MEN'S AND WOMEN'S SELF-REPORTED BEHAVIORAL AND PHYSICAL DEPENDENCE ON CIGARETTE SMOKING

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CHAPTER I

INTRODUCTION

Cigarette smoking is associated with a number of illnesses including cardiovascular disease, emphysema, stroke, and various cancers, most notably lung cancer. In addition, smoking is related to many premature deaths, which primarily occur through diseases such as lung cancer and heart disease. Despite the known risks of cigarette use, smoking rates in the general public remain high. The current rate of smoking in the United States is estimated to be approximately 22.5% (Centers for Disease Control and Prevention [CDC], 2002).

The change in smoking prevalence has been different for men and women. The prevalence of smoking in 1964, at the time of the first Surgeon General's report, was 53% in men and 32% in women. Although smoking rates have decreased for both men and women, the decline has been much smaller in women. In 2002, 25.2% of men and 20% of women were estimated to be current smokers. Among non-pregnant women of childbearing age, the smoking rate was estimated to be 31.1% (CDC, 2002). Thus, there has been relatively little decline in smoking rates among women as compared to men.

Two phenomena that may account for this are increases in the number of teenage girls who initiate smoking, and greater difficulty quitting smoking among women. Indeed, smoking has increased among teenage girls and young women aged 18-21 (CDC, 2001). The CDC also reported in 1998 that women have more difficulty maintaining

abstinence from smoking than men. Their report noted that among adolescents, girls and boys have similar ages of initiation to smoking, but girls who begin smoking remain smokers for longer. Several researchers have demonstrated lower smoking cessation in women (Ferguson et al., 2003; Nides et al., 1995; Perkins, 2001; Scharf & Shiffman, 2004; Wetter et al., 1999a). Women also perform more poorly in most trials of cessation using nicotine replacement therapy (NRT), the primary pharmacological smoking cessation aid (Davis et al., 1994; Gritz, Nielsen, & Brooks, 1996; Killen, Fortmann, Newman, & Varady, 1990; Perkinset al., 1996; Pomerleau, 1996).

Women's poorer cessation may be because they receive different benefits from smoking than men. Dependence can develop due to the drug that is being consumed, and due to behavioral conditioning surrounding drug use. It is possible that women do not receive as much reinforcement from nicotine as from other aspects of smoking cigarettes. If this is the case, it may explain women's poor performance in NRT trials. In addition, gender differences in the experience of dependence would suggest that different methods are needed to assist women in smoking cessation attempts.

There is evidence to suggest that men and women have different experiences of withdrawal, such that women experience more affective symptoms (Svikis, Hatsukami, Carroll, Pickens, 1986), and that women report more craving for cigarettes upon cessation (Fant, Everson, Dayton, Pickworth, & Henningfield, 1996). A number of researchers have also suggested that sensory aspects of smoking may be more important in maintaining smoking behavior in women than in men (Butschky, Bailey, Henningfield, & Pickworth, 1995; Gross, Lee, & Stitzer, 1997; Rose, Tashkin, Ertle, Zinser, & Lafer, 1985). Women may also be less sensitive to nicotine dose and less able to manage the

amount of nicotine they are consuming (Perkins et al., 1996; Perkins, Grobe, Stiller, Fonte, & Goettler, 1992). Women's apparent lack of sensitivity to nicotine and poor response to NRT suggests that something else must maintain smoking behavior in women.

In terms of dependence, this would suggest that women experience more behavioral dependence than physical dependence on cigarette smoking. If this is the case, it would make sense that NRT does not serve as a good cessation aid for women. Instead, other methods of aiding cessation attempts may need to be used to increase the ability of women to quit smoking and remain abstinent.

Although there is ample evidence to suggest that gender differences do exist in response to cigarette smoking and abstinence rates, researchers have not looked at whether or not men and women report different reasons for their smoking, or different perceived consequences from smoking.

CHAPTER II

REVIEW OF LITERATURE

Dependence

Addiction and dependence are terms used to describe a maladaptive pattern of substance use. Drug dependence is a concept that has historically been difficult to define. Researchers continue to have difficulty coming to a consensus on an appropriate definition of dependence. Historically, dependence was thought to occur when physical sequelae of prolonged drug use were present. Namely, tolerance to drug effects and withdrawal symptoms when drug use is discontinued were thought to be the defining features of dependence. However, in the past several decades psychological factors such as anxiety relief, group membership, and behavioral reinforcement have become viewed as important factors in maintaining chronic drug use (Koob & LeMoal, 1997; Martin & Petry, 2005; Nestler & Aghajanian, 1997; Slutske, Eisen, & True, 2000).

The "classic" definition of dependence describes dependence as existing when tolerance and withdrawal are demonstrated. Tolerance and withdrawal are physical changes which are the result of repeated use of a drug. Withdrawal refers to events which occur when substance use is ceased for a period of time (Himmelsbach, 1943). Dependence-causing substances have substance-specific withdrawal symptoms which were traditionally thought to be due to the drug leaving the body (Koob & Le Moal, 1997). Tolerance refers to two related phenomena. First, larger amounts of a substance

need to be taken to achieve the same effect as was earlier experienced with smaller amounts. Second, the effect of the substance is diminished with repeated use.

Tolerance and withdrawal are now considered to be the result of chronic changes to cellular systems due to repeated drug use (Kalant & Khanna, 1990; Nestler, 2001; Nestler & Aghajanian, 1997; Watkins, Koob, & Markou, 2000). Chronic exposure to psychoactive substances can lead to upregulation of some cellular activities. Upregulation is a term that describes a cellular system becoming over-activated and remaining in that state. In substance abuse, upregulation is often an attempt to lower or reduce some acute effects of the substance being used, such as nausea or increased heart rate due to nicotine intake. When the substance is not being used, the upregulated systems continue to be over-activated. Without the substance there, this over-activation results in withdrawal symptoms (Nestler, 2001; Nestler & Aghajanian, 1997). For example, a drug that causes increased heart rate results in upregulation that keeps the heart rate lowered to a normal level. When the drug is discontinued, the upregulation remains, lowering heart rate below normal. This lowered heart rate is a withdrawal symptom. Thus, a person who has used a substance for a prolonged period of time needs the substance in order to maintain homeostasis and avoid unpleasant withdrawal symptoms. This is the basis of physical dependence. Once a person is physically dependent, compulsive drug use is driven by the need to avoid withdrawal (Himmelsbach, 1943).

Tolerance and withdrawal can and do occur with repeated use of some drugs. However, these symptoms have become less central to the concept of dependence in the views of many researchers (Koob & LeMoal, 1997; Martin & Petry, 2005; Nestler & Aghajanian, 1997). This has occurred because of animal and human research that

disputes the idea that all instances of drug dependence are driven by a need to avoid withdrawal and consume enough drugs to overcome tolerance.

In humans, pharmacotherapy which effectively reduces withdrawal symptoms does not usually lead to a reduction in relapse rates. This has been documented in opiate addicts' response to treatment with clonidine and lofexidine, which reduce both affective and autonomic withdrawal symptoms, but do not reduce self-reported drug craving (Gossup, 1988; Jasinski, Johnson, & Kocher, 1985; Kleber et al., 1984; Nestler, 2002). The same is true in alcoholics (Cushman, Forbes, Lerner, & Stewart, 1985). People who relapse when withdrawal symptoms have been relieved are using drugs for reasons other than withdrawal relief. In addition, the occurrence of withdrawal symptoms upon cessation of drug use has been demonstrated not to lead to relapse (Winger, 1988; Winger, Young, & Woods, 1983).

The classic definition of dependence cannot fully explain chronic drug use. Clearly, some people use drugs without being driven to drug consumption through tolerance and withdrawal. Psychological factors have been used to help fill in the gaps, but there has been considerable debate over how to apply them.

Difficulty in defining just what constitutes dependence comes in part from the recognition that the same psychological factors that maintain drug use in some individuals are capable of maintaining a number of behaviors that may not typically be thought of as an addiction or dependence. Thus, dependence should provide an explanation of compulsive substance use that includes more than the physiological effects of use. However, the concept should not be so inclusive that it could be used to explain any learned behavior (Slutske et al., 2000). Regardless, psychological factors are

considered by many to be important in the development of dependence (Koob & LeMoal, 1997; Martin & Petry, 2005; Nestler & Aghajanian, 1997; Slutske et al., 2000). The relative importance of psychological and physiological factors in the maintenance of drug use may differ for individuals. Most researchers agree that the majority of dependence occurs through a combination of physiological and psychological factors (Edwards & Gross, 1979; Nestler, 2002; Obot, Poznyiak, & Monteiro, 2004). However, there can be a range of experiences. It is possible for some substance use to be maintained over long periods of time through psychological factors alone (Koob & LeMoal, 1997; Martin & Petry, 2005; Nestler & Aghajanian, 1997).

The current definition of dependence described in the Diagnostic and Statistical Manual of Mental Disorders, 4h Edition, Text Revision (DSM-IV-TR) (American Psychiatric Association [APA], 2000) requires a person to meet three of the following criteria to be considered dependent on a psychoactive substance:

> 1)tolerance, 2)withdrawal, 3)the substance is often taken in larger amounts or over a longer period of time than was intended, 4) there is a persistent desire or unsuccessful efforts to cut down or control substance use, 5) a great deal of time is spent in activities necessary to obtain the substance, use the substance, or recover from its effects, 6) important social, occupational, or recreational activities are given up or reduced because of substance use, 7) the substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance (p. 197).

The presence of tolerance or withdrawal leads to a specifier of "with physiological dependence", while the absence of both of these symptoms leads to a specifier of "without physiological dependence" (APA, p. 198). Neither tolerance nor withdrawal is necessary for a diagnosis of substance dependence. As can be seen by the DSM-IV-TR's conceptualization of dependence, the classic definition is still influential, but is not seen as representing the whole picture of dependence. Even if a person were to endorse both biological symptoms, at least one non-biological symptom would need to be endorsed in order for that person to receive a diagnosis of substance dependence (APA, 2000; World Health Organization [WHO], 2004). Craving, loss of control over use, and compulsive use have replaced tolerance and withdrawal as central concepts to the definition of dependence (Lyvers, 1998; Nestler, 2002). The criteria for substance dependence as listed by the ICD-10 are somewhat similar to those of the DSM-IV-TR, and have a similar emphasis on psychological symptoms (WHO, 1992).

Dependence on a substance without physiological dependence is commonly referred to as "behavioral dependence". Behavioral dependence is synonymous with the DSM-IV-TR's (APA, 2000) specifier of "without physiological dependence". Behavioral dependence occurs when a person compulsively uses a drug, experiences maladaptive consequences due to this use, and loses control over use. However, in behavioral dependence, there is no evidence of tolerance or withdrawal. According to Laws (1995), behavior patterns that are compulsive, result in immediate gratification, and result in delayed negative consequences can be considered to produce behavioral dependence.

According to previous and current definitions of dependence, the ability of a substance to act as a primary reinforcer is an important aspect of its likelihood to be

abused. People typically begin to self-administer drugs because of their powerful reinforcing effects. The reinforcement value of taking the drug can maintain use over long periods of time. However, reinforcement may not always come from the pharmacological actions of the drug itself. Other aspects of drug use can be reinforcing and maintain the behavior.

Although drug use results in powerful reinforcing effects, it can also result in powerful negative effects. Dependent substance users continue to use despite knowledge of these negative consequences (Nestler, 2001, 2002). This is recognized in the DSM-IV's description of drug dependence. One of the theories behind this phenomenon is that consequence delay may influence the decisions substance users make. Delays to punishment influence the perceived probability of the consequence occurring. Long delay to punishment is associated with reduced perceived probability of the consequence actually occurring (Mischel, Grusec, & Masters, 1969). Drug use results in immediate reinforcement with a high probability of occurring, and delayed punishment with a lower perceived probability of occurring. Because of these perceived consequences, substance abusers will often choose the immediate and certain reinforcement and disregard the possibility of punishment that might occur at some point in the distant future (Edwards & Gross, 1979, Obot, Poznyiak, & Monteiro, 2004).

It is recognized by the majority of researchers that physiological and psychological factors both play important parts in the development of dependence in most individuals (Edwards & Gross, 1979; Nestler, 2002; Obot et al., 2004). This view is not unanimously held (Lyvers, 1990, Martin & Petry, 2005), and the unique contributions of behavioral and physiological factors in the initiation and maintenance of drug use are

far from established. However, behavioral dependence can clearly have a large impact on drug-taking behavior. It appears to be more important in the maintenance of drug-taking behavior and relapse than physiological dependence for many people.

Craving

Drug craving is defined as a desire to experience the consequences of drug-taking, namely the positive reinforcement that immediately follows drug use (Marlatt, 1985; Tiffany, 1990). It is thought to be a reflection of the compulsive nature of self-administration of drugs, and is generally seen as a behavioral process (Kozlowski & Wilkinson, 1987). Craving is thought by some researchers to be one of the defining aspects of dependence, since it is strongly related to relapse, and is reported by all dependent substance users (Kozlowski & Wilkinson, 1987; Marlatt, 1985; Tiffany, 1990; Tiffany & Drobes, 1991; Wise, 1988). Although craving is an important part of dependence, it does not explain all aspects of the dependence syndrome, such as tolerance to drug effects, continued use despite negative consequences, and the apparent loss of control over use experienced by many people. However, it clearly has implications for drug use and may be important in explaining the inability of some people to refrain from drug use.

There are several possible explanations of what causes craving. In one theory, craving is thought to occur largely because of classical conditioning of drug-related cues. People with whom a person commonly uses drugs, environments in which use often occurs, and paraphernalia used to consume drugs can come to be associated with the sensations elicited by drug use (WHO, 2004). When a person who is dependent on a

substance comes into contact with environments where they are accustomed to using the substance, friends associated with use, or drug paraphernalia, strong urges to use or craving, may occur (WHO, 2004).

It is thought that cues such as those described above can come to act as conditioned stimuli which gain the ability to elicit, to a small degree, the sensations and feelings normally elicited by actual drug use. In this classical conditioning paradigm, the drug acts as an unconditioned stimulus. The sensations of intoxication or enjoyment act as an unconditioned response, and later these same sensations act as conditioned responses to drug-related cues. It is important to note that all of the pleasurable sensations need not be due to pharmacological actions of the drug as long as the person using the drug believes the sensations are due to drug use. The small effect that occurs due to conditioning is thought to cause the person to crave more of the same sensations, and thus crave the drug (Tiffany, 1990).

Others have suggested that craving is due to positive reinforcement received from drug use. This theory suggests that a previous learning history in which positive reinforcement was received from drug taking will result in urges to perform the behavior again and receive more positive reinforcement (Tiffany, 1990; Wise, 1988). According to this theory, craving for a drug is no different than urges to perform other behaviors that have previously been associated with positive reinforcement due to a desire to receive the reinforcement associated with them.

Gender Differences in Nicotine Dependence

Women tend to be less successful at quitting smoking than men (Ferguson et al., 2003; Nides et al., 1995; Perkins, 2001; Scharf & Shiffman, 2004; Wetter et al., 1999a), although some researchers contend that this is not true (Killen, Fortmann, Varady, & Kraemer, 2002; Sachs, Sawe, & Leischow, 1993). This discrepancy in quit rates has been documented to occur across treatment modalities (Fiore et al., 2000; Ortner, Schindler, Kraigher, Mendelsohn, & Fischer, 2002; Perkins, 2001). Gender differences have also been shown to exist in both aided and unaided quit attempts (Ward, Klesges, Zbikowski, Bliss, & Garvey, 1997).

Withdrawal symptoms. Previously, gender differences in the experience of withdrawal were thought to account for much of the difference in quit rates between men and women. Several studies indicated that women report more withdrawal symptoms and greater severity of withdrawal than men (Shiffman, 1979; National Institute on Drug Abuse, 1982). However, the majority of more recent research has failed to find such differences in withdrawal (Hughes, 1992; Hughes, Gust, Skoog, Keenan, & Fenwick, 1991; Hughes & Hatsukami, 1986; Svikis et al., 1986; Tate, Pomerleau, & Pomerleau, 1993).

One explanation for this discrepancy is that different self-report methods were used in the studies listed above. Studies in which women reported more withdrawal and more severe symptoms used retrospective reporting methods, while studies finding no gender differences in self-report of withdrawal symptoms used prospective self-report. It has been suggested that this difference between retrospective and prospective self-report may be due to men's tendency to underestimate their past withdrawal symptoms

(Pomerleau, Tate, Lumley, & Pomerleau, 1994; Tate et al., 1993). Pomerleau et al. (1994) assessed self-reported withdrawal symptoms in the same group of subjects retrospectively for past quit attempts, and prospectively for a current quit attempt. They found that women's prospective and retrospective reports of withdrawal symptoms were similar, while men reported a higher number of symptoms prospectively than retrospectively. In addition, men's prospective reports resembled those of women in number and severity.

Men and women may still have somewhat different experiences of withdrawal, however. Women may be more likely to prospectively report symptoms of depression than men (Svikis et al., 1986). It has also been suggested that women may experience fewer physiological symptoms, but prospectively report more craving for cigarettes than men (Fant et al., 1996).

Nicotine self-administration and dose discrimination. Gender differences have been described in self-administration of nicotine and the ability to discriminate between different doses of the drug. For example, Perkins et al. (1996) assigned smokers who were trying to quit to nicotine or placebo administered by nasal spray. Participants administered the nasal spray ad lib for one week. Men assigned to the nicotine condition self-administered almost twice as much nasal spray as those assigned to placebo. Women in both the nicotine and placebo conditions self-administered similar amounts of nasal spray as the men in the placebo condition. In a similar study of smokers who were not making a quit attempt, women were reported to self-administer nicotine nasal spray at a much lower rate than men (Perkins, Sanders, D'Amico, & Wilson, 1997).

Other studies have also reported that men self-administer nicotine by nasal spray

and gum at higher rates than women when administering on an ad-lib basis (Killen et al., 1990; Perkins, Donny, & Caggiula, 1999). Related to this, men appear to be more likely than women to report feeling a "buzz" upon smoking (Pomerleau et al., 2005). In this same study, women had more difficulty remaining abstinent during a quit test. The majority of animal research on self-administration of nicotine has used males exclusively. Achieving robust self-administration curves in female animals is often difficult. This may account for the paucity of research using female animals as subjects (Perkins, 1999).

Research investigating changes in nicotine intake following nicotine preloading (administering a dose before permitting self-administration) have also yielded some interesting results. It appears that women do not titrate their nicotine intake following preloading as well as men do. When participants are pretreated with varying doses of nicotine, and then allowed to smoke cigarettes ad lib for a set amount of time, the ability to titrate intake to achieve a desired dose can be observed. Men tend to titrate their nicotine intake to maintain plasma levels similar to those observed when smoking ad lib without nicotine preloading. On the other hand, women appear to inhale the same amount of nicotine regardless of preloading and the size of the preloaded dose. These results suggest that women are less able to discriminate the amount of nicotine they have already consumed and regulate their subsequent intake (Perkins et al., 1992).

Even when asked to attempt to learn to discriminate nicotine dosages, women perform poorly. In addition, even when they had been taught to discriminate doses adequately, women reported less confidence in the accuracy of their judgments than men did (Perkins, 1996). Taken together, these results suggest that men may be more sensitive to the physiological effects of nicotine than women. The lack of robust self-

administration in female animals and lack of self-administration of nicotine above placebo levels in women suggest that nicotine per se may not be reinforcing for women. Instead, the maintenance of smoking behavior in women may best be explained in some other way.

The differences found in men's and women's abilities to discriminate nicotine dosages may be partially explained by research that suggests that women are consistently less accurate than men at detecting any physiological changes (Roberts & Pennebaker, 1995). Additionally, women's performance at detecting these changes does not improve with feedback about the accuracy of their reports.

Interestingly, this effect is only found in the absence of contextual cues. Sex differences in perceptions of physiological changes are generally not found in the presence of a situational context, which can provide cues that aid in the detection of changes (Roberts & Pennebaker, 1995). There is reason to believe that this may apply to changes due to nicotine intake, too. External cues may be important in determining the perception of physiological changes due to nicotine intake, especially for women.

Genetic contributions. A limited amount of research has been done on a small percentage of people who have a defective allele which interferes with nicotine metabolism. In one such study, the researchers reported that men who have this allele smoke less in order to compensate for the higher plasma levels of nicotine that result from this defect (Tyndale & Sellers, 2002). Nicotine dependent women who have the same genetic defect do not appear to reduce their smoking to compensate for their elevated plasma nicotine levels. Instead, they smoke at similar rates as nicotine dependent women who do not have this allele (Pianezza, Sellers, & Tyndale, 1998). However, in

more recent research, it has been suggested that the CYP2A6 genetic defect may not alter smoking consumption significantly, regardless of gender (Carter, Long, & Cinciripini, 2004).

Sensory aspects of cigarette smoking. Cigarette smoking is most likely maintained, in part, by non-nicotine reinforcement associated with smoking (Rose & Levin, 1991). Some of this reinforcement may come from sensory aspects of smoking. Sensory aspects of cigarette smoking include things such as holding the cigarette in the fingers, moving the lips and mouth, the smell of nicotine smoke, and the feel of the smoke in the back of the throat when it is inhaled. Women appear to respond more to these reinforcing aspects of smoking than to the nicotine itself (Eissenberg, Adams, Riggins, & Likness, 1999; Gritz et al., 1996). A study by Zeman, Hiraki, and Sellers (2002) compared breath carbon monoxide levels and blood nicotine levels of men and women who smoked similar numbers of cigarettes. They reported that although men and women showed similar expired carbon monoxide levels, women had significantly lower blood nicotine levels. They interpreted this as meaning that women receive more exposure to smoke than to nicotine when smoking a cigarette. The authors suggested that this may be due to women smoking light cigarettes or differences in smoking topography. Although they received less nicotine, the women in this study smoked at high rates comparable to men's (Zeman et al., 2002).

External cues appear to increase the subjective pleasure obtained from smoking cigarettes for both men and women. For example, Rose et al. (1985) required male and female participants to gargle solutions that either contained the anesthetic lidocaine, or a saline solution. Participants also inhaled a mist of the same solution. Following this,

participants either sham smoked or smoked real cigarettes. Cigarette smoking was found to significantly reduce subjective cravings. However, anesthetization of the airways blocked the immediate reduction in craving.

When people are required to wear nose clips while smoking, olfactory cues associated with smoking can be almost completely blocked. One study has demonstrated that this blocking of olfactory cues can reduce puff volume, as well as reported taste and enjoyment of smoking in women. There were no men in this sample (Baldinger, Hasenfratz & Battig, 1995). In both of the above studies, blocking sensory cues associated with smoking reduced the pleasure participants received from smoking.

Other evidence that the sensations felt when smoking help to maintain smoking behavior comes from studies in which participants are asked to rate different types of cigarettes. These studies have consistently found that subjective ratings such as 'liking' and 'satisfaction' increase with exposure to standard brand as well as de-nicotinized cigarettes. The de-nicotinized cigarettes decreased reported craving and withdrawal to the same extent as the nicotine cigarettes (Butschky et al., 1995; Gross et al., 1997). In previous studies, smokers who rated nicotine and de-nicotinized cigarettes similarly in 'liking' and 'satisfaction' tended to be more dependent than those who had more dissimilar ratings (Brauer et al., 2001).

Although sensory cues increase the subjective pleasure from smoking in both men and women, there is some evidence that the effect may be stronger in women. When men and women are administered comparable doses of nicotine by cigarette smoking and nasal spray, women report much greater increases in subjective measures such as feeling 'relaxed' and 'comfortable' when smoking cigarettes. This occurred even though the

doses administered by the two routes were similar. Men did not show this same pattern of responding (Perkins et al., 1994).

The effects of non-nicotine stimuli were investigated in a set of three studies. In the first two studies, participants wore swimming goggles and nose clips to block visual and olfactory stimuli. Self-administration and reported satisfaction were reduced when sensory stimuli were blocked. This effect was significant in women, but not in men. Interestingly, further analyses showed that the effect held for olfactory and taste stimuli, but visual stimuli did not appear to affect hedonic ratings or self-administration of nicotine in either gender. In the third study, the same procedure was applied to eating pizza. No gender differences were observed in this study, suggesting that the gender differences in subjective ratings may only apply to substances such as nicotine and not to all consumption (Perkins et al., 2001).

During quit attempts, women are more likely to implement sensory substitutes such as nicotine inhalers or gum into their attempt (Perkins, 2001). It has also been suggested that women may consider 'hand-mouth activity' to be more important in the usefulness of self-administering nicotine gum during cessation attempts and in the use of cigarettes than men do (Parrott & Craig, 1995).

Nicotine replacement therapy. Nicotine replacement therapies (NRT) are the main pharmacological treatment used in cessation attempts (Burton, Gitchel & Shiffman, 2000; Fiore, Jorenby, Baker, & Kenford, 1992; Hughes, 1993). NRT is designed to reduce withdrawal symptoms by replacing nicotine levels in the blood while avoiding exposure to toxins and carcinogens present in cigarette smoke (Benowitz, 1998; Fiore et al., 1992; Henningfield, 1995; Hughes & Hatsukami, 1986; West et al., 2000). NRT has repeatedly

been shown to be effective at increasing the likelihood of success in a cessation attempt (Fiore et al., 1992; Fiore et al., 2000; Silagy, Lancaster, Stead, Mant, & Fowler, 2002) In several studies, nicotine replacement therapy (NRT) has been shown to be more effective than placebo for both men and women (Cepeda-Benito, Reynoso, & Erath, 2003; Perkins, 1996), with some reports of NRT doubling the success rate of smoking cessation (Etter & Perneger, 2001) However, the benefit of NRT in relation to placebo is generally higher among men than it is among women (Davis et al., 1994; Killen et al., 1990). In addition, some studies have reported that NRT is less effective at reducing withdrawal symptoms in women than men (Perkins, 1996; Gritz et al., 1996; Pomerleau, 1996).

Sleep has also been used as a measure of response to NRT, because nicotine withdrawal leads to increased sleep fragmentation. It has been demonstrated that NRT alleviates sleep disturbance and reported withdrawal symptoms in men. However, use of NRT patch appears to exacerbate sleep disturbance in women. Women also report significant withdrawal symptoms when using NRT while men do not (Wetter et al., 1999a).

Men demonstrate higher abstinence rates than women when using NRT in the form of gum, patch or nasal spray. However, abstinence rates are higher among women when using nicotine inhalers as NRT (West et al., 2001). A possible explanation for this finding is that the additional sensory aspects of using an inhaler are helpful for women attempting to quit smoking. The nicotine inhaler may be able to substitute for several of the behavioral aspects of smoking, as it is handled, brought to the mouth and manipulated with the mouth in a similar fashion to using a cigarette.

A recent study suggested that women do not fare better when the nicotine inhaler

is combined with other forms of NRT. Bohadana, Nilsson, Rasmussen, and Martinet (2003) assigned men and women to cessation programs using a nicotine inhaler and patch. One group was assigned to an inhaler and active patch, which was later tapered to an inactive patch. A second group was assigned to inhaler plus inactive patch throughout the cessation program. The authors reported that a larger percentage of men than women were abstinent in both conditions at all time points. The difference between the genders was greater in the group using an active nicotine patch. This was true even though men reported smoking at higher rates and evidenced higher FTND scores at baseline.

As Perkins (1996) noted, findings of gender differences in response to NRT are based on individual studies or on analyses done across a small number of studies. It is not yet clear whether these differences represent phenomena specific to NRT treatment. These findings could simply be an artifact of women's consistently poorer outcome in smoking cessation regardless of treatment type (Benowitz & Hatsukami, 1998; Fiore et al., 2000; Perkins, 2001). One study to date has reported no gender differences in response to two types of NRT (Shiffman, Sweeney, & Dresler, 2005). The reduced efficacy of NRT in women may be evidence in favor of lessened physiological effects of nicotine in women.

The use of other non-nicotine medications is sometimes more effective in women than in men. These non-nicotine medications include clonidine and antidepressants such as bupropion (Perkins, 1996). Bupropion has been demonstrated to be effective in aiding smoking cessation (Hurt et al., 1997; Jorenby et al., 1999; Scharf & Shiffman, 2004). Bupropion appears to be useful for reducing negative affect experienced following a quit attempt (Lerman et al., 2002). It has also been suggested that bupropion may reduce post-

quit weight gain and increases in appetite. This effect appears to be especially large in women (Borelli, Spring, Niaura, Hitsmen, & Papandonatos, 2001). Despite the literature suggesting that women may find bupriopion useful during smoking cessation attempts, women do not always fare better than men in clinical trials (Dale et al., 2001; Gonzales et al., 2002). Collins et al. (2003) reported that men who smoked more than a pack a day and women who smoke less than a pack a day were most likely to benefit from bupriopion combined with behavioral counseling, while Scharf and Shiffman (2004) reported no gender differences in response to treatment with bupropion.

Assessment of Nicotine Dependence

Nicotine dependence has been measured in a number of ways. Biological measurement of recent nicotine consumption is one of these methods. High levels of nicotine consumption are commonly thought to be associated with high levels of nicotine dependence. Biological measures typically include salivary cotinine, expired carbon monoxide, urinary nicotine metabolites, and blood nicotine levels. These measures all involve collection of biological material that contains byproducts of nicotine consumption (Bernaards, Twisk, van Mechelen, Snel, & Kemper, 2004).

Nicotine consumption can also be measured by self-report. High levels of agreement have been found between self-report of cigarette consumption and biological measures of nicotine intake (Bernaards et al., 2004). However, amount of nicotine consumption does not offer other information relevant to measurement of nicotine dependence. Several self-report questionnaires have been developed to assess various aspects of nicotine dependence.

The Current Study

The current study was designed to determine whether or not men and women differ in their responses to questions about dependence on cigarette smoking. The current literature suggests that women may indicate more symptoms and more severe symptoms of behavioral dependence than men. The specific hypotheses of this study were as follows:

1) Men and women would differ on self-report measures of dependence. Specifically, women would score higher on behavioral measures of dependence and craving.
2) Men and women would be classified as dependent according to diagnostic criteria in equal proportions, although the actual symptoms endorsed may differ.
3) Craving and behavioral dependence would be found to be positively correlated with one another.

CHAPTER III

METHODS

Participants

Power analysis using G*Power (Faul, Erdfelder, Lang, & Buchner (in press)) suggested that with an a priori alpha of .05, and an estimated effect size of .40, 84 participants would be needed to detect an effect. However, other studies of gender differences and nicotine use have seldom used such high numbers. For instance, in Pomerleau's (1994) study concerning self-reported withdrawal, and in Wetter et al's (1999a) study of NRT response, 34 participants were recruited. No effect sizes were reported in either of these studies, but both reported significant results. Pomerleau et al. (2005) used 69 participants in their analysis of gender and inability to abstain. Based on the power analysis, and numbers used in other investigations of gender differences in self-reported smoking data, 60 participants were recruited for this study.

Participants were selected from undergraduate psychology courses at Oklahoma State University. Participants either fulfilled an assignment or received extra credit for a psychology course for their participation in this study. OSU students enrolled in Psychology courses were administered a screener in their classroom, and potential participants were selected based on their self-reported smoking status on the screener. They were then sent a recruitment email asking for their participation. Alternatively, students may have seen the Experimetrix posting for this study and contacted the

researcher by email. In this situation, smoking status was verified by checking the student's name against the screener. If the student qualified for participation, an invitation to participate was sent through email. These email messages can be seen in Appendix J.

A total of 109 people participated in at least one session of the study. Of these, 45 participants completed one session, 4 participants completed two sessions, and 60 participants completed all five sessions. Participants who completed the entire study included 20 men and 40 women. Additional demographic characteristics of the participants who completed the entire study can be seen in Table 1 in Appendix A. Participants who completed at least one complete session of the study included 21 men, 24 women, and 4 people who declined to report gender. Participants who declined to report gender were excluded from statistical analyses since gender was essential to the hypotheses of this study. Additional demographic characteristics of participants who completed at least one session of the study can be seen in Table 2 in Appendix A.

Materials

Fagerström Test for Nicotine Dependence. The Fagerström Test of Nicotine Dependence (FTND) was developed in 1991 by Heatherton, Kozlowski, Frecker, and Fagerström. It is a revision of Karl Fagerström's original nicotine dependence questionnaire, the Fagerström Tolerance Questionnaire (FTQ) (Fagerström, 1978). The FTND was developed to assess level of physical dependence on smoked nicotine, aid in matching smokers to cessation treatments based on dependence level, and improve on the

internal consistency and factor structure of the FTQ (Heatherton et al., 1991). Scores may fall anywhere within a range of 0-11, with a score of 0 indicating small or no nicotine dependence and a score of 11 indicating maximum nicotine dependence (Fagerström, 1978). The FTND can be seen in Appendix E.

Glover-Nilsson Smoking Behavior Questionnaire. The Glover-Nilsson Smoking Behavior Questionnaire (GN-SBQ) is a self-report measure of behavioral dependence based on behaviors that may surround smoking or thoughts about smoking. Scores fall within a range of 0-33, with scores of 0 indicating mild behavioral dependence, and scores of 33 indicating very strong behavioral dependence (Glover, Nilsson, & Westin, 2001). The GN-SBQ can be seen in Appendix F.

Smoking Consequences Questionnaire. The Smoking Consequences Questionnaire (SCQ) is a self-report measure designed to assess the expected benefits of smoking (Brandon & Baker, 1991). It measures people's subjective reasons for smoking. A short form of the SCQ has been developed and appears to have reliability, validity, and factor structure consistent with the original questionnaire (Myers, McCarthy, MacPherson, & Brown, 2003). The short form of the SCQ consists of 21 questions which are answered on a Likert scale with a range of 0 to 9. The SCQ yields four factors, Negative Consequences, Positive Reinforcement, Negative Reinforcement, and Appetite and Weight Gain. Factors 2 and 3 of the SCQ were used as measures of behavioral dependence. The SCQ can be seen in Appendix H.

Questionnaire on Smoking Urges. The Questionnaire on Smoking Urges (QSU) is a self-report questionnaire of craving for a cigarette. It is considered a multidimensional assessment of cigarette craving and is based on Tiffany's (1990) conceptualization of

craving. The QSU is composed of 32 items, answered on a Likert scale with a range of 1 to 7, with one being untrue and 7 being very true (Tiffany & Drobes, 1991). The QSU yields four factors, Desire to Smoke, Anticipation of Positive Outcome, Relief of Withdrawal or Negative Affect, and Intention to Smoke. The QSU can be seen in Appendix G.

Diagnostic Criteria. Participants were asked to respond with 'yes or no' to a list of the diagnostic criteria for smoking dependence as listed in the DSM-IV-TR in order to determine whether or not participants in the study met criteria for nicotine dependence. The list of diagnostic criteria which was presented to participants can be seen in Appendix D.

Procedure

Participants were asked to complete five sets of questionnaires presented in an online format. All study materials were posted on a web site using Microsoft FrontPage. Each session required participants to complete several linked web pages. Responses to items were submitted by point-and-click. Each possible choice could be selected by clicking on a blank bubble located adjacent to the item. The web pages were formatted so that only one response could be selected for each item. The first session was estimated to take approximately 20-25 minutes to complete. The four remaining sessions were estimated to take approximately 10-15 minutes each to complete.

Participants completed questionnaires related to their smoking habits on a research website. The address for the website where study materials could be accessed was provided to persons selected based on smoking status. Those students who agreed to

participate in the study completed informed consent on the website. A printable version of the informed consent form was provided on the website for participants to keep for their records. The informed consent form can be seen in Appendix I. Upon completion of informed consent, researchers assumed that the participant understood the procedure, risks, and benefits of the study as outlined in the informed consent. Following completion of informed consent, participants were directed to complete the DSM-IV-TR criteria for nicotine dependence, FTND, GN-SBQ, S-SCQ, and QSU regarding their smoking behavior for the last two weeks. Participants were asked to complete a set of web-based questionnaires four additional times over the course of one month. This set of questionnaires included the FTND, GN-SBQ, S-SCQ, and QSU. At these times, participants were asked to answer the questions as they applied over the last 24 hours. Upon completion of each set of questionnaires, participants' answers were saved in a password protected database, along with an email address which allowed the researcher to identify which answers were given by the same participant. Following coding of the data, files containing email addresses were destroyed.

Participants were informed that the four additional sets of questions could be filled out at any time over the course of the month, but that sets of questionnaires should be completed at least four days apart. In addition, participants were encouraged to avoid completing questionnaires on days during which their smoking habits may have been altered by unusual events. At all time points, participants were asked to complete questionnaires in the evening, and when they had not smoked for at least one hour previously.

Contact information collected on the screeners used to recruit research

participants was used to contact participants, if needed, to remind them of their participation in this study. If no new data had been received from a participant for one week, they were sent an email reminding them to complete their remaining research sessions. Following completion of the study, the database containing information from screeners was destroyed. Participants were offered one point of research credit for completing up to two sessions, and one additional point of research credit for completing at least three sessions.

CHAPTER IV

RESULTS

Data collected from participants who did not complete the entire study were analyzed separately from data collected from participants who did complete the entire study. Analyses based on complete data are presented first.

Consistency of responses across the five time points was measured with intra-class correlation. Intra-class correlation yields a correlation coefficient similar to a Pearson's r correlation used to measure test-retest reliability. Unlike Pearson's r, intra-class correlation can be used to analyze consistency or stability of scores across more than two time points. Reliabilities for the overall sample ranged from $r = .53$ to $r = .92$ for the various measures used in this study. Reliabilities for men ranged from $r = .53$ to $r = .95$, and reliabilities for women ranged from $r = .56$ to $r = .92$. Across these groups, QSU factors demonstrated the lowest reliabilities, and SCQ factors and the GN-SBQ demonstrated the highest reliabilities. Intra-class correlations for the overall sample, men, and women can be seen in Tables 3 and 4, respectively in Appendix A.

The first hypothesis considered whether or not men and women differed on self-report measures of physiological dependence, behavioral dependence, and craving. Possible systematic changes in responding due to time were also considered. A mixed-design MANOVA was performed with gender as the between-subjects factor and time as the within-subjects factor to address this hypothesis. The dependent variables for this

analysis were scores on the FTND, GN-SBQ, the positive reinforcement and negative reinforcement factors of the SCQ (factors 2 and 3, respectively), and the total score of the QSU. The FTND was used as a self-report measure of physiological dependence. Behavioral dependence was measured by the GN-SBQ, and factors 2 and 3 of the SCQ. Craving was measured by the QSU. There was no significant interaction between time and gender [F (20, 39) = .81, p = .69, η_p^2 = .29]. Observed power for this interaction was .47. There was no significant main effect of time [F (20, 39) = .75, p = .76, η_p^2 = .28]. Observed power for the main effect of time was .43. There was also no significant main effect of gender [F (5, 54) = 2.04, p = .09, η_p^2 = .16]. Observed power for the main effect of gender was .64. Cell means for this analysis can be seen in Tables 5 and 6 in Appendix A.

A Chi-square test of association was used to examine the hypothesis that men and women would meet DSM-IV-TR diagnostic criteria for nicotine dependence in equal proportions. The results of the Chi-square suggested that there was not a significant difference in the proportion of men and women who met diagnostic criteria [χ^2 (1) = .33, p = .57]. The effect size for this analysis was small (ø = .07). A visual representation of the Chi-square results can be seen in Table 7 in Appendix A. A Chi-square test of association was also used to examine the hypothesis that within men and women who met criteria for dependence, a larger proportion of men would meet criteria for the specifier "with physiological dependence". This specifier indicates the presence of withdrawal and/or tolerance. Only the 14 men and 25 women (39 participants) who met criteria for nicotine dependence were entered into this analysis. The results indicated that there was not a significant difference between the proportions of nicotine-dependent men and

women who met criteria for the specifier "with physiological dependence" [χ^2 (1) = .20, p = .89]. The effect size for this analysis was small (ø = .07). A visual representation of this Chi-square analysis can be seen in Table 8 in Appendix A.

The third hypothesis examined whether a positive correlation existed between scores on measures of behavioral dependence and scores on measures of craving. Pearson's product-moment (Pearson's r) correlations were used to test the direction and strength of these hypothesized relationships. Significant positive correlations were found to exist between the GN-SBQ and factors 2, 3, and 4 of the SCQ. Factor 3 of the QSU correlated positively with all four measures of behavioral dependence. A table of these correlations can be seen in Table 9 of Appendix A.

Separate analyses were performed on data collected from participants who completed one or two sessions of the study, but did not complete the entire study. Due to the small number of participants who completed two sessions, only data collected from the first session was analyzed. Gender identification was missing from four participants, and so all analyses concerning gender were completed based on the 45 participants who provided gender information.

To address the first hypothesis, concerning a difference between men and women on measures of behavioral and physiological dependence, independent samples t-tests were performed with gender as the independent variable and FTND, GN-SBQ, factor 2 of the SCQ, factor 3 of the SCQ, and the QSU as the dependent variables. No significant differences between genders were found on the FTND [t (43) = -.12, p = .91, d = .05], the GN-SBQ [t (43) = 1.37, p = .18, d = .41], factor 2 of the SCQ [t (43) = 1.91, p = .30, d = .57], factor 3 of the SCQ [t (43) = .14, p = .89, d = .04], or the QSU [t (43) = 1.06, p =

.08, d = .32]. Means and standard deviations for these analyses can be seen in Table 11 in Appendix A.

A Chi-square test of association was performed to determine whether equal proportions of men and women met DSM-IV-TR criteria for nicotine dependence. In this sample, there was not a significant difference in the proportion of men and women who met diagnostic criteria for nicotine dependence [χ^2 (1) = 1.84, p = .18]. The effect size for this analysis was small (ø = .20). A visual representation of this analysis can be seen in Table 10 in Appendix A. An additional Chi-square test of association was performed to test the hypothesis that within participants labeled nicotine dependent, a larger proportion of men than women would meet criteria for the specifier "with physiological dependence". The 19 men and 18 women (37 participants) who met criteria for nicotine dependence were included in this analysis. There was a significant difference in the proportions of men and women who met criteria for the specifier "with physiological dependence", such that a larger proportion of men than women met this criteria [χ^2 (1) = 7.71, p = .01]. The effect size for this analysis was medium (ø = .46). A visual representation of this analysis can be seen in Table 12 in Appendix A.

Pearson's r correlations were performed to examine the hypothesis that positive correlations would exist between behavioral dependence and craving. The GN-SBQ was positively correlated with all other measures. All of the factors of the QSU were correlated with each other. Factors 2 and 3 of the SCQ were positively correlated with each other, and with Factors 1 and 3 of the QSU. A table of the correlation coefficients can be seen in Table 13 in Appendix A.

Due to the lack of significant differences in reliability across time points between

men and women, additional analyses were performed on the entire sample of 105 participants that provided information about gender. In this combined sample, 41 participants were men, and 64 were women. In these analyses, only data from the first session were analyzed for all subjects. Independent samples t-tests were performed to test whether differences existed between men and women on measures of behavioral dependence and craving. There were no significant differences found between men and women on the GN-SBQ [t (103) = .33, p = .74, d = .07], factor 2 of the SCQ [t (103) = 1.26, p = .21, d = .26], factor 3 of the SCQ [t (103) = -.90, p = .37, d = .18], or the QSU [t (103) = 1.48, p = .14, d = .31]. Means and standard deviations for these analyses can be seen in Table 14 in Appendix A.

In order to test whether self-reported behavioral dependence and craving would be different in participants who were physiologically dependent, t-tests were completed on the 69 participants who scored 4 or above on the FTND. A score of 4 or higher on the FTND is used as a convention to differentiate people who are at least moderately physiologically dependent on nicotine (Fagerstrom, Heatherton, & Kozlowski, 1992). In this sample, of physiologically dependent participants, 32 were men and 37 were women. No significant differences were found between men and women on the GN-SBQ [t (67) = -.18, p = .91, d = .03], factor 2 of the SCQ [t (67) = .39, p = .70, d = .10], factor 3 of the SCQ [t (67) = -1.09, p = .28, d = .26], or the QSU [t (67) = 1.43, p = .16, d = .35]. Means and standard deviations for these analyses can be seen in Table 15 in Appendix A.

A Chi-square test of association was performed using the entire sample of 105 participants was performed to determine whether equal proportions of men and women met DSM-IV-TR criteria for nicotine dependence. There was not a significant difference

in the proportions of men and women who met diagnostic criteria for nicotine dependence [χ^2 (1) = 2.21, p = .14]. The effect size was small (ø = -.15). A visual representation of this analysis can be seen in Table 16 in Appendix A. An additional Chi-square test of association was performed on the 76 participants from the entire sample who met DSM-IV-TR diagnostic criteria for nicotine dependence. This Chi-square tested whether a larger proportion of nicotine dependent men than women would meet the specifier 'with physiological dependence'. A significantly larger proportion of men than women met criteria for the physiological dependence specifier [χ^2 (1) = .4.17, p = .04]. The effect size was small (ø = -.23). A visual representation of this analysis can be seen in Table 17 in Appendix A.

CHAPTER V

DISCUSSION

The present study assessed self-reported nicotine dependence and craving through the use of self-report measures presented in an online format. Participants were asked to complete web-based questionnaires concerning smoking habits, craving, and feelings about smoking on five separate occasions over approximately one month. Participants were asked to complete sets of questionnaires at least four days apart, and questionnaires were accessed through personal computers on the participant's own time and schedule.

On the first occasion, participants were asked to respond to items based on their experience over the past two weeks. On the four subsequent occasions, participants were asked to respond to items based on their experience over the past 24 hours. This method was used to examine consistency across trials, and to control for differences between relatively retrospective (past two weeks) and prospective (past 24 hours) reporting. This was a concern because gender differences in retrospective versus prospective reporting on smoking questionnaires have been reported in previous studies (Pomerleau, Tate, Lumley, & Pomerleau, 1994; Tate et al., 1993). There were not significant differences between men's and women's reliabilities across time points in this study.

Men and women in this sample did not demonstrate differences in self-reported behavioral dependence, physiological dependence, or craving. When asked to endorse

nicotine dependence criteria taken from the DSM-IV-TR according to their own experience, men and women met diagnostic criteria for nicotine dependence, and for physiological dependence, in similar proportions. Within the participants who did not complete the entire study, a larger proportion of men met criteria for physiological dependence. This finding also held true when data from the first session of all participants were analyzed. Although differences were not evident in men's and women's responses to self-report measures of dependence, it appears that men endorse symptoms of tolerance and withdrawal at higher rates than women.

Scores on all measures of behavioral dependence were positively correlated with each other, suggesting that all of the questionnaires administered in this study may measure some aspect of the same construct. Factor 3 of the QSU (Relief of Withdrawal or Negative Affect) was also positively correlated with all measures of behavioral dependence. Other aspects of craving measured by the QSU were not correlated with behavioral dependence.

It is unclear from the results of this study whether or not men and women experience different degrees of physiological and behavioral dependence. The apparent closeness of withdrawal and craving, and behavioral dependence and craving suggest that the different aspects of dependence, and nicotine dependence in particular, may not be as easily separable as some theories suggest. An alternative explanation is that our current means of measuring nicotine dependence are not sophisticated enough to discern between the various aspects of nicotine dependence.

Results from analyses on participants who did not complete more than two sessions of this study produced similar results to participants with complete data. The

groups did not appear to differ from each other in any of the analyses conducted.

The lack of significant differences between men and women's self-reported dependence calls into question the reason for women's lower quit rates. It has been suggested in previous studies that men who successfully quit smoking with the use of NRT experience a reduction in symptoms of physiological dependence, making success more likely. It has also been suggested that women's improved quit rates using alternative medications such as buproprion can be explained by the medication's effects on mood and affect (Lerman et al., 2002; Perkins, 1996). If this is the case, we are not able to discern who would fare better with NRT versus alternative medication with currently available measures of dependence.

This study has several limitations, including a relatively small sample size. A larger sample size may have yielded clearer results. However, observed effect sizes were small to moderate. Differences between cell means, which can be viewed in Table 5 in Appendix A are also small, suggesting that there may not be significant differences even in a larger sample, and clinical significance of significant findings may be minimal. It is also possible that the use of an online format may have led to different results than laboratory administration of the questionnaires. Online administration may have decreased attrition in this study, but there may have been confounds that could not be controlled in this format. For example, participants were asked to complete questionnaires at roughly the same time every day, and after refraining from smoking for about an hour. However, there is no way to confirm that participants adhered to these suggestions. Despite these possible limitations, online administration of self-report measures appears to be a valid form of administration. Luce et al. (2007) compared paper

and online administration of self-report measures of weight and shape concerns, as well as a mood screener. They found high rates of agreement and significant correlations between online and paper administrations. They concluded that online assessment appears to be a reliable and valid means of collecting self-report data. Research on the use of online administration of self-report measures has not been conducted in substance using populations. However, reliabilities in the current study were moderate to high, indicating that participants in this study responded in a consistent manner. The addition of a brief mood screener may also have been useful in screening out variability in scores due to fluctuations in mood.

All participants in this study were college students at a large university in Oklahoma. It is possible that college students have different patterns of smoking and different levels of nicotine dependence than the general population. Also, due to the college student sample, the majority of the participants in this study were young, and may have only been smoking for a short period of time. These characteristics limit the generalizability of the results of this study to other populations.

Although a priori power analysis suggested a larger sample size, previous research which has been similar in subject area and format have found significant results with smaller samples. A sample size of 60 was selected as a number larger than those used in previous studies, but more likely to be reached given limitations of data collection. Effect sizes for analyses in this study tended to be small to medium. It is possible that a larger sample size would have been better able to detect significant differences if they truly exist. It should also be noted that the sample size in this study consisted of unequal numbers of men and women, which may have impacted the ability

of the tests to detect significant differences if they existed. It is possible that a larger and more demographically equal sample could be collected in a similar study in which participants would not be asked to complete five sessions. This may have been a deterrent to some possible participants.

Future research on self-report measures of dependence and craving would be helpful in developing more sophisticated measures. The results of this study could be seen as an indication that our current self-report measures of nicotine dependence and craving are not able to identify people's motivation for smoking. Other researchers have reported significant differences on objective withdrawal measures using polysomnographic measures, but no significant differences on self-report measures of withdrawal (Wetter et al., 199b). More sensitive self-report measures would be more helpful for clinicians attempting to choose the most appropriate smoking cessation interventions.

It would also be helpful for future research to elucidate the relationships between withdrawal, craving, and behavioral dependence. A better understanding of the constructs of withdrawal, craving, behavioral dependence, and physiological dependence is crucial to understanding what drives smoking behavior. It is possible that the consistently low efficacy of smoking interventions is due, at least in part, to our limited understanding of nicotine dependence. Women's smoking rates continue to be higher than men's, and quit rates among women continue to be low. A better understanding of women's dependence on smoking, and more sensitive measures of dependence constructs would be very beneficial to attempts to reduce smoking rates in women.

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APPENDICES

APPENDIX A – TABLES

Table 1

Demographic Characteristics of Participants Who Completed Five Experimental Sessions

Age		Ethnicity		Gender	
18-24	55	Caucasian/White	56	Male	20
25-30	2	African American	2	Female	40
31-45	1	Asian/Pacific Islander	2		
46-65	2				

Table 2

Demographic Characteristics of Participants Who Completed One or Two Experimental Sessions

Age		Ethnicity		Gender	
18-24	41	Caucasian/White	36	Male	21
25-30	1	African American	2	Female	24
31-45	2	American Indian	4	Missing	4
46-65	1	Asian/Pacific Islander	1		
Missing	4	Other	2		
		Missing	4		

Table 3

Consistency of the overall sample's scores across time as measured by intra-class correlation

Scale	Reliability Coefficient
FTND	.77
GN-SBQ	.90
QSU Factor 1	.55
QSU Factor 2	.61
QSU Factor 3	.81
QSU Factor 4	.53
SCQ Factor 1	.88
SCQ Factor 2	.87
SCQ Factor 3	.92
SCQ Factor 4	.91

Table 4

Consistency of men's and women's scores across time as measured by intra-class correlation

Scale	Men	Women
FTND	.68	.78
GN-SBQ	.86	.90
QSU Factor 1	.53	.56
QSU Factor 2	.70	.59
QSU Factor 3	.86	.80
QSU Factor 4	.69	.46
SCQ Factor 1	.91	.87
SCQ Factor 2	.87	.87
SCQ Factor 3	.95	.91
SCQ Factor 4	.89	.92

Table 5

Cell Means and Standard Deviations for Men's and Women's Self Reported Dependence Measures Across Experimental Sessions

	Time 1	Time 2	Time 3	Time 4	Time 5
			Men		
FTND	4.95 (1.19)	5.00 (1.41)	5.05 (1.43)	5.50 (1.70)	5.20 (1.61)
GN-SBQ	17.70 (7.43)	17.75 (7.35)	18.80 (6.86)	16.95 (7.76)	17.55 (7.50)
SCQ Factor2	4.37 (2.10)	4.46 (2.57)	4.08 (2.23)	4.17 (2.52)	4.08 (2.38)
SCQ Factor 3	4.74 (2.35)	4.59 (2.33)	4.93 (2.27)	4.67 (2.35)	4.51 (2.46)
			Women		
FTND	4.20 (1.49)	4.10 (1.45)	4.35 (1.60)	4.30 (1.59)	4.33 (1.79)
GN-SBQ	19.40 (10.42)	19.93 (9.98)	19.70 (10.70)	19.58 (11.50)	19.63 (11.05)
SCQ Factor2	4.50 (2.82)	4.62 (2.83)	4.30 (2.74)	4.83 (2.81)	4.53 (2.98)
SCQ Factor 3	5.77 (2.94)	6.01 (2.89)	5.81 (3.09)	5.85 (2.99)	5.58 (3.14)

Table 6

Cross-Tabulations for Chi-Square Test of Association for Proportions of Men and Women Meeting Criteria for Nicotine Dependence (Complete Data Sample)

		Dependence		
		Yes	No	Total
	Male	(13)	(7)	
Gender		16	4	20
	Female	(26)	(14)	
		25	15	40
	Total	39	21	60

Expected values appear in parentheses.

Table 7

Cross-Tabulation Table for Chi-Square Test of Association for Proportions of Nicotine Dependent Men and Women Meeting Criteria for Physiological Dependence Specifier (Complete Data Sample)

		Physiological Dependence		
		Yes	No	Total
	Male	(11.85)	(2.15)	
Gender		12	2	14
	Female	(21.15)	(3.85)	
		21	4	25
	Total	33	6	39

Expected values appear in parentheses.

Table 8

Intercorrelations Between Measures of Behavioral Dependence and Craving (Complete Sample)

	GN-SBQ	SCQ2	SCQ3	QSU1	QSU2	QSU3	QSU4
GN-SBQ	--	.536**	.743**	-.040	.159	.720**	.114
SCQ2		--	.567**	-.044	.224	.512**	-.070
SCQ3			--	-.036	.111	.679**	.044
QSU1				--	.130	.221	.397**
QSU2					--	.295*	-.233
QSU3						--	.280*
QSU4							--

21. *Denotes statistical significance at the .05 level*

*** Denotes statistical significance at the .01 level*

Table 9

Means and Standard Deviations of Participants' Responses at Time 1(Incomplete Data Sample)

	FTND	GS-NBQ	SCQ Factor 2	SCQ Factor 3	QSU
Men	4.29 (1.42)	20.38 (8.97)	5.75 (2.23)	5.61 (2.31)	109.81 (15.94)
Women	4.25 (1.33)	16.92 (8.04)	4.31 (2.76)	5.51 (2.73)	102.58 (27.57)

Table 10

Cross-Tabulation Table for Chi-Square Test of Association for Proportions of Men and Women Meeting Criteria for Nicotine Dependence (Incomplete Data Sample)

		Dependence		
		Yes	No	Total
	Male	(17.27)	(3.73)	
Gender		19	2	21
	Female	(19.73)	(4.27)	
		18	6	24
	Total	37	8	45

Expected values appear in parentheses.

Table 11

Cross-Tabulation Table for Chi-Square Test of Association for Proportions of Nicotine Dependent Men and Women Meeting Criteria for Physiological Dependence Specifier (Incomplete Data Sample)

		Physiological Dependence		
		Yes	No	Total
	Male	(14.38)	(4.62)	
Gender		8	1	19
	Female	(13.62)	(4.38)	
		10	8	18
	Total	28	9	37

Expected values appear in parentheses.

Table 12

Intercorrelations Between Measures of Behavioral Dependence and Craving (Incomplete Data Sample)

	GN-SBQ	SCQ2	SCQ3	QSU1	QSU2	QSU3	QSU4
GN-SBQ	--	.417**	.508**	.331*	.356*	.598**	.424**
SCQ2		--	.598**	.392**	.237	.458**	.155
SCQ3			--	.477**	.194	.587**	.285
QSU1				--	.570**	.598**	.410**
QSU2					--	.486**	.508**
QSU3						--	.458**
QSU4							--

21. *Denotes statistical significance at the .05 level*

*** Denotes statistical significance at the .01 level*

Table 13

Means and Standard Deviations for All Participants' Responses at Time 1

	GS-NBQ	SCQ Factor 2	SCQ Factor 3	QSU
Men	19.07 (8.26)	5.08 (2.25)	5.19 (2.34)	107.29 (18.39)
Women	18.47 (9.61)	4.43 (2.78)	5.67 (2.85)	100.52 (25.26)

Table 14

Means and Standard Deviations for All Participants With an FTND Score of 4 or Above at Time 1

	GS-NBQ	SCQ Factor 2	SCQ Factor 3	QSU
Men	20.00 (7.32)	4.89 (2.17)	5.41 (2.37)	110.06 (18.70)
Women	20.24 (9.57)	4.65 (2.80)	6.06 (2.58)	102.32 (25.13)

Table 15

Cross-Tabulation Table for Chi-Square Test of Association for Proportions of Men and Women Meeting Criteria for Nicotine Dependence (Entire Sample at Time 1)

		Nicotine Dependence		
		Yes	No	Total
	Male	(29.68)	(11.32)	
Gender		33	8	41
	Female	(46.32)	(17.68)	
		43	21	64
	Total	76	29	105

Expected values appear in parentheses.

Table 16

Cross-Tabulation Table for Chi-Square Test of Association for Proportions of Nicotine Dependent Men and Women Meeting Criteria for the Specifier 'With Physiological Dependence' (Entire Sample at Time 1)

		Physiological Dependence		
		Yes	No	Total
	Male	(26.49)	(6.51)	
Gender		30	3	33
	Female	(34.51)	(8.49)	
		31	12	43
	Total	61	15	76

Expected values appear in parentheses.

APPENDIX B – SCREENER FOR PARTICIPATION

Research Screener

Please Print Clearly (All information will remain confidential)

Name: _____ Age: _____ Sex M F

email address:_____ Phone: ( )_____

Best Time to Call:_____ Instructor:_____ Course # _____ Sec#_____

1. Do you have any medical conditions (e.g. heart problems)? If yes, please specify: _____
2. Do you currently use tobacco products? Y / N If YES, circle one of the following:

   Cigarettes Smokeless Tobacco Both Other: _____

3. Have you ever used tobacco products? Y/N If YES, what type? _____
4. Do you drink alcohol? Y / N If NO, skip Questions 5-7
5. On an average week, how many drinks (12 oz. Beer, 10 oz. Wine Cooler, or standard mixed drink) do you consume?
6. If you are a WOMAN, in the last month, have you had more than 4 drinks in a single episode? Y / N
7. If you are a MAN, in the last month, have you had more than 5 drinks in a single episode? Y/N
8. If yes to questions #6 or 7, how many drinks did you have on your heaviest episode in the last 6 months? _____
9. Do you chew chewing gum? Y/N
10. How would you categorize your gum chewing behavior? Daily Almost Daily Occasionally Rarely
11. Which type of gum do you chew frequently? (Circle all that apply)

Sugarless (Extra, Eclipse, Orbit) Sugared (Juicy Fruit, Spear Mint, Double Mint, Winter Fresh, Freedent) Bubble Gum

Others: _____

IF YOU DO NOT USE TOBACCO, SKIP TO QUESTION 16

11. On average, how many cigarettes do you smoke daily? _____
12. Approximately, how many times a day do you use smokeless tobacco? _____
13. How long have you smoked or used smokeless tobacco? Smoke _____mos./yrs.

    Smokeless tobacco _____ mos./yrs.

14. Have you ever tried to quit? (Circle one) Smoking: Yes No Smokeless: Yes No Both: Yes No
15. Are you currently trying to quit smoking/ using smokeless tobacco or cut down?

    Smoking: Y / N Smokeless: Y / N Both: Y / N

21. Approximately how often do you gamble? (in past six months)

    Never 2-3 Times Once Per Month 2 to 3 Times Per Month Weekly

    More Than Once Per Week Every Other Day Every Day

21. What is the largest amount of money you have ever gambled with on any one day in the past 6 months?

    Less than $25 $25 to $50 $50 to $100 $100 to $200 $200 to $300

    $300 to $500 $500 to $700 $700 to $1,000 $1,000 to $2,000 More than $2,000

18. In the past 6 months, have you ever gambled more than you intended to? Yes No
19. Sometimes I think I should cut down on my gambling? Yes No
20. Have you, in the past 6 months, used prescription stimulant medication (for example, Adderall or Ritalin) for any reason (e.g. used it on a prescribed basis, taken more than prescribed or altered the medication to get a high, or used it without a prescription)? Y/N

APPENDIX C – DEMOGRAPHIC QUESTIONNAIRE

1) Please indicate your age

18-24 25-30 31-45 45-65

2) Please indicate your ethnic group

Caucasian African American American Indian Asian/Pacific Islander

Mixed race Other

21. Please indicate your gender

Male Female

APPENDIX D: DSM-IV-TR CRITERIA FOR NICOTINE DEPENDENCE

Please indicate whether or not you experience any of the following:

1) A need for increasing amounts of nicotine to achieve the same effects you once enjoyed — Yes No

2) Less of an effect after continued use of the same amount of nicotine — Yes No

3) Smoking larger amounts or over a longer period of time than originally intended — Yes No

4) Persistent desire or unsuccessful efforts to cut down or control your smoking — Yes No

5) Spending a great deal of time obtaining, using, or recovering from nicotine — Yes No

6) Giving up important social, occupational, or recreational activities because of smoking — Yes No

7) Smoking despite knowing of a physical or psychological problem likely to have been caused or worsened by smoking — Yes No

8) Smoking to relieve or avoid withdrawal symptoms — Yes No

9) When not smoking, do you experience any of the following?

- a. Depressed mood — Yes No
- b. Insomnia — Yes No
- c. Irritability, frustration, or anger — Yes No
- d. Anxiety — Yes No
- e. Difficulty concentrating — Yes No
- f. Restlessness — Yes No
- g. Decreased heart rate — Yes No
- h. Increased appetite o weight gain — Yes No

APPENDIX E: FAGERSTROM TEST OF NICOTINE DEPENDENCE

1. How soon after you wake up do you smoke your first cigarette?	Within 5 minutes 6 to 30 minutes 31 to 60 minutes After 60 minutes
2. Do you find it difficult to refrain from smoking in places where it is forbidden, for example, in church, at the library, in the cinema and so forth?	Yes No
3. Which cigarette would you hate most to give up?	1st one in the morning All others
4. How many cigarettes per day do you smoke?	10 or less 11 to 20 21 to 30 31 or more
5. Do you smoke more frequently during the first hours after waking than during the rest of the day?	Yes No
6. Do you smoke if you are so ill that you are in bed most of the day?	Yes No

APPENDIX F – GLOVER NILSSON SMOKING BEHAVIOR QUESTIONNAIRE

Please indicate your choice by circling the number that best reflects your choice.
0=Not at all, 1=Somewhat, 2=Moderately so, 3=Very much so, 4=Extremely so

1. My cigarette habit is very important to me	0	1	2	3	4
2. I handle and manipulate my cigarette as part of the ritual of smoking	0	1	2	3	4

Please indicate your choice by circling the number that best reflects your choice.
0=Never, 1=Seldom, 2=Sometimes, 3=Often, 4=Always

3. Do you place something in your mouth to distract you from smoking?	0	1	2	3	4
4. Do you reward yourself with a cigarette after accomplishing a task?	0	1	2	3	4
5. If you find yourself without cigarettes, will you have difficulties in concentrating before attempting a task?	0	1	2	3	4
6. If you are not allowed to smoke in certain places, do you then play with your cigarette pack or a cigarette?	0	1	2	3	4
7. Do certain environmental cues trigger your smoking, e.g. favorite chair, sofa, room, car, or drinking alcohol?	0	1	2	3	4
8. Do you find yourself lighting up a cigarette routinely (without craving)?	0	1	2	3	4
9. Do you find yourself placing an unlit cigarette or other objects (pen, toothpick, chewing gum, etc.) in your mouth and sucking to relief from stress, tension or frustration?	0	1	2	3	4
10. Does part of your enjoyment of smoking come from the steps (ritual) you take when lighting up?	0	1	2	3	4
11. When you are alone at a restaurant, bus terminal, party, etc., do you feel safe, secure, or more confidant if you are holding a cigarette?	0	1	2	3	4

APPENDIX G – QUESTIONNAIRE ON SMOKING URGES

	Not True						Very True
1. Smoking would make me feel very good right now	1	2	3	4	5	6	7
2. I would be less irritable now if I could smoke	1	2	3	4	5	6	7
3. Nothing would be better than smoking a cigarette right now	1	2	3	4	5	6	7
4. I am not missing smoking right now	1	2	3	4	5	6	7
5. I will smoke as soon as I get the chance	1	2	3	4	5	6	7
6. I don't want to smoke now	1	2	3	4	5	6	7
7. Smoking would make me less depressed	1	2	3	4	5	6	7
8. Smoking would not help me calm down now	1	2	3	4	5	6	7
9. If I were offered a cigarette, I would smoke it immediately	1	2	3	4	5	6	7
10. Starting now, I could go without smoking for a long time	1	2	3	4	5	6	7
11. Smoking a cigarette would not be pleasant	1	2	3	4	5	6	7
12. If I were smoking this minute, I would feel less bored	1	2	3	4	5	6	7
13. All I want right now is a cigarette	1	2	3	4	5	6	7
14. Smoking right now would make feel less tired	1	2	3	4	5	6	7
15. Smoking would make me happier now	1	2	3	4	5	6	7
16. Even if it were possible, I probably wouldn't smoke right now	1	2	3	4	5	6	7
17. I have no desire for a cigarette right now	1	2	3	4	5	6	7
18. My desire to smoke seems overpowering	1	2	3	4	5	6	7
19. Smoking now would make things seem just perfect	1	2	3	4	5	6	7
20. I crave a cigarette right now	1	2	3	4	5	6	7
21. I would not enjoy a cigarette right now	1	2	3	4	5	6	7
22. A cigarette would not taste good right now	1	2	3	4	5	6	7
23. I have an urge for a cigarette	1	2	3	4	5	6	7

	Not True						Very True
24. I could control things better right now if I could smoke	1	2	3	4	5	6	7
25. I am going to smoke as soon as possible	1	2	3	4	5	6	7
26. I would not feel better physically if I were smoking	1	2	3	4	5	6	7
27. A cigarette would not be very satisfying now	1	2	3	4	5	6	7
28. If I had a lit cigarette in my hand, I probably wouldn't smoke it	1	2	3	4	5	6	7
29. If I were smoking now, I could think more clearly	1	2	3	4	5	6	7
30. I would do almost anything for a cigarette now	1	2	3	4	5	6	7
31. I need to smoke now	1	2	3	4	5	6	7
32. Right now, I am not making plans to smoke	1	2	3	4	5	6	7

APPENDIX H – SMOKING CONSEQUENCES QUESTIONNAIRE

	Not True									Very True
1. Smoking is taking years off my life	0	1	2	3	4	5	6	7	8	9
2. Cigarettes taste good	0	1	2	3	4	5	6	7	8	9
3. When I'm angry a cigarette can calm me down	0	1	2	3	4	5	6	7	8	9
4. Smoking helps me control my weight	0	1	2	3	4	5	6	7	8	9
5. Smoking is hazardous to my health	0	1	2	3	4	5	6	7	8	9
6. I enjoy the taste sensations while smoking	0	1	2	3	4	5	6	7	8	9
7. When I'm upset with someone, a cigarette helps me cope	0	1	2	3	4	5	6	7	8	9
8. When I smoke, the taste is pleasant	0	1	2	3	4	5	6	7	8	9
9. Cigarettes help me deal with anger	0	1	2	3	4	5	6	7	8	9
10. By smoking I risk heart disease and lung cancer	0	1	2	3	4	5	6	7	8	9
11. Cigarettes keep me from overeating	0	1	2	3	4	5	6	7	8	9
12. I will enjoy the flavor of a cigarette	0	1	2	3	4	5	6	7	8	9
13. Cigarettes help me deal with anxiety or worry	0	1	2	3	4	5	6	7	8	9
14. Smoking calms me down when I feel nervous	0	1	2	3	4	5	6	7	8	9
15. Cigarettes keep me from eating more than I should	0	1	2	3	4	5	6	7	8	9
16. Smoking helps me deal with depression	0	1	2	3	4	5	6	7	8	9
17. I enjoy feeling a cigarette on my tongue and lips	0	1	2	3	4	5	6	7	8	9
18. Cigarettes help me reduce or handle tension	0	1	2	3	4	5	6	7	8	9
19. Smoking keeps my weight down	0	1	2	3	4	5	6	7	8	9
20. The more I smoke, the more I risk my health	0	1	2	3	4	5	6	7	8	9
21. Smoking controls my appetite	0	1	2	3	4	5	6	7	8	9

APPENDIX I – INFORMED CONSENT

Smoking Habits and Beliefs Survey-Informed Consent
Carefully read the information below before deciding whether or not to participate in this study. If you choose to continue, your consent will be presumed.

What is this project? Who is responsible for the project?

This project is designed to understand the behaviors of college students who smoke cigarettes. The project is titled "Men's and Women's Reported Dependence on Cigarettes" and is being conducted by Kimberly Haala, a graduate student in the Department of Psychology at Oklahoma State University and Frank Collins, Ph.D. *This project is approved by OSU's Institutional Review Board.*

Why might I be asked to participate?
You have been invited to participate because you are currently a college student who is at least 18 years of age and who reported smoking an average of at least 5 or more cigarettes a day.

What will I be asked to do?

All participants will be asked to complete 5 sessions of the survey. During the first session, you will complete an online survey that includes questions about your cigarette use, beliefs about smoking, and problems associated with smoking. This questionnaire should take approximately 15-20 minutes to complete. Over the following month, you will be asked to complete 4 more surveys that should take approximately 10-15 minutes to complete. You will be asked to complete these surveys at least 4 days apart. Please try to complete the surveys on days that are fairly "normal" for you.

What are the risks of participating in this project?

The risks of this study are minimal and do not exceed those ordinarily encountered in daily life.

What about my privacy and confidentiality?

Participation in this study will require you to share some information that you may consider quite private and sensitive. All records from this study will be kept confidential, and several measures will be taken to make it very unlikely that this confidentiality is compromised. Computerized data, including identifying information, will be maintained in a password-protected file accessible only by the researchers. Your identity will be associated with the data we collect while you are participating in the study. This is done so that we may maintain contact, and to link data from separate sessions. Upon completion or withdrawal from the study, identifying information will be destroyed. Your

identity will be protected from then on by creating a code number. This code number will in no way be associated with your name. Your individual responses to the questionnaire will only be seen by the researchers, and will not be seen by anyone else.

What are the benefits of participating?

If you choose to participate, the primary benefit to you will be two units of research credit. After completing each session of the survey, you will be directed to a separate page that will ask you to submit your name, student number, and other information to allow us to make sure you are given appropriate credit for your participation. You will receive one unit of research credit for the first two sessions that you complete, and one unit of research credit for the remaining three sessions. The personal information you provide will be kept separate from the data you provide on the survey.

What are the alternatives?

The alternative is to not participate. Your participation is voluntary. There is no penalty for choosing to not participate. If you are eligible for research credit in a course due to your participation, the instructor of that course will make optional comparable activities available. You may choose to not participate now, or at any time during your participation.

What if I have other questions or concerns about my participation?

If you have any questions or need to report an effect about the research procedures, you may contact Frank L. Collings, Ph.D. at (405) 744-6027. If you have questions about your rights as a research participant, you may take them to the Dr. Sue Jacobs, IRB Chair of OSU's Institutional Review Board at (405) 744-1676.

PROVIDING ELECTRONIC CONSENT:

Instructions: Click here to continue

"I have read the above conditions and agree to participate in this study."
(Clicking on this link sends you to the beginning of the study)

"No thanks"

APPENDIX J – RECRUITMENT EMAIL MESSAGE

Dear Student,

You are being invited to participate in a study due to your response to a research screener you completed in one of your OSU classes. This study is registered with Experimetrix (experiment #98), and is worth 2 research credits.

The study involves completing online questionnaires concerning your smoking habits. If you choose to participate, you will be asked to complete five brief sets of questionnaires about your smoking habits over a period of about a month. Your participation will be worth 2 research credits towards a class registered with Experimetrix.

Each set of surveys takes 5-15 minutes to complete. Please complete the surveys about 4-7 days apart from each other, and try to complete them after not smoking for about an hour. Also, if you have a weird day (really stressed out, sick, etc) try to avoid completing a survey on that day.

If you are interested in participating, please follow the first link below. The remaining four links will take you to the appropriate pages to complete the remaining four sessions.

http://fp.okstate.edu/collinslab/kim

http://fp.okstate.edu/collinslab/kim/greet1.htm

http://fp.okstate.edu/collinslab/kim/greet2.htm

http://fp.okstate.edu/collinslab/kim/greet3.htm

http://fp.okstate.edu/collinslab/kim/greet4.htm

If you have any questions, please email me by replying to this message, or call at 405-361-0649.
Thank you for your help in completing this project!

Kimberly Haala

APPENDIX K – INCOMPLETE PARTICIPATION EMAIL MESSAGE

Thank you for your participation in this study! I appreciate your help in completing this project. This is a reminder to please complete the ____ session of the study. The link for the _____ session is below. Please complete this session sometime this week. Please try to complete it on a "normal" day…not a day when you are sick or more stressed out than usual.

http://fp.okstate.edu/collinslab/kim/greet1

APPENDIX L – INSTITUTIONAL REVIEW BOARD APPROVAL LETTER

Oklahoma State University Institutional Review Board

Date:	Tuesday, March 21, 2006
IRB Application No	AS0658
Proposal Title:	Men's and Women's Self-Reported Behavioral and Physical Dependence on Cigarette Smoking
Reviewed and Processed as:	Expedited

Status Recommended by Reviewer(s): Approved Protocol Expires: 3/20/2007

Principal Investigator(s

Kimberly Haala
215 North Murray
Stillwater, OK 74078

Frank L Collins
215 N Murray
Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☒ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 415 Whitehurst (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Sue C. Jacobs, Chair
Institutional Review Board

VITA

Kimberly Ann Haala

Candidate for the Degree of

Doctor of Philosophy

Thesis: MEN'S AND WOMEN'S SELF-REPORTED BEHAVIORAL AND PHYSICAL DEPENDENCE ON CIGARETTE SMOKING

Major Field: Psychology

Biographical:

Personal Data: Born in Mankato, Minnesota October 7, 1979

Education: Received Bachelor of Science degree in Psychology from Minnesota State University, Mankato in December, 2000. Received Master of Science degree in Psychology from Oklahoma State University in May, 2005. Completed the Requirements for the Doctor of Philosophy degree with a major in Psychology at Oklahoma State University in July 2007.

Experience: Employed at the Harry Meyering Center in Mankato, Minnesota from 2000-2001. Employed by Oklahoma State University as a graduate assistant from August 2001 to 2006. Completed clinical internship at Veteran's Administration Black Hills Health Care System, Fort Meade, South Dakota.

Professional Memberships: American Psychological Association
Association for Behavioral and Cognitive Therapies
Sigma Chi Honor Society
Preparing Future Faculty in Psychology Fellow

Name: Kimberly Haala Date of Degree: July, 2007

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: MEN'S AND WOMEN'S SELF-REPORTED BEHAVIORAL AND PHYSICAL DEPENDENCE ON CIGARETTE SMOKING

Pages in Study: 79 Candidate for the Degree of Doctor of Philosophy

Major Field: Psychology

Scope and Method of Study: The purpose of this study was to investigate the relationship between gender and self-reported dependence on cigarette smoking. Specifically, the study investigated whether gender differences existed between self-report on measures of behavioral dependence, physiological dependence, and craving. Participants included 109 students from a college in Oklahoma. Of the 109 participants, 60 completed all five sessions of the study. All participants were current smokers. Participants were asked to complete the Fagerström Test for Nicotine Dependence, the Glover-Nilsson Smoking Behavior Questionnaire, the Smoking Consequences Questionnaire, and the Questionnaire on Smoking Urges. Participants were also asked to respond to diagnostic criteria of nicotine dependence from the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR). All research materials were accessed by participants via internet. Materials were presented on a webpage, and participants completed the questionnaires on their own time schedule.

Findings and Conclusions: Intra-class correlations indicated that reliability of self-report across the five time points was similar for men and women. MANOVA revealed no differences between men and women on self-report of physiological dependence, behavioral dependence, or craving. The MANOVA also indicated no significant differences in self-report across the five time points. Chi-Square indicated no significant differences in proportions of men and women classified as dependent by DSM-IV-TR criteria, and no significant difference in proportions of men and women who met DSM-IV-TR criteria for the specifier 'with physiological dependence'. Positive correlations were found to exist between measures of behavioral dependence, and between measures of behavioral dependence and craving. A similar pattern of results was found in participants who only completed one or two sessions of the study, and in analyses of the entire sample at Time 1. However, in participants who completed only part of the study as well as the entire sample, a larger proportion of nicotine dependent men met physiological dependence criteria. The results are inconclusive on whether differences exist in behavioral dependence, physiological dependence, and craving. It is possible that self-report measures of nicotine dependence are not adequately measuring these constructs.

ADVISOR'S APPROVAL: Frank L. Collins, Jr., Ph.D.