



**Analyzing users' introductions to human coaches**  
**Insights from eHealth applications introductions**

**Jonathan van Oudheusden**

**Supervisor(s): Willem-Paul Brinkman, Nele Albers**

EEMCS, Delft University of Technology, The Netherlands

A Thesis Submitted to EEMCS Faculty Delft University of Technology,  
In Partial Fulfilment of the Requirements  
For the Bachelor of Computer Science and Engineering  
June 25, 2024

Name of the student: Jonathan van Oudheusden  
Final project course: CSE3000 Research Project  
Thesis committee: Willem-Paul Brinkman, Nele Albers, Zhengjun Yue

An electronic version of this thesis is available at <http://repository.tudelft.nl/>.

## Abstract

This study analyzed the self-introductions of participants in a smoking and vaping cessation program to understand their motivations, barriers, and support needs. Through thematic analysis of 787 participant introductions, six main themes were identified: Motivations for Quitting, Previous Attempts to Quit, Barriers to Quitting, Desired Support, Usage Patterns, and Identity. Health concerns emerged as the most common motivation for quitting, while psychological and social challenges were the primary barriers. The study found no significant correlation between the length of introductions and participant engagement or satisfaction, suggesting that while introductions provide valuable qualitative insights, they do not relate to other factors. The findings describe the contents of introductions to human coaches, although the direct impact on outcomes requires further exploration. Future research should employ a controlled design to evaluate the effectiveness of detailed participant introductions in enhancing eHealth support and consider the complexity of dual usage in smoking and vaping cessation efforts.

## 1 Introduction

Smoking is the leading cause of preventable and premature deaths [1]. With the emergence of vaping, new challenges have arisen. While vaping is often viewed as a safer alternative to smoking tobacco or as a tool to help quit smoking [2], there is insufficient evidence to conclusively support its effectiveness in increasing smoking cessation rates [2]. Additionally, although vaping might appear less harmful than smoking tobacco, it is not without health risks, which are still being discovered [3]. In the United States, 68.0% of adult smokers express a desire to quit, and 55.1% make attempts to do so annually [4]. However, only 7.5% succeed each year [4]. These statistics highlight the significant challenges smokers face in quitting, particularly without adequate support [5].

Given these challenges, it is crucial to explore and leverage innovative solutions such as eHealth applications to aid smoking cessation efforts. eHealth applications have the potential to support behavior change, including smoking cessation [6]. There are many different kinds of eHealth applications, with mobile applications being potentially promising [7]. One form of an eHealth application involves a chatbot that provides users with periodic sessions, offering motivational information, tips, and tasks to aid the quitting process [8; 9]. Because eHealth applications are digital, they can enhance access to healthcare services, especially for individuals in rural areas, those who prefer interacting with a chatbot over a human, and those seeking more cost-effective solutions [9].

However, studies have shown that the impact of persuasive messages on smoking cessation has been small [10]. One of the recommendations from the study by Albers et al. suggests increasing perceived usefulness by tailoring the recommendation or content to the users' preferences [10]. Other studies

also suggest that designing more personalized interventions could enhance the effectiveness of these applications [6; 11; 12]. Another study highlighted a desire for less artificial and more human-like responses [13]. Studies have shown that incorporating human feedback into chatbot interactions can increase user engagement, self-disclosure, and trust [14]. Evidence from research on internet-based Cognitive Behavioral Therapy (iCBT) indicates that human support leads to better clinical outcomes, higher engagement, and increased self-efficacy [15]. Supportive and empathetic messages also foster a strong therapeutic alliance and encourage self-disclosure, which enhances the overall effectiveness of the treatment [15]. Consequently, integrating human feedback can substantially improve the user experience and effectiveness of eHealth applications.

When a chatbot is designed to mimic human behavior closely, people expect it to perform better, it raises expectations. Consequently, they are more disappointed if it falls short of their high expectations. In contrast, a more basic chatbot may be rated higher because people have lower expectations of it [16]. Additionally, research indicates that the human likeness and social presence of a chatbot can be increased by a combination of information, cognitive, and chatbot empathy. However, the same research also suggests that empathy and human identity can create an uncanny valley effect [17]. Another option to improve the effectiveness of eHealth applications is through human feedback. Yet, this approach can be costly and hard to give to everyone. Thereby limiting the potential reach of the eHealth application. An option is to offer human feedback intermittently, as was done in the observational study that underpins this research [18].

Analysis of what the participants say can provide valuable insights into the users' motivations, challenges, and expectations of the feedback. This can help with understanding the users, which can assist in tailoring and improving the support and feedback they get. It also might give us an idea of how much or how little they want the human feedback. Furthermore, as smokers/vapers' identity is important for quitting [19; 20], understanding what effect this has on the introduction could be valuable.

This study aims to explore participants' perspectives and preferences regarding the assistance they may receive from a human coach. In this study, 798 smokers/vapers had a pre-screening, 5 sessions, and a post-questionnaire with a chatbot. After sessions 1 to 4, there was a 20% chance of getting feedback. To support the human coaches in helping and understanding the participants, the participants wrote an introduction about themselves to the coaches. Participants were instructed to introduce themselves to coaches Karina and Goda, providing their goals, past experiences, and any assistance needed for quitting smoking or becoming more active, in 2-3 sentences [18].

The main research question is, "How do users introduce themselves to their human coaches for preparing for quitting smoking/vaping and how does this relate to their preparation?". The following sub-questions will support this main question.

1. Is there a pattern between the introduction and the Desire

for human support?

2. Does the rated importance of quitting affect the introduction?
3. Does the smoking/vaper and quitter identity affect the introduction?

To analyze the introductions, thematic analysis [21] was done. The themes created by this analysis were triangulated [22] with other studies and qualitative data from this study [18]. The thematic analysis findings were combined with the qualitative data to answer the sub-questions and to see what we can learn from the participants' introductions to the human coaches.

## 2 Materials & methods

As mentioned in the introduction, this work was based on a study of smokers and vapers doing five sessions with a chatbot with possible feedback from a human coach, collected by Albers and Brinkman [18]. That study was approved by the Human Research Ethics Committee of Delft University of Technology (Letter of Approval number: 3683).

### 2.1 Materials

The before-mentioned study was composed of three main components: a pre-screening questionnaire, five conversational sessions, and a post-study questionnaire. Feedback from human coaches could be received after the first four sessions. During each of the questionnaires and sessions, the participants were asked different questions to collect measures.

Attention checks were incorporated into various parts of the study. Participants were not invited to subsequent sessions if they failed to answer these correctly. Additionally, participants were required to respond within two days of being invited to each session or pre/post-questionnaires; failure to do so resulted in exclusion from the remaining sessions. However, since this study primarily focused on the introductions provided by the participants, dropouts during the sessions did not affect the main thematic analysis but could potentially affect the quantitative data collected and calculated.

### Measures

We used the following measures in our analysis:

- **Introductions:** In the first session, participants were asked to write an introduction to the human coaches. This was a free text response. The exact question was "To help Karina and Goda give you suitable feedback on preparing for quitting smoking, how would you introduce yourself to them? For example, you might mention what you want to accomplish with quitting, what you have already learned about quitting smoking in the past, or what you think you might need help with when it comes to quitting smoking or becoming more physically active. Please write 2-3 sentences". Smoking was replaced with Vaping for vapers. Karina and Goda were the names of the human coaches.
- **User Characteristics:**

- **General Statistics:** Data such as age, gender, and education level were collected and used to create Table 7.
- **Quit before:** Yes or No question if they had quit for at least 24 hours before.
- **Smoking/Vaping Status:** Indicated whether they took the questionnaire as a smoker or a vaper.
- **Frequency:** Participants reported how often they smoked or vaped, depending on their self-identified status as a smoker or a vaper.
- **Importance of Quitting:** Participants rated the importance of quitting smoking or vaping on a scale from 0 ("not at all important") to 10 ("desperately important").
- **Dropout Likelihood:** Participants rated their likelihood of continuing the study if it were unpaid, on a scale from -5 to 5, with -5 indicating they would quit and 5 indicating they would continue.
- **Human Feedback Rating:** Participants rated how they perceived receiving human feedback on a scale from -10 ("very negatively") to 10 ("very positively").
- **Effect of Human Feedback:** Participants who indicated they saw human feedback rated its effect on them on a scale from -5 ("Made it a lot harder") to 5 ("Made it a lot easier"), with 0 labeled as "Neutral."
- **Self-Identity:** Participants' self-identities as a quitter, smoker/vaper, and non-smoker/non-vaper were recorded based on three items from [23], measured on five-point Likert scales.

### Participants

The participants were recruited from Prolific [24]. It involved 798 participants, all fluent in English and over 18 (minimum age on Prolific), who were daily smokers or vapers contemplating quitting but not currently engaging in any interventions. Information about all the participants can be found in Table 7.

### Human coach feedback

Karin and Goda are the human coaches and both have a background in psychology. The feedback messages were sent between the sessions on Prolific. When writing the feedback they had access to the participant's introduction, smoking/vaping frequency, whether they had quit before for 24 hours, how often they had tried to quit, how important quitting is for them, their appreciation for human feedback, and some other information from the sessions. All messages ended with "This is not medical advice. If you need more or medical help, please contact your general practitioner or another healthcare professional.". And the feedback where messages with feedback, suggestions, reinforcements, and arguments, based on a study from Ghantasala et al [25].

### 2.2 Method

The primary research utilized thematic analysis [21] to examine the introductions. Thematic analysis is a qualitative method designed to identify, analyze, and report patterns or

themes within data. For this study, an inductive approach to thematic analysis was employed. The process encompassed multiple phases: familiarization of the data, coding, theme identification and analysis, and the reporting of results. The details regarding the materials and the method used will be described.

The initial phase included thoroughly reading the data to familiarize ourselves with its content. During the initial passes, potential codes and patterns were noted, which led to the creation of an initial coding scheme. This scheme was then compared to the data and adjusted to better represent the observed patterns.

### Coding data

Additionally, inspiration from the coding schemes of other studies [10] was used to refine the coding scheme, ensuring each code had an appropriate level of detail and description to be useful. After discussions with the supervisor, two additional codes were added: smoker/vaper identity and non-smoker/vaper identity. The data was coded once the coding scheme was deemed comprehensive, consistently captured relevant patterns, aligned with the research questions, and had clear definitions.

To validate our codes, we employed peer coding. This process involved a second coder independently coding the same data using the established codes. When the peer coder's results align closely with the original coding, it assures that the codes are appropriate and accurately represent the data. The agreement between the two coding schemes was quantified using Cohen's kappa [26] and Brennan-Prediger [27].

Our peer coding was conducted by a peer with a background in computer science and familiar with thematic analysis. First, all the codes and their definitions were discussed together with the peer coder, then we went through 20 examples from the data for training. These examples were picked to illustrate some interesting cases and to in all of the examples have seen every code at least once. We went through these examples together, where each introduction the peer coder would think of what codes it should have. Then we would say if it was what we had coded and then some discussion in case the code was not clear yet. After this, the peer coder, coded all the rest of the data on their own. We calculated Cohen's kappa for each individual code as well as the weighted average score. The weighted average Cohen's kappa value was 0.92, indicating a near-perfect level of agreement. This result provided strong assurance of the coding reliability and consistency. To further demonstrate reliability, a weighted average Brennan-Prediger coefficient [27] was calculated, yielding a value of 0.96. The coding scheme together with their calculated agreement values can be seen in Table 8.

### Creating themes

Upon reviewing the codes and their connections, codes were merged if they collectively conveyed a specific aspect of the data, resulting in preliminary themes. These merged code combinations, forming the basis of our themes, were then given concise definitions, which were subsequently validated against the data. Finally, the themes were assigned descriptive names, thus forming our themes.

These themes were then discussed with a peer who has a background in computer science and experience in thematic analysis. We described the codes and definitions and their connections to the themes, and discussed potential alternative names for some of the themes. Following this peer discussion, the themes were finalized.

These themes were enriched by integrating corresponding text responses from the study. Participants whose responses were selected were anonymized and referred to by numerical identifiers (e.g., P42). This selection process aimed to illustrate each theme with representative examples from the data.

### Quantitative data collection

Following the thematic analysis, quantitative analysis was initiated to provide a contextual understanding of these themes within the context of introductions. All data and calculations can be found on 4TU [28]. For correlations between a theme and other data bivariate correlation was used [29]. In these calculations the themes were seen as binary, either it has the theme or does not. And for the rest of the correlations Spearman's correlation [30]. This was used because the data was not normally distributed. The results of the correlations were interpreted using Dancey and Reidy from Table 1 in Akoglu [30]. The correlations are significant in  $P < 0.05$ . This means that assuming the null hypothesis is true, there is less than a  $P$  chance of observing a correlation as extreme as the one found [31].

## 3 Results

This section presents the main themes identified from the user introductions. The themes include Motivations for Quitting, Previous Attempts to Quit, Barriers to Quitting, Desired Support, Usage Patterns, and Identity. Each theme is discussed with text examples and frequency of codes.

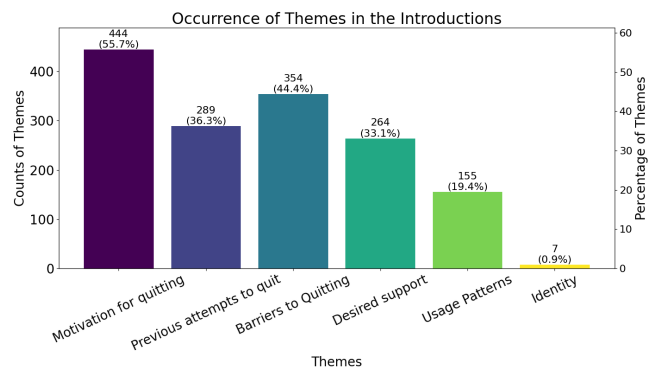


Figure 1: Count of at least one code of each theme in the introductions

### 3.1 Motivations for quitting

Codes	Count	Percentage
Health Concerns	307	51.2%
Financial motivations	118	19.6%
Freedom from addiction and dependency	57	9.5%
Breathing	55	9.2%
Athletic performance	33	5.5%
Pre-study improvements	22	3.7%
Unaware of risks	8	1.3%

Table 1: The codes that are part of the theme 'Motivations for quitting', their occurrence, and percentage of the theme.

The primary theme was participants' motivations for quitting, with health being the most frequently mentioned reason, cited 307 times. Participants expressed fears of health consequences and a desire for better health. Financial concerns were the second most common motivation, with users noting the high cost of smoking or vaping. A participant who mentioned both was P1055, who said "I want to quit vaping so I can save money and be healthier..." P400, P408, and P605 mentioned both as well. Breathing difficulties, specifically related to lung issues, were the third most mentioned reason. P1070 cited this as a motivation "...I feeling shortness of breath from all the vaping".

Other motivations included the desire for freedom from addiction, mentioned by participants who did not want to be dependent on nicotine. "I want to quit vaping because I don't want to be addicted to anything. ...", (P1065). P126, P135, and P221 have the same code. Thirty-three participants linked their motivation to specific sports, feeling that smoking/vaping hindered their performance (P226, P442, P544). Additionally, some participants had already begun improving their lives before the study, reducing their use of nicotine products as part of their broader self-improvement goals (P248, P382, P765). Conversely, a few participants exhibited insufficient motivation, indicating no fear or belief in the consequences of continued smoking/vaping. P1008 was one of those cases "... honestly I don't think that I'm addicted to vaping, despite the fact that I vape several times a day I do not feel any negative affects of it. ...". In a study of just smokers it found that 57% of the motivation was about general health and 32% personal health problems and 32% was social reasons [32]. In our study general health and health problems are combined into one theme, so their findings is a lot higher than ours, and also they don't mention financial reasons. Another study mentioned similar motivations like the cost of cigarettes and health concerns but also mentioned a ban on smoking at work and home, for pregnancy, and the unpleasant smell [33]. A study comparing smoking and vaping cessation noted a theme that was similar reasons to quit for both groups, with "financial loss, industry influence, dependence" being the noted reasons [34].

To see if the theme motivation had any relation with the participants' motivation levels for quitting, the mean rated importance for quitting a correlation between these was calculated, but there was a lack of significance ( $P = 0.42$ ). To

see if perhaps the appearance of this theme might increase the participation or success for succeeding in this study the correlation between this theme and the number of sessions a participant was calculated but again the result had no significance ( $P = 0.82$ ).

### 3.2 Previous attempts to quit

Codes	Count	Percentage
History and attempts	186	54.5%
Quitting strategies	80	23.5%
Replaced smoking with vaping	75	22.0%

Table 2: The codes that are part of the theme 'previous attempts to quit', their occurrence, and percentage of the theme.

Participants discussed their past efforts to quit, detailing various strategies and reasons for their failures. The predominant code in this theme was the history of attempts to quit. "... I have managed a week maximum before going back into the habit. ...", (P351). A study found that previous attempts to quit indicated future attempts [35]. A notable code was "Replaced smoking with vaping," appearing 75 times, where participants switched to vaping as a cessation strategy. A study studying dual users of cigarettes and vapes found 16% vaped for quitting smoking [36]. The final code, "Quitting strategies," encompassed specific methods mentioned by participants, such as quitting cold turkey. "... I've tried to quit in the past by just cutting it cold turkey but it didn't really help as I kept having cravings. ...", (P20) and "... I don't use patches, gum etc, I usually try to quit cold turket", (P259). A study mentioned that 76% of attempts used cold turkey to quit and 68% used nicotine replacement theory [32].

To see if this theme comes up more with people who quit or if this theme itself could be an indicator for having quit a correlation between this theme and having quit before was calculated, there was zero correlation but the result was also not significant ( $P = 0.07$ ). Maybe people who got this theme did better or did more sessions, the correlation between the amount of sessions and this theme was calculated but the result was not significant.

### 3.3 Barriers to Quitting

Codes	Count	Percentage
Emotional and Psychological Triggers	111	25.4%
Habitual behavior	96	22.0%
Hardships of quitting	94	21.5%
Nicotine	58	13.3%
Social aspects	44	10.1%
Location/Environment Dependency	24	5.5%
Physical Limitations	10	2.3%

Table 3: The codes that are part of the theme 'Barriers to Quitting', their occurrence, and percentage of the theme.

Participants identified several challenges they faced when attempting to quit. The most significant barrier was emotional and psychological triggers, with stress and anxiety often leading to smoking or vaping (P3, P257, P347, P4). Other difficulties included cravings (P2, P20, P24, P143), mood issues (P356, P81, P830), fear of weight gain (P318, P324, P331, P377), and losing something that they enjoy (P291, P301, P373, P44). "...However, vaping is associated with the activities I enjoy doing in my life such as going out with my friends. ...", (P1086). P1069 was afraid to gain weight with "That Concerned about weight gain after quitting. When I stopped smoking cigarettes I gained a lot of weight. ..." as the comment. A study mentioned as the main reason for relapsing, mainly smoking cues and withdrawal symptoms, but also lack of smoking cessation aids was a cause. [35]. Social aspects also posed barriers, with some participants mentioning the influence of smoking friends and the social nature of smoking. Additionally, 58 participants referred to their addiction to nicotine itself. Habitual behavior, such as oral fixation and the need to keep their hands busy, was another common obstacle. Location and environment dependency were also noted, where participants found it hard to quit due to specific places or situations where they were used to smoking or vaping. The need for dealing with stress and the enjoyment of using and smoking environment were mentioned as themes in another study [33]. The study that compared smokers with vaping cessation noted a theme with almost the same name as this theme namely "Barriers to quitting vaping and smoking". Their themes included: social benefit, stress reduction, and sensory and behavioral gratification. [34].

A correlation was calculated to see if this theme correlates with previous experiences, but the result was not significant ( $P = 0.72$ ).

### 3.4 Desired support

Codes	Count	Percentage
Desire for support	122	38.6%
Emotional and Psychological Triggers	111	35.1%
Motivation	45	14.2%
Quitting Needs	38	12.0%

Table 4: The codes that are part of the theme 'Desired support', their occurrence, and percentage of the theme.

Many participants expressed a need for help and support in their quitting journey. The most frequent code in this theme was the desire for support, encompassing needs for assistance, suggestions, and accountability. "I feel I would need help managing stress during the smoke-free journey. ...", (P292). Some participants specifically mentioned needing more motivation, noted 45 times. Emotional and psychological support, particularly in managing stress, was also a recurring code in this theme, with participants seeking alternative ways to calm down or relieve stress.

A study analyzing the quitting methods of teenage vapers noted that unassisted quitting was the most used method at

78%, and that 34.6% were interested in mobile apps for assisting quitting [37].

If this theme had a relation with the rated desire for human support a correlation was calculated between the mean rated desire for human support and this theme, however, the result was not significant ( $P = 0.11$ ). Maybe this theme showed up more for people who had experienced quitting, so a correlation between having quit before and this theme was calculated with an not significant result ( $P = 0.34$ ).

### 3.5 Usage Patterns

Codes	Count	Percentage
Habitual behavior	96	54.2%
Location/Environment Dependency	24	13.6%
Boredom	23	13.0%
Pre-study improvements	22	12.4%
Continuous Use	12	6.8%

Table 5: The codes that are part of the theme 'Usage Patterns', their occurrence, and percentage of the theme.

Participants discussed their usage patterns in the introduction. The dominant code was habitual behavior, which included oral fixation and the need to keep their hands occupied. "... I think it's psychological my hands need to be busy", (P35) or "... my consistent fidgeting means that vaping has become a habit. ...", (P323). Location and environment dependency were also significant, with 23 participants mentioning that they smoked or vaped when bored. Some participants noted continuous usage, often at home or in the car. "... I feel like I vape less when I'm active such as at university or in the gym but at home it feels like unlimited vape city.", (P1042). If participants had already reduced their use before the study, this was coded under pre-study improvements.

To investigate if this theme had a relation to the amount of use of the participants, that means, the more they use the more they would mention their smoking/vaping use, a correlation was calculated between their usage and this theme. The result was not significant ( $P = 0.24$ ). To identify, if there is a pattern between the usage and the amount of codes that showed up in the introduction, a correlation was calculated. The result was a weak correlation ( $P = 0.003$ ) between the amount of codes and the usage. This means that the more they smoked/vaped, the more they talked about different topics/codes in their introduction.

### 3.6 Identity

Codes	Count	Percentage
smoker/vaper identity	4	57.1%
non-smoker/vaper identity	3	42.9%

Table 6: The codes that are part of the theme 'Identity', their occurrence, and percentage of the theme.

This theme explored participants' self-identification as smokers/vapers or non-smokers/vapers. Despite being grounded in

literature, this theme was infrequently discussed by participants, with the combined codes appearing only eight times. One of those times was "...it is becoming my personality, and I don't want it to happen. ...", (P1087). In the pre-screening questionnaire, all participants were asked to answer multiple questions about their smoking/vaping habits, quitter status, and non-smoker/vaper identity. Using these responses, correlations with various factors were analyzed. The extent of the introduction between all identities varied depending on the specific questions.

First correlations between the length of the introduction and their ratings for 3 different identity metrics were calculated. There was a weak negative correlation ( $P < 0.01$ ) between the length of the intro and the smoking identity. Between the non-smoker and the quitter identity, the results were not significant enough to conclude. Further to see if people who tried to quit correlated with the quitter identity a correlation was calculated, and there was zero correlation ( $P = 0.01$ ).

### 3.7 Other results

In this section, other collected data and calculations will be discussed. First to see if and how much the amount of text affects the number of codes and for the amount of codes a correlation was calculated and this resulted in a moderate correlation ( $P < 0.01$ ). To further see if there is some relation to the introduction directly and not through the themes a correlation between the length of the introduction and the number of sessions a person did and also between the mean importance was calculated. This was perhaps to see if someone who writes more might be more involved in the study or be more motivated, however, the results were not significant to conclude ( $P = 0.85$  and  $P = 0.66$ ). To see if the length of the introductions had a relation with the rated happiness with the human feedback at the end of the study a correlation was calculated, however the result was not significant. A correlation between the mean dropout rating and the length was calculated to see if there was a pattern but the result was not significant ( $P = 0.08$ ).

### Vapers vs Smokers

Here we would like to talk about some data and correlations concerning whether the participants were smokers or vapers. However, the first thing to note is that the participant populations of the 2 groups are different as seen in Table 7 both because the participants were different and because it was out of the scope of this study, where these differences not discussed in the main and subquestions. However It could be interesting to note them, that is why this part is about.

The study that compared smoking and vaping cessation also noted some differences [34]. For barriers to quitting, it noted enjoyment of flavors, convenience, and discreetness, lack of awareness of vaping behavior, and reasons to quit: lack of trusted information and perceived social acceptability. Some of these were also mentioned in the introductions, "... then vaping was more appealing due to flavors" (P1003), which was one example of the flavors being a barrier. A different study looking at why dual users (both vaping and smoking) quit, suggests that the approach taken to quitting

either is similar [38].

To see if there is a correlation between smoking/vaping and how many sessions there was a correlation calculated between the number of sessions and if they were a smoker or vapers. This resulted in a negative weak correlation between the number of sessions and being a smoker. This indicates that being a smoker instead of a vaper has a weak correlation to not finishing the study or participating in all the sessions. From this result, we thought maybe the rated importance was different and calculated a correlation between the mean importance of quitting and whether they smoked/vaped however this result was not significant ( $P = 0.96$ ). From Table 7 there is a difference in the amount that vapers and smokers use, so from this a correlation between the theme 'Usage Patterns' and whether they smoked or not was calculated but the result was not significant ( $P = 0.7$ ). Because this was not significant we calculated a correlation not with the theme but with the usage itself and this resulted in a weak negative correlation ( $P < 0.01$ ).

### 3.8 Sub-questions

#### Is there a pattern between the introduction and the Desire for human support?

There is a theme for the desire for human support and that came up 264 times. Initially, we thought that there could be a relationship between this theme and the rated importance of human support, But there was no indication or correlation between that theme and the rated importance of human support. So the theme doesn't affect the desire for human support, therefore we calculated the correlation between the mean desire for human support with the length of the introductions, and this had zero correlation ( $P = 0.006$ ). This indicates that there is no pattern between the introductions and the desire for human support.

#### Does the rated importance of quitting affect the introduction?

Just like the previous sub-questions, there is a theme that is close to this, but it is not with the exact name, Motivations for quitting are the closest with people talking about why they want to quit. It does not always directly mean how important it is, but it is the only theme that talks about anything that means how important it is. As written in the section on that theme, correlations were done but none were significant so we cannot conclude that. To also see if there is a link between just the length and the rated mean motivation a correlation was done, but again the result was not significant ( $P = 0.80$ ). So again we cannot conclude if there is an effect other than the knowledge of the motivations.

#### Does the smoking/vaper and quitter identity affect the introduction?

This was discussed in the theme of identity. There was not much mention of their identity in the introductions. As mentioned in the identity section, there was a weak negative correlation between the smoking identity and the length of the introduction. So the more they agree that they are smokers, there was a weak correlation with the length becoming shorter. This could perhaps be explained by this study that mentions that when the smoker's identity increases so are

the reported cravings and less motivation [39]. However the correlation between importance and length was inconclusive, so we cannot draw proper conclusions based on this. And there was zero correlation between having tried quitting and quitters-identity. This goes against what was said by Meijer et al.: "Quitter self-identity was strongly positively associated with quit-intentions." [23]. This could be explained by a study that said that at least for vape users quitting intention was not predictive of quitting attempts [40]. From this, we can say there is a very slight effect for only the smoker's identity but no effect on content and the other identities.

## 4 Discussion

One of the main findings from this smoking cessation study is the inability to draw definitive conclusions solely from the results, aside from the self-reported experiences of the participants. For instance, while 600 participants reported having quit smoking in the past, this theme was only explicitly mentioned 289 times in their feedback. This discrepancy indicates that over 300 participants who had quit previously did not mention this in their responses. Consequently, our ability to derive additional insights from the participants is limited to their reported struggles, but the current lack of detailed information hampers this effort.

The utility of participant introductions for the coaches might still be beneficial. With more comprehensive information, coaches could potentially offer better, more personalized support. However, the present study lacks sufficient data to confirm this hypothesis, as the observed correlations were statistically insignificant.

One potential issue in this study is the inclusion of both smokers and vapers as participants. This might influence the results in several ways, posing challenges to the overall conclusions. The difficulties faced by smokers and vapers are not identical; for example, the health risks associated with vaping are not as well understood as those related to smoking. According to the World Health Organization, there is still considerable uncertainty regarding the long-term health effects of vaping, which could influence the motivations and behaviors of vapers differently from those of smokers. This difference in health risk perception might lead to varying levels of motivation to quit, with vapers potentially feeling less urgency compared to smokers.

Additionally, 75 vapers in the study are former smokers who have switched to vaping as a quitting strategy. This indicates partial success in quitting traditional smoking, yet they remain within this study as they are still using nicotine products. This could complicate the analysis, as these participants have a different quitting experience compared to those who have only smoked or only vaped. Participants may have successfully quit smoking but continue to use nicotine through vaping, thereby potentially affecting the results. There are even participants who are dual users, and they only want to quit one or both P497 is a dual user. P731 is a dual user who wants to quit both who said, "... but, will eventually start smoking again. I've started vaping and that's helped reduce the amount of tobacco I smoke, but, ultimately, I wish to fully quit, including vaping."

Moreover, some participants identify as smokers but use e-cigarettes, which is generally considered vaping. P462 said "... now do not smoke traditional cigarettes, but an electronic cigarette. ...". This user is using a vape, but answered that they want to quit smoking. Their self-identity and beliefs about their smoking status can influence the category they fall into, thereby affecting the results. This complexity is similar to studies comparing heated tobacco products, where individuals consider themselves to be smoking but most would not identify as smokers [41].

## 4.1 Recommendations

Future research could benefit from a controlled study design comparing the effectiveness of coaching feedback with and without detailed participant introductions. This approach could determine if providing extensive background information enhances the coaching process and participant outcomes.

And future studies should allow people to mention if they are dual users, to get a clearer image of their current use, with this they should also be able to mention which ones they want to quit.

## 5 Conclusion

This study analyzed the introductions of participants in a smoking and vaping cessation program to understand what topics participants discuss, what types of help they seek, and any relationships to other factors. The thematic analysis identified six main themes: Motivations for Quitting, Previous Attempts to Quit, Barriers to Quitting, Desired Support, Usage Patterns, and Identity.

Health concerns are the most common motivation for quitting, followed by financial reasons and the desire for freedom from addiction. previous attempts to quit contained what they did and tried on previous attempts and other tactics that were attempted. Barriers to quitting included both psychological and social challenges, with participants expressing the things they struggle with concerning quitting. Desired support was about participants expressing the need for help. The analysis of usage patterns and identities highlighted what and how the participants used either smoking or vaping.

Quantitative analysis showed no significant correlation between the length of introductions and participants' engagement or satisfaction with the program. This suggests that while introductions provide valuable qualitative insights, they alone do not predict the success of cessation efforts or participant satisfaction.

The study's results emphasize the importance of understanding individual narratives to tailor eHealth interventions effectively. However, the utility of detailed introductions in improving outcomes remains inconclusive, warranting further research. Future studies should consider a controlled design to compare the effectiveness of coaching feedback with and without detailed participant introductions. Additionally, allowing participants to disclose dual usage of smoking and vaping could provide a clearer picture of their quitting journey.

In summary, while participant introductions offer qualitative data that can enhance the personalization of support in

cessation programs, their direct impact on outcomes needs further exploration. Integrating these narratives into eHealth applications has the potential to create more empathetic and effective interventions, ultimately supporting individuals in their journey to quit smoking and vaping.

## 6 Responsible Research

### 6.1 Materials

Albers and Brinkman [18] collected the materials and data for this study, with approval from the Human Research Ethics Committee of Delft University of Technology (Letter of Approval number: 3683). To ensure privacy, all personal information, such as names and medical conditions, was removed from the dataset. Participants are only linked to their responses by random IDs, ensuring their anonymity.

### 6.2 Reproducibility

The primary method used in this study was thematic analysis, conducted with a systematic and transparent approach. Peer coding was employed to enhance the validity of the coding process and to strengthen the potential for replication by other researchers. All code used in the study has been made available [28]. Additionally, all procedural steps are thoroughly documented in this paper.

At the time of writing, the data itself has not been released. The dataset, along with the random IDs, will be made available on the OSF [18] in the future. This will allow the codes to be combined with the dataset, enabling independent verification of the process and results. These measures significantly enhance the reproducibility of our work.

### 6.3 Ethical concerns

There are several ethical concerns related to this study. One potential issue arises if the results show that human feedback improves the success of the eHealth application primarily because people are more motivated by knowing a human is evaluating their results. In such cases, the same effect might be achieved by simply telling participants that a person provided feedback, even if it was actually a sophisticated chatbot posing as a human. This deception is ethically problematic and should be avoided, though it could be used to test for a placebo effect. Conducting such studies ethically is challenging, and therefore, obtaining approval from an ethics board is crucial.

Another issue is the accessibility of mobile applications. Even if the eHealth application is highly effective, it might be difficult for some individuals to use, rendering it ineffective for them. This concern is particularly relevant for older adults, who may struggle with using mobile phones or may not possess one at all. Since smoking has a higher prevalence among older adults compared to vaping [7], this demographic might be disproportionately disadvantaged. Additionally, incorporating human feedback could lead to users being less candid in their responses compared to when interacting with an AI chatbot [9].

Moreover, most eHealth studies focus on participants from Western countries [42], potentially limiting the applicability of the feedback and improvements to other populations.

This geographic bias might result in interventions that are not culturally or contextually appropriate for non-Western users. Age-related limitations also present ethical concerns. The study restricts participation to individuals aged 18 and older, which is reasonable given that smoking is illegal for minors in most countries and is a limitation of the prolific platform [24]. However, this exclusion means that individuals who began smoking as children and are now struggling to quit are not addressed by the study, leaving a vulnerable population without support, just like P177 and P302 are two participants who mentioned in their introductions that they started when they were young.

## 7 Acknowledgement

We want to extend our gratitude to Nele Albers and Willem-Paul Brinkman, for assisting us in the process of writing this paper. We also want to thank our peer coder for doing the peer coding, and our peer theme reviewer for discussing our themes.

This work is part of the multidisciplinary research project Perfect Fit, which is supported by several funders organized by the Netherlands Organization for Scientific Research (NWO), program Commit2Data - Big Data & Health (project number 628.011.211). Besides NWO, the funders include the Netherlands Organisation for Health Research and Development (ZonMw), Hartstichting, the Ministry of Health, Welfare, and Sport (VWS), Health Holland, and the Netherlands eScience Center.

Participants	Total	Smoker	Vaper
Total	798	397	401
Man	382	182	200
Women	398	207	191
Other	18	8	10
mean age	36.0	39.4	32.7
std age	11.2	11.2	10.1
min-age	18	20	18
max-age	77	77	69
Frequency of use			
Uses once a day	37	10	27
2-5 times a day	126	59	67
6-10 times a day	167	109	58
11-19 times a day	186	125	61
more than 20 times a day	282	94	188
Education level			
Don't know / not applicable	6	2	4
No formal qualifications	5	4	1
Secondary education (e.g. GED/GCSE)	70	36	34
High school diploma/A-levels	172	92	80
Undergraduate degree (BA/BSc/other)	308	153	155
Graduate degree (MA/MSc/MPhil/other)	119	50	69
Technical/community college	107	55	52
Doctorate degree (PhD/other)	11	5	6
Has quit before	600	332	268

Table 7: The number of participants, total and separated by smoker and vapers

Codes	Quantity	ck	bp
Health Concerns - <i>Wants to improve health and avoid diseases, possibly influenced by losing someone to smoking-related issues, excluding breathing.</i>	307	0.93	0.94
Physical Activity - <i>Exercises, or uses exercise as a substitute for smoking and aims to be more active.</i>	237	0.91	0.92
History and attempts - <i>Mentions previous quitting attempts and strategies used.</i>	186	0.91	0.93
Desire for support - <i>Needs help, suggestions, or accountability to quit smoking.</i>	122	0.89	0.94
Financial motivations - <i>Wants to save money by quitting smoking.</i>	118	0.98	0.99
Emotional and Psychological Triggers - <i>Uses smoking to manage stress or anxiety.</i>	111	0.95	0.98
Habitual behavior - <i>Engages in smoking as part of a habitual routine, fidgeting with hands, or due to oral fixation.</i>	96	0.90	0.95
Hardships of quitting - <i>Faces challenges like cravings, mood issues, weight gain when quitting, and losing something they enjoy.</i>	94	0.88	0.95
Quitting strategies - <i>Discusses methods like nicotine replacement, lowering nicotine content, or quitting strategies.</i>	80	0.91	0.97
Replaced smoking with vaping - <i>Used to smoke but now vapes instead.</i>	75	0.97	0.99
Nicotine - <i>Mentions nicotine explicitly.</i>	58	0.90	0.97
Freedom from addiction and dependency - <i>Desires to eliminate nicotine and overcome addiction.</i>	57	0.85	0.96
Breathing - <i>Has or fears breathing issues and wants to improve lung health.</i>	55	0.96	0.99
Motivation - <i>Needs a reason or motivation to quit smoking.</i>	45	0.96	0.99
Social aspects - <i>Finds quitting hard due to social factors, like smoking/vaping with friends or having close smokers/vapers.</i>	44	0.96	0.99
Quitting Needs - <i>Mentions necessary factors for quitting, such as support systems and willpower.</i>	38	0.82	0.96
Athletic performance - <i>Wants to improve health and performance in sports.</i>	33	0.92	0.99
Location/Environment Dependency - <i>Smokes or vapes based on specific locations or environments.</i>	24	0.83	0.98
Boredom - <i>Uses when bored.</i>	23	0.91	0.99
Pre-study improvements - <i>Had already started reducing smoking/vaping or nicotine use before the study, started improving their life in general.</i>	22	0.85	0.98
Continuous Use - <i>Smokes or vapes frequently throughout the day.</i>	12	0.89	0.99
Physical Limitations - <i>Cannot exercise due to injury or other physical problems.</i>	10	0.86	0.99
Unaware of risks - <i>Mentions a lack of awareness or concern about the risks of smoking.</i>	8	0.87	0.99
smoker/vaper identity - <i>Identifies as a smoker or vaper.</i>	4	0.50	0.99
non-smoker/vaper identity - <i>Does not identify as a smoker or vaper.</i>	3	0.80	0.99
Weighted Average	-	0.92	0.96

Table 8: Codes with their definitions, quantity, cohen kappa, and Brennan-Prediger values

## References

- [1] WHO, "Tobacco." Retrieved April 30, 2024 [Online]. Available: <https://www.who.int/news-room/fact-sheets/detail/tobacco>.
- [2] "Adult smoking cessation—the use of e-cigarettes." [Online]. Available: <https://www.cdc.gov/tobacco/sgr/2020-smoking-cessation/fact-sheets/adult-smoking-cessation-e-cigarettes-use/index.html>.
- [3] "Who report on the global tobacco epidemic, 2021 addressing new and emerging products fresh and alive," 2021. [Online]. Available: <https://www.who.int/publications/i/item/9789240032095>.
- [4] "Smoking cessation: Fast facts — smoking tobacco use — cdc." [Online]. Available: <https://www.cdc.gov/tobacco/data-statistics/fact-sheets/cessation/smoking-cessation-fast-facts/index.html>.
- [5] J. Cooper, R. Borland, H. H. Yong, A. McNeill, R. L. Murray, R. J. O'Connor, and K. M. Cummings, "To what extent do smokers make spontaneous quit attempts and what are the implications for smoking cessation maintenance? findings from the international tobacco control four country survey," *Nicotine & Tobacco Research*, vol. 12, pp. S51–S57, 10 2010.
- [6] Y. E. Fang, Z. Zhang, R. Wang, B. Yang, C. Chen, C. Nisa, X. Tong, and L. L. Yan, "Effectiveness of ehealth smoking cessation interventions: Systematic review and meta-analysis," *J Med Internet Res* 2023;25:e45111 <https://www.jmir.org/2023/1/e45111>, vol. 25, p. e45111, 7 2023.
- [7] M. Barroso-Hurtado, D. Suárez-Castro, C. Martínez-Vispo, E. Becoña, and A. López-Durán, "Smoking cessation apps: A systematic review of format, outcomes, and features," *International Journal of Environmental Research and Public Health*, vol. 18, p. 11664, 11 2021.
- [8] A. Dziuba, "Types, roles, and applications of chatbots in healthcare." [Online]. Available: <https://relevant.software/blog/chatbots-in-healthcare/>.
- [9] Authors, M. Clark, and S. Bailey, "Chatbots in health care: Connecting patients to information," *Chatbots in Health Care: Connecting Patients to Information: Emerging Health Technologies*, 2024.
- [10] N. Albers, M. A. Neerincx, K. M. Penforntis, and W. P. Brinkman, "Users' needs for a digital smoking cessation application and how to address them: A mixed-methods study," *PeerJ*, vol. 10, p. e13824, 8 2022.
- [11] N. A. Id, M. A. Neerincx, W.-P. Brinkman, F. L. Wang, and H. K. Metropolitan, "Addressing people's current and future states in a reinforcement learning algorithm for persuading to quit smoking and to be physically active," *PLOS ONE*, vol. 17, p. e0277295, 12 2022.
- [12] N. Albers, B. Hizli, B. L. Scheltinga, E. Meijer, and W. P. Brinkman, "Setting physical activity goals with a virtual coach: Vicarious experiences, personalization and acceptance," *Journal of Medical Systems*, vol. 47, pp. 1–14, 12 2023.
- [13] N. Albers, M. A. Neerincx, N. L. Aretz, M. Ali, A. Ekinici, and W. P. Brinkman, "Attitudes toward a virtual smoking cessation coach: Relationship and willingness to continue," *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, vol. 13832 LNCS, pp. 265–274, 2023.
- [14] Y. C. Lee, N. Yamashita, and Y. Huang, "Exploring the effects of incorporating human experts to deliver journaling guidance through a chatbot," *Proceedings of the ACM on Human-Computer Interaction*, vol. 5, 4 2021.
- [15] P. Chikersal, D. Belgrave, G. Doherty, A. Enrique, J. E. Palacios, D. Richards, and A. Thieme, "Understanding client support strategies to improve clinical outcomes in an online mental health intervention," *Conference on Human Factors in Computing Systems - Proceedings*, 4 2020.
- [16] E. Go and S. S. Sundar, "Humanizing chatbots: The effects of visual, identity and conversational cues on humanness perceptions," *Computers in Human Behavior*, vol. 97, pp. 304–316, 8 2019.
- [17] G. Park, M. C. Yim, J. Chung, and S. Lee, "Effect of ai chatbot empathy and identity disclosure on willingness to donate: the mediation of humanness and social presence," *Behaviour Information Technology*, vol. 42, pp. 1998–2010, 9 2023.
- [18] N. Albers and W.-P. Brinkman, "Perfect fit - learning when to involve a human coach in an ehealth application for preparing for quitting smoking or vaping," 1 2024. [Online]. Available: <https://osf.io/78cnr>.
- [19] E. Meijer, E. Vangeli, W. A. Gebhardt, and C. van Laar, "Identity processes in smokers who want to quit smoking: A longitudinal interpretative phenomenological analysis," <https://doi.org/10.1177/1363459318817923>, vol. 24, pp. 493–517, 12 2018.
- [20] E. Meijer, B. V. den Putte, W. A. Gebhardt, C. V. Laar, Z. Bakk, A. Dijkstra, G. T. Fong, R. West, and M. C. Willemsen, "A longitudinal study into the reciprocal effects of identities and smoking behaviour: Findings from the itc netherlands survey," *Social science medicine (1982)*, vol. 200, pp. 249–257, 3 2018.
- [21] V. Braun and V. Clarke, "Using thematic analysis in psychology," *Qualitative Research in Psychology*, vol. 3, pp. 77–101, 2006.
- [22] N. Carter, D. Bryant-Lukosius, A. Dicenso, J. Blythe, and A. J. Neville, "The use of triangulation in qualitative research," 9 2014.
- [23] E. Meijer, W. A. Gebhardt, C. V. Laar, R. Kawous, and S. C. Beijck, "Socio-economic status in relation to smoking: The role of (expected and desired) social support and quitter identity," *Social Science Medicine*, vol. 162, pp. 41–49, 8 2016.
- [24] "Prolific — quickly find research participants you can trust." [Online]. Available: [url=https://www.prolific.com/](https://www.prolific.com/).

- [25] R. P. Ghantasala, N. Albers, K. M. Penforinis, M. H. van Vliet, and W. P. Brinkman, "Feasibility of generating structured motivational messages for tailored physical activity coaching," *Frontiers in Digital Health*, vol. 5, p. 1215187, 9 2023.
- [26] J. R. Landis and G. G. Koch, "The measurement of observer agreement for categorical data," *Biometrics*, vol. 33, p. 159, 3 1977.
- [27] R. L. Brennan and D. J. Prediger, "Coefficient kappa: Some uses, misuses, and alternatives," <http://dx.doi.org/10.1177/001316448104100307>, vol. 41, pp. 687–699, 10 1981.
- [28] J. van Oudheusden, "Analysis code underlying the publication: 'analyzing users' introductions to human coaches' .," 2024.
- [29] J. M. Swank and P. R. Mullen, "Evaluating evidence for conceptually related constructs using bivariate correlations," *Measurement and Evaluation in Counseling and Development*, vol. 50, pp. 270–274, 2017.
- [30] H. Akoglu, "User's guide to correlation coefficients," *Turkish Journal of Emergency Medicine*, vol. 18, p. 91, 9 2018.
- [31] J. Cohen, *A power primer.*, pp. 279–284. American Psychological Association.
- [32] A. Sieminska, K. Buczkowski, E. Jassem, K. Lewandowska, R. Ucinska, and M. Chelminska, "Patterns of motivations and ways of quitting smoking among polish smokers: A questionnaire study," *BMC Public Health*, vol. 8, p. 274, 12 2008.
- [33] K. Buczkowski, L. Marcinowicz, S. Czachowski, and E. Piszczek, "Motivations toward smoking cessation, reasons for relapse, and modes of quitting: Results from a qualitative study among former and current smokers," *Patient Preference and Adherence*, vol. 8, pp. 1353–1363, 10 2014.
- [34] S. Sanchez, P. Kaufman, H. Pelletier, B. Baskerville, P. Feng, S. O'Connor, R. Schwartz, and M. Chaiton, "Is vaping cessation like smoking cessation? a qualitative study exploring the responses of youth and young adults who vape e-cigarettes," *Addictive Behaviors*, vol. 113, p. 106687, 2 2021.
- [35] X. Zhou, J. Nonnemaker, B. Sherrill, A. W. Gilseman, F. Coste, and R. West, "Attempts to quit smoking and relapse: Factors associated with success or failure from the attempt cohort study," *Addictive Behaviors*, vol. 34, pp. 365–373, 4 2009.
- [36] A. F. Harlow, J. Cho, A. P. Tackett, R. S. McConnell, A. M. Leventhal, A. C. Stokes, and J. L. Barrington-Trimis, "Motivations for e-cigarette use and associations with vaping frequency and smoking abstinence among adults who smoke cigarettes in the united states," *Drug and Alcohol Dependence*, vol. 238, p. 109583, 9 2022.
- [37] E. Jones, R. Endrighi, D. Weinstein, A. Jankowski, L. M. Quintiliani, and B. Borrelli, "Methods used to quit vaping among adolescents and associations with perceived risk, addiction, and socio-economic status," *Addictive Behaviors*, vol. 147, p. 107835, 12 2023.
- [38] E. M. Klemperer and A. C. Villanti, "Why and how do dual users quit vaping? survey findings from adults who use electronic and combustible cigarettes," *Tobacco Induced Diseases*, vol. 19, 2 2021.
- [39] J. Blondé and J. M. Falomir-Pichastor, "Accounting for the consequences of tobacco dependence on cravings, self-efficacy, and motivation to quit: Consideration of identity concerns," *The Spanish Journal of Psychology*, vol. 23, p. e34, 2020.
- [40] E. Sobieski, J. Yingst, and J. Foulds, "Quitting electronic cigarettes: Factors associated with quitting and quit attempts in long-term users," *Addictive Behaviors*, vol. 127, p. 107220, 4 2022.
- [41] K. A. East, C. R. Miller, S. C. Hitchman, A. McNeill, and C. N. Tompkins, "'it's not what you'd term normal smoking': a qualitative exploration of language used to describe heated tobacco product use and associated user identity," *Addiction*, vol. 118, pp. 533–538, 3 2023.
- [42] M. H. da Fonseca, F. Kovalski, C. T. Picinin, B. Pedroso, and P. Rubbo, "E-health practices and technologies: A systematic review from 2014 to 2019," *Health-care*, vol. 9, 9 2021.