Optimizing digital smoking cessation interventions

Impact Paragraph

Smoking is the leading cause of disease and death in the Netherlands. Every year, about 19,000 people die in the Netherlands from a disease caused by smoking. Yet, in 2021, 20.6% of the adult population in the Netherlands still smoked. The health, societal, and economical benefits of developing policies and interventions to reduce smoking, and with it the illnesses and deaths caused by smoking, is very high. This is reflected in the Dutch National Prevention Agreement (in Dutch: Nationaal Preventieakkoord). This agreement aims to achieve a smoke-free generation by 2040, in which "children won't know what tobacco smoke smells like anymore." Interventions that help smokers quit benefit the health of the individual smoker primarily. Yet, they also play an important role in preventing youth from taking up smoking, because every adult who quits is one less adult who models smoking behavior to youth. Thus, effective and accessible smoking cessation interventions also contribute to create a smoke-free generation. This dissertation focused on the use of digital interventions for smoking cessation and potential ways to optimize them.

Digital smoking cessation interventions can be offered in the form of smartphone apps or on websites. People who are motivated to quit smoking can use such interventions to prepare their quit attempt and/or receive help during and after the quit attempt. The digital smoking cessation interventions that have been shown to be effective in the Netherlands were based on psychological models (e.g., the I-Change model) and were mostly computer-tailored. Computer tailoring means that participants complete questionnaires about their demographics, smoking behavior, and psychological constructs (e.g., pros and cons of smoking), which is used to yield tailored intervention content. In other words, the feedback that individuals receive is adapted to their individual characteristics. While the effectiveness of digital smoking cessation interventions has been established, low use by participants hinders the realization of their full potential. The studies presented in this dissertation share the common goal of exploring ways to optimize digital smoking cessation interventions using a variety of strategies.

First, we found that using animation instead of text in digital smoking cessation interventions increased user engagement. User engagement describes how positively people perceive a digital intervention and how intensively they use the intervention. Second, we found that informing participants in a digital smoking cessation intervention about e-cigarettes and their use for smoking cessation increased knowledge about e-cigarettes, but had no effect on behavior. In other words, individuals who received information compared with individuals who did not receive such information were better informed, but they did not use e-cigarettes more frequently as a method of smoking cessation. Third, we found that the early pre-vaccination phase of the COVID-19 pandemic in spring 2020 affected smokers who were motivated to quit within 5 years in several ways. On the one hand, some smokers (14%)

smoked more because of the COVID-19 pandemic; on the other hand, one-third of smokers were more motivated to quit smoking because of the COVID-19 pandemic. Fourth, we found that certain situations in an ex-smoker's daily life were associated with smoking relapse. For example, coffee drinking and sexual intercourse were found to be associated with increased risk of relapse.

SCIENTIFIC IMPACT

All articles published to date of this dissertation have been published in peer-reviewed open access journals. In particular, the article on smoking and smoking cessation in times of COVID-19 (Chapter 2) was well received by the scientific community, as indicated by the relatively large number of citations in the brief time that it is available. The findings of the research were presented at the annual congress of the Netherlands Network of Tobacco Control Researchers (in Dutch: Nederlands Netwerk voor Tabaksonderzoek) in 2020, 2021, and 2022. The congress provides an opportunity to exchange ideas and discuss current research results with other national researchers in the field of tobacco control. Furthermore, the results were presented in a symposium on digital health at the annual conference of the European Health Psychology Society in 2022.

For intervention development, the studies have high practical relevance, as we have developed and tested specific intervention features that can be used in future interventions. While many projects focus on developing entirely new interventions and then evaluating them, this PhD project focused on analyzing ways to optimize digital smoking cessation interventions, adapting several specific intervention features. Both types of projects are needed. One advantage of evaluating intervention features is its added value for intervention development, as other researchers can build on the findings and incorporate effective features into their own interventions. For example, the use of tailored animated video was incorporated in a digital intervention to support adherence to urate-lowering therapy among gout patients at the Department of Internal Medicine at Maastricht University Medical Center.

Key recommendations for future research in this dissertation are: (1) Investigate under what conditions animated videos increase user engagement, both in terms of target group (e.g., level of health literacy) and features of the animated video (e.g., length); (2) Examine the public health impact of e-cigarette use, combining potential effects on smokers and non-smokers; (3) Explore how support in situations of risk for relapse can be incorporated into digital (just-in-time) smoking relapse prevention interventions.

SOCIAL IMPACT

The main group benefiting from the studies presented in this dissertation are smokers. First, participation in the studies on animated video (Chapter 2) and information about e-cigarettes (Chapter 3 and 4) increased the likelihood of long-term abstinence. In fact, 22.4% (62/277) of participants in the overall sample of the study on information about e-cigarettes achieved smoking abstinence after six months. Many more smokers can be helped by future smoking cessation and smoking relapse prevention interventions that build on the findings of the studies conducted, and help achieve a smoke-free generation by 2040. In addition, people's self-efficacy for behavior change increases when they successfully quit smoking, which facilitates changing other health-risk behaviors or participating in health-promoting behaviors. In general, some findings (e.g., the use of animated video) can be applied to the development of interventions for other health behaviors such as physical activity, healthy eating, or sunscreen use, thereby increasing quality of life through more effective interventions.