructed to abstain for 24 hours. After 24 hours they were exposed to the cue-availability paradigm. The findings from the 2001 study were replicated. Participants reported larger craving during cigarette trials as compared to water trials as well as increased craving as smoking availability increased. The deprived smokers exhibited generalized increases in craving. Although this study replicated Carter and Tiffany's (2001) previous findings, consistent with previous research results (Wertz & Sayette, 2001a, b; Juliano & Brandon, 1998), this study was not able to show that deprived smokers were more sensitized to cigarette cues and increasing cigarette availability than the 'smoke as usual' group.

Wilson and colleagues utilized brain imaging to determine the effect of smoking opportunity on cue-elicited brain activation (Wilson, Sayette, Delgado, & Fiez, 2005; Wilson, Sayette, Delgado, & Fiez, 2008, Wilson, Sayette, & Fiez, 2011). In their initial study (2005) they found they found that smoking cues produced differing neural activations compared to neutral cues, which is consistent with previous research. They also found an interaction between instruction (smoking is available or unavailable) and cue-elicited brain activation, with those expecting to smoke soon having greater medial orbitofrontal cortex activation and less lateral orbitofrontal cortex activation. Interestingly, there was no effect of smoking availability on self-reported urge (Wilson, Sayette, Delgado, & Fiez, 2005). The same protocol also looked at the effect of smoking availability on responses to monetary gain and loss (Wilson, Sayette, Delgado,

& Fiez, 2008). Those who were instructed that they could smoke during the study (available condition) had smaller responses to monetary gains and losses in the caudate nucleus than those in the unavailable condition. The 2011 study found that the activation patterns were different for those who were quitting-motivated (i.e. wanted to quit in 2 weeks) and those who were quitting-unmotivated (i.e. had no desire to quit at the time of the experiment). Again they observed cue-elicited activation in the prefrontal cortex in those expecting to smoke in seconds, compared to those expecting to smoke in hours, regardless of quitting motivation. However, interregional correlations with areas of the prefrontal cortex differed depending on quitting motivation.

In addition to utilizing brain imaging modalities to study smoking availability, researchers have also studied smoking availability in naturalistic settings. Dar and colleagues (2010) evaluated the relationship between craving to smoke and deprivation, anticipation of smoking, and actual smoking in flight attendants. Their results illustrate that craving increased as flight duration elapsed, and peaked as landing approached, regardless of flight length. Therefore, as smoking became more available, craving to smoke increased. There was significant difference in craving reports when comparing the equivalent time points on the short flight (right before landing) and long flight (about 4 hours into a 8-13 hour flight), with craving rated higher in the short flight (smoking is available soon) than in the equivalent time in the long flight (smoking is unavailable).

Purpose and Objectives for Current Study

Based on the above research, it is well supported that urge increases in smokers who believe they can smoke soon compared to those who believe smoking is unavailable. Although some studies varied the probability of smoking being available immediately, to our knowledge, no study has examined more than two time points of actual availability. In order to determine the

linearity of the relationship a third time point must be used. Although Carter and Tiffany (2001) and Wilson & Sayette (2001a) include three probabilities, their use of probabilities instead of time points makes it difficult to determine the linearity of the relationship between the amount of time before smoking is available and smoking motivation. The present study adds a third availability group to determine if the relationship between availability and smoking motivation is linear or curvilinear in nature.

Different theories of addiction have different predictions on whether the relationship between smoking availability would be linear or curvilinear as a function of time. Theories of anticipation of withdrawal would posit that cues associated with withdrawal (i.e. the inability to smoke for 24 hours) can come to elicit withdrawal reactions which would increase one's motivation to smoke (Wikler, 1973). Previous research indicates that urge increases when smoking is available and decreases when smoking is not available for 1-3 hours, yet when drugs become unavailable for 24 hours Wikler would hypothesize that urge would increase depicting a curvilinear relationship. Tiffany's cognitive theory (1990) may suggest that smoking unavailability of three hours could be within a person's drug use schema (i.e. not being able to smoke during block classes or during a movie), but when that unavailability stretches to 24 hours, this may cause much greater urge because this length of non-smoking interferes with their typical drug use schema. Anecdotal information from patients in an in-treatment facility echoes these ideas (Juliano, in correspondence, 2011). Since they receive a weekly stipend, these patients report greater urges to smoke on Sundays when they're out of money, their cigarettes have run out, and they know they will not get their next check or pack of cigarettes until Monday. Together, this evidence would hypothesize a curvilinear relationship between smoking availability and urge.

Learning theorists might predict that smoking availability becomes the discriminative stimulus, or "occasion setter" associated with drug and environmental stimuli pairings (i.e. Hogarth & Duka, 2006). The occasion setter signals that a given cue will lead to a paired response (Field & Duka, 2001). Therefore these theorists might posit that if drugs are unavailable then the discriminative stimulus is not present which would prevent previously conditioned stimuli (i.e. a pack of cigarettes and an ashtray) from eliciting their conditioned responses (i.e. smoking). For the present study this would predict that urge would decrease as a function of unavailability in a linear function.

In addition to testing the linearity of the relationship between smoking availability and urge, mood, and reaction time, this study aims to replicate Juliano and Brandon's (1998) study. The reviewed research varies its characterization of the 'available' and 'unavailable conditions. Typically the "available" condition is described as within the experimental session, anywhere from a few seconds to 20 minutes. As for the unavailable condition studies indicated participants could smoke at the end of the experimental session which lasted from 1 to 3 hours depending on the experiment. Therefore, this study chose to divide heavy smokers into three conditions where they would be able to smoke in A) 20 minutes (within the experiment), B) three hours (at the end of the experiment), or C) in 24 hours (at the follow-up appointment). These time points were chosen based on their feasibility and comparability to previous research. The 20 minute and 3 hour availabilities replicate Juliano and Brandon's study (1998). We decided that 24 hours is an important time point in many quit attempts and developing information on the relationship between smoking unavailability at that time point with urge, mood, and reaction time would have important treatment implications. It was also a practical time point to use because our participants believed they had to return the next day for a follow-up appointment.

The primary objective of the current study is to determine the nature of the relationship between smoking availability and motivation to smoke at three time points. We hypothesize that our results will be consistent with previous research such that the 20 minute group will have greater self-reported urge than the 3 hour group, but do not make a directional prediction for the 24 hour condition since different theories would make contradicting predictions. Therefore, if there are significant differences between our groups we will test both a linear and a curvilinear model to see which best fits the data.

In addition to measuring self-reported urge, we also included measures of mood and reaction time. The effects of smoking availability on mood have had mixed results. Sayette and Hufford (1995) found that smokers who were allowed to smoke ad libitum had more positive action units on the FACS scale than those who were told to abstain for 12 hours. Yet, Juliano and Brandon (1998) found no effects of the availability manipulation on mood. Tiffany and colleagues found that positive mood increased as the probability of smoking cigarettes became more available and that negative mood increased as they became more unavailable (Carter & Tiffany, 2001; Bailey, Goedeker, & Tiffany, 2009). To further elucidate the nature of the relationship between smoking availability and affect, we are including a mood measure in the present study.

To further replicate the Juliano and Brandon (1998) study we are including a simple reaction time task. They found increased reaction times in the unavailable condition, only in the presence of smoking stimuli. On the contrary, Wertz and Sayette (2001a) found cognitive interference in the Emotional Stroop task increased when smoking was available. We hope that by including this measure we can determine if there is a relationship between reaction time and smoking availability, as well as whether the relationship is linear or curvilinear.

Finally, one trait that is linked to substance abuse problems is impulsivity. Impulsive individuals are at more risk for developing substance use disorders. In addition, drug taking can escalate from controlled to uncontrolled use making quitting difficult. In this sense impulsivity is both a risk factor and consequence of drug abuse (Moeller & Dougherty, 2002). Hogarth (2011) found that the non-planning factor of impulsivity moderated the relationship between craving and drug taking, such that non-planning impulsivity decreased the relationship between craving and consuming drugs, but not seeking them. We chose to include an impulsivity measure in the present study. Since we were not measuring actual drug taking we wanted to ensure there were no baseline differences in impulsivity that could be affecting the results of our manipulation.

Overall, the purpose of this study is to expand upon the understanding of smoking availability's roles in smoking behavior by determining its relationship to urge, mood, and reaction time, as well as whether these relationships are linear or curvilinear. Understanding the role of smoking availability in smoking behavior can provide researchers and clinicians with information that can increase the likelihood of smoking cessation in smokers who are trying to quit. The knowledge gleaned from this study can inform interventions during the first 24 hours of treatment programs to help smokers maintain cessation, (Gulliver & Hughes, 1995).

CHAPTER 2

METHOD

Participants

Participants were recruited from the university campus and the surrounding Washington D.C. metropolitan area using flyers and web-based advertisements (e.g., Craigslist). Participants were selected if they met the following criteria: (1) at least 18 years old, (2) smoke cigarettes daily (3) smoked at least 10 cigarettes per day, (4) have been smoking for at least one year. Previous research used heavy, regular smokers; therefore these inclusion criteria were selected to ensure obtaining similar subject characteristics.

Ninety smokers began the study. Data for 5 participants were not used resulting in a final sample of 85 individuals (59 males, 26 females). Three participants dropped out of the study after learning that they would be required to abstain for 24 hours. One participant lacked comprehension of the assessments and one participant indicated having heard details about the study from another participant. Thirty-nine of the participants identified themselves as Caucasian, 36 as African American, 1 as Asian, 9 as other or mixed race (1 did not identify race), additionally, 5 identified themselves as Hispanic. Participants smoked a mean of 14.93 (SD= 4.46) cigarettes per day. The breakdown of other baseline data is provided in Table 1.

Table 1. Demographic Information

Variable	Percent (%) of participants
Sex	
Male	69 %
Female	31%
Age (in years)	31.10 (SD=13.42)
Race	
Caucasian	46%
African American	42%
Asian	1%
Mixed	7%
Other	4%
Highest level of **e**ducation	
11th grade	4%
High school (GED)	39%
Some college	31%
Associate's	8%
Bachelor's	7%
Some graduate	8%
Graduate degree	3%
Employment	
Part-time	17%
Full-time	26%
Unemployed	48%
Retired	1%
Disability	8%
Student status	
Full-time	36%
Part-time	12%
Not a student	52%

Measures

Alveolar carbon monoxide breath sample (COa). Breath samples were obtained using a Bedfont Micro Breathalyzer (Medford, NJ). Carbon monoxide readings were used to verify smoking status and to encourage compliance with the three hours of required abstinence required before the first session.

Smoking History Questionnaire (consisting of demographic and smoking history information). This questionnaire contains eight demographic information questions, as well as seven additional smoking history questions including the
Fagerström Test for Nicotine Dependence questionnaire (Heatherton, Kozlowski, Frecker, & Fagerström, 1991). This is a six-item measure validated to measure nicotine dependence. Coefficient alpha reliability in the present study is .549. (See Appendix A)

Barratt Impulsiveness Scale (BIS-11). (Patton, Stanford, & Barratt, 1995). This scale was included to determine equivalent levels of impulsivity across our groups at baseline. This 30-item measure includes six first-order factors of impulsiveness: attention, motor, self-control, cognitive complexity, perseverance, and cognitive instability impulsiveness; and three second-order factors: attentional, motor, and non-planning impulsiveness. This scale shows strong internal consistency and was validated in multiple groups including normal undergraduates, substance abuse patients, general psychiatric patients and prison inmates. Coefficient alpha reliability in the present study is .829. (See Appendix B)

Diener & Emmons Positive and Negative Affect Scale. (Diener & Emmons, 1984). This measure was included to determine if the three conditions had any differing effects on affective state. This scale lists four positive (‘happy’, ‘joyful’, ‘pleased’, and ‘enjoyment/fun’) and five negative (‘depressed/blue’, ‘unhappy’, ‘frustrated’, ‘worry’, and ‘angry/hostile’) emotions that participants rated as experiencing 1 (not at all) to 7 (extremely much). Coefficient alpha

reliability in the present study averaged .905 for the positive scale, and .868 for the negative scale. (See Appendix C)

Urge Ratings Scale. Participants completed a 3-item questionnaire indicating their desires, wants, and cravings to smoke a cigarette. Each item was rated 1-7 on a Likert-type scale (1= Strongly Disagree, 7=Strongly Agree). The self-report questions, like those on this form, have been used (with and without variation) in many studies assessing urge to smoke (Tiffany and Drobes, 1991; Perkins et al., 2008; Sayette, Lowenstein, Kirchner, & Travis, 2005). This scale demonstrated adequate reliability and validity (Kozlowski, Pillitteri, Sweeney, Whitefield, & Graham, 1996). Coefficient alpha reliability in the present study averaged .864. (See Appendix D)

Reaction Time Task. A simple reaction time task evaluated how quickly participants responded to a tone (Juliano & Brandon, 1998). The series of tones (72 dB, 600Hz, 250ms duration, with inter-stimulus intervals averaging 20 seconds) were presented through speakers connected to the computer. The computer program DirectRT recorded response latencies for each participant. Participants had one practice session that lasted four trials, and two experimental sessions (baseline and post-manipulation) that lasted six trials. Responses lasting longer than 1000 ms were considered non-responses and removed from analysis. Based on Juliano & Brandon (1998) the mean of only the first 2 reaction time trials were analyzed. Coefficient alpha reliability in the present study averaged .833.

Manipulation Check Measure. This 5-item measure was developed for this study to ensure that the participants in each group intended to follow the smoking availability instructions they received. For the 20 minutes and 3 hours conditions, this was not anticipated to be a problem because their next opportunities to smoke were within the duration of the first session.

Yet, for the 24 hours condition it was important to determine that they did intend to not smoke for 24 hours as their instructions indicated. This questionnaire asked participants how difficult it would be for them to follow the smoking instructions, as well as whether or not they intended to follow the instructions. It also assessed their confidence in being able to abstain until they are permitted to smoke. These questions were answered on a 1 ("Not at all confident") to 7 ("Extremely confident") scale. In addition there was an open ended question where participants were invited to share any other reactions they had to the smoking availability information they were given. (See Appendix E)

Experiment Evaluation. This measure was also developed by the author to gain feedback on their experience in the experiment overall, as well as to ascertain if the participants has any knowledge of the deception in the experiment. Ten questions were asked including general questions, "Did you enjoy the study?" as well as questions that ask if they think they were deceived, "Do you think there is more to this study than meets the eye?" (See Appendix F)

Procedure

Design. Participants who completed a phone screen and were deemed eligible scheduled their appointments with an investigator. All participants were instructed at this time to abstain from all nicotine use for 3 hours before their appointment time. They were also told to bring a pack of their preferred brand of cigarettes with them to the session. Participants were assigned by the experimenter to one of three conditions using a randomization sheet that was created by a random number generator, while ensuring equal numbers in each condition. The three conditions were: 1. Told they can smoke in 20 minutes; 2. Told they can smoke in 3 hours; 3. Told they can smoke in 24 hours. All subjects, regardless of condition, were exposed to smoking related

stimuli (cigarette pack, ashtray, and lighter) during the experimental manipulation (but not during the pre-manipulation assessment).

Phone Screen. Individuals interested in participating were screened by telephone to determine if they were eligible to participate. First, potential participants were told that the experiment required 2 laboratory visits, scheduled one day apart. Next, they were told that they would be required to abstain from nicotine for three hours before the first session, and that the first session could last for up to three hours and the second session would last approximately five minutes. During the sessions they would be expected to complete questionnaires and tasks on the computer, as well as provide a breath sample to verify their smoking status. Finally, those who were interested and met the criteria of smoking at least 10 cigarettes per day for at least one year, and were between the ages of 18-65, scheduled their appointments. They were asked to bring their pack of preferred brand of cigarettes to the first session. They were given no information about whether or not they would be permitted to smoke during the study.

Experimental Session. Upon arrival, participants were greeted by the experimenter. They were led to a room that contained a desk, two chairs, a computer, speakers, and an intercom. While reviewing the Informed Consent Form, participants were reminded that the session could last for up to three hours, and they would be asked to return the following day for a brief follow up appointment. After consent was obtained, a carbon monoxide breath sample was obtained and the experimenter recorded time of last cigarette and obtained the participant's pack of cigarettes. The box that contained the Smokelyzer was placed on the desk to block the participant's view of the smoking stimuli (their cigarettes, a lighter and an ashtray) during the baseline assessment. Baseline measures included the Smoking History Questionnaire, Barratt Impulsiveness Scale-11, Diener & Emmons Mood Scale, and Urge Ratings Scale. Participants

also performed 4 practice trials of the simple reaction time task, followed by 6 baseline trials. The experimenter returned to the room when the participant signaled they were done and delivered one of three manipulations based on random assignment:

1. Smoking Available in 20 minutes. Participants assigned to this group were told, "Today's session will last for up to three hours. However, you will have a break to smoke a cigarette within the next twenty minutes. During the break you can smoke in the laboratory room, which has been ventilated for smoking, or you can choose to go outside to smoke in the courtyard if you would like."
2. Smoking Available in 3 hours. Participants assigned to this group were told, "Today's session will last for up to three hours. You will not be permitted to smoke at all during the session today; however, you will have a break within the next twenty minutes. During the break you can stay in the laboratory room or you can choose to go outside in the courtyard if you would like. Your next opportunity to smoke will be at the end of the three hours, after you leave here today."
3. Smoking Available in 24 hours. Participants assigned to this group were told, "Today's session will last for up to three hours. You will not be permitted to smoke at all during the session today or for the next 24 hours. As indicated earlier, you will be asked to come back in 24 hours for a brief five minute assessment. This will include a breath sample which indicates your carbon monoxide level, and tells us if you have smoked recently. After these 24 hours, you can smoke if you would like to. You will have a break within the next twenty minutes. During the break you can stay in the laboratory room or you can choose to go outside in the courtyard if you would like."

While the participant was given information about when they would next have an opportunity to smoke, the experimenter discretely removed the box that held the carbon monoxide detector, which now exposed the smoking stimuli. This procedure was used to expose participants to smoking stimuli while reducing the potential reactivity that may occur if the experimenter were to physically place down the smoking stimuli and then tell the participant they will not be permitted to smoke, as was done in Juliano & Brandon (1998). Participants then completed the post-manipulation measures, which were the Diener & Emmons Mood Scale, Urge Ratings Scale, Reaction Time Task, and Manipulation Check Measure. When the post-manipulation measures were completed, the experimenter returned to the room and informed the participant that there was a problem with the computer program for the next section of the study and they would actually be finished within the next 20 minutes and would not need to return for the follow-up appointment. Before leaving, participants were asked to complete a few more short questionnaires (Diener & Emmons Mood Scale, Urge Rating Scale, and an Experiment Evaluation Form). Lastly, the participants were debriefed. They were told that the purpose of the experiment was to see how beliefs about when they could smoke affected their urge, mood, and reaction time. It was explained that because the experiment was only interested in the effects of the belief, it was not necessary to actually abstain, or to have a follow-up appointment. Participants were also asked not to share this information with any potential future participants. Before leaving, cigarettes were returned and participants were compensated. The entire session took approximately 45 minutes. No smoking took place during the experiment. See Figure 1 for the study flow chart.

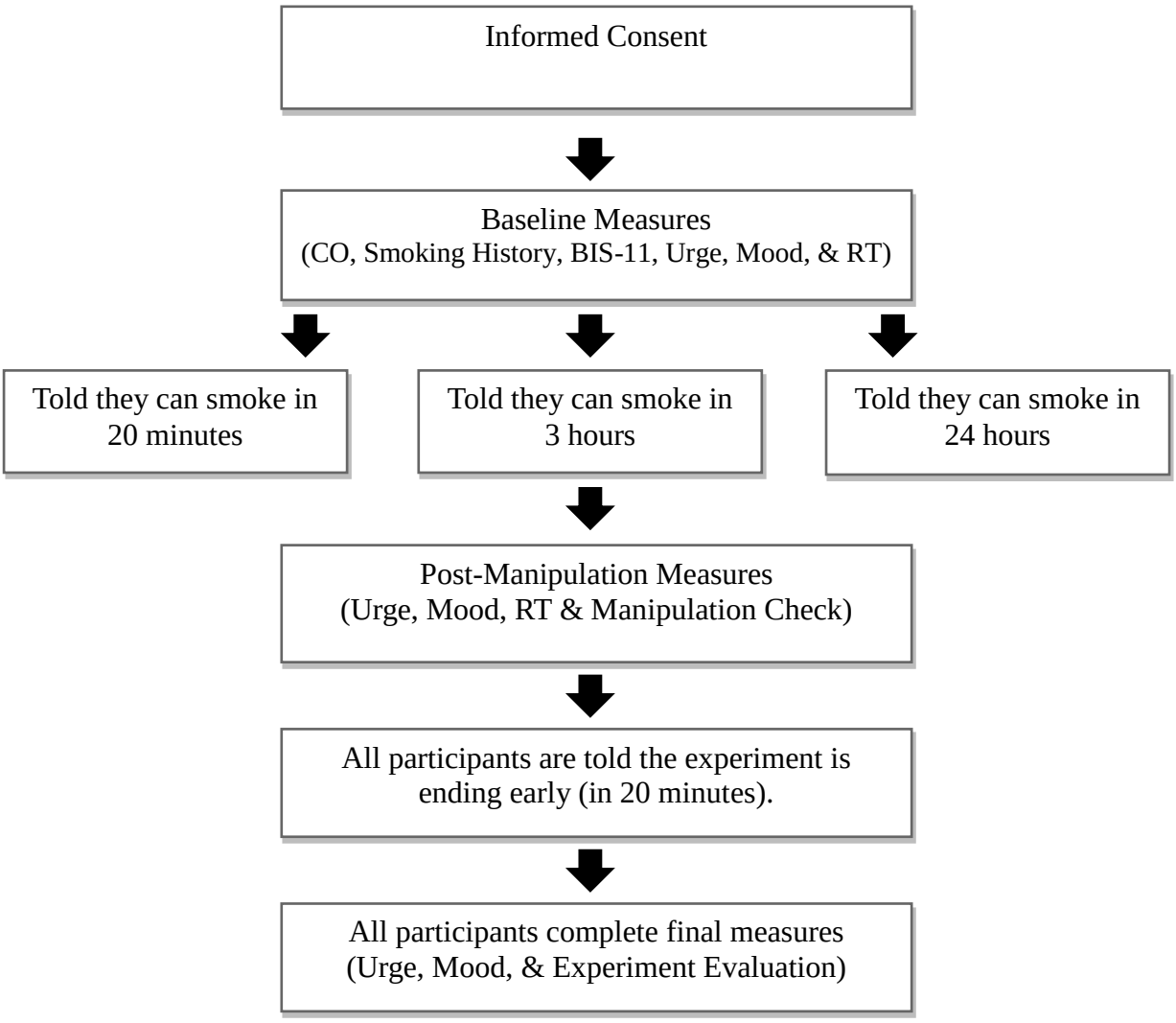

Figure 1. Study Flow Chart.

CHAPTER 3

RESULTS

Baseline Data

A one-way Analysis of Variance (ANOVA) was conducted to rule out baseline differences across groups on all baseline variables including demographic and smoking history variables and measures of urge, mood, and reaction time (see Table 2). There were no baseline differences between the groups.

Table 2. Baseline Values Across the Experimental Groups

	Conditions					
	20 minutes		3 hours		24 hours	
	M	(SD)	M	(SD)	M	(SD)
Impulsivity	64.38	(10.08)	64.14	(9.91)	68.92	(12.19)
Cigarettes/day	15.75	(5.67)	15.72	(4.10)	13.29	(2.87)
Years smoked	15.86	(13.13)	13.31	(11.57)	10.48	(10.04)
Total FTND	4.48	(1.81)	4.66	(1.67)	3.50	(2.24)
Last cigarette (hours)	5.89	(3.86)	6.04	(4.02)	6.82	(6.65)
CO Level (ppm)	12.89	(11.54)	10.24	(10.28)	6.93	(6.04)
Baseline Urge	4.96	(1.68)	5.49	(1.51)	4.87	(1.69)
Baseline Pos. Mood	3.80	(1.27)	3.50	(1.34)	4.27	(1.39)
Baseline Neg. Mood	2.44	(1.22)	2.93	(1.35)	2.89	(1.42)
Baseline RT	330.54	(93.18)	292.83	(86.10)	309.19	(87.64)

Note. FTND = Fagerström Test of Nicotine Dependence, ppm = parts per million. * $p < .05$

Data Analytic Strategy

Participants completed self-report urge, mood, and reaction time assessments before and after the manipulation. Difference scores were created by subtracting the pre-manipulation scores from the post-manipulation scores for each of the variables. Planned comparisons of each of the conditions were conducted using independent samples t-tests. For reaction time, analyses were conducted using difference scores based on the mean of all 6 reaction time trials as well as only the first 2 reaction time trials (Juliano & Brandon, 1998).

In instances where there are significant group differences, curve estimations were used to generate regression statistics and related plots for both linear and quadratic models to determine which model is a better fit for the data collected. Group is used as a continuous time variable for these estimates and is re-coded as .33333, 3, and 24.

A final measure of urge and mood was taken after participants were told the experiment was ending. There were no significant changes ($p > .05$) from post-manipulation to this last data collection point, therefore this data is not included.

Self-Reported Smoking Urge

Planned comparisons revealed no differences between any of the three availability manipulations on self-reported urge to smoke. Unfortunately, urge ratings were negatively skewed and showed strong ceiling effects with 30% of participants endorsing the highest possible value for self-reported urge prior to the manipulation. To try to correct for the highly skewed data we use a square root and a logarithmic transformation, but were still not able to normalize the data. Figure 2 displays the mean urge change ratings for each of the conditions.

Self-Reported Mood

There was a significant effect of smoking availability on positive mood, with participants who were told that smoking would be available in 24 hours reporting a greater decrease in positive mood than those that were told that smoking would be available 20 minutes or 3 hours (see Table 3); 3 hours vs. 24 hours $t(55) = 2.07$, $p = .043$, Cohen's $d = .59$; 20 minutes vs. 24 hours $t(54) = 2.92$, $p = .005$, Cohen's $d = .79$. There was no difference in positive mood change between the 20 minute group and 3 hour group, $t(55) = 1.12$, $p = .267$. The curve estimation analysis indicated there was a significant linear relationship between positive mood scores and smoking availability, $F(1, 83) = 10.07$, $p = .002$, and a significant quadratic relationship, $F(2, 82) = 5.185$, $p = .008$.

Analysis of the negative mood difference scores showed no significant effect of smoking availability, 20 minutes vs. 3 hours, $t(55) = -.335$, $p = .739$, 3 hours vs. 24 hours $t(55) = -1.14$, $p = .259$, 20 minutes vs. 24 hours $t(54) = -1.61$, $p = .114$ (see Figure 3).

Reaction Time

Planned comparisons of the individual cell means also revealed no differences between the conditions when all 6 reaction time trials were analyzed. Based on Juliano & Brandon (1998) the mean of only the first 2 reaction time trials were analyzed. Analysis of the mean change in reaction time for trials 1 and 2 revealed a significant effect of smoking availability. As shown in Table 3, there was an effect of smoking availability, with participants who were told that smoking would be available in 24 hrs showing more of an increase in reaction time compared to those told 3 hours, $t(53) = -2.37$, p .021, Cohen's $d = -.65$. Participants in the 20 minute group also showed more of an increase in reaction time compared to the 3 hour group, but this difference did not reach significance, $t(53) = 1.88$, $p = .065$, Cohen's $d = .52$. There was

no difference between those told 20 minutes and those told 24 hrs, t(52) = -.441, p = .661 (see Figure 4). The curve estimation analysis indicated a trend towards a significant quadratic relationship, F (2, 79) = 2.99, p = .056. The linear model was not significant (p = .170).

Table 3. Mean Difference Scores Between Pre- and Post-manipulation Across Experimental Conditions.

	Conditions					
	20 minutes		3 hours		24 hours	
	M	(SD)	M	(SD)	M	(SD)
Self-reported Urge Difference Score	.417	(.892)	.274	(.969)	.619	(1.57)
Positive Mood Difference Score	-.152	(.558)*[a]	-.319	(.567)*[b]	-.714	(.852)*[ab]
Negative Mood Difference Score	-.050	(.068)	.021	(.943)	.329	(1.09)
RT Trials 1 and 2 Difference Score	61.56	(97.52)	15.59	(83.35)*[c]	73.19	(96.48)*[c]

Note. FTND = Fagerström Test of Nicotine Dependence, ppm = parts per million. a) Significant differences between the 20 minutes and 24 hours conditions, b) Significant differences between the 3 hours and 24 hours conditions, c) Significant difference between the 3 hours and 24 hours conditions. * $p < .05$

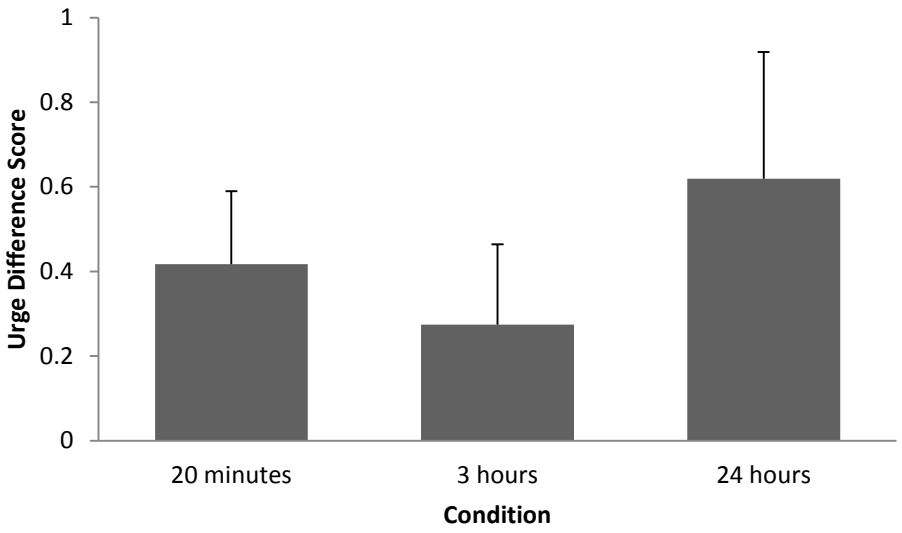

Figure 2. The Effect of Smoking Availability on Urge. Planned comparisons revealed no significant differences between the conditions. Error bars illustrate the Standard Error of the mean.

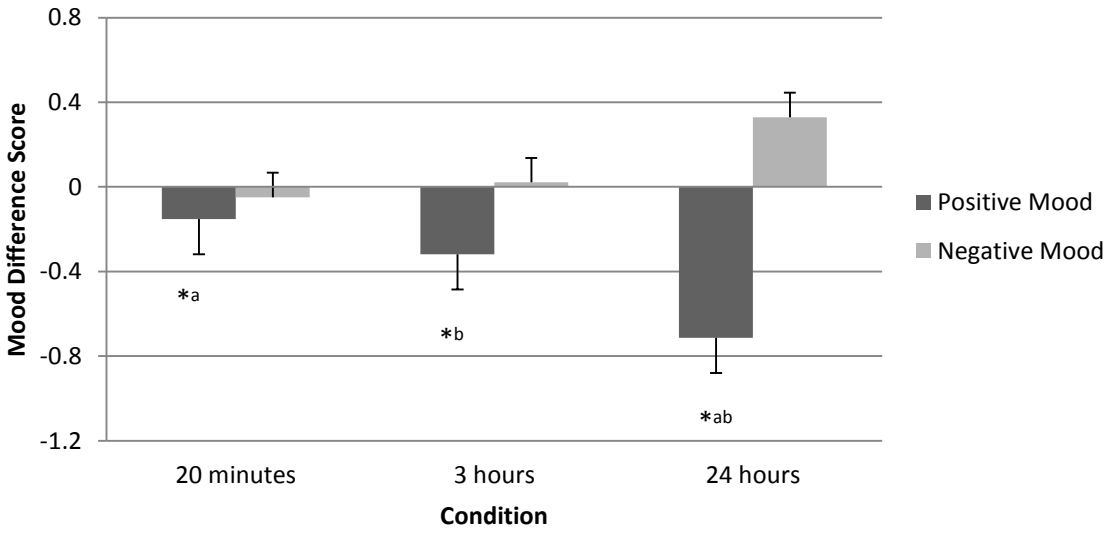

Figure 3. The Effect of Smoking Availability on Mood. Planned comparisons revealed: a) significant differences between the 20 minutes and 24 hours conditions, b) significant differences between the 3 hours and 24 hours condition, * $p < .05$. Error bars illustrate the Standard Error of the mean.

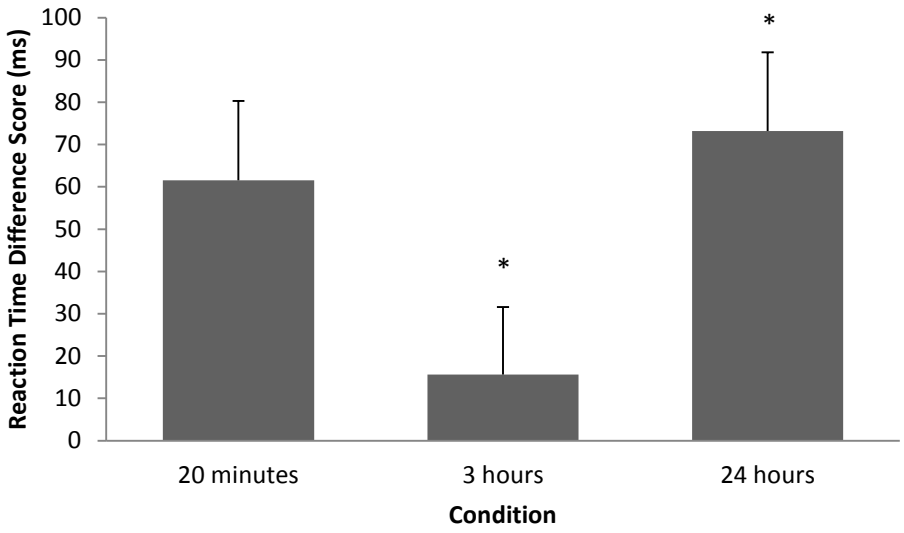

Figure 4. The Effect of Smoking Availability on Reaction Time. Planned comparisons revealed the 24 hour condition had significantly greater reaction times compared to the 3 hour condition, * $p < .05$. Error bars illustrate the Standard Error of the mean.

CHAPTER 4

DISCUSSION

This study manipulated smoking availability by including three time points (20 minutes, 3 hours, and 24 hours) to determine its effect on urge, mood, and reaction time. We found that positive mood significantly decreased the longer that smoking was unavailable; however, there was no significant relationship with negative mood. Contrary to previous findings, a significant relationship between smoking availability and urge was not found, but perceived smoking availability did have a significant effect on reaction time with the 24 hour condition having greater reaction time compared to the 3 hour condition.

Additionally, we sought to determine if the relationship between urge and smoking availability would be linear or curvilinear. Although the pattern of means suggests a curvilinear relationship, there were no significant differences found in the planned comparisons between each condition. These findings do not support previous research. Manipulations of smoking availability have consistently yielded increased self-reported urge to smoke in the available (within session) condition compared to the unavailable (end of session) condition (Juliano & Brandon, 1998; Carter & Tiffany, 2001; Droungas, Ehrman, Childress, & O'Brian, 1995; Wertz & Sayette, 2001a; Wertz & Sayette, 2001b; Bailey, Goedeker, & Tiffany, 2009).

One possible reason why we did not see a change in self-reported urge scores from baseline to post-manipulation is because of ceiling effects that occurred during baseline responding. For these participants there was no possibility for them to report increased urge after the manipulation. We posit that the anchors for each self-reported urge question may have led to the ceiling effects. Each question was scored on a 1-7 scale, where 1= "not at all", and 7= "extremely," similar to Tiffany and Drobes' (1991) validated Questionnaire of Smoking Urges that uses a similar 1- 7 scale where respondents either "strongly agree," or "strongly disagree".

We used only three questions for our study because the measure was given multiple times within a short amount of time, and we did not want our measure to induce reactivity. Other researchers used one-item measures on a 1 ("no urge at all") -100 ("the strongest urge I have ever felt") scale with success (Wertz & Sayette, 2001a; Sayette, Lowenstein, Krichner & Travis, 2005; Juliano & Brandon, 1998 with a 1-10 scale). However, one-item urge measures have also been critiqued for their lack of reliability. Although other studies have used our scale with success, our intent to increase urge was not accurately depicted with this scale.

In addition to the vague scale anchors, we asked that participants abstain for 3 hours before coming in for the session. Subsequently 30% of the participants rated their baseline urge as 7 out of 7. This may have decreased sensitivity and obscured possible effects. Other studies that used 12 hours of abstinence were not able to see an effect in their urge measure (Wertz & Sayette, 2001a; Sayette & Hufford, 1995). Studies that did find an effect used abstinence before the session ranging from 3 hours, to smoking a pre-session cigarette (Juliano & Brandon, 1998, Carter & Tiffany, 2001; Droungas, Ehrman, Childress, O'Brian, 1995). Due to recruitment difficulties, we chose to use participants who had abstained for *at least* 3 hours, instead of 3 hours exactly. Our participants averaged 6.25 hours of abstinence before the experimental session. This increase in abstinence could have been enough to create the ceiling effects seen in the baseline urge measure.

When removing participants who had a baseline urge score of 6 out of 7, or 7 out of 7 we are left with only 47 participants. Of those 47 participants, those in the 24 hour condition still had the largest increase in urge after the manipulation (N=18, M=1.03), but there is no longer a difference between the 20 minute or 3 hour condition (N= 16, M=.67; N=13, M=.64 respectively). With such a reduced sample size it is hard to draw reliable inferences from this

exploratory analysis. Future studies should use a scale with adequate room for changes in pre- to post-manipulation scores, and ensure that the abstinence criterion before the experimental session does not result in ceiling effects.

The mood measure analysis indicated that increased smoking availability was associated with increases in positive mood. Interestingly, there was no significant effect on negative mood. This finding supports research that has found a dissociated relationship between positive and negative mood (Diener & Emmons, 1985). The positive mood results are consistent with those found in studies by Carter and Tiffany (2001) and Bailey, Goedecker, and Tiffany (2009). Both found that increases in the probability of being able to smoke were related to increases in positive mood ratings. Our study indicated that both the linear and quadratic relationship between smoking availability and positive mood were significant; however, the linear model is a much closer match to our data based on the means for each group. Additionally, we had medium to large effect sizes (.59 - . 79). This finding has specific treatment implications. The significant decrease in positive mood in the 24 hour condition should be a therapeutic target for those trying to quit smoking. Counseling can try to bolster positive mood in anticipation of the first 24 hours of abstinence to prevent affect-related lapses.

Based on the Juliano and Brandon (1998) study we believed that reaction time could be considered a behavioral metric of cognitive load. We found significantly greater reaction time in the first two trials when comparing the 24 and 3 hour condition, and a trend toward greater reaction time in the 20 minute condition compared to the 3 hour condition. We had medium to large effect sizes (.52 - . 65). Our reaction time analysis indicated a trend toward a curvilinear relationship between reaction time and smoking availability, and explained more of the variance (R^2 = .265) than the non-significant linear model (R^2 = .153). However, our trend toward

significance between the 20 minute and 3 hour condition is inconsistent with Juliano and Brandon's (1998) results. Although Juliano and Brandon (1998) showed the 3 hour condition had greater reaction time than the 20 minute condition it could have been a result of how they displayed the smoking related stimuli. By bringing in the smoking related stimuli after telling each condition when they could smoke next they may have generated greater reactivity in the 3 hour condition who knew they would not be permitted to use the stimuli. In order to reduce this potential reactivity we chose to have the stimuli in the room, but obscured from view until after the manipulation was delivered. The reduced reactivity to stimuli may have resulted in our reaction time data mirroring previous studies of urge to smoke, such that the 20 minute condition has greater reactivity than the 3 hour condition. Overall, future research is needed to determine the effect of smoking availability on reaction time because cognitive interference in the 24 hour condition could have important treatment implications. Smoking cessation programs could develop coping skills that focus on problem solving and goal maintenance which can be compromised during cognitive interference.

If an increase in urge reduces the availability of cognitive resources, then the measure of reaction time can be considered a behavioral measure of urge. Although we were not able to find a relationship with our self-reported urge measure, we may be able to deduce an effect of smoking availability on urge through our reaction time measure. However, other factors could be playing into reaction time other than urge. For instance, smokers in the unavailable conditions could be engaging in distracting thoughts to prevent them from focusing on their cravings and subsequently increase their cognitive workload and slowing their reaction time. Future research should explore this possibility.

Other general limitations to this study are the large individual variability seen in the participants regardless of condition. Although this gives the study greater ecological validity, the large standard deviations may have made effects difficult to detect. Also, three participants originally assigned to the 24 hours condition dropped out after receiving their abstinence instructions because they could not comply. They were heavy smokers and their exclusion likely contributes to the lower FTND mean and cigarettes per day mean at baseline in this condition. Although these were not significantly different, this may have affected the findings. We did our best to ensure that those who were told they could not smoke for 24 hours believed they would have to comply and intended to comply, but the internal validity of our manipulation is affected when more people (N=3) in the 24 hour condition quit that those in the other conditions (N=1 for the 20 minute condition, N=1 for the 3 hour condition). Also, the effects we did find may have been stronger if these participants did not drop out. Only two participants, one in the 3 hour condition and one in the 24 hour condition indicated that they did not intend to follow their smoking availability instructions. The analyses did not change when exclude these participant so they were included. Future research could use treatment-seeking smokers who would be more motivated to comply regardless of smoking history.

This study provides additional evidence that altering smoking availability influences motivation to smoke. However, the nature of the relationship appears to differ across different indices of smoking motivation. The finding that participants in the 24 hour condition showed the poorest mood, greatest urge, and greatest reaction time should be explored in future studies as it could have important implications for smoking cessation success. Knowing which indices of smoking motivation are affected by making smoking unavailable can provide specific targets for intervention such as cue exposure to reduce urge, guided imagery increase positive mood, and

coping skills to deal with cognitive interference. It is important to know if the expectation that one cannot smoke for an extended period of time, such as when attempting to quit smoking, causes a sudden increase in motivation to smoke. It tends to take individuals more than one attempt to quit smoking, and by increasing the efficacy of quit attempts through targeted treatment interventions we can help more people become smoke free (WHO, 2011)

APPENDIX A

SMOKING HISTORY QUESTIONNAIRE

Instructions: Answer each question by selecting the appropriate box or by writing in the answer, if indicated.

1. Gender: □ Male □ Female

2. Age:_____

3. What is your current marital status?

□ Single □ Married □ Separated □ Divorced □ Other:_____

4. What race do you consider yourself to be?

□ American Indian or Alaska Native □ Asian □ Black or African-American

□ Native Hawaiian or Other Pacific Islander □ White □ Other:_____

5. Do you consider yourself to be Hispanic or Latino? □ No □ Yes

6. Are you a student? □ No □ Yes, part time □ Yes, full time

7. What is your employment status? □ Employed F/T □ Employed P/T □ Unemployed □ Retired

□ Disability

8. What is the highest level of education that you completed?

□ No high school degree. Enter last grade completed: _____

□ High school or GED □ Some college technical or vocational training □ Associate's Degree

□ Bachelor's Degree □ Some Graduate study □ Graduate Degree

9. How many cigarettes do you smoke per day on average? _____

10. How many years have you been smoking daily? _____

11. How soon after you wake up do you smoke your first cigarette?

□ Within 5 minutes □ 6-30 minutes □ 31-60 minutes □ After 60 minutes

12. Do you find it difficult to refrain from smoking in places where it is forbidden (e.g., in church, at the library, in cinema etc.)? □ No □ Yes

13. Which cigarette would you hate most to give up? (check one)

□ The first one in the morning □ The cigarette with/after breakfast

□ The cigarette with/after lunch □ The cigarette with/after dinner

□ The last cigarette before going to bed □ Other:_____

14. Do you smoke more during the first hours after waking than during the rest of the day?

□ No □ Yes

15. Do you smoke if you are so ill that you are in bed most of the day? □ No □ Yes

16. How many times have you made a serious attempt to quit smoking in which you remain abstinent for at least 24 hours?_____

17. What is your desire to quit smoking at this time?

1 2 3 4 5 6 7

No desire at all Very strong desire

18. What brand of cigarettes do you smoke most of the time? _____

19. Do you typically smoke menthol or non-menthol cigarettes? □ Non-Menthol □ Menthol

20. What strength cigarettes do you smoke most of the time? □ Ultralight □ Light □ Medium

□ Regular

21. What size cigarette do you smoke most of the time? □ Kings □ 100s

□ Other:_____

APPENDIX B

BARRATT IMPULSIVENESS SCALE- 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 put an X on the appropriate circle on the right side of this page. Do not spend too much time on any statement. Answer quickly and honestly.

	O Rarely/Never	O Occasionally	O Often	O Almost Always/Always		
1 I plan tasks carefully.	O	O	O	O		
2 I do things without thinking.	O	O	O	O		
3 I make-up my mind quickly.	O	O	O	O		
4 I am happy-go-lucky.	O	O	O	O		
5 I don't "pay attention."	O	O	O	O		
6 I have "racing" thoughts.	O	O	O	O		
7 I plan trips well ahead of time.	O	O	O	O		
8 I am self controlled.	O	O	O	O		
9 I concentrate easily.	O	O	O	O		
10 I save regularly.	O	O	O	O		
11 I "squirm" at plays or lectures.	O	O	O	O		
12 I am a careful thinker.	O	O	O	O		
13 I plan for job security.	O	O	O	O		
14 I say things without thinking.	O	O	O	O		

15 I like to think about complex problems.	O	O	O	O
16 I change jobs.	O	O	O	O
17 I act “on impulse.”	O	O	O	O
18 I get easily bored when solving thought problems.	O	O	O	O
19 I act on the spur of the moment.	O	O	O	O
20 I am a steady thinker.	O	O	O	O
21 I change residences.	O	O	O	O
22 I buy things on impulse.	O	O	O	O
23 I can only think about one thing at a time.	O	O	O	O
24 I change hobbies.	O	O	O	O
25 I spend or charge more than I earn.	O	O	O	O
26 I often have extraneous thoughts when thinking.	O	O	O	O
27 I am more interested in the present than the future.	O	O	O	O
28 I am restless at the theater or lectures.	O	O	O	O
29 I like puzzles.	O	O	O	O
30 I am future oriented.	O	O	O	O

APPENDIX C

DIENER & EMMONS POSITIVE AND NEGATIVE AFFECT SCALE

Instructions: Please answer each question by selecting the number that best describes how you are feeling RIGHT NOW.

1. **Angry/Hostile.**

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all						Extremely Much

2. **Happy.**

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all						Extremely Much

3. **Worried/Anxious.**

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all						Extremely Much

4. **Joyful.**

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all						Extremely Much

5. **Depressed/Blue.**

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all						Extremely Much

6. **Pleased.**

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all						Extremely Much

7. Frustrated.

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all						Extremely Much

8. Enjoyment/Fun.

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all						Extremely Much

9. Unhappy.

1	**2**	**3**	**4**	**5**	**6**	**7**
Not at all						Extremely Much

APPENDIX D

URGE RATINGS SCALE

Instructions: Please indicate how much you agree or disagree with each of the following statements.

1. **I have a desire for a cigarette right now.**

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

2. **I do want to smoke now.**

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

3. **I crave a cigarette right now.**

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

APPENDIX E

MANIPULATION CHECK MEASURE

Instructions: Please answer the following questions.

1. **How difficult will it be for you to follow the instructions you were given about when you can smoke?**

Not difficult at all — Extremely difficult

1 2 3 4 5 6 7

2. **How much do you intend to follow the instructions you were given about when you can smoke?**

No intentions at all to follow the instructions about smoking — Very strong intentions to follow the instructions about smoking

1 2 3 4 5 6 7

3. **How confident are you that you can remain abstinent from smoking until you are permitted to do so?**

Not confident at all — Extremely confident

1 2 3 4 5 6 7

4.. **How confident are you that you can remain abstinent from smoking for 24 hours?**

Not confident at all — Extremely confident

1 2 3 4 5 6 7

5. **Is there anything else you would like to share with us about your reactions to the information you were given about when you can smoke?**

_____
_____
_____
_____

APPENDIX F

EXPERIMENT EVLAUATION

1. How would you rate your experience as a research participant in this project?

a. excellent
b. good
c. neutral
d. poor
e. very poor

2. Would you like to be a research participant again in the future if the opportunity arises?

a. definitely yes
b. most likely yes
c. maybe
d. most likely not
e. definitely not

3. Would you recommend this study to friends or family?

a. definitely yes
b. most likely yes
c. maybe
d. most likely not
e. definitely not

4. How interesting was this study for you?

a. very interesting
b. somewhat interesting
c. neutral
d. somewhat uninteresting
e. very uninteresting

5. Did you enjoy participating in this study?

a. no, I disliked it a lot
b. no, I disliked it a little
c. neutral
d. yes, I liked it a little
e. yes, I liked it a lot

6. Did you learn anything from participating in this study?

a. no
b. yes (please describe in the space below)

_____

_____

7. If you had to describe to someone the purpose of this study, what would you tell him or her?

_____

_____

8. Do you think there is more to this study than meets the eye?

a. No
b. Yes (please describe in the space below)

_____

_____

9. Is there anything about the study you disliked?

a. No
b. Yes (please describe in the space below)

_____

_____

10. Sometimes research experiments require that participants be deceived about certain aspects of the study or what they are asked to do. Is there anything in this study that you feel you may not have been told the truth about?

a. No
b. Yes (please describe in the space below)

_____

_____

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