

*Chapter 6*

**NEGATIVE REINFORCEMENT IN THE RELATIONSHIP  
BETWEEN NEGATIVE AFFECT AND SMOKING  
RELAPSE: A REVIEW**

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**ABSTRACT**

Different strategies and treatments (psychological or pharmacological) for smoking cessation have been proposed and evaluated. However, a recurring problem related to effectiveness is that regardless of the type of treatment used, only a small percentage of people attending treatment remain abstinent. Therefore, various studies have focused on investigating the variables that predict lapse and relapse after a smoker remained abstinent. The results of these studies suggest that predictors of lapse and relapse can be grouped into the following categories: demographic, cognitive (self-efficacy, sensitivity, motivation), physiological (level of dependence, withdrawal symptoms, and increase in weight), behavioral (consumption pattern, lapses, relapses), social context (social networks, social support) and emotional (negative affect, depression, anxiety, stress).

In the context of additions, negative affect refers to the presence of motivational signs of withdrawal, including irritability, physical pain, emotional pain, malaise, dysphoria, alexithymia and loss of motivation by natural rewards. There are different models that explain the onset, maintenance and relapse from negative reinforcement, i.e., during withdrawal, when negative affect is experienced, cigarette consumption reduces or terminates the aversive state.

Therefore, the purpose of this chapter is to review current research findings on the relationship between tobacco consumption, negative affect, negative reinforcement, and relapse. At the end of this review we will discuss and propose future research aimed at solving relapse related to smoker's negative affect.

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## INTRODUCTION

For both smokers who quit smoking on their own and smokers who attend to a formal program of treatment, relapse is a frequent event, most of them end up relapsing in the first year of abstinence (Hajek, Stead, West, Jarvis and Lancaster, 2013). Among quitters, relapse is a major problem (Garvey, et al., 1992). Zhou et al. (2009) explained that even a significant number of people want to quit smoking, only a third part of them succeed around 75%-80% relapse before 6 months and 40% of those who have remained abstinent during the first year will return to smoking (U.S. Department of Health and Human Services, 1990). In addition, 90% of those smokers who have tried to quit will relapse (Hughes et al., 1992; Zhou et al., 2009). Therefore, a recurrent problem related to the effectiveness of different treatments for smoking cessation is that regardless of the type of treatment used only a small percentage of the people who attend the treatment maintain their abstinence.

Several studies suggest that the predictors of lapse and relapse can be grouped in different categories. The categories mentioned include: demographic, cognitive (self-efficacy, sensitivity, motivation), physiological (level of dependence, reactivity, withdrawal symptoms, increase in weight), behavioral (consumption pattern), social context (social network, social support) and emotional (negative affect, depression, anxiety, stress) (Matheny and Weatherman, 1998; Míguez and Becoña, 1997; Ockene, Emmons, Mermelstein et al., 2000; Scheitrum and Akillas, 2002). In recent years, the negative affect has become very important because of its relationship with the lapse and relapse; therefore, in the next section the model of affect regulation will be reviewed.

## THE AFFECT REGULATION MODEL, DRUG CONSUMPTION AND RELAPSE

The National Institute on Drug Abuse (NIDA, 2014) defines addiction as “a chronic, relapsing brain disease that is characterized by compulsive drug seeking and use, despite harmful consequences. It is considered a brain disease because drugs change the brain, change its structure and how it works. These brain changes can be long lasting and can lead to many harmful, often self-destructive behaviours.” The WHO (2003) expert committee on drug dependence defines drug abuse as “persistent or sporadic excessive drug use inconsistent with or unrelated to acceptable medical practice.” Actually, there is no a consensual definition of drug addiction, several terms as drug addiction, drug dependence, or substance abuse are used interchangeably.

Repeated administration of certain psychoactive drugs induces dependence and tolerance. Because of repeated administration of drugs, the organisms adapt to receive that drug (dependence). Tolerance consists in the reduction of the effect of a drug, in such way that is necessary to increase the doses to obtain the initial effect. In the process of adaptation to the presence of the drug, the organisms experience alterations in the central nervous system that regulate the initial response to the drug, to the development of dependence and tolerance, and

to the relapse after abstinence (Koob, 1997). The consumption of drugs includes several phases: acquisition, controlled consumption, and uncontrolled consumption. The transition between the last phases is characteristic of dependence and therefore considered as a criterion of dependence.

As a consequence of the changes related with the development of tolerance and dependence, when a drug is retired appears a cluster of physiological and psychological symptoms (withdrawal syndrome) that vary in time duration and magnitude according the type of drug. After a period of withdrawing the drug, appear symptoms and physiological and psychological states which frequently are opposite of those produced by the drug.

It is well known in the area of drug addiction that drugs have a positive reinforcing or rewarding effect that is mediated by dopamine (DA). The first theories proposed to explain reward suggested that this function was mediated by noradrenergic (Stein, 1968) and dopaminergic pathways (Wise, 1978). Actually, there is much evidence showing that DA plays an important role in reward function that is in the processing of reward in general and with reward of drugs of abuse (Wise, 2008). Reward is modulated by the reward system through the mesolimbic pathway, in which DA neurons located in the ventral tegmental area projects to the nucleus accumbens and prefrontal cortex (Koob, 1997). The rewarding effects of psychoactive drugs have been demonstrated even in conditions in which there is no physical dependence (Bozath and Wise, 1984; Dai et al., 1989).

Even though positive reinforcement plays an important role especially in the acquisition of the use of drugs, the negative reinforcement also contributes in the acquisition and maintenance of addictions. The consequence of abstinence or drug deprivation is the manifestation of withdrawal syndrome that besides the physiological effects is accompanied by craving (the urge or desire for drugs), alteration of motivational state and negative affect. The presence of these factors is very important because in order to escape from them during the withdrawal symptoms the drugs are self administered again. Drug addiction includes impulsive and compulsive disorders, impulsivity comprises pleasure, immediate gratification, while compulsivity consists or anxiety and stress before engage in a repetitive behavior. According to Koob et al. (2004) drug addiction is conceived as a disorder that progresses from impulsivity to compulsivity in a cycle of addiction comprised of three stages: preoccupation/anticipation, binge/intoxication, and withdrawal/negative affect.

The negative reinforcement theory establishes that the use of drugs continues with the intention of relief the withdrawal symptoms. According to this theory, drug use will persist with the intention of alleviate these withdrawal symptoms (Koob, 2013). Koob (2013) defines negative affect stage as the presence of motivational signs of withdrawal, including chronic irritability, physical pain, emotional pain (i.e., hyperkatifeia), malaise, dysphoria, alexithymia and loss of motivation by natural rewards.

There is currently a controversy to explain what keeps the consumption of drugs, if it is only the reinforcing effect of drugs or if there is a dysregulation between the systems of positive reinforcement and negative reinforcement (i.e., anxiety, stress). Although it is clear that the DA play an important role there are other systems that are activated and are involved in addiction (Wise and Koob, 2014).

Even though there is not a consensual definition of addiction, there are some common characteristics in the different definitions as the compulsive consumption of the drug, the lack of control and the withdrawal symptoms. Moreover there are some issues that need more

research since there is evidence that the compulsive consumptions of drugs is observed in subjects that do not show dependence or tolerance.

There are different models that explain the onset, maintenance and relapse from negative reinforcement. For example, during withdrawal, when negative affect cigarette consumption reduces or terminates the aversive state is experienced (Baker, Brandon et al., 2004; Baker, Piper et al., 2004; Eissenberg, 2004).

Particularly in the case of tobacco consumption, Cameron et al. (2013) demonstrated in 40 smokers that implicit associations between avoidance and negative affect were negatively correlated with time to relapse after a smoking cessation attempt. In a study with 259 participants, Farris, et al. (2015) reported that experiential avoidance (tendency to reduce or avoid internal distress) before cessation treatment was related with higher levels of nicotine withdrawal, craving, and negative affect. After treatment the reduction of experiential avoidance also was accompanied with reduction of withdrawal symptoms, craving and negative effect; given the relevance of experiential avoidance it the authors conclude that should be considered in the treatment.

Negative reinforcement is an important element of motivation in relation to the consumption of tobacco and abstinence, that is, smokers consume tobacco to escape or avoid aversive states such as stress, negative affect and withdrawal symptoms (Baker, Brandon et al., 2004; Baker, Piper et al., 2004; Shiffman, 2005). Therefore, the regulation of these aversive states has important implications in the treatment to quit smoking and remain abstinent. Therefore it is important to rescue the results of the empirical evidence with regard to the function of the negative reinforcement and the techniques to regulate the aversive states in the treatments for smoking cessation and, thereby, decrease the risk of a likely relapse. This is a great challenge that involves to giving up the short-term negative reinforcement (reducing the aversive states through smoking) and choose a long-term positive reinforcement (not smoking and improving health).

Therefore, the purpose of this chapter is to review current research findings on the relationship between tobacco consumption, negative affect, negative reinforcement, and relapse. At the end of this review we will discuss and propose future research aimed at solving relapse related to smoker's negative affect.

## METHOD

The databases MEDLINE, PsychoINFO and PubMed from 2000 to 2015, were searched for studies including the key words: negative affect, smoking, relapse, lapse and negative reinforcement. The inclusion criteria used in this review were: a) that the sample did not have the diagnosis of a psychiatric disorder, b) that the criteria of consumption of alcohol or other drugs in users was not included, c) that the sample did not include pregnant or postpartum women, d) that the sample did not have the diagnosis of a chronic disease such as cancer, diabetes, COPD, heart disease, and e) age 18 or older.

## RESULTS

Nine studies that met the inclusion criteria were identified (Table 1). Investigations were transversal with a counterbalanced design or in the context of the evaluation of an intervention for quit smoking, frequently a comparative gender analysis was included in the relationship between the tobacco consumption, negative reinforcement, negative affect and relapse.

In the study of Kenford, Smith, Wetter, Jorenby, Fiore and Baker (2002) were contrasted the physical dependence model (Khantzian, 1997) and the affect regulation model (Baker, et al., 2004) to know which model could predict relapse to the six months after the end of treatment for smoking cessation. Measures of dependence resulting from this model were: exhibition of nicotine which was evaluated using a self-report of the consumption of cigarettes and three biochemical indices (nicotine level in serum, cotinine level, level of carbon monoxide in expired air); severity of withdrawal and compulsive consumption. The measures derived from the affect regulation model were negative affect, coping styles, perceived stress, history of depression and expectations that smoking will reduce the negative affect. After defining and selecting measures for each model, 505 smokers were randomly assigned to three types of programs for smoking cessation. First treatment, 8 weeks with 22-mg nicotine patch therapy and group counseling; the second, 4 weeks of 22-mg nicotine patch therapy and 2 weeks of 11-mg nicotine patch therapy with individual counseling; and the third, 8 with 22-mg nicotine patch therapy and individual counseling; in all cases with 3 and 6-month follow-up.

The results showed that between traditional measures of physical dependence model, the severity of withdrawal symptoms in the first week after quitting and gender were predictors of abstinence at six months. Regarding variables affect regulation model, the predictors of abstinence at 6 months were gender, history of depression, negative affect one week after quitting and expectations of negative reinforcement.

In addition, Cosci, Schruers, Pistelli and Griez (2009) evaluated whether participants who attended a clinic to quit smoking showed a high level of emotional symptoms compared to participants who were not interested in quitting. For this purpose, to 136 people without a diagnosis of a psychiatric disorder (68 who attended a clinic to quit and 68 smokers of general population) were applied different instruments to detect the level of nicotine dependence, and measure symptoms of depression and anxiety. The results showed that smokers who attend smoking cessation clinic for the first time have higher levels of negative affect than smokers who were not interested in quitting.

The relationship between negative affect and smoking is complex and involves bidirectional contextual, causal and predisposing factors, and individual differences in response to the aversive state that are difficult to separate. For example, Delfino, Khamer and Whalen (2001) investigated the relationship between mood, urge to smoke and cigarette smoking. Participants were 25 women and 35 men between 18 and 42 years, with a consumption of 10 cigarettes a day, with no health problems. Participants completed 2 sessions of 24-hour ambulatory monitoring; the average between the first and second sessions was 9 days.

**Table 1. Results of the studies reviewed**

<b>Author</b>	<b>Objective</b>	<b>Participants</b>	<b>Design</b>	<b>Results</b>
Delfino, Jamer and Whalen (2001)	To investigate the relationship between mood, urgency of smoking and consumption of cigars.	60	Repeated-measures	<ul style="list-style-type: none"> <li>- Positive associations between the urgency of smoke and anger (<math>p &lt; .001</math>), anxiety (<math>p &lt; .001</math>), the state of alert in men and women (<math>p &lt; .05</math>), fatigue only in men (<math>p &lt; .01</math>), sadness stronger in men than in women (<math>p &lt; .01</math>), and happiness only in women (<math>p &lt; .01</math>).</li> <li>- Decrease in alertness and increased anxiety predicted consumption of cigars subsequently only in men (<math>p &lt; .05</math>).</li> <li>- Smoking was followed by the decrease in levels of anger in men and women (<math>p &lt; .01</math>), and decreased the sadness only in men (<math>p &lt; .05</math>).</li> </ul>
Kenford, Smith, Wetter, Jorenby, Fiore and Baker (2002)	To contrast the models of physical dependence and affect regulation to find the model that could predict relapse within six months after completion of treatment to stop smoking.	632 people interested in quitting	Randomized, double-blind, placebo-controlled trials	<p>Predictors of abstinence at six months:</p> <ul style="list-style-type: none"> <li>- Physical dependence model: the severity of withdrawal symptoms in the first week (<math>p &lt; .01</math>) after quitting and gender (<math>p &lt; .001</math>).</li> <li>- Model of regulation affect: gender (<math>p &lt; .01</math>), history of depression (<math>p &lt; .01</math>), negative affect one week after quitting (<math>p &lt; .001</math>) and expectancies of negative reinforcement (<math>p &lt; .01</math>).</li> </ul>
Hogle and Curtin (2006)	To investigate physiological indicators of the negative affect neurobiological mediators during a period of acute nicotine withdrawal.	41 men 39 women	Experimental	<ul style="list-style-type: none"> <li>- Significant differences in the level of cortisol in men and women (<math>p = .02</math>).</li> <li>- Significant differences according to the gender, women showed a high startle response (<math>M = 5124.6</math>) than men (<math>M = 577.5</math>), <math>p = .015</math></li> </ul>
Leventhal, et al., (2007)	To investigate whether men and women showed differences by suppressing consumption of smoking in self-reported measures related to withdrawal, affect and intense desire to smoke, cognitive tasks execution and physiological responses.	203 participants 101 men 102 women	Counterbalanced	Women reported an increase of negative affect and abstinence-related anxiety and the desire to smoke to relieve anxiety by abstinence.

<b>Author</b>	<b>Objective</b>	<b>Participants</b>	<b>Design</b>	<b>Results</b>
Cosci et al. (2009)	To evaluate whether participants who attended a clinic to quit indicated a high level of affective symptoms than participants who were not interested in quitting smoking.	136 participants, 68 who wanted to quit 68 general population	Cross-sectional, Case-control	Significant differences between the groups: smokers who attended a clinic for smoking cessation had an average higher than the general population group in: -Hospital Anxiety Depression Scale (HADS) total score $p < .01$ ; anxiety subscale $p < .005$ . - Montgomery Asberg Depression Rating Scale (MADRS) (total score, dysphoria, and retardation subscale scores $p < .0001$ ). -Beck Depression Inventory BDI depression (total score $p < .005$ ; somatic subscale score $p < .005$ ). -Hamilton Anxiety Scale HAM-A scale of anxiety (total and subscales score $p < .0001$ ).
Leventhal (2010)	To assess whether the association between affect and the urgency of smoking is regulated by the strengthening of tobacco use.	N = 212	Transversal, correlational	People with a high level of reinforcement for tobacco consumption showed a correlation between low positive affect and a high level of urgency for smoking ( $p < .05$ ), the urge to smoke was associated with reinforcement, with negative affect and low level of positive affect, so it is concluded that smoking has the purpose to regulate affect ( $p < .001$ ).
Pang y Leventhal (2013)	Investigated gender differences in negative affect related to tobacco withdrawal, time to start smoking in a task similar to a fall smoking and the interrelationship between gender, negative affect associated with abstinence from smoking and fall.	N = 199 131 men 68 women	Counterbalanced	Women indicated a more severe withdrawal than men in 4 scales of negative affect (fear ( $p < .001$ ), anxiety ( $p < .001$ ), depression ( $p < .05$ ) and confusion ( $p < .05$ ) and general negative affection ( $p < .01$ ).
Perkins, Karelitz, Giedgowd and Conklin (2013)	To investigate the influence of smoking abstinence overnight (12 hours) and exposure to a method of inducing negative mood in the craving and negative affect on women compared with men.	Study 163 men 42 women Study 285 78 women	Counterbalanced	Induction of negative affect (negative vs. neutral) produced significant differences in negative affect ( $p < .001$ ) and was higher in women in both conditions ( $p = .004$ ). Similar results were obtained in craving ( $p < .001$ ), in both conditions of induction, women showed higher values ( $p = .047$ ).

**Table 1. (Continued)**

<b>Author</b>	<b>Objetive</b>	<b>Participants</b>	<b>Design</b>	<b>Results</b>
Pang et al. (2014)	To assess the relationship between gender and expectancies to negative affect by negative reinforcement (controlling the level of dependency to nicotine), other expectations (as weight control), depression and anxiety of the participants.	Sample 1: 278 people who smoke daily and did not seek treatment to stop smoking Sample 2: 494 people that they smoked daily and were interested in quitting	Transversal	Compared with men, women showed increased expectations of negative reinforcement (with or without statistical control of nicotine dependence), of other expectancies, anxiety and depression in both samples ( $\beta$ s= .06 to .14, ps = .06 to < .001).

Each participant was asked to come to the sessions with 6 hours of abstinence from tobacco use to get the cardiovascular response to his first cigarette of the day and compare it with the response of the rest of the day. In addition, blood pressure was obtained every 20 minutes for 24 hours that lasted the session. On the other hand, for the days that such measures were not obtained, participants were asked to complete a self-report every time they smoked a cigarette in which should indicate location, activity, if consumed coffee or alcohol, mood and level of urgency, and get the level of blood pressure before and after smoking a cigarette. The results show positive associations between the urge to smoke and anger, anxiety, alertness in men and women, fatigue only in men, sadness stronger in men than in women, and happiness only in women. Decreased alertness and increased anxiety predicted subsequent cigarette smoking in men only. Smoking was followed by lower levels of anger in men and women, and fell sadness only in men. The authors concluded that the results suggest that smoking is generally associated with negative affect energy level and mainly in men, and have palliative effects in men sadness and anger for men and women.

A related study conducted by Leventhal (2010) assessed whether the association between affect and the urgency of smoking is regulated by the strengthening of tobacco use. The study included 212 people who smoked more than 5 cigarettes a day. Different instruments were applied to detect the history of cigarette smoking, level of dependence, positive and negative affect, the reasons for consumption, depression and the urge to smoke. The results showed that people with a high level of reinforcement of smoking showed a positive correlation between low positive affect and a high level of urgency for smoking. Also, the urge to smoke was associated with reinforcement, with negative affect and low level of positive affect, so it is concluded that smoking tobacco purpose is to regulate affect.

Gender is a factor that has guided the research in this area because it is presumed that the reduction of the consumption of tobacco affect differentially men and women. It is suggested that women may be more motivated than men to smoke for negative reinforcement, i.e., there is a relationship between smoking behavior and decrease of negative affect. Specifically, the role of expectations are emphasized, that is, the belief that smoking alleviates negative affect (Baker, Brandon and Chassin, 2004; Delfino et al., 2001; Schnoll, Patterson and Lerman, 2007).

Therefore, Leventhal, et al. (2007) investigated whether there are gender differences in withdrawal symptoms in self-reported measures related to the affect, the intense desire to smoke, in performance of cognitive tasks and in physiological responses. To meet this objective 203 participants (with an average consumption of 15 cigarettes a day) attended two sessions, in the first with 12 hours of abstinence and in the second came with free consumption. The results showed that women consistently reported that during withdrawal increased their negative affect (anxiety, sadness, irritability, tension, impatience, and restlessness), also related distress abstinence and the desire to smoke to relieve anxiety about abstinence. In contrast, both genders showed similar changes of positive affect in abstinence, urge to smoke for pleasure, physiological measures and cognitive performance. Therefore, it is concluded that gender differences, in particular with regard to withdrawal, may mediate the relationship between gender and smoking behavior, such as the ability to quit.

Pang and Leventhal (2013) investigated gender differences in negative affect associated with abstinence from tobacco, the time to start smoking in a similar task to the lapse of smoking and the interrelationship between gender, negative affect associated with abstinence and lapse. Participants (n=199) attended to two laboratory sessions (one with withdrawal of

16 hours and the second session with free consumption) on a counterbalanced design. Measures on withdrawal symptoms, moods and of a task analogous to the lapse by tobacco were obtained. In the task the participants were reinforced monetarily to delay smoking. The results showed that during withdrawal in women increased negative affect and several particular states of negative affect (fear, anxiety, depression, confusion). These results suggest that the differential sensitivity of negative affect related to abstinence could be the basis of consumption patterns specific of gender.

Perkins et al. (2013) conducted two studies to compare sex differences on the influence of overnight abstinence smokers (12 hours) and exposure to the mood induction procedure in negative affect and craving. The study 1, compared in men ( $n = 63$ ) and women ( $n = 42$ ) smokers the effect of neutral mood images on the affect and craving when they had 12 hours overnight abstinence from smoking and in participants with no abstinence. The results showed that the negative affect and craving were significantly higher in the abstinence condition. Sex differences were detected; craving was higher in women in abstinence condition.

The study 2 compared in men ( $n = 85$ ) and women ( $n = 70$ ) smokers with no abstinence the effect of mood induction procedure (images and music) on negative affect and craving. The results showed statistically significant changes in the negative affect of the baseline compared to the mood induction conditions. In addition, the interaction of mood by gender was significant, i.e., the negative affect in women compared to men was higher. Compared with baseline, craving increased more with slides related with negative mood than with neutral slides. Also craving increased negative affect mainly in women compared with men, the interaction of mood by sex was significant. Perkins et al. (2013) conclude that the craving was strongly associated with negative affect in both studies, that is, specifically in very serious situations of negative mood and overnight abstinence, craving to smoke may increase more in women than men.

In another study, Pang et al. (2014) evaluated the relationship between gender and smoking by the expectation of negative reinforcement to the negative affect controlling statistically the level of nicotine dependence, other expectations (such as weight control), depression and anxiety controlling statistically the level of nicotine dependence. Two groups were compared, the first was formed of people who do not seek treatment and smoked daily, the second by people who consumed daily and sought treatment for smoking cessation; measures of the level of dependence, smoking expectancies, symptoms of anxiety and depression were obtained from all participants. It was found that both women seeking treatment and those not seeking treatment have higher expectancies that smoking alleviates negative affect than men.

Under the same line it was investigated whether there are physiological factors involved in the relationship between tobacco use and negative affect. For example, Hogle and Curtin (2006) investigated gender differences in neurobiological mediators of negative affect during a period of acute nicotine withdrawal. Eighty people (41 males) were assigned to one of four groups: smokers with 24 hours of abstinence, dependent smokers, occasional smokers and nonsmokers; all were exposed to a conditioning paradigm that induced fear. The response of negative affect was measured with fear-potentiated startle response occurring during shock presentation and during the recovery phase. The results showed that when the signal of fear was present, the group of participants with 24 hours of abstinence showed a more intense negative emotional response than dependent smokers, occasional smokers and people who did

not smoke groups. Specifically, women showed higher startle response than men, in the recovery phase the startle response was slower in abstinent women than women who continued smoking; moreover, they showed elevated levels of cortisol in saliva during the fear conditioning procedure.

## CONCLUSION

Maintain long-term effectiveness of treatments is one of the biggest difficulties they face different interventions for smoking cessation.

Tobacco consumption seems to be related with negative affective states (depression, anxiety, and stress) and with a difficulty to self-regulate negative moods (Pedersen and von Soest, 2009). As with addiction to other drugs, nicotine dependence is characterized by the presence of negative affect expressing homeostatic dysregulation due to alteration of brain dopamine systems (Koob and Le Moal, 1997).

Kenford, et al. (2002) point out that traditional models of physical dependence suggest that nicotine dependence is manifested by the exposure to the drug (rate of smoking) and physiological adaptation. The affective model suggests that nicotine dependence should be related to the tendency of individuals to experience negative affect and expectations that the use of nicotine diminish such effects. Although the results support both models, the most powerful predictor seems negative affect post-withdrawal, which explains much of the predictive value of traditional measures of nicotine dependence. The emotional reactivity appears to be a central constituent of dependence. Besides, Baker et al. (2004) reformulated the model of negative reinforcement for addictions to drugs and suggest that avoidance of negative affect is the main reason for drug use. The negative affect is one of the main components of withdrawal and, through repeated consumption of tobacco and abstinence; smokers learn to detect internal signals of negative affect.

From the studies reviewed, we can say that the negative affect has an important role in lapses in the first weeks of abstinence that can lead to relapse and that women have a harder time quitting and are more likely to have relapses which have relevance in the clinical setting (Hogle and Curtin, 2006; Pang et al., 2015; Pang and Leventhal, 2013).

Different authors indicate that treatment options for solving socially relevant problems are the treatments including cognitive behavioral techniques which are effective in the long term (Brown, et al., 2005; Carmody, Vieten and Astin, 2007; Werth, et al., 2004; Zvolensky, et al., 2009). The techniques suggested are those used for stress management, for irritability, loss of motivation to regulate the internal signals to anxiety and depression, to increase the tolerance of negative affect, to manage craving, and emotional control of withdrawal symptoms. Specifically for the treatment for smoking cessation (Abrams et al., 2003; Brandon, 2000; Hiscock et al., 2013; Hofmann et al., 2012; Killen et al., 2008), the multicomponent programs that include techniques for gradual reduction of intake of nicotine and tar, stimulus control, the model of relapse prevention, self-control techniques, training in self-management skills and problem solving are effective for smoking cessation (Curry, Marlatt and Gordon, 1987; Lira-Mandujano and Cruz-Morales, 2012; Lira-Mandujano, et al., 2009; Marlatt and Donovan, 2005; Marlatt and Gordon, 1985; Míguez and Becoña 1997; Shiffman, et al., 1997).

Recapitulating the results of the review, from the psychological point of view it is important to point out that it is essential to consider three aspects in the field of interventions for smoking cessation:

1. Before the implementation of a smoking cessation intervention, the initial evaluation should include the detection of negative affect and outcome expectancies related to tobacco use in order to evaluate the relevance of include in the intervention techniques focused on the attention of such factors. In this sense, there are different instruments to assess outcome expectations, the negative affect with the Smoking Consequences Questionnaire (Copeland, Brandon and Quinn, 1995) or the short version. If the score obtained is high, techniques to change expectations to relief aversive states associated with smoking abstinence should be included.
2. Implement smoking cessation interventions with a gender perspective. It has been observed that women as opposed to men, used tobacco to regulate negative affect, i.e., as a negative reinforcement (Eissenberg, 2004; Leventhal. Boyd, Moolchan, Waters, Lerman and Pickworth, 2007). In this regard, Pang et al. (2015) and Schnoll et al. (2007) explain that the use of non-nicotine drug treatments have side effects, and low effectiveness in women, therefore, the most viable intervention for smoking cessation in women is cognitive behavioral interventions and self-help manuals because it has been seen that women are more adherent to them.
3. In the context of interventions for smoking cessation, it is important that from the detection of negative affect, the implementation emotional regulation techniques, techniques to deal with the negative affect associated with not smoking, and strategies for managing anger and stress (Delfino, Jammer and Whalen, 2001; Pang and Leventhal, 2013; Pang et al., 2015).

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