

# The Use of Tobacco

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What is the role of the family, genetics, and environmental factors leading to the use of tobacco? In order to answer this question, this discussion will begin with an exploration the varied responses people experience to the effects of initial nicotine exposure. Then, two different models of tolerance will be reviewed to enhance the understanding nicotine dependence. Finally, by the integration and synthesis of this material a better understanding of the development of tolerance, dependence, and the relative impacts of genetic and environmental influences can be better comprehended.

#### **Initial Response to Nicotine**

Initiation into tobacco was once a ritual of male adolescence (Pomerleau, Collins, Shiffman, & Pomerleau, (1993). While this rite of passage may not be the zeitgeist of current adolescence experience, tobacco is still present, and adolescents continue to experiment with, and use it. After its first use, which is frequently aversive, what follows that makes it so highly addictive for some and not others, and why do some people respond to stimuli to smoke and others do not. The answer to this is essentially that it is a combination of factors specific to each person that leads to tolerance and dependence of tobacco. Research has shown that individuals differ in their motives for smoking and respond differently to situational cues that elicit smoking (Shiffman, 1993). Only <sup>3</sup> one third<sup>4</sup> of people who have experimented with tobacco have gone on to smoke regularly McNeil, 1991 (as cited in Pomerleau, Collins, Shiffman, & Pomerleau, (1993). What about the others who do not become addicted, even some of which smoke occasionally? One proposed reason that some do not become addicted is that some

individuals have an <sup>3</sup> innate sensitivity<sup>4</sup> to nicotine and because of the intense aversive effects of the initial experience with nicotine, they make a decision never to smoke again Silverstein, Kelly, Swan, & Kozlowski, 1982 (as cited in Pomerleau, Collins, Shiffman, & Pomerleau, 1993). Notwithstanding the aversive response of some, others are less sensitive to the effects of nicotine and more likely to use it after their initial exposure to it Friedman, Lichtenstein, & Biglan, 1985 (as cited in Pomerleau, Collins, Shiffman, & Pomerleau, 1993). These people will continue to use tobacco, especially when its use is maintained by social reinforcement Friedman et al. 1985; Hirschman, Levanthal, & Glynn, 1984; Presti, Ary, Lichtenstein, 1992 (as cited in Pomerleau, Collins, Shiffman, & Pomerleau, 1993).

### **Models of Tolerance**

**Background to the Models.** Across several twin studies analysis has shown significant genetic contributions to nicotine dependence (Xian, H., Scherrer, J. F., Grant, J. D., Eisen, S. A., True, W. R., Jacob, T., & Bucholz, K. K. (2008). Earlier research by Fisher, 1958, 1959 (as cited in Pomerleau & Kardia, 1999) found that the concordance for smoking behavior was significantly higher for monozygotic twins than for dizygotic twins. Elsewhere, studies from behavioral genetics adoption and twin studies indicated that heritability of smoking behavior was at least <sup>3</sup> 50%<sup>4</sup> True et al., 1997; Li, 2003 (as cited in Lujic, Reuter, & Netter, 2005). Given this possibility of genetic influence one might be falsely tempted to reason that the family, or genetic factors, is responsible for approximately half of the smoking behavior we see. It is however, not that simple and there are many stimulus cues for one to smoke on a daily basis. Frequently, smoking is socially rewarded by the interaction with others while smoking. This social reinforcement occurs commonly with adolescents who have not had sufficient time and

exposure to nicotine to have become dependent on its pharmacological effects (Lujic, Reuter, & Netter, 2005). They choose to smoke because they perceive it as socially rewarding.

Complicating the picture more is the fact that smokers are motivated by other factors other than genetics or social reinforcement. For example contrast the previously cited examples of individuals with smokers who may or may not be addicted and smoke for a variety of reasons. For example, the *Indulgent smoker* Russell, et al., 1974; Wetterer & Troschke, 1986 (as cited in Lujic, Reuter, & Netter, 2005) who smokes for pleasure or relaxation and has no problem trying to quit smoking. The *Stimulation Smoker* Russell, 1974 (as cited in Lujic, Reuter, & Netter, 2005) is another type of smoker who uses the stimulant effect of nicotine to help concentrate, focus, and maintain performance. This is certainly not an exhaustive description of why people smoke but demonstrates that smokers are of a heterogeneous group of people and their resultant differences in behaviors may serve to obscure the reasons as why one family member smokes and one does not.

### **Exposure Model of Tolerance**

This model (Pomerleau, Collins, Shiffman, & Pomerleau, 1993) begins with the premise that the exposure of individuals with **high sensitivity** to nicotine **may** experience an aversive response of sufficient intensity that they choose to never smoke again. Individuals exposed to their initial experience of nicotine with **low sensitivity** have little aversive reaction to nicotine and may over time, by mere happenstance, respond to societal cues to smoke (Pomerleau, Collins, Shiffman, & Pomerleau, 1993). They can do this because the social reinforcements from communal use of nicotine exceed what ill effects they may experience from the nicotine. Because nicotine is an addictive substance however, a pattern of continual social use can lead to

development of some degree of tolerance to nicotine. For idiopathic reasons some people will smoke more frequently in response to social cues. These individuals will be more likely to develop extensive tolerance.

While useful, this model failed to adequately explain the process of tolerance across varied situations, individuals, and outcomes (Pomerleau, Collins, Shiffman, & Pomerleau, 1993). First, the true relationship between nicotine and tolerance is not known and some of the more recent research failed to support the *Exposure Model* (Pomerleau, Collins, Shiffman, & Pomerleau, 1993). As a result, an alternative, or *Sensitivity Model*, was created to help explain some of the differences in initial sensitivity to nicotine in the development of tolerance (Pomerleau, Collins, Shiffman, & Pomerleau, 1993).

### **Sensitivity Model of Tolerance**

Proponents of this model (Pomerleau, Collins, Shiffman, & Pomerleau, 1993) believe that nicotine use is entrained in a permissive environment of smoking, even if a person has a high sensitivity to it initially. The model posits that there are abundant opportunities to smoke and it is encouraged. People exposed to that environment are more likely to smoke because of its indicated desirability. With their continuing socially sanctioned nicotine use, such people are thought to develop sufficient tolerance to nicotine's aversive effects. Conversely, people with a low sensitivity to initial nicotine use will be minimally effected by nicotine, and find it less rewarding. Consequently, they may be light smokers, known as chippers, or they may choose not to smoke after their first exposure (Pomerleau, Collins, Shiffman, & Pomerleau, 1993).

**Toward an Integrated Understanding of the Models.** The individual begins with a genetic endowment which may predispose them to smoking behavior. If smoking were truly a

genetically determined behavior and identical twin number one smoked, twin number two would also smoke, since they are the same genetically the same. However, concordance rates are closer to .60, meaning that if twin number one smoked, there would be a 60% probability that twin number two would smoke. Given this example, there is a 40% probability that reasons other than genetics would lead twin number two to smoke. Concordance rates vary based on individual research but much of the literature suggest that it is over 50%. Consequently, on this basis, it appears that family genetics are the primary determinant of smoking.

### **Concluding Comments**

The Diagnostic and Statistical Manual of Mental disorders {DSM-IV-TR} (American Psychiatric Association, 2000, p. 265) states that <sup>3</sup> 80%<sub>4</sub> of smokes want to quit smoking but noted that fewer than <sup>3</sup> 5%<sub>4</sub> are able to quit without some form of help. This helps illustrate the fact that most people are succinctly aware of the health problems associated with the use of nicotine want to discontinue its use.

## References

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