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# Nicotine and addiction

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## Is nicotine addictive?

In February 2000, the Royal College of Physicians (RCP) published a report on nicotine addiction which found that nicotine complied with the established criteria for defining an addictive substance. The report states: *“On present evidence, it is reasonable to conclude that nicotine delivered through tobacco smoke should be regarded as an addictive drug, and tobacco use as the means of self-administration.”*<sup>1</sup>

The report noted that: *“Cigarettes are highly efficient nicotine delivery devices and are as addictive as drugs such as heroin or cocaine.”*<sup>1</sup> Two years earlier, the report of the Government’s Scientific Committee on Tobacco and Health (SCOTH) stated that: *“Over the past decade there has been increasing recognition that underlying smoking behaviour and its remarkable intractability to change is addiction to the drug nicotine. Nicotine has been shown to have effects on brain dopamine systems similar to those of drugs such as heroin and cocaine.”*<sup>2</sup>

Both the RCP and SCOTH reports confirmed the findings of the landmark review by the US Surgeon General in 1988 on nicotine which also concluded that cigarettes and other forms of tobacco are addicting and that nicotine is the drug in tobacco that causes addiction.<sup>3</sup>

Despite these authoritative reviews, there has been some debate about the extent to which the smoking habit is controlled by physiological addiction. The debate has arisen because there is no universally accepted definition of addiction although the World Health Organization has defined addiction as: *“A state, psychic and sometimes also physical, resulting in the interaction between a living organism and a drug, characterised by behavioural and other responses that always include a compulsion to take the drug on a continuous or periodic basis in order to experience its psychic effects, and sometimes to avoid the discomfort of its absences. Tolerance may or may not be present.”*<sup>4</sup> On the basis of this definition, it is possible to demonstrate a scientific basis for defining nicotine as an addictive substance.

## Properties of nicotine

Nicotine is a stimulant drug, but paradoxically effects of both stimulation and relaxation may be felt. The mental and physical state of the smoker, and the situation in which smoking occurs, can influence the way in which a particular cigarette will affect psychological perceptions.<sup>3</sup> The addictive effect of nicotine is linked to its capacity to trigger the release of dopamine - a chemical in the brain that is associated with feelings of pleasure.

## Properties of nicotine (continued)

However, recent research has suggested that in the long term, nicotine depresses the ability of the brain to experience pleasure.<sup>5</sup> Thus, smokers need greater amounts of the drug to achieve the same levels of satisfaction. Smoking is therefore a form of self-medication: further smoking alleviates the withdrawal symptoms which set in soon after the effects of nicotine wear off.

## Difficulty in quitting

Possibly one of the strongest indicators of the effect of nicotine is the discrepancy between the desire to quit and quitting success rates. Surveys have shown that the majority of smokers (around 70 per cent) want to stop smoking<sup>6</sup> yet the successful quit rate remains very low.

Twenty per cent or less of those who embark on a course of treatment succeed in abstaining for as long as a year, while only around 3 per cent succeed in quitting using willpower alone.<sup>7</sup> Most smokers take several attempts to quit before they finally succeed. The power of addiction is also demonstrated by the fact that some smokers are reluctant to stop smoking even after undergoing surgery for smoking-induced diseases. Around forty per cent of those who have had a laryngectomy try smoking soon afterwards, while about 50 per cent of lung cancer patients resume smoking after undergoing surgery.<sup>8</sup> Among smokers who have had a heart attack, as many as 70% take up smoking again with a year.<sup>9</sup>

## Other measures of dependence

There are a number of markers which can measure dependence on a substance. A key factor is the degree of compulsion to take the drug experienced by the user. Most smokers smoke on a daily basis. In Britain, the average self-reported consumption of cigarettes is 14 per day.<sup>10</sup> Fewer than 1 in 20 smokers smoke less frequently than daily. Other indicators of dependence include the time from waking to first cigarette. In 2007, among smokers of all ages, 17 per cent reported lighting up within five minutes of waking. Heavy smokers are much more likely than light smokers to smoke immediately on waking: 35% of those smoking more than 20 cigarettes a day compared to just 3% of those smoking fewer than 10 a day. Few smokers believe that they could manage to go without smoking for a whole day. Eighty-five percent of smokers who smoke 20 or more cigarettes a day say that they would find it difficult to go a whole day without smoking.<sup>Error! Bookmark not defined.</sup>

## Nicotine withdrawal symptoms

Another marker for addiction is the occurrence of withdrawal symptoms following cessation of drug use. For smokers, typical physical symptoms following cessation or reduction of nicotine intake include craving for nicotine, irritability, anxiety, difficulty concentrating, restlessness, sleep disturbances, decreased heart rate, and increased appetite or weight gain. The fact that these symptoms can be attributed to nicotine, rather than behavioural aspects of tobacco use is shown by the finding that withdrawal symptoms are relieved by nicotine replacement therapy (gum, patches, etc.) but not by a placebo (i.e. products that do not contain nicotine). For further information about using nicotine as an aid to stopping smoking [ASH Fact Sheet: Benefits and aids to quitting](#).

## Genetic influence

Recent research suggests that certain smokers may be predisposed to nicotine addiction through the effects of a gene responsible for metabolising nicotine.<sup>11</sup> Scientists have found that non-smokers are twice as likely to carry a mutation in a gene that helps to rid the body of nicotine. In addition, smokers who carry mutations in the gene, (known as CYP2A6) are likely to smoke less because nicotine is not rapidly removed from the brain and bloodstream. By contrast, smokers with the efficient version of the gene will tend to smoke more heavily to compensate for nicotine being removed more

## Tobacco industry recognition of the importance of nicotine

rapidly.

Tobacco industry documents dating from the 1960s have shown that tobacco companies recognised that the main reason that people continue smoking is nicotine addiction. A lawyer acting for Brown & Williamson said: *“Nicotine is addictive. We are, then, in the business of selling nicotine, an addictive drug.”*<sup>12</sup> Publicly, however, tobacco companies denied that nicotine was addictive, because such an admission would have undermined their stance that smoking is a matter of personal choice. As the US Tobacco Institute put it in 1980: *“We can’t defend continued smoking as ‘free choice’ if the person was ‘addicted’.*<sup>13</sup> The industry was also quick to realise that selling an addictive product is good for business: as a British American Tobacco memo said in 1979: *“We also think that consideration should be given to the hypothesis that the high profits additionally associated with the tobacco industry are directly related to the fact that the customer is dependent on the product.”*<sup>14</sup> In March 1997, Liggett Group, the smallest of the five major US tobacco companies, became the first to admit that smoking is addictive as part of a deal to settle legal claims against the company.<sup>15</sup> Subsequently the tobacco companies tried to cast doubt over the meaning of addiction by comparing smoking with other common pursuits such as shopping or eating chocolate.<sup>16</sup>

For further examples of the tobacco industry’s position on addiction see [chapter 2](#) of ‘Tobacco Explained’. Other examples can be found in [“Trust Us, We’re the Tobacco Industry”](#)

## References

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