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Smoking and contraception containing ethinylestradiol: A mixed-methods study into women's intentions to quit smoking

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Abstract

Background: Smoking while using contraception containing ethinylestradiol increases the risk of cardiovascular diseases. Therefore, it is especially important to stimulate women who use these contraceptives to quit smoking.

Objectives: This study aimed to examine the role of risk perception and coping in relation to the intention of these women to quit smoking, using the Protection Motivation Theory as the theoretical foundation.

Design: This was an explanatory sequential mixed-methods design.

Methods: An online survey ($n=68$) was used to examine the relationship among risk perception, coping assessment, and intention to quit smoking. After that 15 in-depth semi-structured interviews were conducted to understand how women appraised risk and coping strategies during their quit attempt(s).

Results: Results from the survey showed that risk perception induces the intention to quit smoking. More specifically, perceived vulnerability appeared to be a significant predictor. The interviews showed that women were largely unfamiliar with the combined risks surrounding smoking and contraception use but acknowledged the risks of smoking. In the survey, women seemed to perceive themselves as self-efficacious. However, interview participants mentioned that they encountered many difficulties.

Conclusion: Based on these findings, we conclude women are largely unaware of the synergetic risk of contraception use and smoking. Stimulating risk perception and knowledge might help women to create the intention to quit smoking. However, to turn this intention into behavior, providing women with concrete tools to assist them might successfully sustain their quit attempt.

Keywords

cigarette smoking, smoking cessation, hormonal contraceptives, oral contraception, motivation, mixed-methods research, cardiovascular diseases, ethinylestradiol-containing contraceptives

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Introduction

Smoking is an important risk factor for several health problems,¹ such as cancer, respiratory diseases, and cardiovascular diseases.² In addition, smoking harms blood vessels and increases the risk of thromboembolism,³ which can cause a pulmonary embolism, a stroke, or a heart attack.⁴ Even limited tobacco consumption leads to an increased risk of developing a myocardial infarction.⁵

It is not only smoking that can lead to cardiovascular diseases for women; contraception use may also play a role.

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Women who use an oral contraception containing ethinylestradiol have a higher chance of developing venous thromboembolism than women who are not taking any form of oral contraceptive.^{6,7} Since progestin-only pills do not cause an increased risk of thromboembolism, the focus of this paper is contraceptives containing ethinylestradiol.⁷ Research has shown that the NuvaRing and the hormonal Evra-patch have the same prothrombotic potential as combined oral contraceptives.^{8,9} Therefore, the contraceptive methods the NuvaRing, the Evra-patch, and oral contraceptives containing ethinylestradiol are central in this paper.

The *combination* of taking an oral contraception containing ethinylestradiol and smoking can increase the risk of myocardial infarction,^{10,11} heart attacks, strokes, and thromboembolic diseases, especially in women over the age of 35.¹² Therefore, clinical guidelines for general practitioners in the Netherlands, recommend not to subscribe to oral contraceptives above the age of 35.¹³ More importantly, research suggests that there may be a synergistic effect of smoking and oral contraceptive use containing ethinylestradiol. That is, the combined risk of smoking and using those contraceptives for acute myocardial infarction and venous thrombosis is larger than simply adding the effects of each of the behaviors on their own.¹⁴ In the Netherlands, 56% of women who use contraceptives use those that contain ethinylestradiol. This makes women who smoke and use contraception a relevant target group for health interventions. In this study, we therefore focus on women who smoke and use contraceptives containing ethinylestradiol. We explore the predictors of their intention and behavior to quit smoking focusing on their risk perceptions of this behavior and their coping assessment.

The Protection Motivation Theory (PMT)¹⁵ was used as a theoretical foundation of this study. This theory explains whether individuals engage in protective behavior as a response to health risks. The model contains two appraisals, one of risks and one of coping. The risk appraisal is about the extent to which people perceive themselves to be vulnerable to certain health risks (*perceived vulnerability*) and the perceived severity of a risk (*perceived severity*). The coping appraisal is about whether certain behaviors are effective in lowering health risks (*perceived response efficacy*) and whether people feel they can perform this behavior (*perceived self-efficacy*). While both appraisals have frequently been examined as predictors of smoking cessation,^{16–18} it remains largely unknown to what extent these predictors are relevant for women who smoke in combination with using contraceptives containing ethinylestradiol. Current study taps into this research gap. Moreover, this study uses a sequential mixed-methods design to not only (quantitatively) examine the intention of women to quit smoking and the role of risk and coping appraisals in predicting this intention, but also to get insight into the process of translating this intention into behavior (qualitatively). We hereby address the often-found intention-behavior gap

in health behavior research,¹⁹ to extract strategies by which risk and coping appraisal can be promoted by healthcare professionals. These research gaps lead to the following research questions:

1. To what extent are risk and coping appraisals (PMT) relevant for the intention to quit smoking for women who use contraceptives containing ethinylestradiol?
2. How do risk and coping appraisals help to turn the intention to quit smoking for women who use contraceptives containing ethinylestradiol into behavior?

Materials and methods

Study design and setting

This study used an explanatory sequential mixed-methods design,²⁰ starting with a quantitative online survey followed by a qualitative interview study. We examined the role of risk perception and coping assessment in the intention and behavior to quit smoking of women who smoke and use contraceptives containing ethinylestradiol. These two data collection methods both looked into similar themes. The survey was used to examine the relationship among risk perception, coping assessment, and intention to quit smoking. The interviews were then used to understand how women appraised risk and coping strategies during their actual quit attempt(s) to address the intention-behavior gap. Results were combined to create a more complete picture of the topic. The explanatory sequential mixed-methods design enabled us to understand how the significant determinants from the survey results contributed to the success of smoking cessation for women who use contraceptives containing ethinylestradiol.

Reporting checklists were used to ensure the completeness of information provided. That is, the STROBE checklist²¹ for observational cross-sectional studies was used for the survey study; the COREQ checklist²² was used for the interview study. Both are included as Supplemental Material.

Survey study

Participants. Inclusion criteria for the online survey included (a) women (b) within the age category of 25–60 (c) who smoke and (d) use contraceptives containing ethinylestradiol. The minimum age was chosen to be able to inform women well ahead of time who are approaching the age above 35 of the risks involved in this combination since women about 35 years old are especially vulnerable to the risks of the *combination* of taking an oral contraception and smoking. The maximum age was based on the age for menopause. The average age for menopause in the Netherlands is 51.5, but it ranges from 46 to 56 years.²³ A

margin of about 10 years was allowed so that women who reached menopause after the age of 56 could also be included avoiding bias.

Recruitment took place via a general practitioner practice in Amsterdam, the Netherlands. An email with the link to the survey was sent to 5504 women registered as a patient of the practice who met the age criteria based on registration data (25–60 years old), but 228 email addresses appeared to be invalid so these emails could not be sent. Of the 1433 women who participated in the survey, 1251 women provided informed consent. Women who did not provide informed consent were excluded. Moreover, women were screened out when their self-reported age did not meet the age criteria ($n=96$) or because they did not smoke and use an ethinylestradiol-containing contraceptive ($n=1087$). The final sample consisted of 68 participants. While this is a relatively small sample, an a priori power analysis showed that to detect medium-size effects (0.5) with a power of 0.80, α set at 0.05, and 12 predictors, a sample size of 47 participants would be sufficient.

In addition to our scientific research purpose, the general practitioners' purpose was to inform women about the risks of smoking while using contraceptives containing ethinylestradiol. Information about these risks was provided at the end of the survey.

Data collection and concepts. The online survey was conducted using Qualtrics validating and measuring the concepts from the PMT on a 5-point Likert scale. Data collection took place in April 2019. All statements used a forced response format to prevent missing data. Intention to quit smoking ($\alpha=0.83$) was measured by five items that were created for the purpose of this research. Perceived vulnerability (eight items; $\alpha=0.93$) and perceived severity (six items; $\alpha=0.88$) were based on the Risk Behavior Diagnosis Scale²⁴ to measure how severe women believed the risks of combining smoking and contraceptives were and their likelihood of being affected by those risks, and were adapted to fit the current topic of research. Perceived response efficacy (six items; $\alpha=0.98$) was measured using a response efficacy scale,²⁵ asking if women believed that they would reduce their health risks when they quit the combination. Perceived self-efficacy (four items; $\alpha=0.91$) was measured by adapting a health self-efficacy scale²⁶ measuring to what extent women felt capable of quitting the combination. All concepts had good reliability. Supplemental Appendix A provides an overview of the measures including the items used, references, and reliability per construct.

Moreover, education level, age, cigarette dependence, and reason for contraceptive use were used as control variables. Education level was split into two groups (no academic degree/academic degree). Cigarette dependence was measured with five items using the cigarette dependence scale-5²⁷ and used as a dichotomous variable (high

versus low dependency) in the analysis based on the median split method. The reasons why women used their method of contraception were measured with a nominal scale.²⁸ Women indicated the most important reason for using their current contraception method. The answering options were “easy to use,” “reliable,” “recommended by my doctor,” “control over menstrual cycle,” “as an aid against acne or menstrual pain” or “other.” Women could only select one of the options.

Data analysis. The quantitative data were analyzed using IBM SPSS Statistics 29 (IBM Corporation, Armonk, NY, USA). To start with, means, standard deviations (SD), and the correlation between the different PMT constructs were calculated. After that, a multiple linear regression model was run using stepwise backward selection. The intention to quit smoking was used as the dependent variable. Perceived severity, perceived vulnerability, perceived response efficacy, and perceived self-efficacy were used as predictor variables. Education level, cigarette dependence, age, and reasons for contraceptive use were used as control variables. To assess multicollinearity, VIF scores were computed. However, none of them exceeded the threshold of 5²⁹ with the highest score of 2.23, implying that multicollinearity was not a problem in our analysis.

Interviews

Participants. Inclusion criteria for the interviews consisted of (a) women (b) between 25- and 60 years old (c) who at least tried to quit smoking once and (d) use or used a contraceptive containing ethinylestradiol while smoking. Originally, we planned to purposively approach the respondents from the survey study to participate in the interviews, but due to COVID-19, it was difficult to reach women via the general practitioner practice and only one woman was recruited via the practice. This woman, however, did not participate in the survey. Another woman from the practice wanted to participate but was not available during the data collection period. The other women ($n=14$) were recruited using convenience sampling with the help of social media. Posts on Facebook and Instagram were shared in the personal network of the researchers. Due to this, some of the interviewees ($n=6$) were acquaintances of the interviewer. In total, 15 Dutch women aged between 25 and 51 years were interviewed by phone.

Data collection. Data collection took place in April and May 2020. Semi-structured interviews were scheduled based on the availability of the women. Interviews were conducted once with each participant, one-on-one by phone. Women were alone while being interviewed. Beforehand, participants received information about the risks of smoking in combination with contraceptives containing ethinylestradiol, and they were asked to sign an

Table 1. Participants' characteristics survey.

Variables	Responses	Frequency (%)
Age	In years	30.6 (6.6) ^a
Education level	No academic degree	15 (22.1)
	Academic degree	53 (77.9)
Cigarette dependence	Low (median split)	33 (48.5)
	High	35 (51.5)
Cigarette use	In cigarettes per day	3.40 (6.16) ^a
Contraceptive use	In number of years	9.13 (7.04) ^a
Reason for contraceptive use	Easy to use	20 (29.4)
	Reliable	6 (8.8)
	Recommended by my doctor	13 (19.1)
	Control over menstrual cycle	12 (17.6)
	As an aid against acne or menstrual pain	13 (19.1)
	Other ^b	4 (5.9)

^aMean (SD). SD: standard deviation.

^bOther reasons included: issues related to menopause (to postpone it or deal with complaints), to prevent pregnancy, it became a habit.

informed consent form. In this form, it was explained that participation was voluntary, data would be analyzed anonymously and participants could withdraw from participation at any time. Explicit permission was asked to record the interview. Interviews were deleted after transcription.

During the interviews participants talked about their attempt(s) to quit smoking, risk and coping appraisal, and factors that helped or hindered them. Interviews were structured around the determinants of the PMT. That is, the main topics included: perceived severity (e.g., *What health risks do you perceive related to smoking? And the combination of smoking and the use of oral contraceptives?*), perceived vulnerability (e.g., *Do you think that you are more at risk than women of your age who do not use this combination? Why?*), perceived self-efficacy (e.g., *What made you think you could or could not quit smoking?*), and perceived response efficacy (e.g., *What results do you expect of quitting smoking or the combination of the oral contraceptive and smoking?*).

The interviewer (female; BT) used the responses of the interviewees to guide more in-depth questioning during the interviews. Before data collection, a test interview with an acquaintance of the interviewer was held to assess the clarity of the interview guide. At the time of data collection, the interviewer was attending a master's program in which she received training on conducting qualitative research. The average time of an interview was 45 min, ranging between about 20 and 70 min.

Data saturation occurred after approximately 12 interviews. Three additional interviews were executed to ensure that no new information was missed. Women were thanked but did not receive any compensation for their participation. They did not receive the transcripts and were not involved in data analysis or verification.

Data analysis. The interviews were recorded and transcribed verbatim. Field notes were not taken to enable the

interviewer to fully focus on the conversation at hand. After the transcription, the data was coded by one researcher (BT) performing a thematic analysis by using Atlas.ti. Themes and codes were frequently discussed with and checked by another researcher (FH) to increase the reliability of the analysis. First, open coding took place in which codes were created based on the responses of the interviewees. Then, during the second step of axial coding, codes were merged into themes. Finally, in the selective coding step, further relations were made between themes and results were linked back to the concepts of the theoretical model, namely perceived susceptibility, perceived severity, self-efficacy, and response efficacy.

Results

Survey study

The research sample consisted of 68 women. The average age was 30.6 years. A total of 77.9% of the women had an academic degree or higher. The number of cigarettes women smoked varied between 0 and 35 per day ($M=3.40$, $SD=6.16$). On average, women have been using contraception for about 9 years ($M=9.13$, $SD=7.04$), ranging from 0 to 36 years. Additional characteristics of the participants who took part in the survey sample are displayed in Table 1.

Table 2 presents the means, standard deviations of each concept, and correlations between the concepts from the survey study. Notably, the intention to quit smoking was significantly correlated with perceived vulnerability and perceived response efficacy.

The final model of the multiple linear regression contained four predictors. Results showed that perceived vulnerability ($\beta=0.35$, $p=0.002$), having an academic degree ($\beta=0.26$, $p=0.02$), and having "control over menstrual cycle" as the main reason to use a contraceptive ($\beta=0.28$,

Table 2. Means, standard deviations, and correlations between constructs measured in the survey.

Constructs	Mean	SD	Correlations				
			1	2	3	4	5
1. Perceived severity	3.39	0.79	1				
2. Perceived vulnerability	3.19	0.85	0.57**	1			
3. Perceived self-efficacy	3.80	0.99	0.13	-0.13	1		
4. Perceived response efficacy	3.88	0.88	0.50**	0.54**	0.02	1	
5. Intention to quit smoking	3.36	0.98	0.09	0.28*	0.07	0.26*	1

All concepts were measured on a 5-point Likert scale. SD: standard deviation.

*Correlation is significant at the 0.05 level (two-tailed).

**Correlation is significant at the 0.01 level (two-tailed).

Table 3. Participants’ characteristics interviews.

Participants	Age	Behavioral change	Years of smoking	Number of cigarettes per day
Participant 1	25	Quit smoking	9	10 cigarettes
Participant 2	25	Quit smoking	4	8 cigarettes
Participant 3	25	Quit contraception containing ethinylestradiol	4	8 cigarettes
Participant 4	26	Quit smoking	11	4 cigarettes
Participant 5	26	Still uses the combination of contraception containing ethinylestradiol and smoking	9	2 cigarettes
Participant 6	27	Quit smoking	5	7 cigarettes
Participant 7	28	Still uses the combination of contraception containing ethinylestradiol and smoking	8	Smoked 9 cigarettes, but uses now an electronic cigarette with regular cigarettes during social events
Participant 8	28	Still uses the combination of contraception containing ethinylestradiol and smoking	5	Smoked 6 cigarettes, but now only during social events
Participant 9	29	Quit smoking	8	15 cigarettes
Participant 10	29	Quit contraception containing ethinylestradiol	16	Smoked 30 cigarettes, but uses now an electronic cigarette with 4 regular cigarettes
Participant 11	36	Still uses the combination of contraception containing ethinylestradiol and smoking	20	15 cigarettes
Participant 12	36	Still uses the combination of contraception containing ethinylestradiol and smoking	18	20 cigarettes
Participant 13	37	Quit smoking	18	13 cigarettes
Participant 14	49	Still uses the combination of contraception containing ethinylestradiol and smoking	28	20 cigarettes
Participant 15	51	Quit contraception containing ethinylestradiol	37	13 cigarettes

$p=0.01$) were significant predictors of the intention to quit smoking, while age was not ($\beta=-0.03, p=0.07$). This implies that women with a high education level, a high level of perceived vulnerability, and those who specifically use their contraceptive method to control their menstrual cycle have greater intentions to quit smoking. This model explained 25.3% of variance, $F(3,64) = 5.34, p=0.001$.

Interviews

In total 15 women participated in the interview study. Women were aged between 25 and 51 years old. They have

been smoking on average for about 13 years, ranging from 4 to 37 years. There is an overview of the participants’ characteristics of the interviewees in Table 3.

Risk appraisal. A substantial part of the women *knew the synergistic risks* of combining taking an oral contraception containing ethinylestradiol with smoking, but six of them were not aware of those risks. A woman (participant 6, now age 27) explained that while she was aware of the increased risk of thrombosis, she did not feel susceptible to this risk: “When I started smoking, I was only 16 years old. At that time, I did not seriously consider the risk, I thought

it would not happen to me.” She further explained that she had many friends who smoked and used birth control without experiencing negative health consequences, which made her believe that the combination was not that bad.

During the interviews, it also became apparent that women mostly viewed risks of smoking, while they were less aware of or occupied with the risks of using contraception containing ethinylestradiol, or the combination. One participant remembered that her general practitioner asked her about smoking when she started to use the birth control pill, but she did not remember him informing her about the risks. In contrast, two other women shared stories remembering their general practitioner explaining that the combination was bad for their health, but both did not really understand or care about it at that moment.

Even if the women were aware of the combined risk, the focus of the interview was mostly on smoking and its consequences. All of them perceived the seriousness of the risk of smoking. A young woman (25 years) linked smoking to contraception because she believed that smoking impairs the effectiveness of the birth control pill, which made her anxious to become pregnant. The seriousness of smoking, not the combination, made most of the women want to quit smoking. One of the women described the following risks of smoking:

Increased risk of cardiovascular diseases, um increased risk of cancer, lung cancer. . . Narrowing of the blood vessels, reduction of the sense of smell, less taste, and it just makes you ugly [laughs]. More wrinkles, bad skin, and things like that. (Participant 4)

The severity of those risks played a role for most of the women in their intention to quit smoking. Many of them felt that their smoking addiction affected their lives. They felt dependent on cigarettes and therefore wanted to quit smoking. Furthermore, being in poor shape because of smoking was often mentioned, and this was one of the main reasons why they wanted to quit. Moreover, saving money was mentioned as a main reason to stop smoking.

While the women acknowledged the risks of smoking, the *perceptions of their vulnerability* differed. A few of them thought that they had no additional risk compared to other women who did not smoke or use oral contraceptives containing ethinylestradiol. One of the women explained:

I think, for example, lung cancer or something is such a big thing, in my opinion, that only occurs with heavy smokers, so to speak, who have smoked more than a package a day for a long time. . . I don't think that I'd suddenly get lung cancer. I mean we also have poor air quality in the city. . . So, there are more reasons why you could get lung cancer, not only from smoking, I do not see that happening to me. (Participant 5)

Knowing someone who had become ill due to smoking made the women feel more vulnerable. Participant 7

explained: “. . . and of course there are those pictures on cigarette packages nowadays. That does not bother me that much. But when it gets closer, it gets closer, then I am more likely to think about it.” Specifically in relation to the combination of smoking and contraceptive use containing ethinylestradiol, one woman became aware of the synergetic risks, because she knew someone who used the same contraceptive method as her, while smoking, and got a blood clot due to this, which made her intention to quit smoking stronger.

It is worth mentioning that many of the younger women viewed the risks of smoking or the combination of smoking and contraception containing ethinylestradiol, as a future problem, that was not yet relevant for them. In contrast, women who were older felt more vulnerable and therefore considered it important to quit smoking. They also more often (were advised by their general practitioner to) change(d) their contraceptive method.

Coping appraisal. In relation to *response efficacy*, most of the women expected that their smell and taste would improve if they quit smoking. Wanting to improve their physical condition was also mentioned as a reason to quit. Participant 6 said: “I really want to see if exercising becomes easier and if my lungs will be better [if I quit smoking].” Women who felt vulnerable also hoped that more serious risks would decrease but were unsure whether this would happen. A few of the women used an application that provides updates about the health improvements and/or money savings resulting from quitting smoking. These applications made the women aware of the health benefits, which helped as motivation to maintain the quit attempt. These applications were only related to smoking cessation, not contraceptive use. Some women did explain that they found it also difficult to change their contraception method, for example, because they wanted to have control over their cycle.

Different women had different feelings about whether they felt capable of stopping smoking, and their views were mainly based on their experiences during previous quit attempts. Most of the women found it difficult to sustain smoking cessation, especially at the beginning. Social events, withdrawal symptoms, and stressful moments at work were challenging for most of them. Participant 8 explained: “I think especially at work that there was a difficult situation that I suddenly thought: I should smoke, and you say to yourself ‘no you will not smoke.’ Especially those moments were difficult.” Maintaining the cessation was perceived as easier if there was a good reason to quit smoking, such as being pregnant or having medical issues. In addition, some women mentioned the COVID-19 pandemic as a facilitator. That is, since there were fewer social events, it was easier to sustain not smoking. However, other women experienced an increase in smoking because they were home alone all the time.

Women found different ways to enhance their self-efficacy. Some of them looked for distractions, used chewing gum or using lollipops (popsicles; hard candy on a stick) as a replacement, or avoided people who smoke and the places where they smoke. Others explained that they told other people that they had quit smoking, so they felt social pressure not to start smoking again, as participant 14 described: "I then posted a message. 'From today I quit. If you run into me and I have a cigarette in my mouth, you should get really mad at me.' I thought I could use some social pressure." In contrast, some of the women found it annoying to be reminded of their quit attempts by others.

Furthermore, acupuncture sessions, nicotine patches, or electronic cigarettes were used as tools to maintain self-efficient. Electronic cigarettes were especially effective at helping them to smoke fewer traditional cigarettes. That is, the women did not count an e-cigarette as equivalent to one traditional cigarette. They found it difficult to estimate their intake of e-cigarettes but felt that they smoked fewer traditional cigarettes (or even none) because they were (also) using e-cigarettes. Women who used e-cigarettes believed that they contained less or no nicotine and thus helped them to gradually quit smoking. They did not relate this to the risks of contraceptive use containing ethinylestradiol.

Discussion

This sequential mixed-methods research aimed to investigate the role of risk and coping appraisal, in the intention and behavior of women who smoke and use contraception containing ethinylestradiol to quit smoking. The PMT was used as theoretical foundation. The results of the survey study indicated that risk appraisal, mainly vulnerability to the risks of smoking combined with this specific contraceptive use, was an important predictor of the intention to quit smoking. In line with this, the interview results showed that health risks and improving one's condition were important reasons for most women to try to quit smoking. Perceived vulnerability and other health considerations are often important reasons for smoking cessation.^{17,30,31} Although health concerns, especially risks of smoking, were an important predictor, only half of the women felt vulnerable to the risks of smoking, which is in line with earlier studies showing that smokers often do not believe that they are subject to any additional risks compared to nonsmokers.³¹ Also, many of the younger women viewed the risks of smoking or the combination of smoking and contraception containing ethinylestradiol, as a future problem, that is not yet relevant for them. It is worth mentioning that during the interviews it further became apparent that women mostly viewed risks of smoking, while they were less aware of the risks of contraception or the combination. Even if they were aware of this, the focus of the women themselves in the interview was often on

smoking and its consequences. As a first step to assist women, it might thus be needed to (better) inform them about the risks of combining smoking and contraception.

In addition, the survey results showed that women with a higher educational level intend to quit smoking to a higher degree than women with a lower educational level. These results are in line with previous research.³² Moreover, it was found that using a contraceptive to control one's menstrual cycle was a predictor of smoking cessation. As the advantage of planning one's cycle is only offered by contraceptives containing ethinylestradiol,³³ women might prefer smoking cessation over switching contraceptives. This is something to take into account. As it might be difficult for women to find a contraceptive method that fits this need for control over one's cycle, it might be more beneficial to stimulate women to quit smoking instead.

While response efficacy was correlated with intention to quit smoking, it did not turn out to be a significant predictor in the regression analysis. Also, in the interviews, women said that the perceived benefits of quitting only played a small role. The interviews also showed that, while perceived self-efficacy in the survey was quite high, smoking cessation was experienced as difficult, mainly due to smoking habits that often connect smoking with social activities. Other studies have shown that stress, alcohol intake, or being surrounded by smokers may lead to someone starting to smoke again.²⁸ This implies that the intention-behavior gap also relates to the consideration of response costs (costs of carrying out the behavior) and the expected loss of rewards in switching one's behavior. The concepts of rewards and costs are included in the revised PMT.³⁴ They were not explicitly included in our study, but their importance became apparent in the interviews. This was also shown in the importance of monetary rewards and (health) benefits, including better condition and odor, that interviewees related to smoking cessation.

In contrast, the women said that both previous quit attempts and well as talking to others enhanced their self-efficacy. In this way, the social environment had a positive impact on smoking cessation. A social network in which nobody smokes could motivate someone to quit smoking.^{31,35} Some of the women might also have been inspired to sustain their attempts by hearing acquaintances' success stories.³¹ Most of the women told their family and friends that they had quit smoking so that they could benefit from social pressure. The literature shows that family and friends positively influence smoking cessation.³⁰

Implications for practice

Based on the results of this research, general practitioners and other healthcare professionals could use fear appeals to stimulate women to change their behavior since women do not always feel vulnerable to the risks of smoking. They

could be informed about the synergistic effect of smoking and contraceptive use to increase their vulnerability perception of this risk. Notwithstanding, it could be helpful to stress once more the disadvantages of smoking on the body (both on fitness and appearance). It also could be helpful to point out patients' responsibility toward their family in terms of health status to increase their severity perception of the risk. However, it is important to note that only tapping into their patients' risk perception is most likely not effective. Health care providers should also focus on efficacy beliefs and perceived rewards in their messages.

For example, the general practitioners and other health-care professionals could refer patients to examples and tools for coping: persons who did quit smoking and demonstrate the health improvements they experienced and eHealth tools that monitor cessation progress. Furthermore, they can mention different strategies to enhance self-efficacy for succeeding in smoking cessation. These include among others the stimulating support of partners, family members, friends, and/or colleagues (accountability), avoiding triggering situations, and replacing cigarettes with (healthy) alternatives. General practitioners could monitor their patients on a yearly basis and offer several options for quitting.

Strengths and weaknesses

This research provides in-depth information about the role of risk and coping appraisal in women who smoke and use contraceptives containing ethinylestradiol. One other recent study examined the association between hormonal contraceptive use and smoking in females.³⁶

While this study found that hormonal contraception could be linked to current and past smoking cessation attempts of women in college, to our best knowledge we conducted the first study into perceptions and intentions of women regarding this combination. Despite these unique insights, the study has some limitations. First, our research sample of the cross-sectional survey was relatively small. Our power analysis indicated that our small sample was sufficient for our modest research purpose, though. As part of our sequential mixed-methods research, we also performed interviews in which data saturation occurred.

Moreover, while the women in the survey study reported their intention to quit smoking, women in the interviews talked about their quit attempts. Intentions might differ from actual behavior. This might explain the difference in perception regarding coping appraisal. Women who were asked about their intentions in the survey might have overestimated their self-efficacy, while women in the interviews, who (tried to) quit smoking, experienced the many difficulties related to smoking cessation, and hence had a more realistic picture.

Also, regarding the interview study, there were some limitations worth mentioning. Firstly, providing the women with risk information before the interviews might

have influenced their perceptions. Since we originally planned to conduct interviews with the women who participated in the survey, it was decided to provide women in the interview study with the same information as the women in the survey received at the end of the survey. In addition, some of the interviewees were personal acquaintances of the interviewer, which might have influenced the information they shared during the interview. Furthermore, a few of the women who were included in the interviews had quit smoking a couple of years ago, possibly resulting in recall bias. However, all participants were able to answer the questions immediately and remembered many details, which shows that quitting smoking is an important and memorable event.

In addition, the mean age of the women in the interviews was around 30 years old. If more women over the age of 30 had participated in this study, other themes could have emerged or other predictors might have been relevant. Such themes might have included pregnancy or the adverse effects of smoking on children. Future research could investigate the intentions of older women. Other options for future research include examining the risks of using electronic cigarettes in combination with contraceptives. The results of our research indicated that a few of the women used electronic cigarettes as an alternative. Women who used e-cigarettes believed that they contained less or no nicotine, but did not relate e-cigarettes to risks of contraception use. When our study was conducted, there was no evidence about the risks using of electronic cigarettes in combination with oral contraception.³⁷

Conclusion

Based on the findings of our research, it might be useful to focus on risk perception to stimulate women who use contraceptives containing ethinylestradiol to quit smoking. However, not all women feel that they are more vulnerable to the risks than nonsmokers. Moreover, it seems essential to stimulate self-efficacy throughout the quit attempt as women might perceive themselves as self-efficacious but encounter many difficulties along the way.

Declarations

Ethics approval and consent to participate

All procedures performed were in accordance with the Helsinki Declaration on ethical standards. All participants in this research provided written informed consent to participate and use their data. Participants in the survey provided consent online at the beginning of the survey, while participants in the interview study signed an informed consent form that they received via email before the interview started. The ethical committee of the Universiteit van Amsterdam provided ethical approval of this study (numbers 2019-EXT-10355/2020-EXT-12165).

Consent for publication

All participants in this research provided written informed consent to report the results of our study anonymously.

Author contribution(s)

Femke Hilverda: Conceptualization; Methodology; Writing – original draft; Investigation; Formal analysis; Data curation; Project administration.

Brigitte van der Til: Conceptualization; Methodology; Data curation; Investigation; Formal analysis; Writing – review & editing.

Peter Vonk: Conceptualization; Methodology; Writing – review & editing.

Claudia van der Heijde: Conceptualization; Methodology; Data curation; Investigation; Formal analysis; Supervision; Writing – review & editing; Project administration.

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Competing interests


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Availability of data and materials

The data used to support the findings of this study are available from the corresponding author upon reasonable request. The data are not made publicly available due to privacy concerns and participants did not provide consent for this.

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Supplemental material

Supplemental material for this article is available online.

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