



National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Towards a nicotine-free generation

Options to **reduce e-cigarette appeal** by regulating the appearance and functionality



The colour, shape and functionality of an electronic cigarette are important characteristics that influence the attractiveness of the e-cigarette. By regulating these characteristics, policymakers can reduce the attractiveness of e-cigarettes, including for specific target groups such as young people. Depending on the specific target group, discreetness in use, an attractive colour and shape, technological ‘gadgets’, ease of use and adaptability to one’s own wishes make an e-cigarette attractive to use. Currently, small and

colourful disposable e-cigarettes seem to be particularly popular among young people, but the market is constantly changing and follows new trends and developments. Policymakers may therefore consider implementing a standardized design for e-cigarettes. This approach is in line with the WHO’s call to promote stricter regulation of e-cigarettes and thereby reduce their attractiveness and potential harm to the population.

Introduction

Electronic cigarettes (e-cigarettes), or vapes, are appealing to youth [1-4]. Over the last several years, e-cigarettes have become increasingly popular among young people in the Netherlands and worldwide [5, 6]. In 2023, 22% of young people aged 12-25 had used an e-cigarette in the past 12 months [7]. E-cigarettes often contain the addictive substance nicotine and are harmful to their users’ health [8]. In addition, there are indications that e-cigarettes are a gateway for young people to start smoking tobacco [3, 9, 10]. The Dutch National Prevention Agreement aims to achieve a smoke-free generation by 2040. Youth e-cigarette use does not contribute to this goal [11]. Therefore, several

measures have been taken to reduce the attractiveness of e-cigarettes, including a ban on all e-liquid flavours other than tobacco and plain packaging requirements [12]. E-cigarette devices are available in a wide range of designs. One option to further reduce e-cigarette appeal is by restricting attractive device characteristics. This factsheet gives an overview of attractive device features in terms of aesthetics -such as colour and shape- and functionality, e.g. power settings mediating nicotine delivery of the e-cigarette. Furthermore, it describes which options are available to regulate design aspects to reduce attractiveness.

Figure 1. Examples of various e-cigarette device types



Types of e-cigarette devices

Many types of e-cigarettes are available that vary in shape, size, functionality and target group (Figure 1). New designs are continuously being developed [13]. The first type of e-cigarette introduced to the market were the so-called *cig-a-likes* [14]. These look like tobacco cigarettes, are commonly rechargeable and come with twist-on prefilled cartridges. Another type of device are *tank devices* or *modular devices (mods)*, these include cylindrical devices called *vape pens* and larger rectangular devices called *box mods*. They are rechargeable and have a refillable tank, containing e-liquid. They commonly include options for modifications through various interchangeable parts and customizable features, such as wattage and temperature settings [14]. Currently very common e-cigarette types are *disposable e-cigarettes* and *pod systems* [2-4, 15-17]. Disposables are usually small and come in a range of colours and shapes. They are pre-filled and charged, thus ready to use. They cannot be refilled or recharged and are not modifiable. Pod systems are rechargeable and come with cartridges, or pods, often pre-filled with liquid, which are easy to click on to the device. The first pod devices were mostly black and had a sleek, streamlined design, often similar in shape to USB devices [4]. Newer models are available in various shapes and colours.

E-cigarette designs are also described as “closed” or “open.” Closed systems are disposable or reloadable with prefilled cartridges. Open systems enable users to refill their product, either by means of a refillable tank or refillable cartridges. The wide variety of e-cigarette devices available enables manufacturers to target various consumer groups, based on their needs, experience and personal preferences. Moreover, there are clear trends in popularity of e-cigarette device types changing over time [14, 15], showing that manufacturers keep developing new designs to appeal to new generations of users.

Figure 2. Example of an e-cigarette resembling a toy [26, 27]



Device characteristics contributing to attractiveness

Overall, e-cigarettes come in a wide range of designs and types that each have characteristics that are appealing to distinct groups of users. Furthermore, what is considered attractive may change over time, with trends and developing devices. Yet, several common appealing device characteristics have been reported in literature. These are described below.

Discreetness

One of the most reported appealing aspects and reasons for use of (certain types) of e-cigarettes is discreetness [3, 17-22]. This characteristic refers to devices that are small in size and/or produce minimal or no discernible smell. This makes them easy to hide. Both young and adult e-cigarette users appreciate discretely designed devices as they facilitate concealed use and use in places where e-cigarette use is not allowed, such as in schools. Discreetness is often mentioned as an attractive feature of disposables and pod-mods in particular [19, 21]. These are smaller models, generally.

Aesthetics

Another e-cigarette device characteristic that is frequently reported as attractive or as a reason for use is their stylish design [16, 17, 23, 24]. Particularly adolescents and young adults seem to be drawn to devices with modern, sleek designs, and vibrant colours [17, 21]. In one study, young teens were presented with images of different types of e-cigarettes. They described disposable e-cigarettes as ‘cool’, ‘trendy’ and ‘a fashion accessory’ and viewed them as designed in a way to target youths. They perceived tank devices as being used by older adults [21]. Another recent study showed that different device colours appealed to different subgroups of adolescents [25]. Designs may thus serve as marketing tool for manufacturers to preferentially target particular prospective user groups. Noticeably, in some countries, manufacturers have marketed e-cigarette devices that resemble toys, candy or other consumables (Figure 2) [26]. Such designs are undeniably targeted to appeal to youth and may give the impression that the products are less harmful.

Technological features

Manufacturers have been bringing e-cigarette devices to the market with technological, gadget-like features, such as Bluetooth functionality, coloured led-lights and display screens. Some devices incorporate additional technologies

such as location trackers, pedometers, music or video players, integration with social media accounts or even mobile phone functions [28, 29]. While these features offer added convenience and entertainment for some users, they also raise ethical concerns regarding privacy and data security.

Convenience and ease of use

Ease of use or user-friendliness is another favoured aspect of e-cigarette design [18, 22]. For example, some users describe their devices as “lightweight and easy to carry along”. Another aspect is the ease of operating and maintaining the device. Further, some users indicate choosing devices with long battery life, fast charging or removable batteries and battery life indicators [18]. Both pod and tank devices have been described as convenient and easy to use [17, 18, 30], in contrast to ‘cig-a-like’ or ‘drip-mod’ devices [30].

Modifiability

Many e-cigarette users customize e-cigarette product features to provide a more satisfying taste or throat hit or to produce larger and denser vapor clouds. They use open system e-cigarettes that allow for users to customize flavours, nicotine content and other e-liquid characteristics, and/or have modifiable temperature and power settings [1]. Noticeably, the ability to customize flavors was seen as an appealing product feature by susceptible never e-cigarette users [1]. One study found that younger and middle-aged adults found modifiability of device characteristics to be more important than older adults [24]. A US sample of e-cigarette enthusiasts indicated in interviews that they modify devices to produce large clouds, change levels of nicotine delivery, alter tastes of e-liquids, and experience different throat hits [31]. It seems that these modification practices were more widespread with older models that

were not meeting consumer preferences, but became less common with the development of more advanced products. Those who continue to modify e-cigarettes tend to be hobbyists and their modifications could be more extreme, resulting in higher risk of accidents and harm to health [31].

Nicotine delivery

An important reason for use of e-cigarettes is as a nicotine delivery system [18, 19]. Generally, users need to consume a certain amount of nicotine to maintain their addiction. But users also have different preferences when it comes to consumption of nicotine; some prefer a strong hit, whereas others prefer a smoother experience [18]. Moreover, some users use e-cigarettes to gradually decrease their nicotine consumption over time. Consequently, preferences for devices with fixed nicotine delivery or adjustable options vary among users [18]. The extent to which e-cigarettes deliver nicotine depends on a variety of device characteristics (e.g. electrical power, coil dimensions), as well as liquid constituents (e.g. nicotine concentration, ratio of propylene glycol to vegetable glycerine) and user behaviour (e.g., puff duration). These factors also influence the extent to which e-cigarettes emit other toxicants that may be harmful to users’ health. Thus, devices that allow for higher nicotine delivery may also emit increased amounts of harmful substances. Furthermore, users generally perceive aerosols from devices with higher power settings and increased nicotine concentrations as harsher and with more throat hit [32]. In a study among US high school students, high nicotine e-cigarettes were viewed with less curiosity, as more dangerous, delivering more buzz, and less easy to use, relative to low nicotine or nicotine-free e-cigarettes [30]. It should also be noted that sizeable proportions of users are unaware of the nicotine concentration they are using, or are using nicotine-free e-cigarettes [1, 3].

Alternative vape practices

An additional way in which e-cigarettes can be appealing, particularly to adolescents, is that they can be manipulated to be used for alternative use practices such as cloud chasing and dripping. Both seem common among U.S. adolescents and young adults, with studies showing one fifth up to half of them engaging in these behaviours [33, 34].

Cloud chasing

A specific group of hobbyists is known to engage in vape tricks known as “cloud chasing”, where they exhale e-cigarette aerosols to produce a large or artistic vape cloud. For this practice, specific *sub-ohm* e-cigarettes or coils are used, that have low resistance capacity and the ability to produce larger vapor clouds and more intense flavours. This trend peaked in the US in late 2015 and has been declining since [35]. Indeed, large clouds are not appealing to all users; a study among US high school students showed that smaller vapor cloud e-cigarettes were perceived as less dangerous, less buzz-inducing, and easier to use [30].

Dripping

E-cigarettes commonly include a tank with a pre-made heating element (coil) that is filled with e-liquid. However, some hobbyists prefer to drip e-liquid directly on to the coil, a practice called “dripping” [36]. This direct approach is often combined with high wattage to instantly vaporise the e-liquid and is said to provide an intense burst of flavour and vapour. Dripping can also produce thicker clouds of vapour, which enable users to conduct vape tricks (cloud chasing). This practice is mostly seen among advanced users who experiment with making or adapting coils and other e-cigarette parts to achieve an optimal experience. There are specific devices available that allow users to engage in dripping practices, sometimes called “drip-mods”. Dripping is concerning because it can expose users to e-liquid aerosol that is heated to high temperatures, which can yield greater levels of nicotine and other toxicant emissions [36].

Conclusions and recommendations

E-cigarette devices are attractive by design. They are available in a wide variety of styles with characteristics that appeal to different user groups. Small and colourful disposable devices seem to be especially popular among youth, currently. However, trends in popularity have been developing over time and are likely to continue doing so as new devices are being developed. Producing various product types with attractive features and marketing aimed at different segments of society, is a marketing practice called ‘market segmentation’. This is also a known tactic applied by the tobacco industry [37]. In order to reduce e-cigarette appeal and use among youth, and to prevent manufacturers from appealing to different target groups and creating trends, regulators should consider implementing a standardized design for e-cigarette devices. This approach is in line with the WHO’s call to strongly regulate e-cigarettes to reduce their appeal and their harm to the population [38]. Among other things, WHO recommends prohibiting attractive and/or promotional features, such as colours, regulating features that enable the user to manipulate the product, and limiting the influence of power on nicotine and toxicant delivery.

Some countries have already taken measures to reduce e-cigarette attractiveness. In Belgium, the e-cigarette may have no other function than producing vapor for inhalation. They prohibit to market e-cigarettes with attractive functionalities that are not useful for the operation of the device, such as decorative lights [39]. Canada prohibits not only attractive functionalities, but also products that have an appearance, shape or other sensory attribute that could make the product appealing to young persons [40]. Furthermore, disposable e-cigarettes are or will be banned completely in several countries among which France [41, 42] and the UK [43] on environmental grounds, and the fact that they are cheap and attractive to young people.

The Dutch government takes the position that the use of e-cigarettes should be limited to the group of smokers who are really unable to quit with proven effective aids [44]. To that purpose, it is sufficient to have a safe and standardized device that delivers nicotine at levels that enable smoking cessation. There are multiple approaches to standardize the design of e-cigarette devices and more research is needed to determine which set of device characteristics maximally reduces e-cigarette appeal to youth. One option could be to adopt a simplified design that lacks any fancy aesthetic features and has no modifiable features or adjustable settings. The appearance would be similar to the first generation cig-a-like e-cigarettes. Such devices may be less appealing to nicotine-naïve young people, but could still be suitable and appealing to smokers who

wish to switch to e-cigarettes. Said simplified standardized design would also align with the standardized appearance requirements implemented for cigarettes since 1 July 2022 [45]. This entails among other things, that cigarettes should have standard dimensions, unprinted white paper and a white or imitation cork tip. Regulators may also consider going one step further in reducing the appeal of both tobacco cigarettes and e-cigarette devices, by giving them a dark colour and/or printed health warnings. Both have been shown to increase harm perception and decrease product appeal [25, 46, 47]. When implementing standardized designs, regulators are also advised to consider implementing a certain cost threshold, as low costs have been frequently reported as an attractive feature of certain e-cigarette devices [16, 18].

Regardless of the exact features, any standardized design means a large restriction of the current variety of products and will likely reduce e-cigarette attractiveness. Even more so, as consumers generally prefer personalised products over standardized ones [48]. However, regulators should also be aware of the possibility that manufactures and users will find ways to circumvent restrictions of design features, for example by marketing and use of colourful

device covering sleeves. An unintended consequence of restricting e-cigarette design is that it may lead to users switching to other nicotine or tobacco products. It is therefore recommended to consider implementing a standardized design for all nicotine and tobacco products, in order to prevent switching and to decrease attractiveness of these products overall.

Limitations

The information presented in this factsheet is based on publications from 2018 to March 2024. As e-cigarette trends and products are developing fast, some of the presented information may be outdated or become outdated within a short amount of time. The retrieved literature on the topic of e-cigarette design attractiveness was limited and often restricted to specific models or user groups. Therefore, it should be noted that when features reported as attractive to one user group or in relation to one product type, this does not imply that they are unattractive to other user groups or in relation to other product types. It just means they are only studied in the group/product type that is reported and we cannot infer conclusions about other groups/product types.

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**National Institute for Public Health
and the Environment, RIVM**

P.O. Box 1 | 3720 BA Bilthoven
The Netherlands
www.rivm.nl/en

April 2024

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