Towards Preventive Oral Care: A digital matching tool for products and habits

Strategic Product Design Master Thesis TU Delft.

Student: Elias van der Linden (4343352)
Chair: Ir. R.J.H.G. van Heur
Mentor: Prof. R.R.R. van der Vorst

Table of contents

1. Preface

I doubted for a long time whether I was going to graduate or not.
Because of the many projects next to my studies, I postponed it for a long time. In the end, I made the decision to take the step.
A choice I don't regret, now that the story is complete.
Writing the thesis was an eye-opening and instructive experience.
I hope this experience is reflected in the story of this thesis.
Enjoy reading,

Elias van der Linden

03/12/2020

1: Introduction

Two years ago, I founded a start-up that developed its own subscription based toothbrush. Since then, my interest in strategic developments of oral care products has increased exponentially which in turn motivated me to explore it further as a Master thesis topic.

During this time of developing the company I noticed that society generally lacks interest in preventive oral care and related consumer products. Oral care is known to have an impact on general wellbeing, where poor habits could lead to unaffordable dental expenses. This occurs due to individuals neglecting their mouth and the care it needs.

An enormous amount of knowledge about personal oral care and oral care products is available, but in practice, almost no consumer is interested in it (H. Köpcke et al., 2016). In all honesty, if nothing seems to be wrong, why should someone be interested in improving their habits and routines?

This research aims to find a way to enhance preventive oral care and related products in an attractive manner. By doing so, I hope to realize the commercial benefit for the future product assortiment of the startup.

I learned a tremendous amount on strategy, branding and design during my MSc in strategic product design. However, I always felt that a project stopped just at the actual realisation of the idea where a new project would swiftly follow. Therefore, in this thesis research, I want to put the emphasis on testing and validation of the strategy in the actual market. This is possible by accessing the audience from the startup.

With the results of this thesis, I hope to realize a fully operational and scalable digital system that would make preventieve oral care attractive again. Such a strategy and design could potentially apply to other startups in other sectors.

Figure 1: Elias van der Linden with the first product from Boombrush, the sonic toothbrush.

Startup

The start-up in mind for this thesis is called the Boombrush, a digital brand for subscription based oral care products. I am one of the two founding partners and currently the Chief Marketing Officer (CMO) of the company which I founded during an SPD MSc elective called 'Build your Startup' in late 2019.

Currently, the startup sells one product: a sonic toothbrush, which is sold with a subscription program for the brush heads. In an interval of one, two or three months, customers receive a new brush head in their postbox. All products are only digitally available for purchase where the subscription is strictly sold through the website www.boombrush.com.

The company is still an early-stage startup; Boombrush has the ambition to become a known brand within the field of commercial oral care products. The startup wants to break away from your standard "my dentist recommends" TV commercials and make oral care unpretentious again. The startup believes that good oral care can be achieved with three elements: regular check ups with dental specialists, sticking to a healthy routine, and using the correct products.

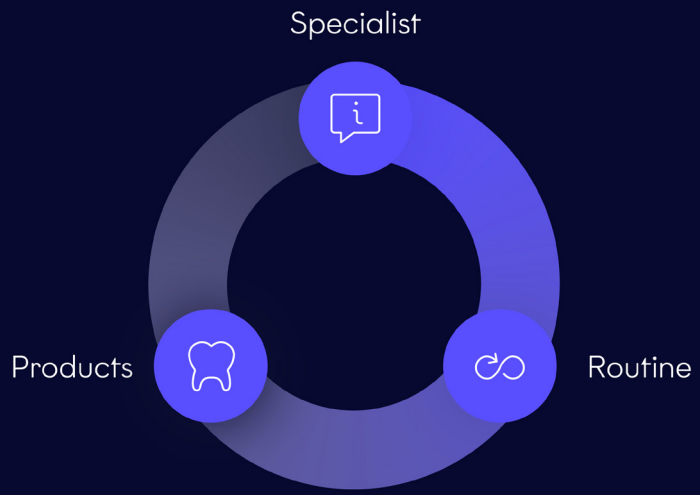


Figure 2: The vision of Boombrush: good oral health can be made possible with three elements: specialist, routine and products. Derived from boombrush.com/oral-care

Boombrush does not claim to be your dentist, nor is there a wish to replace your dentist. The startup supports visiting your dental experts for regular checkups or special treatments. The startup is currently testing and starting up a dental ambassadors program. Eventually, the startup wants to bring consumers and dental specialists closer together by offering digital tools to improve the contact with your specialist.

The second element is routine. Good personal and preventive oral care can only be practiced with the right habits in a consistent routine. By offering different methods of digital education, the startup wants to create more awareness regarding personal oral care. This will also help in building a stronger brand by creating more awareness regarding the product assortiment.

The last element revolves around the core business of the startup, selling personal oral care products. Despite having just launched their first product, the startup has the goal to sell a full range of subscription based oral care products throughout Europe. There is an endless amount of possibilities that the startup could add to their subscription such as different toothpastes, flosses and various types of brush heads. However, the startup hopes that with a simple, yet effective product range, they can win a significant part of the market.

By bringing together products, routines and specialists in a scalable digital environment, the vision of the startup is to offer full service oral care by 2025. Since the expert connection is not fully commercial and does not have much interference with the strategic design, it is not discussed further in this thesis to limit the research.

This graduation thesis investigates the aforementioned routines and products along with the ways that these two elements interact with one another. In the next chapter, the content of the research will be discussed in depth, starting with an introduction of the research.

2: Research Introduction

In this chapter, a description of the research is given. First, the research is introduced with a small introduction in the field of oral care. This is followed by the research structure where first, the research is explained after which the main research question and its sub questions are introduced.

Introduction

The oral care market is measured at 28 billion US dollars in 2017 with a suspected growth of 5% per year. In comparison, the worldwide video game and cellphone market is measured at 26 billion US dollars in 2017 (Grandviewresearch, 2018). The dental care sector in Europe can be divided into two parts: acute care and preventive care (N. Lurie, W. G., 1987). The former is provided exclusively by professionals such as doctors and general practitioners, but also by people such as periodontists and dentists. The majority of this care executed by specialists in the Netherlands is considered acute care and can be insured and is, thus, not fully commercial.

On the contrary, the market in the United States is more commercial where dental visits are often not insured. As a result, the american oral care market developed faster and is now ahead of the European and Dutch market. Following this trend, the startup has received great inspiration from various American companies with similar business models such as Quip, Goby and BURST.

This commercial part of oral care is the sector in which the startup wants to get involved too, since commercial activities allow it to build a much stronger brand. Over the last few years, the commercial part of oral care in Europe has seen many developments such as teeth whitening-at-home-devices and invisible braces, which all have already been active in the US for a longer period of time.

Figure 3: Franksmile, invisible aligners. www.franksmile.com

Despite the large amount of oral care products available, consumers lack interest in good oral care habits and oral care products (Healthline.com, 2018). Despite regular dental check ups, equating to a couple of visits a year, this advice is sometimes ignored. Which is strange since the teeth could be regarded as the reflection to someone's health when seeing a photo of them or when speaking to them. As well, the first stage of digestion occurs in the mouth, adding to the importance of good preventative oral care. In the end, everything goes inside via the mouth (M. S. Haumschild, et al, 2009). Colgate also states on their website that by neglecting your oral health, you have a higher chance to get cardiovascular diseases, dementia, or diabetes (Colgate, 2020).
Due to the discrepancy between traditional oral care and wrong habits on the one hand and a lack of education and insufficient interest on the other hand, a large part of oral care has become symptomatic; people only go to the dentist when it is too late. Preventive care would be much better since it will be less hassle, cheaper but also in general better for your oral health.
In the Netherlands alone, in 2019, an average of 80% of all Dutch people visited the dentist an average of three times a year (CBS, 2019), which is a total of more than 30 million dental visits. According to the data from CBS, about half are periodic check-ups, while the other half is a treatment, which could partly be prevented. According to (allesoverhetgebit.nl, 2020) the average price of a dental visit is €80,67. If the startup can prevent 5% of these visits by offering the right products with proper digital education, over 12 million euros worth of dental visits would be saved in the Netherlands alone. With this approach, the company might eventually become a very valuable asset for insurance parties too.

A number of apps and companies already provide preventive support for things such as muscle building, weight loss or sleep problems. Traditional oral care lags behind on this. Good products and communication that actively support consumer awareness and good lifestyles do not exist yet. In addition to selling the products, the start-up can engage in communication and education regarding preventive oral care. This opportunity forms the basis of the research for the graduation thesis, which is the focus of the next chapter.

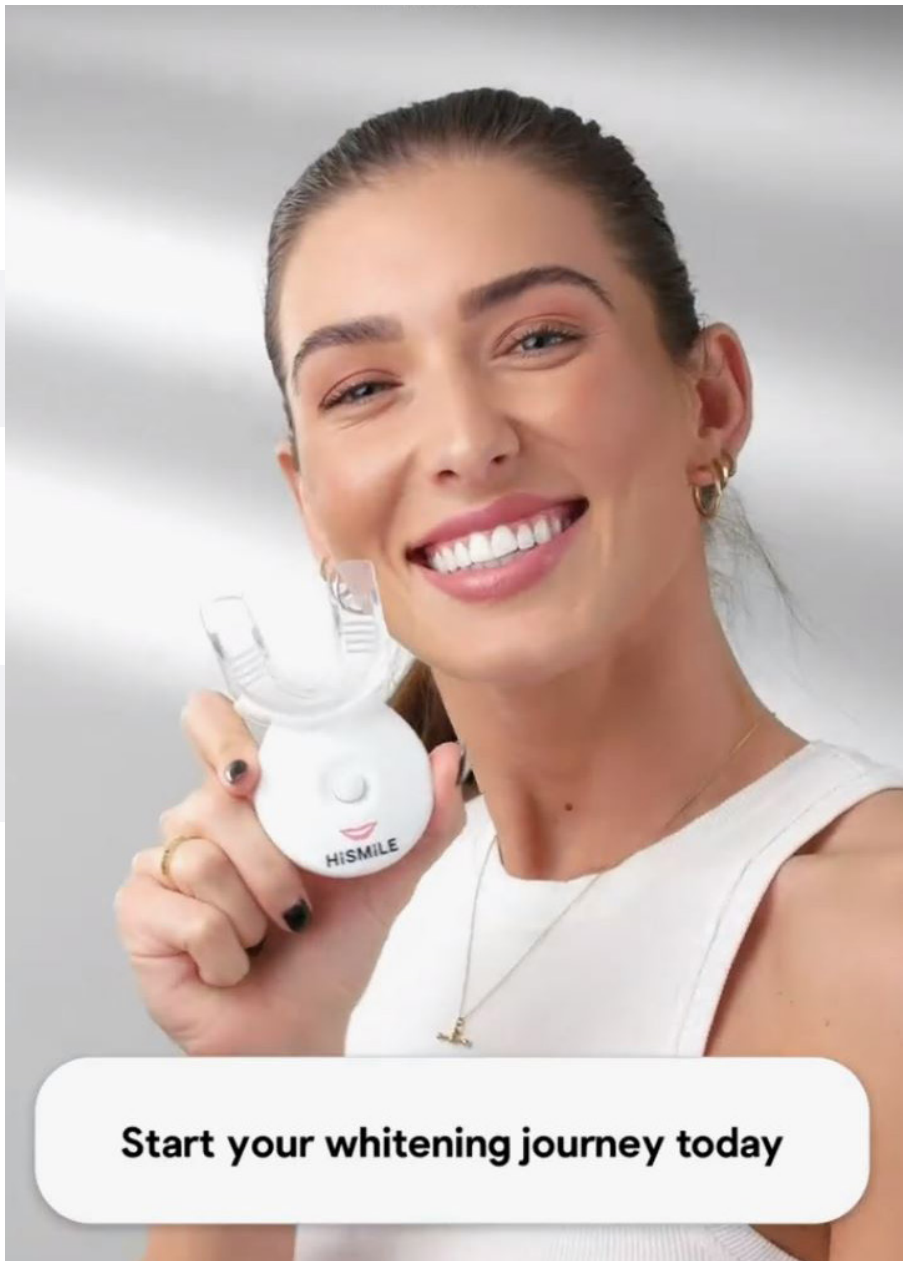


Figure 3: HiSmile, Teeth whitening kit. www.hismile.com

Research structure

The goal of Boombrush is to offer full service oral care to people. In this research, by means of research into good educational methods, research into habits and good products and research within e-commerce, it is examined which initial steps the startup can best take. The end product of this research will eventually become a digital application with which these initial steps can be outlined. This end product will eventually become a digital application because it should be scalable and easy to deploy for the startup, without the need for large investments and will then actually be put into use if successful. This application will not only be relevant for the startup, also the user of the application, the people, will benefit from this. In addition, the findings of the research will also add value to other business and fields of education or e-commerce. The goal of the application will be to increase the awareness of the people to support preventive oral care and prevent the people from having severe oral care problems. Therefore, the main question can be written down as follows within this research:

"Can a digital application support preventive oral care?"

This question is answered by means of three sub-questions. These sub-questions are divided into three elements. These three parts can be found in figure 4 and consist of Awareness, Product assortment and Digital application. The first and most important element is awareness. First of all, people have to become aware of the problems they are experiencing, or might experience. This is done through education. But which ways of education are important when teaching people about oral care? And how can people be trained in the habits that can cause the problems? Chapter 3 answers the following sub-question:

"How to educate people on preventive oral care?"

This sub-question is answered by means of research and literature. First of all, the current status of preventive oral care within the Netherlands is explained. Because most dental problems are caused by our own habits, it will be discussed further in chapter 3 which habits are most common and which problems these habits cause. One should be trained to solve these problems caused by habits, but which ways of education are suitable for this? Finally, chapter 3 examines which educational methods are best suited to teach these good and bad habits and how this is done in other sectors. The second element that is discussed within this research is the product range. This is a very important part for the startup. The startup cannot just introduce all products, and not all products contribute equally to improving people's preventive oral care. Chapter 4 answers the following sub-question:

"Via which product assortiment can preventive oral care best be practiced?"

This question will be answered by means of a pre-test and literature research. Prior to this pretest, research is done into the world of e-commerce, and it is explained how the startup works within it. In addition, before the pretest, research is done into products that can solve the certain problems discussed in chapter 3 in the chapter habits. The pretest was finally performed based on this preselection and was distributed to a number of respondents by means of a survey. This was done in order to find out which problems are considered the most significant and which products are the most attractive to solve these problems. After the pretest these products, which came out of the pretest, were further elaborated in chapter 4, including prices and visualizations.

The third and final element discussed within this research combines the ways of education and the product range into a digital application that educates people to become more aware of the problems they experience and that these can be solved through products. How this digital application is designed will be examined in chapter 5 in which the answer to the following sub-question will be given:

"How can education and products be communicated in a digital application?"

After research, user testing and feedback, is decided which digital application is the best to combine the education and the products. This concept will be worked out into a final digital application. This is done in chapter 6. With the use of this digital application, an experiment is performed to answer the last sub-question:

"Does this digital application increase awareness and purchase intention towards preventive oral care?"

Within this experiment, an A/B test is performed in which version A of the digital application does not contain an education method, while version B contains the elaborated education method. In this way, a conclusion can be drawn from the results of this experiment. With the help of these results, which are described in chapter 7, an answer will be formulated to the main question.

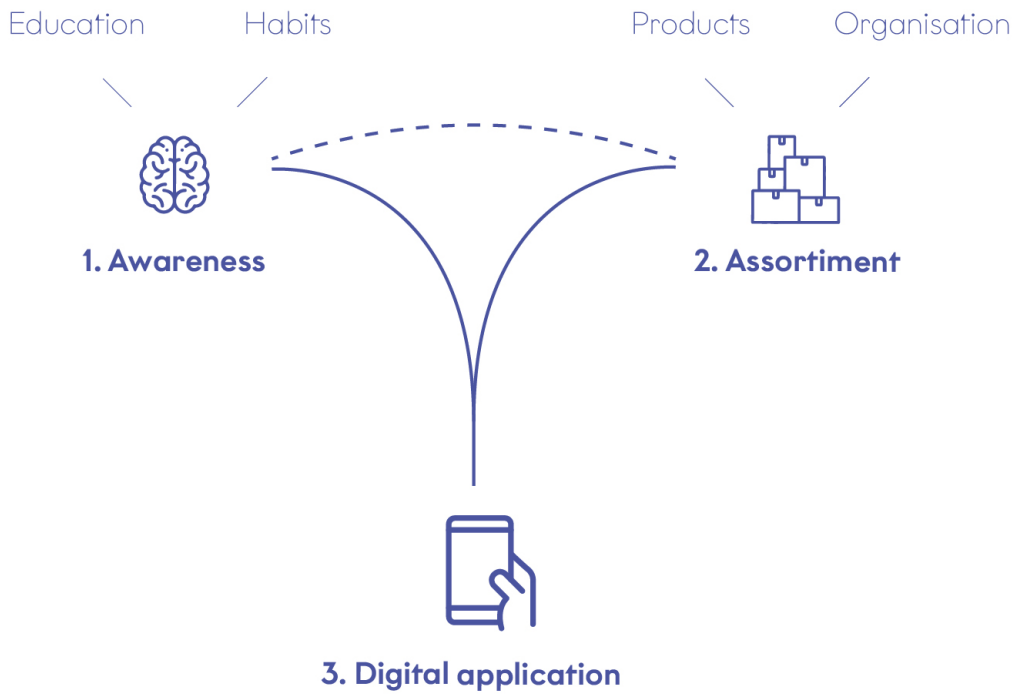


Figure 4: The research can be seen as three elements; 1. Awareness, 2. Assortiment and 3. Digital application. Awareness and Assortiment can influence each other and will be combined into the digital application.

3: Preventive education

This chapter discusses the awareness section (from figure 4 on page 9) and answers the subquestion 'how to educate people on oral care'. First, a summary is given of what the oral care market currently looks like in the Netherlands and then the commercial oral care market is discussed in detail. To what extent is this market preventive? And to what extent are people educated in the field of oral care right now? These are questions that are discussed in this part of the chapter.

Not only dentists are important in oral care. Also people's own routines and habits have a major impact on their dental health. For this reason, this chapter also discusses the most common habits that cause dental problems.

Further in this chapter, ways of education are discussed that can help prevent dental problems. E-health, M-health and tailored health communication are discussed, which will later play a major role in the research.

Figure 5: Person at the dentist, for a yearly check up.

The oral care market in the Netherlands

Dentists, orthodontists, periodontists and other dental specialists are an essential part of the dental market. In the Netherlands, that specialist market is, for the largest part, regulated by the government. In the next alineas, insured dental treatments, commercial dentists and information platforms are discussed, to get an idea of what the oral care market in the Netherlands looks like at the moment.

Insured dental treatments

In the Netherlands, the professional dental world is mostly guided by regulations from the government. If a dutch dental practice wants to be able to declare treatments with insurance companies, the practice must be registered within the '*Ministerie van volksgezondheid, welzijn en Sport*' to be able to apply for the '*Wet kwaliteit, klachten en geschillen zorg*' (Wkkgz), which allows insured treatments.

In addition to being registered with the Dutch government, all treatments executed must be part of a list called 'Prestatie- en tariefbeschikking Tandheelkundige zorg - TB/REG-20600-02', which can be found visiting the website of the government. Every year, the Dutch Healthcare Authority, which is part of the Dutch government, publishes a list with all maximum tariffs for all possible dental treatments. The reason for this list to exist is so that dental care practitioners cannot charge a client, or the insurance company of a client, too much for a treatment. The list contains sixteen categories defined by letters, which can be seen on figure 6.

Each category in the list contains different treatments that each have a maximum price for the treatment. If a consumer does not have dental insurance, the treatment can still not cost more than indicated in the list. This list is, in the meantime, also the reason that registered dental experts cannot make profit with selling or recommending commercial oral care products such as toothbrushes. There is no code in the list for this kind of activities, therefore, dental practitioners are not allowed to practice these commercial activities.

They are only allowed to recommend products, but without any commercial benefits. However, according to Marieke Bakker (2020), an orthodontist from rechtentanden.nl, this is a very grey and undefined area. According to

her, dental practices get rewarded for recommending products by things such as free luxurious holidays or expensive dinners.
As can be noticed from the list in figure 6, there is also a category for 'preventieve mondzorg', category M. Interestingly enough, according to Maartje Hijers, a dentist at tandheelkundig centrum, most of these treatments rarely get declared. The only codes that often do get declared are M03, cleaning and M40, fluoride treatment. However, they only get declared during checkup visits and not with special preventive care checkups.

	Titel	Code
I	Consultatie en diagnostiek	C
II	Maken en/of beoordelen foto's	X
III	Preventieve mondzorg	M
IV	Verdoving	A
V	Verdoving door middel van een roesje	B
VI	Vullingen	V
VII	Wortelkanaalbehandelingen	E
VIII	Kronen en bruggen	R
IX	Behandelingen kauwstelsel	G
X	Chirurgische ingrepen (inclusief verdoving)	H
XI	Kunstgebitten	P
XII	Tandvleesbehandelingen	T
XIII	Implantaten	J
XIV	Uurtarieven bijzondere tandheelkunde en Wlz	U
XV	Abonnementen	Z
XVI	Informatieverstrekking en onderlinge dienstverlening	Y

Figure 6: All types of declaration codes for insured dental specialists in the Netherlands.

Commercial dentists

However, next to the dentist following all the guidelines from the government, there are also dental practices which do not follow the guidelines of the government. The treatments that these practices provide, cannot be insured in any form. These dental practices are considered commercial dentists. Examples of commercial dental practices are practices that focus on the cosmetics of your teeth such as replacements or fake or golden teeth, which are often extremely expensive treatments and not considered acute. An example of such a practitioner is Rademakers & Kinsbergen, a clinic in Amsterdam which provides facings for various athletes, television people and stars. Although commercial dentists like these are allowed to make profit over selling secondary products, there only are a few practices, which often have a much broader range than just good oral care.

Figure 7: Facings, after grinding away most of your real teeth, a composite of porcelain is placed on as shells ofer your actual teeth.

Competitor field

The oral care market is a huge market, so of course there is a lot of competition. Within the market of toothbrushes, in particular, in addition to a number of small brands, there are actually two large companies that control most of the market. This is the Dutch Philips and Oral B, a subsidiary of Proctor and Gamble.

Both companies strive to achieve the highest position among toothbrushes with their high-end models. I would like to discuss two of these high-end models because both also have an application that can be compared to the idea of the application of this research.

The models that are discussed are the Philips Sonicare Diamondclean and the Oral B iO 9. The Sonicare costs €238.39, and the Oral B €224,99. Both quite heavy prices for a toothbrush. In the following paragraphs, both are discussed separately, starting with the Philips Sonicare Diamondclean.

Besides a luxury charging glass, travel case in which the toothbrush automatically charges, and three different toothbrush heads, the Philips Sonicare Diamondclean also has a Sonicare app. Via Bluetooth, someone can connect their toothbrush to the App. While they are brushing, they can see which part of their teeth hasn't been brushed yet on their phone. In America there is also the feature Tele Dentistry, with which they can get advice from an expert. There is also an Automatic brush head ordering service available, with which they can automatically receive a brush head when they need it

Figure 8: A few of the competitors in toothbrushes

However, in practice this Sonicare app is not very popular. The app only scores an average of 2.7 in the appstore with most of the reviews 1 star, as can be seen in figure 10. Besides a number of connection issues, it appears that the app is not wanted, because people often never touch the app again after using it twice. It is not as pleasant to stare at the screen of your phone for two minutes every time you brush your teeth.

Oral B's toothbrush has a smart brush pressure sensor, interactive display, 3D Tracking and A.I. as well as an app. When looking at the reviews of this app, it scores a little higher than the Philips app, but is also not reviewed as good. The score of the app can be seen in figure 9. The reviews here are more positive but are mostly about the fact that the app is more of a marketing feature than that it is actually pleasant to use.

Within this project, there is the idea to put this in a different way, the startup does not believe in these extra features such as 3D Tracking and A.I. will help someone brush their teeth better. The startup believes that good oral care goes much further than that. For example, the startup believes more in good living habits and besides using a good toothbrush, especially also the use of secondary products such as floss or mouthwash.

Oral B or Philips could also develop an app that recommends products, but would simple products like floss or toothpaste fit the high tech brand they have? In the case of Philips, this is totally challenging because they do not currently sell any other oral care products besides their brushes. Philips only sells high end products where a piece of technology comes into play. Oral B already has toothpastes and other oral care accessories, making this step easier for the brand.

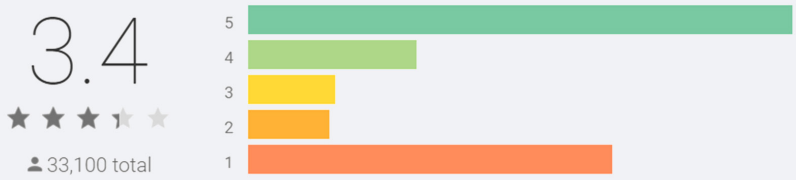
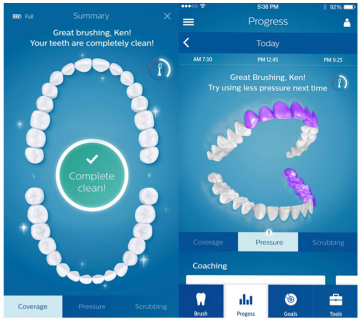


Figure 9: Oral B



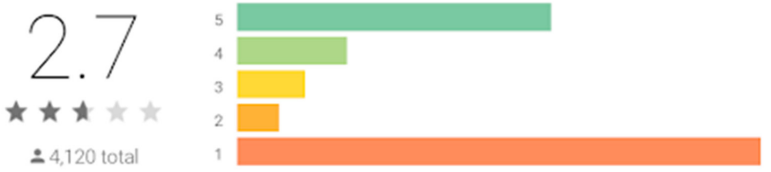


Figure 10: Philips

Information platforms

In order to provide a picture of how people in the Netherlands are currently educated in the field of preventive oral care, the current information platforms are outlined in the following paragraphs. Within the market of oral care in the Netherlands there are multiple digital platforms for dental specialists or dental labor unions. Examples of these platforms are KNMT, Dental Plek and tandarts.nl. KNMT is the official professional organization of dentists, orthodontists and oral surgeons in the Netherlands. On their website is a lot of information on oral care available, but only for professionals. Dental Plek and Tandarts.nl do also have some information, but very minimal and also only for specialists. Both companies also have revenue business related to helping dental professionals with new clients or new software.

For consumers, there is a platform called allesoverhetgebit.nl. Allesoverhetgebit is a really elaborative website with lots of information regarding oral care. This website also seems to be an initiative from KNTM, the professional dental organisation. The about us page of allesoverhetgebit.nl states: "The information is intended to support the oral information provided by dentists to patients." The platform on itself contains great information, however the purpose of the platform is not to promote preventive oral care. The website allesoverhetgebit.nl does not have any social media account or seems to do any form of other marketing.

In addition to the KNMT website and allesoverhetgebit.nl, there are still some other websites with oral care information. These are websites from dental practices with a few very minimal blogs and some topics they specialize in.

Figure 11: www.allesoverhetgebit.nl is a place for dental specialists to refer to if they want to give their clients extra information.

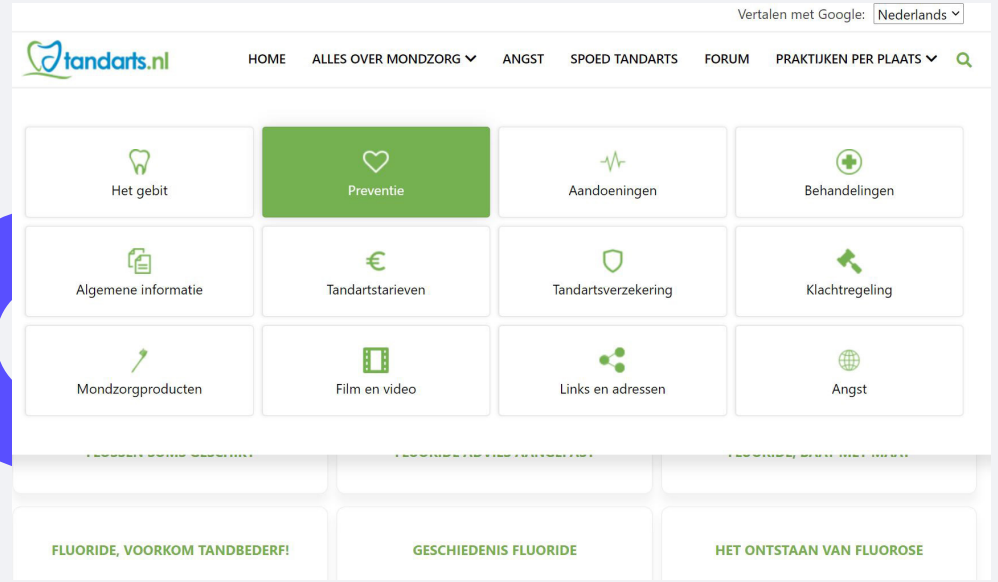


Figure 12: www.tandarts.nl, a website for all information regarding to detists and detal care.

Habits

In general, it can be noted that there is a lot of information on preventive oral care available on the internet, but still, there is not much interest in preventive care. Which makes sense, if there is no problem regarding your oral health. On average, the situation is just fine, and no action is required. However, the field of oral care is influenced by more than just how people brush their teeth and how often they go to the dentist. Oral health also largely depends on oral habits, such as the food people eat and how much and what they drink, as well as the routines people follow when performing or not performing their daily oral care. Some habits are harmful or beneficial to oral health. The most common bad and good habits are found based on desktop research and literature research, and are described in the following paragraphs. In addition, all habits are prioritized to filter which can efficiently be implemented inside the digital application.

Figure 13: Smoking, one of the most common bad habits.

Habits list

In order to find and sort all relevant habits, first a large list of all possible influential habits is set up. The list is set up with a combination of desktop research and literature research. Also, the list is validated and improved with the help of two dental experts.

The desktop research is done by deriving tips and tricks from various websites from health insurers and dental practice websites. These websites include among others Healthline, 123Dentist and Allesoverhetgebit. The full list of websites used in the desktop research can be found in appendix 1.1. Most websites give similar and basic tips and tricks such as not brushing too hard or drinking too much coffee. However, more elaborate search terms such as 'oral health habits' or 'oral health influencing factors' brought in deeper habits regarding brushing behaviour. These habits include things like; Don't rinse after brushing, it will cause the fluoride from the toothpaste to stick less. Dental health services Victoria displays on their website dhsv.org.au, a 5 step list of how to brush your teeth: 1. Don't use too much toothpaste, 2. Brush at a 45 degree angle, 3. Use rotating movements, 4. Don't forget to brush inside surfaces, 5. Use back- and forward motion on chewing teeth. To ensure completeness using other websites, also extra desktop research is executed on what happens if someone does not stick to these brushing tips. All the habits derived from the desktop research, including the effects and consequences, are added to the habits list which can be found on figure 14.

The American Dental Association (ADA, 2020) also states that medication, even just vitamins, can have a negative effect on your oral health. Certain medications can cause abnormal bleeding, altering taste, and soft-tissue reactions. However, the effects differ per individual.

In addition to desktop research, literature research has been carried out in which multiple journals and reports are analysed to find scientifically proven habits that are influencing oral health. The study from A. Hasselkvist et al. (2014), shows that there is a significant relation between the carbonated drinks consumption and oral health amongst swedish adolescents.

The study of John E. Peterson et al. (1991) also shows some interesting habits. In the article, thumb sucking is mentioned as a severely damaging habit, especially for adolescents where it actually often still happens. The article also mentions that mouth breathing is not an proven effective habit since it has complex symptoms and is often bound together with other factors. The last habit the article mentions is Bruxism, also known as teeth grinding. Peterson mentions that grinding is a difficult topic since it can have multiple causes, and can most of the time only be solved by expert solutions.

1	A lot of Soda/ carbonated drinks	Damages enamel	Yellow teeth
2	Aging	Quality of oral health goes backward	Dry mouth
3	Biting nails	The dirt and germs which transfer from fingernails to the mouth	Gum disease
4	Brushing less than twice a day	More plaque and bacteria	Toothache
5	Brushing too hard	Brushes away enamel	Sensitive teeth
6	Cheek biting	injury to your mouth tissue	Mouth sores
7	Crooked teeth	Food leftovers can get stuck near your gums	Gum disease
8	High sugar foods	Sugar combines with saliva and bacteria	Cavities
9	Insufficient carbohydrates intake	Influence of the metabolism on the dental plaque	Bad breath
10	Insufficient proteins intake	Less/Weak enamel, which causes	Sensitive teeth
11	Insufficient vitamins intake	Less strong teeth and slower teeth recovery	Mouth sores
12	Medication intake	Multiple effects	Dry mouth
13	Nog doing a 6 months checkups	Earlier notice of problems and thus prevent (major) interventions	Multiple effects
14	Not brushing at rotating movement	Pushing the bacteria in a wrong way	Cavities
15	Not brushing insides of your teeth	Pushing the bacteria in a wrong way	Cavities
16	Not enough water	Multiple effects	Dry mouth
17	Not flossing at least twice a week	Removed material between teeth, best done at night	Cavities
18	Not wearing a mouthguard in sports	Broken/damaged teeth	Multiple effects
19	Smoking	Carius, periodontal disease, tooth loss	Bad breath
20	Spitting when you rinse	Less fluoride, less enamel	Sensitive teeth
21	Thumb sucking	Weird growing teeth	Multiple effects
22	Too much alcohol	De body will convert alcohol into acid	Bad breath
23	Too much coffee	enamel damage and erosion.	Yellow teeth
24	Too much intake moments, 7+ per day	Doesn't allow the enamel to restore	Toothache
25	Too much red wine	Damages enamel	Yellow teeth
26	Too much toothpaste	Can damage enamel	Sensitive teeth

Figure 14; The full list of (bad)habits with a corresponding problem per habit

The publishing of Douglas E. Morse et al. (2007) shows that indeed there is a significant relation between consuming alcohol with 7+ drinks a week, and oral cancer. According to the article, the relation between smoking and oral cancer is however more significant. Noteworthy also is that it is mentioned that this relation only shows significance for 5+ years of heavy alcohol beverages consumption. The study from PHD David locker (1992), confirms this with a significant relation between smoking on a daily basis and carius, periodontal disease and tooth loss.

The publication of Betsy Hornick in the Journal of Dental Hygiene (2002) states that collaboration between dietetics professionals and oral health care professionals are essential in identifying, educating, and treating oral health problems related to nutrition. This is confirmed by the article from G. A. Scardina et al. (2011). In the article, a significant relation is found between a nutritional imbalanced diet and poor oral health. In the article, nutrition is broken down in three elements: vitamins, proteins and carbohydrates. A lack of vitamins and minerals, which typically can be found in fruits and green food, will influence your teeth development and recovery, especially in younger ages. Insufficient proteins in your diet can lead among other things to less and less strong enamel which can cause sensitive teeth. Protein typically can be found in things such as dairy products, nuts, beans, chicken and lean meat. And lastly, not enough carbohydrates can lead amongst other things to caries, periodontal disease and Oral Candidosis. Carbohydrates can be found in grains, such as bread or rice and pasta, as well as in vegetables such as potatoes and corn. What diet affects your oral health in what way is visualized in figure 15.

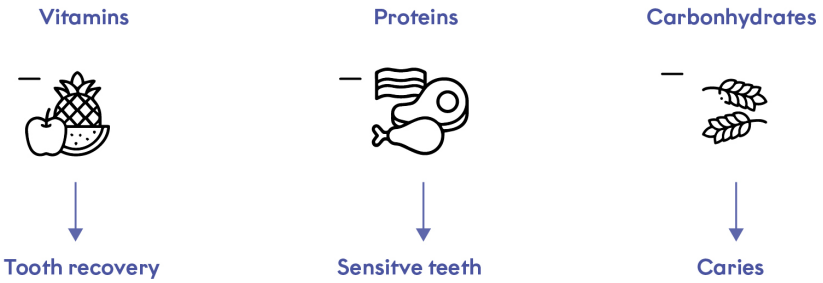


Figure 15; What diet affects your oral health in what way?

In addition to the habits found in the desktop research, all findings from the literature study are also added to the list in figure 14. To validate the findings from the desktop research and literature review, the list of habits, effects and consequences is shared with an expert: Annika S., dental specialist and lecturer at Radboud University Nijmegen. Overall Annika agreed with the content of the list, but still managed to add a significant amount of details including amongst others that smoking itself does not necessarily cause caries, but it highly increases the risk, and therefore chance of development of caries. The full conversionaton with Annika S. can be found in appendix 1.3.

From the list can also be noted that all habits have a main problem. What is also striking is that many of these problems are the same. In this way, with the list of habits, also a list of general problems is set up. These problems will later be assessed for significance by means of a pre-test. The full list of problems can be found in figure 16. As can be seen from the list, not all these habits have a direct clear solution or can be solved easily without expert intervention or repetition.

Problems
Yellow teeth
Tooth sensitivity
Bad breath
Cavities
Gum issues
Dry mouth
Toothache
Mouth sores

Figure 16; List of problems

In order to find the suiting habits for the digital application, the habits are prioritized and filtered in the next paragraphs.

Prioritizing the habits

As explained in the introduction, the purpose of the digital application is not to replace your dental experts in any way. Rather, it has the purpose to teach users about the habits which are easy to improve upon. Therefore, in order to increase the effectiveness of the digital application, the list of habits is filtered to increase the effectiveness of the containing habits. The list is filtered on two scores; importance and implementation. Each habit in the list is given a 5-point score for both elements.

The score importance is chosen since it can give priority to the habits which have a great influence on oral health. On the high end of the importance scale, brushing too hard, not brushing twice a day and not drinking enough water stands out. At the low end of the scale, habits with unclear effects stand out. These include amongst others "not wearing a mouthguard in sports" and "medication intake".

However, as explained before, not every habit is easy to solve and might require expert help. Therefore, the list is rated with a second scale: implementation. This scale defines the level of easiness to correct these habits. The high end of the implementation scale contains habits such as dietary requirements and the brushing frequency. The low end of the score include elements such as medication intake and detailed brushing instructions.

As a next step both scores are accumulated with each other to create a combination score. To filter the list down to only effective and easy to solve habits, it has been decided that only habits with a score above six receive a place in the final habit list. After accumulating the scores, a total of 17 habits remain. These are the habits which will be implemented within the digital application, linked to the most common dental problems which can be seen in figure 17. In the next paragraphs, research has been carried out on how to educate consumers to unlearn bad habits and learn good habits, in an effective digital application.

Nr	Habit	Effect	Main problem
1	A lot of Soda/ carbonated drinks	Damages enamel	Yellow teeth
2	High sugar foods	Sugar combines with saliva and bacteria	Cavities
3	Insufficient carbohydrates intake	Influence of the metabolism on the dental plaque	Bad breath
4	Insufficient proteins intake	Less/Weak enamel, which causes	Sensitive teeth
5	Too much intake moments, 7+ per day	Doesn't allow the enamel to restore	Toothache
6	Brushing less than twice a day	More plaque and bacteria	Toothache
7	Nog doing a 6 months checkups	Earlier notice of problems and thus prevent (major) interventions	Multiple effects
8	Not brushing at rotating movement	Pushing the bacteria in a wrong way	Cavities
9	Not brushing insides of your teeth	Pushing the bacteria in a wrong way	Cavities
10	Not wearing a mouthguard in sports	Broken/damaged teeth	Multiple effects
11	Spitting when you rinse	Less fluoride, less enamel	Sensitive teeth
12	Insufficient vitamins intake	Less strong teeth and slower teeth recovery	Mouth sores
13	Not enough water	Multiple effects	Dry mouth
14	Too much coffee	enamel damage and erosion.	Yellow teeth
15	Too much red wine	Damages enamel	Yellow teeth
16	Biting nails	The dirt and germs which transfer from fingernails to the mouth	Gum disease
17	Not flossing at least twice a week	Removed material between teeth, best done at night	Cavities

Figure 17; The 17 habits that remained after accumulating the scores.

Education Methods

In order to best educate the startup's audience about the insufficient habits from above, research has been carried out on various education methods. First, research has been carried out on how to learn new habits. Following that, various digital education methods are discussed and compared to each other.

Learning new habits

According to Wood et al. (2005), a habit manifests itself when behaviour is continuously repeated within a similar context such as times of the performance, the location or other stable context features. Within the case of this very research, this context can include things such as location and timing. For the location, options could be for instance the bathroom, the kitchen and the shower. The timing regarding brushing your teeth could be for instance, first thing in the morning, after breakfast, or before you leave the house.
In some other examples about learning new habits, this context, or specific elements that happen in this context, are referred to as an 'anchors' or 'triggers'. These are essentially the same. According to Steve R. (2018), the trick in learning new habits seems to be to connect two unrelated elements to each other. One is the elements that you want to learn, one is something that is already happening. For instance; if you want to floss more often, you can link it to certain time slots such as Monday and Friday mornings.

For breaking bad habits, there are similar, as well as different, more unique methods. For example, Jager, W. (2003) poses multiple solutions for breaking bad habits. Like this, the first method to quit bad habits, according to Jager, is to simply make it impossible. However, this is often difficult. Therefore, it is often made less attractive or less rewarding, like for instance speeding tickets. Another way to make a bad habit less attractive is to make the alternative more attractive or rewarding. Jager also mentions changing the context, he states that by incorporating a better suggestion within the message, the chance of success is much higher.

Reflecting back on the list of oral care habits from figure 17, not every habit can be easily linked to a trigger. In order to educate on the elements that can't be easily linked to triggers, other methods must be used. These are discussed in the following paragraphs.

Digital education methods

When there is a conflict between what people want and what they should do, health professionals face the challenge of encouraging people to initiate or maintain healthy routines (Rothman et al., 2006). However, to find out in what ways someone can learn new habits and what it takes to transfer knowledge effectively, research is executed on what education methods are used in other sectors. These sectors include quitting smoking, weight loss, muscle gain and other subjects in health care. In order to communicate these problems to people, different educational methods are used with different starting points, advantages and disadvantages. The most common and most effective education methods in health care nowadays, according to the literature, are discussed below. These methods are E-health and M-health.

Figure 18; Visualisation of M-health

E-Health
E-health is a term that arose around 2000 and stands for Electronic-Health. In 2001, Eysenbach described it as follows: "e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology". Research shows that over the years there have been many developments and this e-health has only become more and more present in our society. Nowadays, almost everyone first looks up things about their health on the internet before going to a specialist to have it tested.

There are several types of e-health. A few examples are forums, blogs, apps, but also, for example, the electronic management of patient files. The healthcare sector is also digitizing. The biggest similarity that these examples have is that they offer information to consumers, while also offering it to experts. This is a nice bridge to the goals that are achieved with the use of e-health. The main goal is to provide information and help search for this information. In addition, e-health is also used to promote and teach healthy behavior. In addition, it helps gathering research in healthcare, connecting experts with patients and interacting with these experts. The development of e-health ensures that a lot of information is available for experts and their consumers, so that patients know more about their own health and the experts have a better understanding of their patients. In the dental care sector some forms of E-health are already implemented, but still it can be improved a lot to get more transparent insights for the consumer.

M-Health
Just like E-health, M-health mainly takes place online and digitally. M-health stands for mobile health. With the rise of the internet and smartphones, m-health has become increasingly more popular. There are various methods within m-health, such as trackers or wearables, which can literally measure everything. Examples include: the number of steps one takes in a day, the average heart rate and the number of calories intake. Another very common method of m-health is communication via messaging. Reminders, but also via text messages or push notifications from, for example, the dentist. This m-health is very important for today's time, not only because it can help people, but also because it offers a lot of insight for health insurance companies and experts in how they can help people appropriately. Also consumers can learn from this and prevent or work towards certain (health)goals.

According to De Ridder (2017), M-health was set up on the basis of six different incentive driven technologies: financial, feedback, education, social information, reminders, alerts and gamification. All these points within m-health are important to keep a user motivated. Financial means that when using m-health, one can receive a reward in the form of a voucher, a bonus or a discount. The recent developments in blockchain and cryptocurrency technology support this. Like this, the user is extrinsically motivated, which means the user holds on to the task because it gets a reward. In case of feedback, it is important that the m-health can give feedback on the user, but also vice versa. This is to ensure that the user and the m-health can continuously improve by learning from each other. The education refers to the use of technology to present instructions and information to the user with the vision of reducing the need for contact with specialists. The social aspect is also important because it allows people to share their results and connect with others. In this way, an intrinsic motivation is linked to the use of m-health. The reminders and alerts are very similar. This means that while using m-health, the user is reminded of their own goals that want to be achieved. As a last technology, gamification is used in m-health. This is also to intrinsically motivate the user. By turning the 'good behavior' into a game, it is easier to follow it up and more fun to execute on it, because it is simply more fun. In combination with the social aspect, it can also include a competition which can be played against other users. This way, it is more of a challenge to execute it.

Combination of E-health & M-health: tailored health communication
As described above, e-health and m-health are two important educational methods that are currently very large and growing. When one combines these two methods, one will end up with the best of both worlds: tailored health communication. With the method tailored health communication, tailoring is used to create relevance for the consumer to follow the education (Kreuter, 2003). It is a method in which data from or about a user is used to set up an assessment. In addition to this, a particular

health outcome is used to determine the most appropriate information or strategies to meet that person's unique needs (Rimer & Kreuter, 2006). An important part of this is customization. Customization is the extent to which a message (combination of content, station, images, channel, etc.) responds to relevant, individual characteristics. When the level of customization is high, the message is specific to an individual. As the level of customization decreases, the message becomes accessible to more people but is not specific to an individual (Hawkins, 2008).

According to Hawkins (2008), there are a number of message processing mechanisms and strategies associated with tailoring. Below the message processing mechanisms tailored messaging, effortful processing, emotional processing and self reference are discussed. The tailored messaging increases the attention of the user by responding to the specific needs and preferences of the user. Effortful processing is focused on fitting the message with the user's own schemes and reminders to create strong arguments for the user's execution of the task. Thirdly, tailored health communication also involves emotional processing by responding to the emotions of the user. This by giving the user the feeling that the sender understands them, which makes the message more credible and makes the user follow the advice sooner than before. The last message processing mechanism is self reference. Tailoring can encourage self-reflective thinking by confronting the user with their own behavior and also the desired or good behavior, while also creating a personal connection.

In addition to these message processing mechanisms, Hawkins (2008) also states that three strategies can also be distinguished in tailored health communications: personalization, feedback and content matching. All three are discussed below.

Personalization is an important strategy, because personalization increases motivation and attention for information processing. This can be achieved by the means of identification, for example by mentioning the name of the user. Another example of this is evoking expectations with messages such as: this advice is especially for you and contextualizing the message by framing it in a meaningful context for the received by taking into account for example demographic data. The next strategy discussed is feedback. This means that the user is presented with his own information. This can be done in three different ways, namely through descriptive feedback, based on what the user has given himself, comparative feedback, where the information is compared with other users of e.g. the same gender or age, and evaluative feedback, where the information received is converted into an appropriate advice based on interpretations. The last strategy of tailoring is content matching. In content matching, the given message is adjusted based on the input, in our example the consumer. Here the message is most focused on the behavior where the change is most needed. A combination of these three strategies ensures an optimal functioning of the tailored health communication.

Based on the literature, it has been decided to test the functioning of tailored health communication. Here it is being tested whether the addition of this tailored health communication ensures a higher involvement of the consumer in their own problems and possible solutions. Adding the tailored health is tested by comparing it with the same type of digital application that does not contain this tailored health. In chapter 6, the way that will be chosen in the digital application to represent the tailored health communication will be further explained.

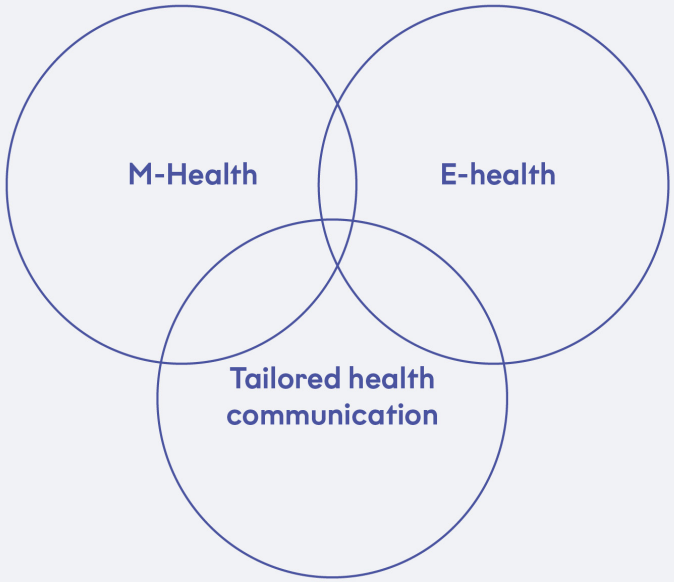


Figure 19; the division between the three education methods M-health, E-health and Tailored health communication.

4: Assortiment

This chapter describes research into which products can solve certain oral care problems and which products are the most fulfilling for the startup and for the users. The chapter starts with an introduction to e-commerce and why it is advantageous to introduce more products in addition to fulfilling the full service oral care that the startup is working towards.

The startup has started late 2019 with their first product, a sonic electric toothbrush is sold with a subscription for the brush heads. However, the vision of the startup involves more than the toothbrush. The vision of the startup is to sell a full range of oral care products in the subscription throughout the whole of Europe. With a simple, yet effective product range, the startup aims to win most of the oral care market in Europe. However, the products that will be present inside this future products assortiment are still undefined.

There are a lot of different oral care products available for the startup to source and to add their product assortment. For example, the search term 'toothbrush' on amazon, the world's largest retail platform, gives more than 2000 search results. This is not including extra products such as toothpaste, floss, mouthwash or other oral care products. In order to arrive at the startup's vision of "full service preventive oral care" A good taxonomy is needed between demand from the market and supply, the product assortment from the start-up. Within this chapter is research on what products the startup can put inside their product assortiment.

The research starts with an introduction to E-commerce, as well an explanation as the subscription business model of the startup.
As a next part via an oral care products survey is defined which oral problems from chapter 3 are perceived as significant by the respondents. In addition, within this survey is researched which products people would use to solve these problems. Via this method, a potential product assortiment for the startup is defined.

The survey is divided in three sections; Problems and products, the survey and survey outcome. As a final step of this chapter these outcomes of the survey, the product assortiment, is realised. This is done terms of visualisation, pricing,and packaging.

E-commerce introduction

The business to consumer market of product retail has rapidly been changing in the last few years. There has been an immense shift from buying your personal products in a physical store to buying everything online (J.D. Wells et al, 2020). The business to consumer e-commerce market has been, and still is, rapidly expanding.

According to Aaron Orendoff from Shopify (A. Orendorff, 2019), a leading platform for online stores, the ecommerce retail market has grown from $1.5T in 2015 to $4.1T in 2020, An impressive 273,4% increase. With this growth, the mobile purchases also have grown over 50% according to Lengow's blog (N. Botting, 2019) and will keep growing in the next few years.

More and more companies are making the transition to selling their products online (Y. Zhou, 2018) And for a good reason;, with an online store your brand is much closer to your audience, enabling you to provide a better and more customized service (B. Sohrabi, 2012).

The main revenue source of the startup is also originating from direct to consumer e-commerce. However, the startup uses a special e-commerce business model since it is a product subscription option which causes recurring revenue. In the next chapter this subscription business model is explained in detail.

Subscription businessmodel

Boombrush sells one-time-purchase products, such as their toothbrush. In addition to this, the startup also offers a refill plan for the brush heads for the toothbrush. This generates recurring revenue from automatic repeat purchases in the refill plan. With every toothbrush sold, also a subscription is sold, meaning for every toothbrush sale the amount of subscriptions is growing too. With more subscriptions, the daily amount of refill sales is also automatically increasing.

When some factors, such as the cancelations of subscriptions, are neglected, the total sales volume of sales can be expressed with the following formula:

$$V_{total} = V_{toothbrush} + \Sigma V_{toothbrush} * V_{refill}$$

The total sales volume (Vtotal) can be expressed by the toothbrush sales volume (Vtoothbrush) plus the total toothbrushes sold times the refill sales volume (Vtoothbrush * Vrefill).

This means that with a constant daily sales volume of the toothbrushes, the sales volume of the brush heads increase with linear growth. With an average sales price of €60 for the toothbrush, and €5 for a brush head sent every month and a constant sales factor of 100 toothbrush sales each month the following plot can be set up, seen in figure 20..
However, this also means that with a linear growth in toothbrush sales, the brush head sales experience exponential growth. When increasing

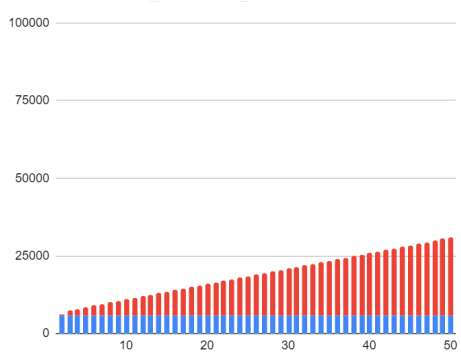


Figure 20. With stable toothbrush sales the revenue grows linear because of the refill subscriptions.

the constant sales factor of 100 toothbrushes with 5 sales extra for every month, the revenue growth becomes an exponential curve as, illustrated in the plot in figure 21.
The formula for the total sales volume in figure 21 can be divided in two parts, the toothbrush sales (Vtoothbrush) and the refill sales (Vrefill).

By increasing the Refill sales by adding more products to the product assortment the curve becomes even more exponential.

By adding more products inside the subscription, the subscription products sales volume is increased, which causes a more exponential curve as can be

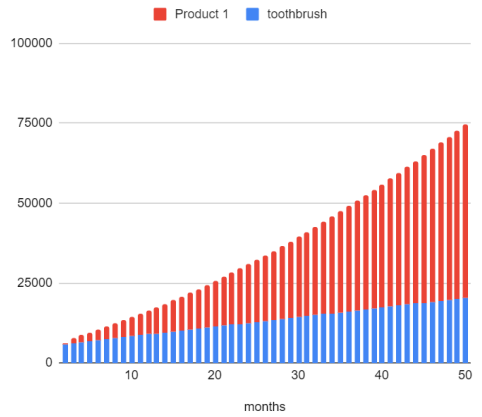


Figure 21. With linear growth in toothbrushes, the overall revenue grows exponentially.

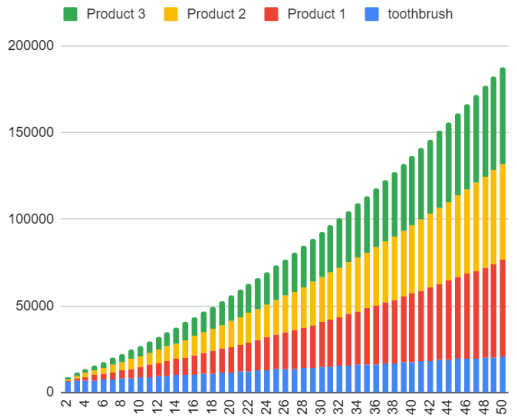


Figure 22. By adding more products so the subscription, the revenue grows even more exponentially.

seen in figure 22. Please note the scale on the Y-axis is now 2 million revenue instead of 1 million. These plots show the value for the startup to add more refill products to their assortiment. In the next alineas is researched via a survey, what these products could be.

Oral care products survey

To find out which products can be integrated as refill products in the startup's product assortiment, first, a large list of potential products is set up. As a second step, this list is sent out to 100 respondents to find out which oral problems are perceived as significant and which products of this list would be used to solve those problems.

Problems and products

To arrive at a set of products for the startup to integrate in their assortment, first two broader lists are set up. By the means of a digital survey these lists are spread among 100 respondents to define which products are significant. In addition to the products, also a list of problems is spread, these problems are based on the research in chapter 3 on page 18.

In order to set up a list of significant products, desktop research is executed to find products that can solve these very problems from the research from chapter 3.

For sensitive teeth, one of the most effective and easiest products to use is a sensitive teeth toothpaste according to Crest (2020). Also on the website of Healthline (2020), it is stated that salt water rinse as well as vanilla extract can help with sensitive teeth. For the problem sensitive teeth, the products in the survey include sensitive toothpaste, vanilla extract and salt rinse.

Having a bad breath can be an annoying problem. According to Allure (2020) and Buzzfeed (2020), bad breath can be tamed by a combination of a tongue scraper, breath spray and mouthwash. A more obvious solution is using chewing gum. These products are added for the problem of bad breath.

On the website of medbroadcast (2020), it is stated that mouthwash can help with multiple problems next to bad breath. Like this, mouthwash can also be used to help with gum diseases and bad breath.

For yellow teeth there are multiple solutions to make your teeth white again. According to Business Insider (2020), some of the popular, good selling products include whitening kits and whitening strips.

Products to help with caries or tooth decay include amongst others supplements, mouthwash and hot pouches according to Crest (2020). In the table below, all products can be seen inside the list.

Nr.	Product
1	Toothpaste
2	Salt rinse
3	Vanilla extract
4	Tongue scraper
5	Breath spray
6	Mouthwash
7	Chewing gum
8	Whitening kit
9	Whitening strips
10	Hot pouch
11	Supplements
12	Floss
13	Ragers
14	Folic acid

Figure 23. The selected products before the pre test.

As can be seen in figure 24, the products are displayed as blank products without any labels or text. This was done to assure that the respondent has no brand experience and is therefore more focused on the product. These images are created by removing labels from common oral products using Adobe Photoshop. In the survey, parameters, such as price and availability, are explicitly left out to have the respondent focus the products without any external influences.

In the table on page 25, a matrix can be found to which products are displayed at which problem.

Figure 24. All products from figure 23 visualised.

		Tooth sensitivity	Bad breath	Yellow teeth	Toothache	Bleeding gums	Cavities	Mouth sores	Dry mouth
1	Toothpaste						x		
2	Salt rinse	x							
3	Vanilla extract	x							
4	Tongue scraper		x						x
5	Breath spray		x						
6	Mouthwash		x						x
7	Chewing gum		x						
8	Whitening kit			x					
9	Whitening strips			x					
10	Hot pouch				x				
11	Supplements					x		x	x
12	Floss					x	x		
13	Ragers					x			
14	Folic acid							x	

Figure 25. Which products are displayed at which problem.

The survey

This preliminary research consists of a quantitative survey in the form of a questionnaire. To execute a good data analysis, the survey is built with software Qualtrics. To justify the significant differences, it was decided that the questionnaire had to be completed by at least 100 respondents. Since the size of the oral care is very large, there is no need for a well-defined or complex sample and therefore the sampling method used is random sampling. The questionnaire is spread via software prolific and in total 122 respondents completed the questionnaire, After filtering the data, 112 usable results remained.

The questionnaire starts with a welcome so that visitors to the survey can be introduced to the fact that the questionnaire is about personal oral care. It also states that the results of the questionnaire are completely anonymous and that the survey can be stopped at any time. In order to prevent manipulation as much as possible, the second page of the questionnaire emphasizes that there are no right or wrong answers, but that the respondent should fill it out truthfully as much as possible. After that, questions are asked about the factors, topics and products, which are further explained below. The entire survey flow can be found in the Appendix 2.1.

Inside the questionnaire, for each chosen problem, as indicated in figure 25, a set of products will be available to choose from. As can be seen in figure 25, there are some products which are labelled under two different topics.

Survey outcome

The result of the survey is analysed in two parts, the problems and the products. In Appendix 2.2 the data from the SPSS analysis can be found.

Problems

The data shows that a lot of respondents experienced at least one of these issues. Only seven respondents experience none of the problems at all. In figure 26 an overview is shown of how often the other topics occurred. Yellow teeth and tooth sensitivity are the most selected, respectively 54 and 53. Mouth sores is the least chosen problem with only 10 selections.

Problem	Entries
Yellow teeth	54
Tooth sensitivity	53
Bad breath	35
Cavities	33
Gum issues	30
Dry mouth	24
Toothache	20
Mouth sores	10

Figure 26. How often the problems occurred among respondents

Another interesting statistic is how many topics the different respondents filled in. From this analysis, it became clear that the respondents filled in an average of 2.31 problems. Figure 27 shows the number of problems compared to the number of times they occurred. It can be noted that few people select more than three topics, more than four topics almost never occur.

entries	number of occurrence
0	7
1	23
2	31
3	23
4	16
5	3
6	2
7	0
8	1
average	**2.31**

Figure 27. The number of problems compared to the number of times they occurred.

Per problem, a number of questions are asked to define how relevant this problem is for the respondent. In this section, six questions are asked that can be divided into three scores: 1. Problem seriousness (Q1 & Q2), 2. Willingness to solve (Q3 & Q6) and 3. Purchase intention. (Q4&5). Per question, a 7-point likert scale was used to measure the consumer's answers. The scores from the table below are only filled in when the topic was chosen and therefore do not form averages to compare with each other.

	Tooth sensitivity	Bad breath	Yellow teeth	Toothache	Bleeding gums	Dry mouth	Cavities	Mouth Sores
Seriousness	3.17	4.51	5.27	3.1	3.27	3.67	4.08	2.6
Willingness to solve	4.32	4.67	4.84	4.95	4.33	4.15	4.77	4.55
Purchase intention.	4.32	4.41	4.86	4.8	4.22	3.54	5.2	4.3

Figure 28. Scores of the problems on 1. Seriousness, 2. Willingness to solve and 3. Purchase intention.

What is striking about this data is that the topics Tooth sensitivity, Toothache and Mouth Sores have a low seriousness score, 3.17, 3.1 and 2.6 respectively. Despite the low score for seriousness, the topic tooth sensitivity still has a high occurrence of 53 according to figure 26. Toothache and Mouth Sores on the other hand have very occurrences, 10 and 20 respectively. Based on the combination of the toothache and mouth sores being the least chosen issues according to figure 26, but also the least issues serious problems according to figure 28, they are removed from the list. All other problems remain relevant.

Products

For each issue, a set of products is shown that might solve that specific issue. When analysing the data, it is interesting that there is a high conversion from topic to products. On average, 60% of the respondents chose at least one product for each topic. Another interesting analysis is that, on average, people choose 1.2 products per issue. This learns us that people are willing to try new products if it might actually solve their problems.

For each topic different products are shown in order to see which product is most likely to solve the problem, as is shown below.

Products for Sensitive teeth:
53 respondents experienced sensitive teeth as a problem. Of these 53 people, 43 chose to solve the problem with toothpaste. In addition, 15 people chose salt rinse and 13 chose vanilla extract.

Products for Bad breath:
35 respondents said they suffered from bad breath. Of these, 27 respondents chose to use a mouthwash to solve their problem. 16 respondents opted for the chewing gum and 12 and 8 respondents opted for the breath spray and tongue scraper respectively.

Products for Yellow teeth:
Of all 112 respondents, 54 experienced having yellow teeth. To solve this problem, 37 respondents chose to use special toothpaste and 34 respondents chose to use a mouthwash. In addition, 26 respondents opted to use a whitening kit and an additional 21 respondents opted for whitening strips.

Products for Toothache
20 respondents experienced toothache as a problem. Of these, 10 respondents prefer to solve it with mouthwash and 7 respondents with hotbags.

Products for gum issues
30 respondents experienced gum issues as a problem. Mouthwash is the most commonly chosen product. It was chosen by 20 of the 30 respondents.

In addition, there is a similar preference for floss, supplements and interdental cleaners that were chosen 12, 11 and 10 times respectively.

Products for dry mouth
Of the 112 respondents, 24 indicated that they suffered from dry mouth. Most of the respondents would like to solve this problem with a mouthwash (10 respondents). In addition, the respondents are certainly prepared to use supplements (9 respondents) or breath spray (8 respondents).

Products for cavities
An error was made in this analysis because the same products as in dry mouth are shown here, therefore this data is not included in the test.

Products for mouth sores
Mouth sores are not recognised as a problem by many respondents, but 10 out of 112 respondents recognise this as a problem. Of these, 6 respondents chose to solve it with supplements and 4 with folic acid.

The table below shows the amount of times a product was selected by a respondent.

Nr.	Topic	Toothpaste	Salt rinse	Vanilla extract	Tongue scraper	Breath spray	Mouthwash	Chewing gum	Whitening kit	Whitening strips	Hot pouch	Supplements	Floss	Ragers	Folic Acid
		1	2	3	4	56	7	8	9	10	11	12	13	14	15
1	Yellow teeth	37							26	21					
2	Tooth sensitivity	43	15												
3	Bad breath				12	8	27	16							
4	Cavities						-					-			
5	Bleeding gums						20					11	12	10	
6	Dry mouth					8	10					9			
7	Toothache						10				7				
8	Mouth sores											6			4
	Total	**80(2)**	**15**	**0**	**12**	**16(2)**	**67(4)**	**16**	**26**	**21**	**7**	**20(4)**	**12**	**10**	**4**

Figure 29. Numbers of chosen products with the problems.

What is interesting to see in this data, is that toothpaste is the most commonly chosen product. This is not a very unexpected outcome, but what is interesting to see is that with both issues, yellow teeth and tooth sensitivity, the toothpastes score equally high, namely 37 and 43 respectively. This shows us that there need to be two different toothpastes. One focussed on sensitive teeth as well as one focussed on whitening.

It is also noticeable that mouthwash is a popular product, it is chosen a total of 67 times, especially within bad breath (27) and gum issues (20). Since dry mouth has not shown a significant preference for mouthwash, and since the issue is not anymore valid, a mouthwash focused on bad breath and gum issues is added to the assortment.

Although whitening strips and the whitening kit have similar scores (26 and 21 respectively), whitening strips are added to the assortiment. This is chosen because whitening strips have a lower initial purchase cost, making it easier to sell inside the subscription.

Another product that will be included in the product assortment is floss, since it has a critical function within oral care.

The supplements show a high score for gum issues and dry mouth (11 and 9 respectively). The score for mouth sores is lower (6), and mouth scores is also not a significant problem. Therefore supplements with the focus on gum issues is added to the assortiment.

Breath spray does not show a significantly high score, respectively 16 with two issues, it is still an added assortment as the last product. This is done because the topic dry mouth only has mouthwash to solve, while it is still a popular issue.

The full list of chosen products can be seen in figure 30.

1	Toothpaste Whitening
2	Toothpaste Sensitive
3	Mouthwash
4	Whitening strips
5	Supplements
6	Breath spray
7	Floss

Figure 30. The final products

Based on the chosen products, a matrix can be created between the problems and the products. This matrix is later used to offer a product combination to the customer based on these problems.

		Toothpaste Whitening	Toothpaste Sensitive	Mouthwash	Whitening strips	Supplements	Breath spray	Floss
1	Yellow teeth	x			x			
2	Tooth sensitivity		x					
3	Bad breath			x			x	
4	Cavities					x		x
5	Gum issues		x					x
6	Dry mouth			x			x	

Figure 31. The product assortment combination per product.

Realisation

In order to measure the purchase intention regarding the products from the list in figure 30 the products first must be realised. Within this research is focused on visualisation and pricing, to limit the research, extra factors such as stock, order quantities, packaging and logistics are not discussed. First, using 3d modelling and rendering, for each product, a visualisation is made. The products include labels, displaying the focus points, as well as the branding and logos from the startup. As a second part, the product assortiment is realised in terms of pricing by analysing similar prices on desktop research. As a secondary element, the margins are determined by analyzing the bulk prices from suppliers.

Visualisation

In order to create images that are convincing for consumers to buy, multiple 3d models are set up as well as downloaded from websites such as Thingiverse and Grabcad. Below, an overview of the 3d models can be found.

Figure 32. All products worked out in 3d models without labels and branding

By adding the colors and fonts of the startup, the products get a more realistic look. It was also decided to display the problems that this product can help with on the products. The labels are set up in Adobe Illustrator and placed on the products via Keyshot.

Figure 33. The worked out products including labels.

Pricing and margins

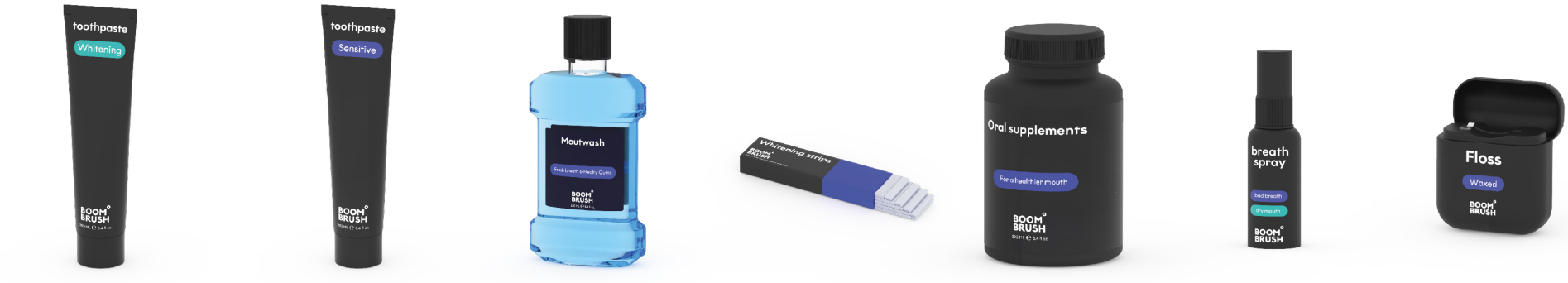
In order to determine an actual sales price of these fictive products, a calculation was made to ultimately arrive at realistic sales prices with a still decent profit margin for the startup. These prices do not take into account any marketing or other fixed costs, just variable costs.
The full calculation of the sales prices can be seen in figure 34.

This sales price calculation consists of four steps: Import, assembly, shipping and tax.
The import costs are calculated by looking at the sales prices of different suppliers. An overview of these suppliers can be found in appendix 2.4. Most suppliers that are chosen are from China, which is commonly known for its low production prices. Since the packaging and assembly of these products is still unknown, an average cost of €0.90 cents for the packaging, assembly and bulk transport is set. These costs are roughly the same for the current refill products of the startup. The costs for shipping are mostly determined by the weight. As can be noted from the shipping cost sheet, mouthwash is very expensive to ship. This is because it has a large volume of water and thus quite a heavy weight. It is interesting to explore other possibilities like mouthwash powder or an extract in the future. As can be noted, the other shipping prices are extremely low and do not match the normal shipping tarifs from PostNL. Instead, the shipping prices are considerably lower since the products are sent in big batches of 1000 using PostNL Partijenpost.
The last column to determine the profit margin is Tax. Since all products are purchased from a dutch webshop, there always is a standard of 21% revenue tax, this is calculated in the prices.

With these variable costs, rounded off prices were chosen as sales prices. As can be seen in the table, all product prices have profit margins between 38 and 44 percent with the expectation of mouthwash. Despite the low margin to mouthwash, it is still included in the assortment since it is a product necessary for the total oral care.

	Import	Assembly	shipping	Tax	costs	salesprize	margin	Maring (%)
toothpaste 1	€ 0,71	€ 0,90	€ 0,55	€ 1,26	€ 3,42	**€ 6,00**	€ 2,58	43%
toothpaste 2	€ 0,78	€ 0,90	€ 0,55	€ 1,26	€ 3,49	**€ 6,00**	€ 2,51	42%
mouthwash	€ 1,26	€ 0,90	€ 2,95	€ 1,68	€ 6,79	**€ 8,00**	€ 1,21	15%
Whitening	€ 2,75	€ 0,90	€ 0,55	€ 2,52	€ 6,72	**€ 12,00**	€ 5,28	44%
Supplements	€ 3,56	€ 0,90	€ 0,55	€ 3,15	€ 8,16	**€ 15,00**	€ 6,84	46%
Floss	€ 1,03	€ 0,90	€ 0,55	€ 1,26	€ 3,74	**€ 6,00**	€ 2,26	38%
Breath spray	€ 0,55	€ 0,90	€ 0,55	€ 1,05	€ 3,05	**€ 5,00**	€ 1,95	39%

Figure 34. Full calculation of sales prices.



1. Toothpaste Whitening 2. Toothpaste Sensitive 3. Mouthwash 4. Whitening strip 5. Supplements 6. Breath spray 7. Floss

Figure 35. The worked out products including labels.

5. Linking preventive education & products

Introduction

In the previous chapters, first, a number of methods of education were discussed, followed by a number of products that could solve the most common problems of people regarding oral care. In this chapter, research is executed on research question three; how can the education and products be combined and communicated in a digital application? In answering this question, it is important that the information from both chapters is linked and a good combination of both can be formed.

Earlier, we found multiple factors that influence oral health. In this research, it was also found that most of these factors are everyday habits which can greatly influence oral health. After bringing down a large list of habits to a significant list, a list of 17 habits remained. In addition, different ways of digital education in today's time were discussed. Here e-health, m-health and tailored health communication were mentioned. All three types of education methods take place digitally. With these education methods, preventive health care is encouraged because people are able to control their own health and because the information is personalized. This is mostly the case with Tailored health communication.

To solve problems in oral care, not only information is needed, but also actions of a person. These actions require products to take care of the problems. Via a survey built in qualtrics and distributed via Prolific is significantly determined which products should be part of the product assortment. As a next step, these products were visualised using 3D Modelling, creating labels and rendering.

In this chapter, the education and products are linked to each other. The linking of the education and the products can ensure that consumers can solve or prevent their own oral care problems through the use of certain products. These are the quick wins for the consumer that the start-up can provide through the combination.

Linking preventive education & products

As mentioned earlier, both good education and the access to the right products are necessary for consumers to maintain a healthy mouth. In this chapter, the following question is being discussed and answered: how can education and products be communicated in a digital application? If this is succeeded, higher awareness regarding specific oral care problems will be created and therefore also might raise attention towards the solution, which are the presented products. The functioning of this combination will be tested by means of an experiment in the next chapter, but first we will investigate which type of digital application works best as a combination of education and products.

Linking education and oral care products in a digital, lifestyle focussed application is not something that fits the brand of every 'oral care company'. Bigger corporations such as Phillips and Oral B, but also various toothpaste companies such as Elmex and Sensodyne have been focused on toothpaste so long that they became a toothpaste or toothbrush brand. The startup has the vision to help people get started and prevent or solve their problems by offering products. By linking the education with these products, the startup might increase awareness and give customers the opportunity to solve or prevent their problems by using the offered products. In this way, the startup tries to help customers by presenting quick wins, but also to create a range of products with which they can help a large group of people with their problems.

To investigate how the education and products are being linked, a creative design process is being set up starting with the ideation phase. Here broad ideas are taken into account. In the conceptualisation phase, these broad ideas are clustered and converted into concepts. These concepts are judged on the basis of criteria that are drawn up and explained beforehand. After that a selection has been made of concepts that could possibly be a good elaboration on the basis of the criteria, 3 concepts are further detailed into low fidelity sketches after which these are assessed by means of user testing in the form of a survey. After knowing which idea will work best according to the outcomes of the tests, a final digital application is chosen to build the experiment with.

Ideation

First, the ideation phase was set up, starting with two word maps with the words education and products. All words that came up with the words education and products were written on post-its and put in a circle around the words. For education these were words like learning, information and feedback and for products these were words like store, purchase and utensils. In the images below you will find the complete word maps per word.

As a next phase of the ideation, clusters were made. All post-its with words were placed on the wall and then clustered into groups with words that belong to the same category as can be seen in figure 36. The words of both word maps are clustered here. For the education post-its, this resulted in the following groups; Fear, Punishment, Feedback, Examination, Lectures, Tutorials, Science, and Stimulating. For the products, this resulted in the following groups; Urge, Tailoring, E-commerce, Customer Loyalty, Physical and Necessity.

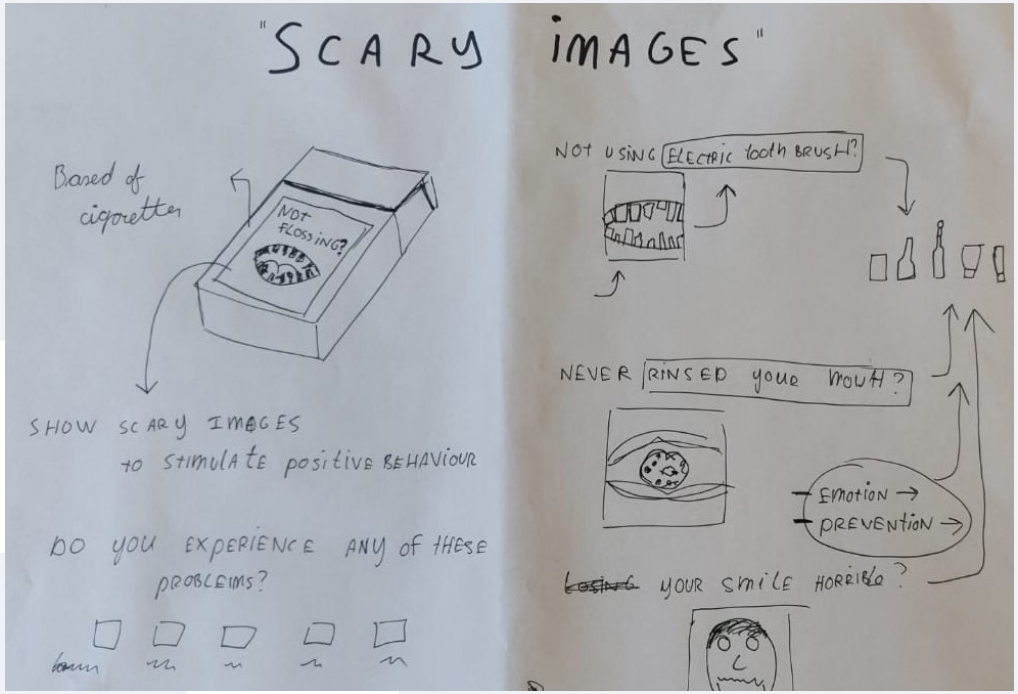
In the last step of the ideation, all cluster post-its are copied and placed in between both word maps, as can be seen on figure 36, this will form a basis for the conceptualisation.

Figure 36. The ideation phase.

Conceptualisation

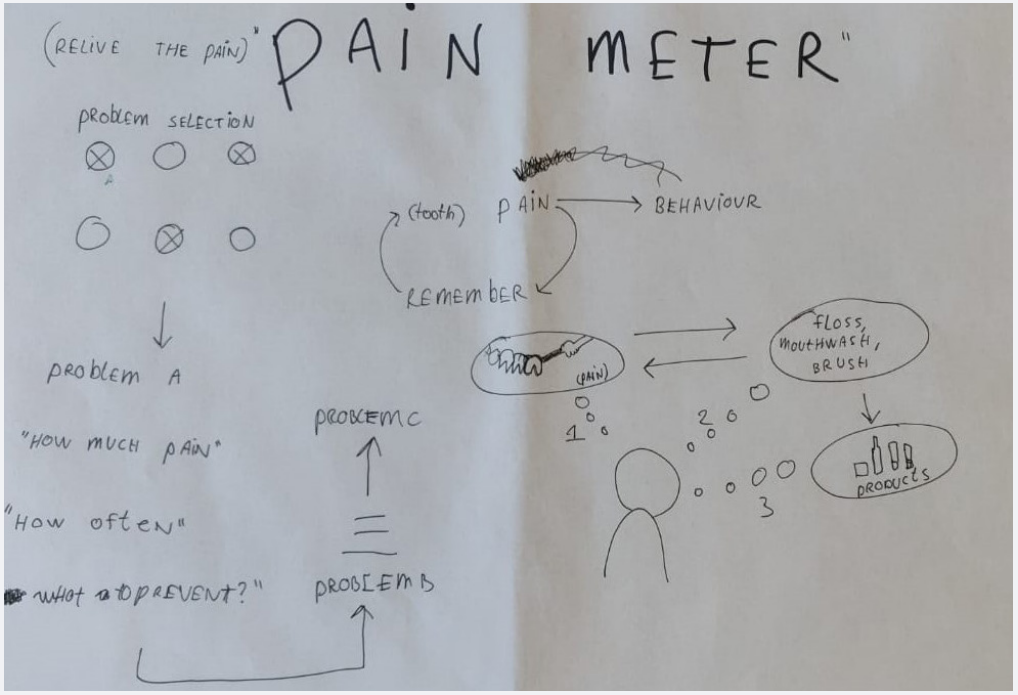
By combining the clusters, as well as extra post-its, six ideas are set up. In the conceptualisation, the combinations have the requirement to contain at least one post from both the education and products side. Also some cluster post-its from the ideation are copied and used in multiple combinations. Following this method, six ideas are set up. These ideas are respectively; 1. Fear appeal 2. Pain Meter, 3. Webinar, 4. Reward game, 5, Quiz, 6. Habit feedback.

As a next step in the design process, all six ideas are further detailed. By sketching the flows and ideas out on one A3 paper per idea, the concepts are detailed. Here, all sketches and concept detailing can be found.

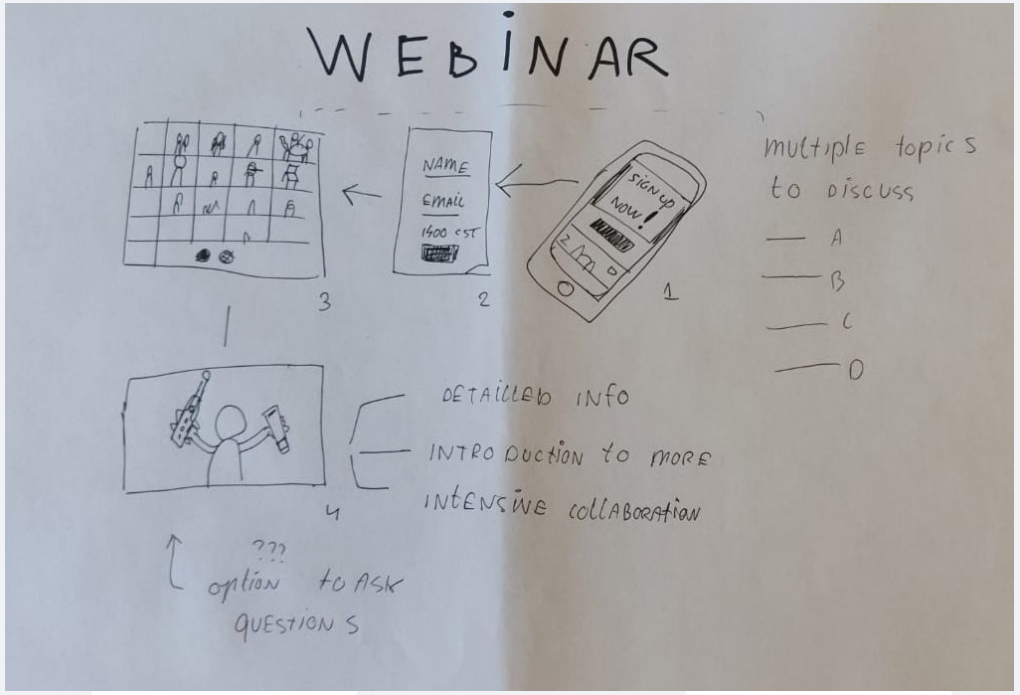


Fear appeal

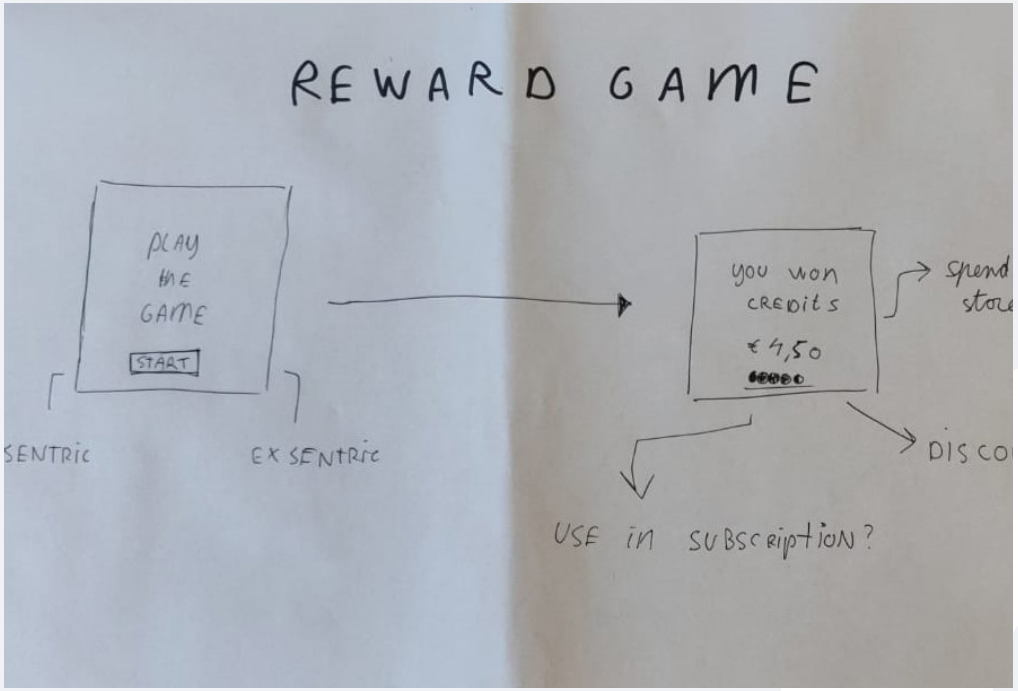
The idea of fear appeal is very similar to the images on cigarette packages, in the tobacco industry this method works well since it creates a negative toward cigarettes. The concept of this idea is that by showing very disturbing or disgusting images people are reminded about the importance of taking care of their teeth. Images that can be shown are images of mouth sores, rotten teeth, or heavy cheek surgery. Next to these images there will be textual elements that will link the text elements that will link them towards the product assortiment.



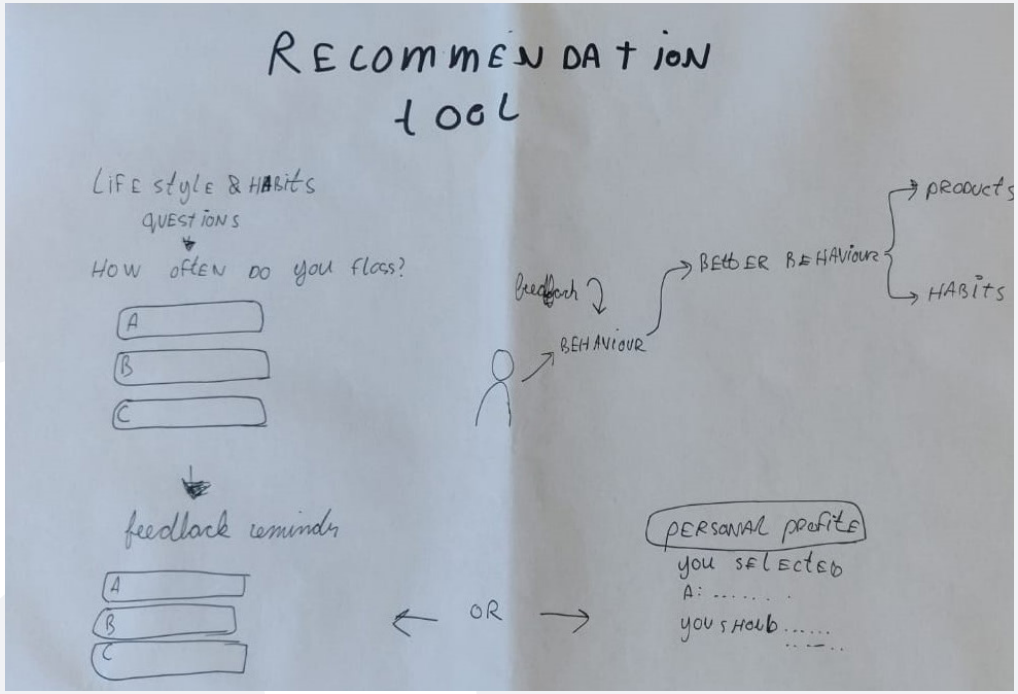
Pain Meter
The second idea is also one where negative communication is used, however much less negative or disturbing than in the previous idea. With the idea 'pain meter', the concept is to let consumers relive the painful or annoying experiences they had before by asking in-depth questions about these experiences. This can for instance be done by asking questions such as: "how much pain do you experience from sensitive teeth?" and "how much are you limited by your sensitive teeth?". By asking probes that lean towards products, the link with the products can be made. Examples of these questions include: "what did you try to solve this issue?" as well as "how much would you pay to solve this?". In this way, people will become more aware of their problem and will be more inclined to solve the problem using products.



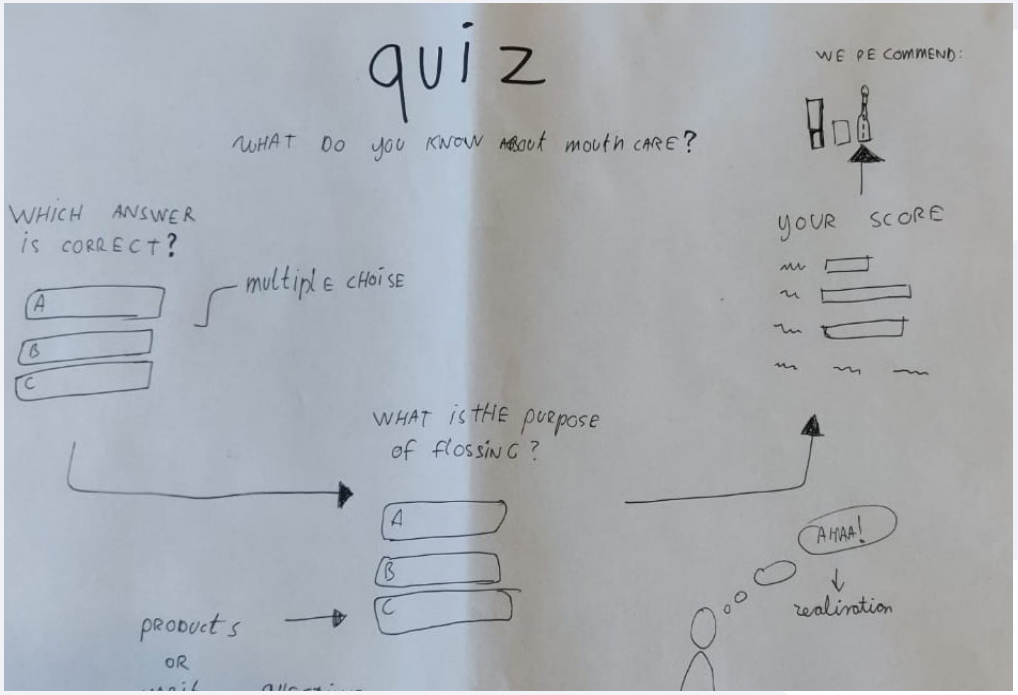
Weekly Webinar
A webinar is a form of communication where a host is giving an online lecture about a specific topic, often webinars are used as an introduction to something more complex such as a software service or detailed guide. The benefit of hosting a webinar is that consumers can get involved in a very easy way. By signing up for a weekly webinar the consumers can easily learn about oral care and during the webinar the consumers will have the possibility to ask questions to the lecturer. To sign up for the webinar, the consumer must leave his details, which the startup might later use for retargeting the consumers.



Reward game
This idea is a manifestation of gamification. By playing a game, the customer can learn about oral care. As a reward of the game credits can be won, these credits can be spent in the store as a discount on products. The idea here is that this will lead to more spendings in the store, which will draw attention towards the products, and thus more revenue for the startup. The concept shows great potential, but it is questionable how good a game is in conveying the education.



Habit feedback
With the habit feedback idea, the consumer is asked about his habits regarding oral care, as well as lifestyle elements that influence oral care. In a later stage of this digital application, feedback is given about these habits, as well as product recommendation to improve this with. This feedback might lead to better oral care behaviour which might result in a higher purchase intention.



Quiz
The last idea is the quiz. Here, the idea is to show multiple choice questions with only one right answer. By asking questions such as “what is the purpose of flossing? " the consumer might realise things about their behaviour and new oral care products, which might increase the presence of knowledge and the purchase intention.

When comparing all these ideas with each other, not all seem suitable for further development. Therefore, a number of criteria have been drawn up to assess these concepts. These criteria include: it should be educational, digital and scalable. It should also be interesting for the user and as a last point it should be perceived as professional.

When looking at the 3 concepts, almost all of them comply with the fact that it has to be digital and educational. The only one that does not meet these requirements is the reward game, which is mostly entertaining and not educational. So this concept is not taken into account any further. When looking at the next criteria, scalability, the webinar is dropped. This is because every week someone has to be online to give the webinar. This is not scalable enough because there always has to be someone available every week to give a webinar. Furthermore, the other concepts do meet this criterion. The 4 remaining concepts, which are fear appeal, pain meter, quiz and habit feedback, are generally all interesting for the user. When looking at the professionalism of the digital applications, fear appeal falls off, because this does not come across professionally to the user. Showing disgusting pictures can scare the user off and thus create a bad association with the brand of the startup. Therefore, the fear appeal method is not professional to use.

The three remaining concepts, namely the quiz, the pain meter and the habit feedback, meet all the above criteria and are therefore used to be further developed into low fidelity prototypes. In the following paragraphs these are further explained and tested by means of user testing.

Further development of concepts

The previous section showed that the pain meter, the quiz and the habit feedback are the three concepts that best fit the combination of education and products in a digital application. Therefore, these are further elaborated below. In order to gain a better insight of how the ideas might work, all the elements are further detailed. Using an interface design and prototyping tool called Adobe XD, all three versions of the application are developed as low-fidelity prototypes. The low fidelity prototypes do only contain basic functionalities and do not contain any branding or visual animations. Since almost 80% of the traffic of the startup is mobile traffic, the prototypes are designed for mobile.

In total, three prototypes are set up, for the three different concepts: The pain meter, Habit feedback and the Quiz. All three digital prototypes consist of three parts: an introduction, a middle section and a product section. In order to compare the three prototypes with each other, the introduction and the product section are the same for all three prototypes. Because of the time available and usefulness, it was decided to work out only one of the six problems with each prototype. This problem is the sensitive teeth, since this is the most common problem.

In figure 37, the routes of all the prototypes can be seen. As can be noted, there are three variations for the middle section corresponding with the three prototypes. In the following paragraphs the prototypes are discussed individually, starting with the pain meter.

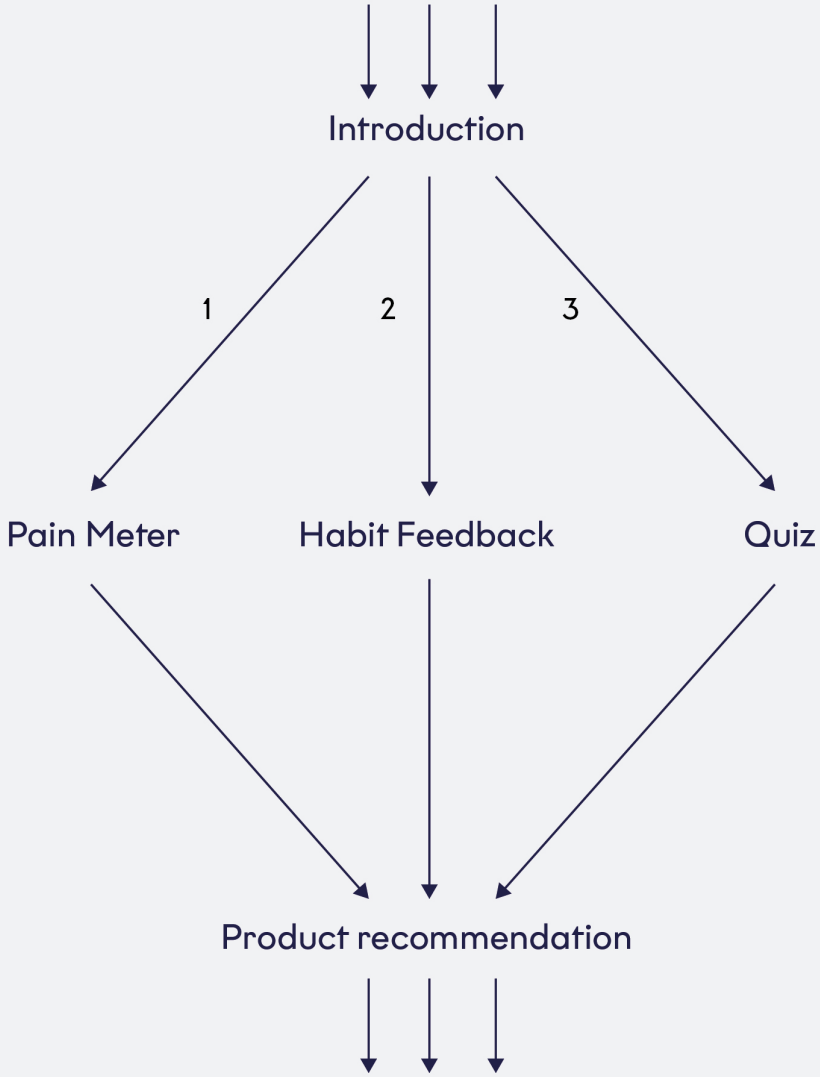


Figure 37. The routes of all the three prototypes.

Pain meter

With the concept of the pain meter, the consumer is reminded about painful dental experiences with the aim to stimulate attention towards the products that might help with this painful experience. In the prototype, the consumers can fill in multiple choice questions regarding the selected problems. After selecting the problems the consumer is interested in, the consumer is asked how much pain he experiences regarding this topic. Following this, multiple probes are asked regarding this pain. These probes include questions such as “Does this pain limit you in your life?” and “How much did you try to fix this issue?”. As a second last question, the consumer is asked how much he is willing to spend to fix this issue. In the last screen a product is shown that can fix this issue.

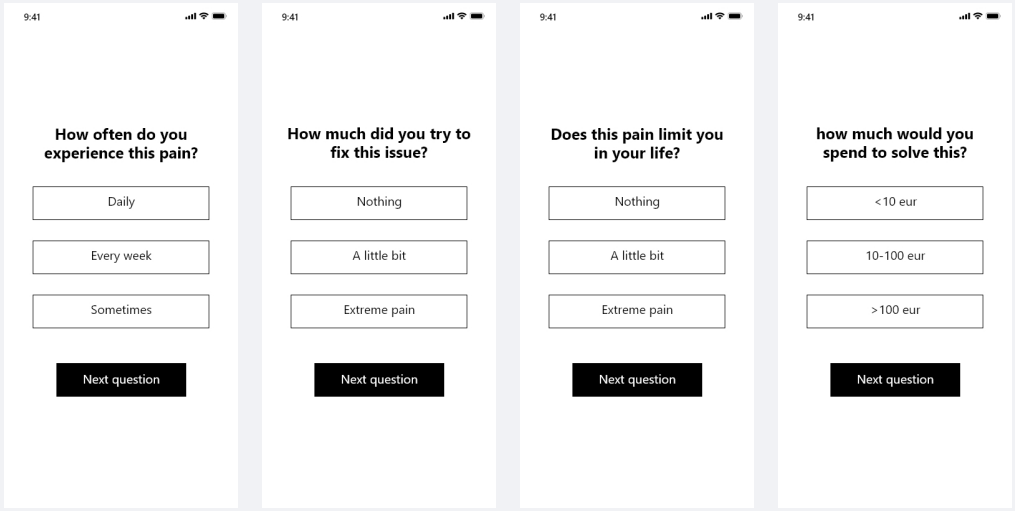


Figure 38. The different screens of the pain meter in low fidelity,

Habit feedback

In the concept of habit feedback, the consumer is asked about his habits regarding his brushing behaviour and routines. As mentioned, in the prototype, only the problem sensitive teeth is implemented. Inside the prototype the consumers are asked questions such as “how much toothpaste do you use?”, and if you follow certain diets. All questions are multiple choice questions.

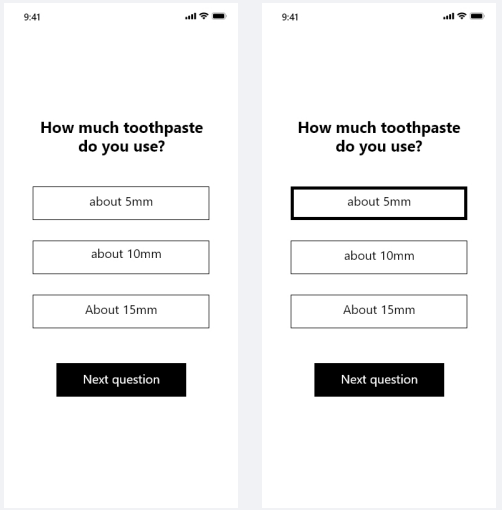


Figure 39. De questions and answers in the habit feedback

After filling the questions of these habits, the consumers are shown a recommendation, based on the answers they filled in. This recommendation, as can be seen on the screen to the right, contains in-depth feedback and explanation to the habit. After this habit feedback screen, the products are shown which can help improve this specific problem.

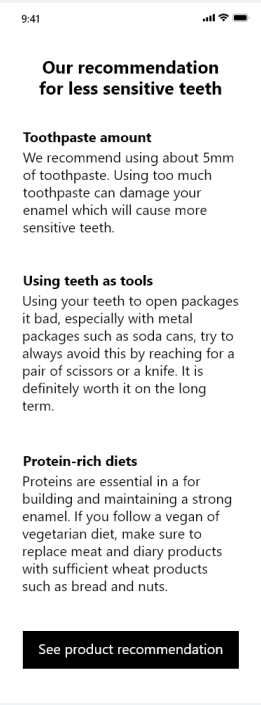


Figure 40. The feedback that is given after the questions are filled in.

Quiz

The last concept that is developed into a prototype is the concept of the Quiz. In the quiz prototype, multiple choice questions are asked with only one right answer. When a user presses on the answer, a green or red light will indicate if the answer is right or wrong. Inside the quiz prototype, questions such as “which of these do not cause sensitive teeth” and “when do you not experience pain from cold teeth” are asked.
After the quiz questions, a product is shown which can help with the problem.

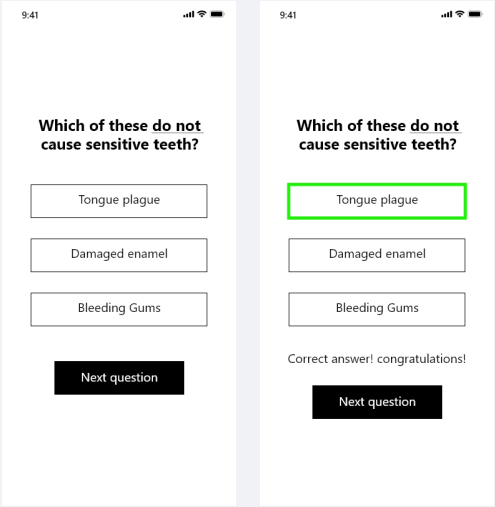


Figure 41. The questions asked at the quiz and when the respondent answers the question right.

In the previous paragraphs the explanation and elaboration per prototype has been processed. In the following paragraphs we will discuss and examine which digital application best suits the research and which prototype will be developed and processed in the experiment.

User testing

In order to gain feedback on the designs and to select which of the prototypes is most suitable for further development, the prototypes are tested with fellow students and friends who do not have anything to do with the startup or oral care.

To the extent that this is possible within the context, users' tests are carried out personally by means of a survey via Google Forms. During the user test, all three prototypes are shown and the user is asked to fill in a number of questions about these prototypes. The users are asked to rate prototypes based on 4 requirements. These requirements include Oral care education effectiveness, Product Purchase effectiveness, Easiness to use, Fast to use. Eventually seven people were asked to judge the prototypes based on the questions and their own experiences. In the next paragraphs the results will be discussed.

Results of testing the prototypes

In this section, it is first discussed per requirement which prototypes scored the best and the worst and why this can be the case. After that, the remaining feedback from the users who did the test is discussed and a final conclusion is drawn from the discussed results. Figure X shows the results of the test, with a number of points for each requirement. These points are based on a score that could be given per requirement where 1 means that the prototype did not meet the requirement at all and 5 means that it did. In figure 42, the results of the test can be found. Remarkably, the habit feedback is the highest score on the requirement education, compared to the quiz and the pain meter. After the habit feedback scores the quiz the highest with a score of 3.2, after which the pain meter follows with a score of 2.6. This implies that the users consider the feedback the most instructive. The score of the habit feedback but also of the quiz is particularly much higher than the pain meter. This is because also in the habit feedback but also in quiz the user by completing the test learns what the good behavior is that they should follow. This is not the case with the pain meter.

Also in the purchase intention scores the habit feedback the highest, namely a score of 3.4 in addition to a score of 2.8 and 2.4 respectively of the pain meter and the quiz. That the purchase intention of the habit

	Pain Meter	Habit Feedback	Quiz
Education	2.6	4	3.2
Purchase intention	2.8	3.4	2.4
Speed	4	3	2.8
Easy to use	3.8	4	3.2
average	**3.3**	**3.6**	**2.9**

Figure 42. The results of the test for the different prototypes.

feedback is higher is explained by a simple fact from the theory of the Tailored Health Communication. At the time, the user gets the idea that the recommendation is specifically based on his answers, the user is more likely to hear the feedback as truth, so recommending products after the habit feedback provides a higher purchase intention. This is not the case with the pain meter and the quiz. In the quiz, the questions have nothing to do with the final product that is recommended to solve the problem and in the pain meter, the problem that is experienced is better highlighted, so there is slightly more need to purchase the product than in the quiz.

The speed of filling in the prototypes has also been assessed by the test users of the prototypes. Here is the pain meter as fastest from the test came with a score of 4. Then the habit feedback as the highest rated with a score of 3, after which the quiz came with a score of 2.8. At the pain meter, this can be explained because it is about your own experiences. These questions can be quickly filled in because one does not have to think about the "right" answer. In the habit feedback is the test in the same way, only the difference is that the user after the questions also gets the feedback to read so that the speed slightly decreases. With the quiz, the user has to think about giving the answers, which reduces the speed of filling in the quiz.

The last requirement that has been tested is whether the prototypes are easy to use. Here, the habit feedback scores the highest, then the pain meter and then the quiz. This can be explained because at the quiz, the most thinking is required. In addition, the scores of the pain meter and the habit feedback are very close because both contain only filling in their own experiences and habits which is generally not complicated to think of and fill in in the fields.
In addition to the different scores, the users also gave some points as feedback during the testing of the prototypes. Some experienced the habit feedback as a fun activity because they got interesting information in return. In addition, some let it be known that they at the pain meter a less pleasant feeling because they were asked to think back to their problems and their pain experiences. There were also comments about the quiz, which differed from a positive playing experience to a useless addition and crazy bridge to the product recommendation. Finally, almost everyone who tested the prototypes liked the habit feedback the most because they actually got customized advice after answering the questions.

When looking at the average scores of all these four requirements, it can be concluded that the habit feedback has the highest average score, i.e. 3.6 average. This compared to 3.3 at the pain meter and 2.9 at the quiz. Also, the habit feedback scores highest on almost all areas, except for the speed. This is considered less of an important factor to contribute to greater awareness or a higher buying intention. Based on the previous results, the habit feedback is chosen to be carried out in the experiment.

The advantages of the habit feedback for the startup
Besides the fact that the habit feedback came out of the test as the best option, it also fits best with the vision of the startup. The vision of the startup is to deliver full service oral care and help the consumers to solve and prevent their oral care problems. With the habit feedback, the consumer is taken by the hand by the startup. The company takes on a learned role to give the consumer information and to solve the problems he or she experiences. The solutions are offered to consumers in the form of products. The products make the consumer think preventively about taking care of their teeth. At the moment that the consumer will indeed apply preventive care within his oral care, this is advantageous for the consumer because he is less likely to experience oral care problems and also for the startup because, in addition to leaving a positive image, the startup also sells the products. These are quick wins for both parties.
Based on all the results, habit feedback was chosen. In the next chapter the further elaboration of the research will be discussed, namely, how the questions were formulated, how the research is structured and how the differences can be seen.

6: Experiment

In this chapter the complete recommendation tool is developed and the habit feedback is implemented. To test whether this addition of the habit feedback actually adds something, an experiment is carried out. This experiment is first discussed in the chapter 'method' after which the criteria, for when the test is and is not considered successful, are discussed. Then, the structure of the recommendation tool is discussed in the chapter 'Stimulus'. In this chapter certain choices for questions are explained and design choices are substantiated. Finally, the chapter 'experiment, testing and respondents' explains how the experiment will be performed and how the experiment will be tested. This section also discusses the respondents participating in the experiment.

Method

To test if the addition of feedback on oral care habits can contribute to a higher awareness and purchase intention, a digital application is set up. With an experiment, this awareness is tested by the means of measuring the purchase intention towards the products of the startup. To test if habits feedback can actually influence the awareness, a comparison is made with the respondents where 50% is shown the recommendation tool with the section with habit feedback, and 50% is led directly towards the products recommendation and will not be exposed to the habit feedback. In this way, the experiment is built up so it can be tested whether the habit feedback has a positive impact on the awareness of the problems and the purchase intention towards the products.

The results of the experiment will show what products the startup should introduce, but in addition there is another reason to test this. 'Selling' products that do not exist yet, gives high certainty that when these products are realised, they will actually be sold. For the startup this is important since this gives a stronger base to reach out to investors. Another advantage for the startup is that by collecting data about consumers problems and habits, they could possibly be retargeted with even more tailored health communication such as newsletters with blogs about their topics.

In both the A and B version of the tool, the discussed communications strategies from Hawkins (2008) are used. Within the tool the elements personalisation and content matching are implemented to ensure that respondents are only shown relevant information. In the habit feedback section, which will only be shown to half of the respondents, the strategy feedback is used.

In order to test this, 2 versions of the digital application are set up, an A version and a B version. In figure 43, the flowchart of the digital application can be seen. The application consists of 4 elements: An introduction, problem selection, Habit feedback and product recommendation. In version A, the habit feedback is skipped and the consumer is led directly to the product recommendation. In the paragraphs below, the different sections are discussed briefly. In the chapter 'Stimulus', the different sections are further detailed, visualised and developed into a digital application. Here also, the flow choices and design choices are explained. Before the

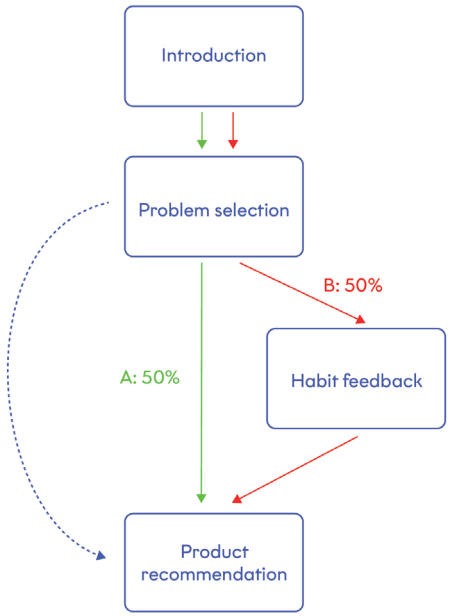


Figure 43. The survey flow for version A and B.

stimulus chapter, the conditions of the test are determined. In this part, it is described when the test is found to be successful.

In the introduction section, some basics such as their name age and gender are identified. Their name is asked so it can be used further on in the application so the user has the idea of personification. After these questions, the user is asked to leave their email voluntarily or just continue to the questions.

The next step of both versions is the problem selection, where the respondents can select which oral care problems they experience and want to resolve. Based on these problems, the product's recommendation is already made, as indicated by the blue dotted line in figure X. The further elaboration of the problem selection is discussed in the next chapter 'Stimulus'.

To test the effectiveness of the habit feedback inside the digital application, an A/B test is executed where only 50% of the respondents are shown the section of the habit feedback. The full details of the habit feedback are discussed in depth in the next chapter with heading Stimulus.

In the last section, the consumer is shown certain products from the product assortiment based on the problems selected. In this section, the purchase intention towards the different products is measured. In the product recommendation the consumer selects the products he would like to buy. However, when pressing the button to continue, information is shown that these products are not available yet. At the same time, the products that the consumer selected are sent to a Google Spreadsheet.

Afterwards, when analyzing the data, a comparison is made between the purchase intention regarding the product assortiment from respondents in route A, without the habit feedback, and respondents using route B, with the extra questions regarding their habits.

The results of this experiment will be used to answer the main question: How can a digital application support preventive oral care? The hypothesis is that the respondents which are shown the habit feedback, show a greater interest and purchase intention towards the products assortment of the startup and have therefore a greater awareness regarding their own oral care problems and their solutions. In the next chapter, the further details regarding this digital application are discussed in depth, but first the conditions of when the test can be found to be successful are discussed.

Figure 44. The whitening toothpaste, one of the products in the digital application.

Conditions

Before the test can be successfully completed, it is important to decide when the test can be considered successful and when certain conclusions can be drawn. This is described in the following paragraphs.

When is the test successful?

The goal of the test is to "sell" products so people can solve their oral care problems by themselves. Simply said, the test is successful when products are sold. It is not necessarily about a large quantity of products, but more about which products people are interested in. This can be measured when customers see all products inside their recommendation and then add some of these products to their shopping cart.

One of the criteria to determine when this test was successful was chosen based on the current conversion data of the webshop of the startup. For example, the startup has an average conversion rate of about 1.72% of the last 4 months according to figure 45. This conversion rate shows the number of people who actually buy a product in the store versus the people that visit the website. That is why a minimum conversion rate of 2% is used for the test. This means that when 200 respondents complete the test, at least 4 have to 'purchase' a product via the recommendation tool to see the test as successful. To make this criterion a bit more realistic for the test, it is decided to look at the 'add to cart' conversion percentage from the store of the startup. This is because the products cannot actually be bought, but can only be added to the cart. The data from the store of the startup shows that 4.76% of the people who visit the website, add a product to their cart, and 1.72% actually buy something. Therefore, in this test, 5% add to cart conversion is used to determine if the test is considered successful. This means that at least 5% of the respondents inside the application have to add one or more products to their cart. When this does not happen, the test is declared insignificant.

Besides the fact that the conversion rate is important, it is also important to determine the minimum number of respondents that have to pass the test in order to see the test as successful. The startup currently has a customer base of about 2000 people. All these people can be reached by means of a mailing with the question if they want to fill in the recommendation tool. On average about 8% of the people click on links when they receive a mailing. This is about 160 people. These numbers are based on the last mailing sent in which a discount was mentioned. That is why it was chosen to take a percentage of 5% of people who use the tool after receiving the mail. The test can therefore be considered successful if a total of 100 people use the tool, i.e. 50 people in each version, 50 in the version with habit feedback and 50 in the version without habit feedback.

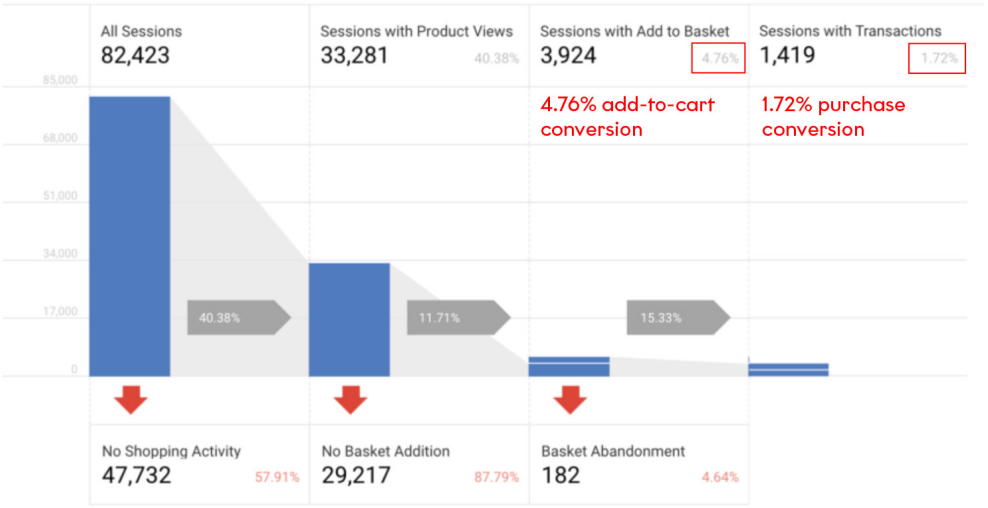


Figure 45. The current conversion rate and add to carts on the website of Boombrush.

When does the test work better significantly?
As already discussed there are two versions of the survey, an A version and a B version. The B version of the survey contains the extra part in which feedback is given on the user's habits. With version A, as well as version B, the product recommendation is made based on the problem selection in the beginning of the survey. Because this product recommendation is only made on the basis of the problem selection, it can be tested whether adding extra information about the habits has an effect on the buying intention towards the products presented. It is expected that adding extra information about the habits will lead to more interest in the problem, and therefore more buying intent towards the solution. The solution that is offered is in short the product range. For example, it is expected that with version A, the conversion between the product served and the product actually purchased will be a lot lower than with version B. This difference must be substantial. That is why we choose to let this difference be at least 10%. This is not about how many products are 'bought' but only about whether products are 'bought'.

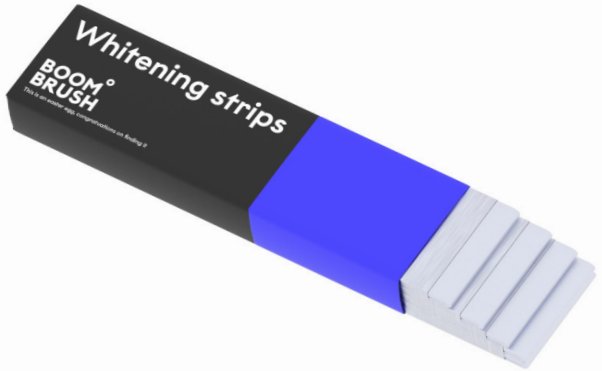


Figure 46. The whitening strips, one of the products in the digital application.

Stimulus

In this chapter the digital application is discussed in detail per section. The tool is completely designed and built by me, with some development help from the startup. In the following paragraphs the parts introduction, problem selection, habit feedback and product recommendation are discussed in detail. First, the structure of each section is discussed. This structure is substantiated with low fidelity sketches and a clear explanation of the flow per section. After that, the design choices for each section of the tool are explained. After this chapter, the respondents who filled in the recommendation tool, in version A and B, are discussed. After that, the experiment and the technical aspects are discussed in the results section. The final version A and B can be accessed via the links in the Appendix.

Figure 47. The problem selection part of the digital application.

Introduction

In the introduction section, which is shown in both versions A and B, respondents are welcomed in the recommendation tool. They are then asked to fill in a number of demographic data. In the following paragraphs, the structure of the introduction is discussed in detail and the choices made per screen, in terms of flow in the first part and in terms of design in the second part, are discussed.

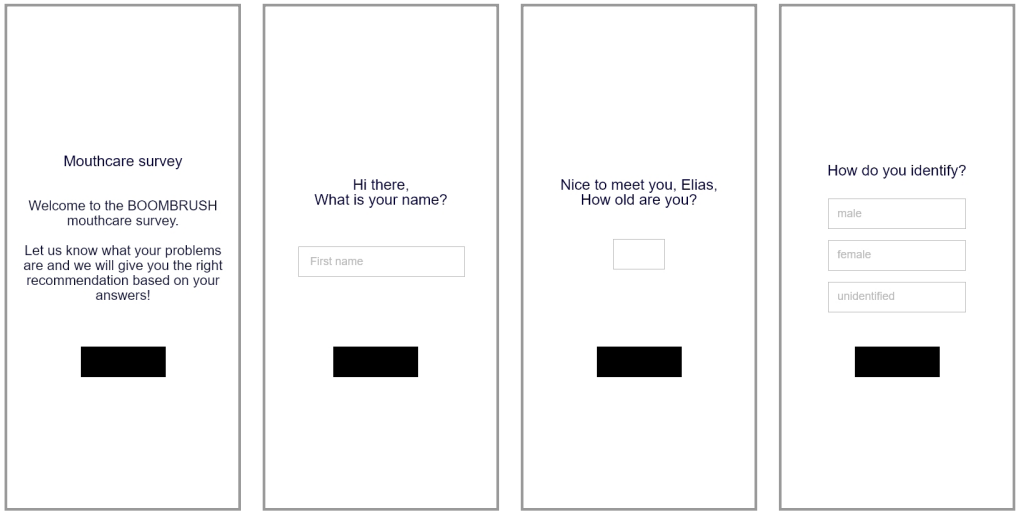


Figure 48. The introduction section of the digital application.

Structure

The introduction section consists of a total of five screens. The low fidelity concept per screen is shown in figure 48. In the first screen the user is welcomed to the mouth care survey, in which the concept is introduced and explained. On the first screen the user is stimulated to fill in the test by the text: 'Let us know what your problems are and we will give you the right recommendation based on your answers!'. After this welcome screen, respondents go to the first question. In the second screen, the respondents will be asked to fill in their first name. This is done so that the user can be called by his own name in the tool. This way, the first part of tailored health communication is applied, namely personification. In this way a better connection of the user with the brand and with the tool is formed.

In the third screen the respondents are asked to fill in their age and on the screen after that the gender is asked. These demographics are asked so that at the end of the test, it is possible to see if there are certain results or correlations based on age or gender. As a last and also fifth screen of the introduction, the user has to fill in his or her email address. This screen is only displayed if the user is not logged in on the website of the startup, otherwise the email is taken which belongs to the account the user is logged in with and this screen is not shown to the user. This is done to collect as many email addresses as possible and to link the entered data to the accounts but also to cause as little dropoff as possible. In the next section, in addition to the structural choices of the introduction, the design choices are explained.

Design

To incorporate the branding of the startup within the screens, the font of the startup has been used to display the text. This font is called Graphit. Within this font 3 styles are used. For the titles Graphit Medium is used (24px). For the rest of the text Graphit Regular is used (22px) and for the answers Graphit Regular is also used, but a smaller size (18px) and a different color, namely gray instead of dark blue, which follow the brand guidelines of the startup.

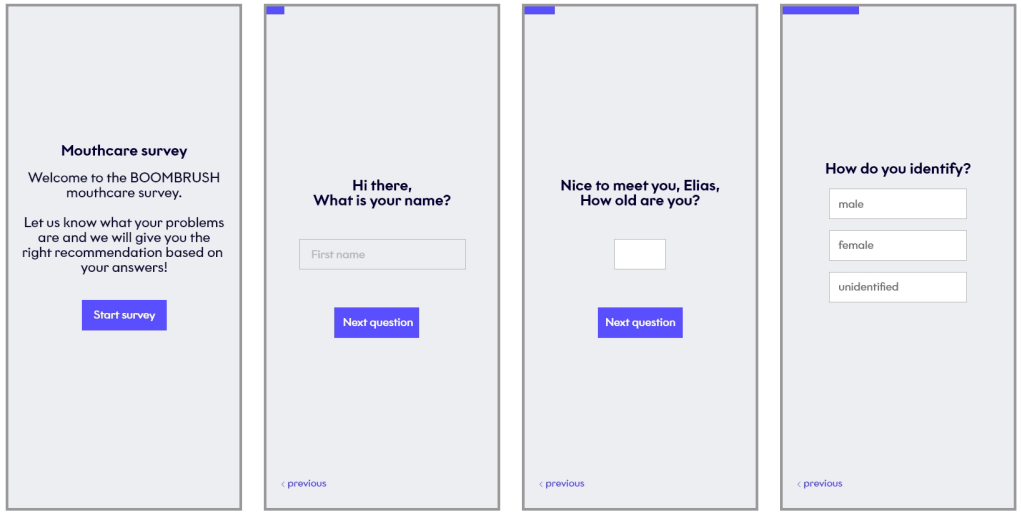


Figure 49. The screens of the introduction worked out including the design.

You can also see that in the visual design the color purple of the startup is used. This color is mainly used as a call to action color, which drives the user to action. Therefore, it is mainly used in the buttons. In figure 49, the application of these fonts and different color choices can be found. In addition to the different fonts and colors used, there is a purple bar at the top of each screen throughout the entire recommendation tool. This bar indicates how far the user has completed the tool and will fill up as the user progresses. The fonts and colors chosen in the tool and the progress bar can be found in each section and will not be explained any further in the next sections.

In general, the user goes to the next question using a button. As can be seen in figure 50, this is not the case with every screen. When a multiple choice question is asked, the respondent only needs to select the answer instead of clicking an extra button. This choice is made in the design process. When the user chooses the field of his answer, a purple outline will appear (seen on figure X). After 0.5 seconds the user is automatically redirected to the next question. This to keep the pace of filling in the questions. However, the user always has the possibility to go back to the previous question by using the button 'previous' at the bottom left of the screen.

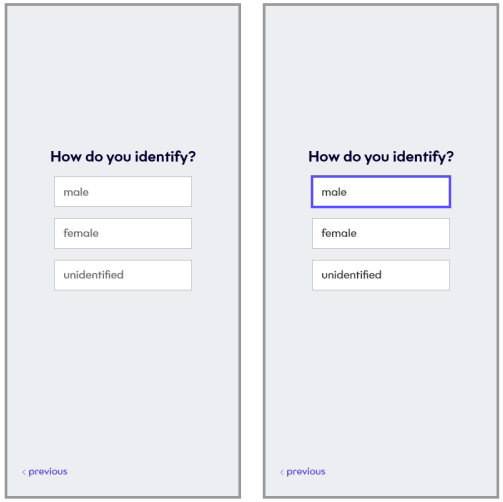


Figure 50. Going to the next question with multiple choice questions without a button.

Problem selection

The next part of the recommendation tool is the problem selection. This part is also shown in version A and in version B in the test, just like the introduction.

Structure

In the problem selection section six possible problems are shown to the user. These problems are yellow teeth, sensitive teeth, bad breath, cavities, gums issues and dry mouth. These problems are selected based on the pretest. In the pretest, eight problems are described of which only the remaining six appeared to be significant. Further details of the pretest can be read on page 24-29 . The intention of showing these problems is that the user indicates which problems he or she experiences or recognizes. Figure 51 shows the development of this screen in low fidelity. To add extra emphasis, text is added that elaborates the possibility for the user to select multiple problems.

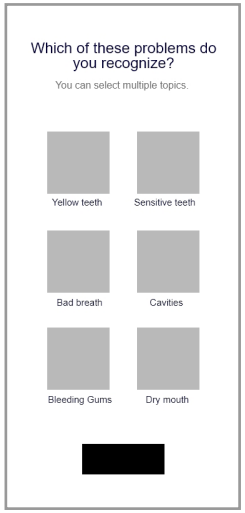


Figure 51. The problem selection part in low fidelity.

In this screen the user makes an important choice. The final product recommendation is based on the choices made by the user. This is the case in both versions. Not only the product recommendation is based on this problem selection. Also the questions in the habit feedback section, which will be discussed in the next chapter, are based on the problems the user selects.

Design

The problem selection section consists of one screen. Here, the six problems are displayed as can also be seen on the low fidelity sketch. To make the problems clearer for the user, the problems are explained by special designed icons. Each icon contains three different colors. These colors are dark blue, the color of the font of the titles and the text, and the two shades of gray that are also used as text color and outline in the recommendation tool. Figure 52 shows all icons worked out per problem.

Besides the design of the icons, other design choices have been made in this part of the recommendation tool. When the user selects a problem, a purple circle has been chosen to appear around it (see figure 53). This is a similar interaction to the multiple choice questions. This makes it clear to the user that the problem has been selected. In addition, the same general design choices have been applied that can also be found in the introduction, such as the purple button and the colors and fonts used.

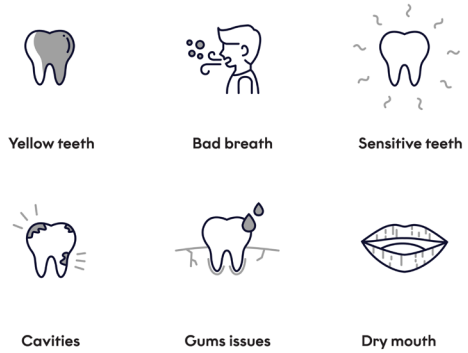


Figure 52. All icons worked out in the problem selection part.

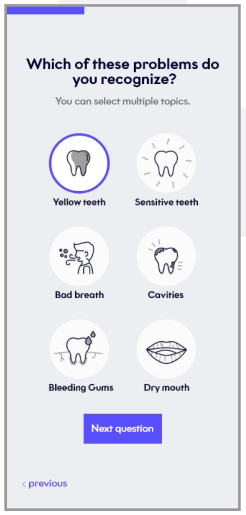


Figure 53. How the problems are selected in the problem selection screen.

Habit feedback

The next part of the recommendation tool is the habit feedback. This part is not shown in both versions, but only in version B. With the habit feedback, users are asked to indicate which habit they are showing and which ones they are not, in combination with the problems they have chosen in the problem selection. In the following paragraphs the structure and design choices are explained.

Structure

In the habit feedback, based on the selected problems in the second section, problem selection, three multiple choice questions are asked per problem. So when someone has selected one problem they will get three questions, two problems will get six questions and so on. These multiple choice questions are drawn up based on the table on page 18 in which most frequently occurring habits which cause problems are linked to the problems in the problem selection.

After the user has answered the multiple choice questions, feedback is given on the habits per problem. Per question there is a fixed advice, so the user gets an appropriate advice that is not 100% personalized. This is chosen because otherwise there would be too many fields that would have to be filled in. In order to make it 100% personal there would have to be a huge code per problem (six different problems), with three different questions per problem, three different answers and three different combinations of feedback per question and title, with a lot of different fields and 'if so' situations. In total this would result in over 300 fields of text entries, which is not feasible in the scope of the experiment. That is why it is chosen to leave this fixed. Figure 54 shows a low fidelity elaboration of this feedback.

Design

As described earlier, the questions in the habit feedback section are linked to the problems selected in the problem selection section. Therefore, for each question the icon of the problem selected by the user is shown, so that the user knows that he will receive the question as a result of the selected problem. In addition, as in the introduction to the gender question, when the user has clicked on the answer, a purple outline has been chosen around it and instead of placing a button it is automatically moved on to the next question. This is to keep the pace of filling in the recommendation tool. However, users always have the possibility to go back to the previous question with the previous button at the bottom left of the page. Also in this section the choices for colors and fonts are applied in the same way as in the previous sections.

The feedback also includes the icons of the problems, so that it is clear to the user to which problem and to which questions the feedback belongs. This can be seen in figure 54.

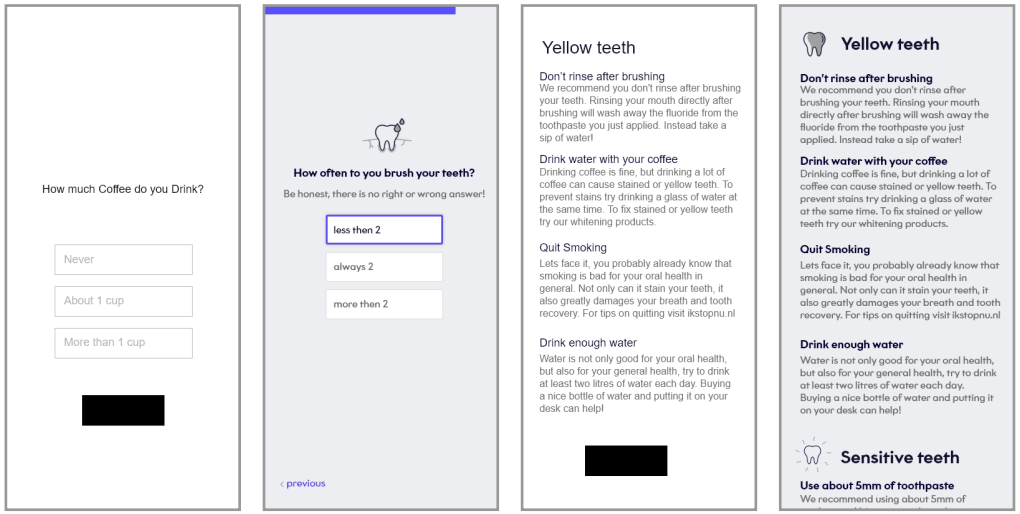


Figure 54. The low fidelity and worked out version of the questions and the feedback in the habit feedback section.

Product recommendation

The next and last part of the recommendation tool is the product recommendation. This part is shown to the users in both versions. Here, a product recommendation is made for the user based on the selected problems in the problem selection. Details on this product recommendation can be found in chapter 4.

Structure

Just before the product recommendation is shown, the user will see a screen stating that the recommendation is being determined for him or her. This screen will be shown for about one second after which the product recommendation will appear to the user.

After this screen, the user is directly redirected to the product recommendation. Figure 55 shows a low fidelity sketch of this product recommendation. By using the user's first name the personal aspect of this recommendation is enhanced. The products shown to the user are the products that are linked to the problems they have selected in the problem selection section. By clicking on the arrow below the product pictures, the user can get more information about the product and by clicking on the cross above the product image, the product can be removed. At the bottom of the page, a button will appear with which the user can add the desired products to the shopping cart. When a user presses the add to cart button, the selection of the user is sent to a Google spreadsheet, in the next chapter Experiment, testing & respondents this will be further explained. After clicking the button, the screen of the product recommendation will change and it will become visible that the products are not yet available. This can also be seen in figure 55.

Under the message that the products are not yet available, the user is asked if they want to receive a notification when the products are available. This is useful for the startup because in this way they also have insight into whether people really need the product. They can confirm this choice with a click on the button that saves the user's email address with a special tag in the startup's database.

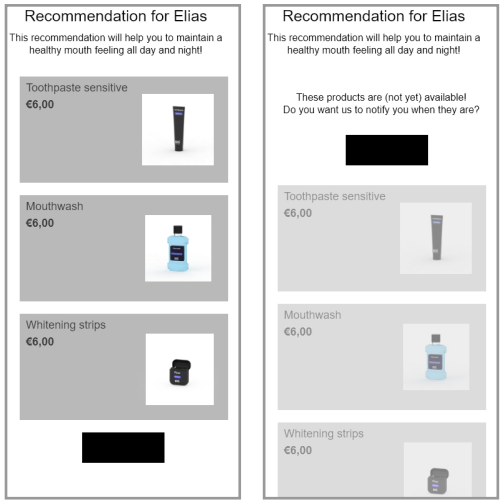


Figure 55. The product recommendation in low fidelity

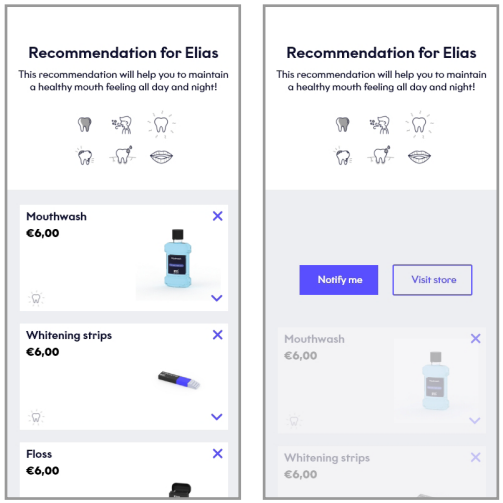


Figure 56. The worked out product recommendation.

Design

As described earlier, the products are linked to the problems selected in the problem selection section. Therefore, it is chosen to place the icon of the problem linked to the product with the product. This can be found in the lower left corner of the product. This can be seen on figure 56. In figure 57 all products can be seen. These products are 3D modelled in solidworks and labeled with the render program Keyshot to look as realistic as possible. As previously described, a description per product can appear when the user clicks on the drop-down arrow that can be found in the bottom right corner of the product picture. How this works can be seen in figure 56.

After the user has clicked on the add to cart button, one will find out that the products are not available. The products that were originally in the shopping cart therefore become transparent so that it is extra clear that they are currently unavailable. This is clearly visible in figure 56.

Figure 57. All worked out 3d models of the products in the digital application.

Above, all parts of the application are discussed in detail in structure and design choices. In the next chapter 'Experiment, Testing & Respondents' first the experiment will be further explained, then the way in which it will be tested and then the final respondents will be discussed.

boombrush.com/en/survey

Experiment, testing & respondents

In this chapter, first the structure of the experiment is discussed. Following that, the technical specifications of the experiment are discussed. After the construction of the experiment it is taken into account how the test process of the experiment is constructed. This is done in two stages. Finally, in this chapter the respondents of the entire test are discussed. After this chapter, the results of the complete test are discussed.

Experiment & testing

As discussed earlier in the method, a test will be performed by means of two different versions. Version A consists of an introduction and a problem selection part where immediately afterwards a product recommendation will be given. Version B consists of these same parts. The difference between the two is that in version B there is another part between the problem selection and the product recommendation, namely the habit feedback. This habit feedback should make a difference in the buying intention of users of certain products of the startup. Both version A and B are divided equally among the respondents so that there is an equal number of respondents per version. This way, the results can be easily compared with each other. In the next section the technical aspects of the experiment will be discussed.

Technical specifications

Both versions are distinguished by a unique url. For version A this link is: https://boombrush.com/en/survey/a and for version B this link is: https://boombrush.com/en/survey/. These links are distributed among the respondents using mailings via Mailchimp as can be seen in figure 58. In the mailing for version A, respondents are asked if they want to know which products suit them, after which the link to the survey is presented to them. In the mailing for version B, respondents are asked if they want to find out if their teeth are healthy. Again, the link to the survey is given after this question and a short introduction.

When the respondents click on the link, the experiment starts. The experiment ends with the product recommendation. Everyone who completes the survey eventually ends up with this part. Here, a number of products are presented based on the problems in the problem selection. At the bottom of the products, the users can press 'add to cart' to actually place the products in their shopping cart. As soon as the respondent presses 'add to cart', the consumer's choice is sent to a Google spreadsheet via a Google API connection. The results are saved from the moment the respondent reaches the product recommendation section, in the spreadsheet it can be seen which products the respondents were presented when they clicked on 'add to cart'. It can also be seen when the respondents are removing products to their shopping cart. Besides showing which products the respondents prefer to use to solve their problems and whether they are willing to buy products to solve these problems, the versions of the respondents are also included in this spreadsheet so that the results of both versions can be compared immediately.

In addition to the analysis of results collected via the datasheet, results are also analyzed via Google Analytics and Mailchimp. With these tools the behavior of the respondents can be traced exactly and certain bugs and improvements can be found within the test and the spreading of the test. By means of Mailchimp and Google Analytics, the exact figures can be numbers when it comes to the conversion rate, the number of people that clicked on the links and also the flows that the respondents follow.

In the following paragraphs the ways of testing are divided into two different parts, namely test #1 and test #2. In the part for test #1, a first part of the experiment is explained in which a kind of pretest is performed as preparation for the complete test, test #2. Hereby a number of parameters are taken in which decisions are made that influence the results of the complete test #2.

Test #1
Before the full test is performed, a small test is performed in which a total of 400 respondents are approached to test the last bugs, data collection, flow of the experiment and the first conversion ratios. Based on these quick results, small changes are made to improve the test for the final full test.

The 400 respondents who contribute to test #1 consist of the 400 oldest subscribers of the startup. This leads 200 to version A and 200 to version B. Of these 200 respondents in both versions, 66 respondents opened the mail in version A and 67 respondents opened the mail in version B. This is an opening percentage of 35% for both versions. What is noticeable is that in version B much more people clicked on the link, namely 20 out of 67, compared to 7 out of 66 in version A. This may indicate that the mail from version A is found to be more attractive. When looking at the results in the Google spreadsheet it can be seen that the conversion rate of version A is also a lot higher than with version B. With version B this conversion rate is 0%. With version B this conversion rate is 15% with a total of 5 add to carts.

Test #2
For the test #2, a much larger audience is attracted. However before doing so, first some details in the method are changed. The first thing that is changed is the obligatory email sign-up. By looking at the data from google analytics, it can be found that in both version A as well as version B there is a big drop off at survey/step/5, this is the screen where the users sign up with their email.

The second thing that is changed is the email used to spread the survey, as resulted from test #1, it can be noted that much less people opened the email for the version B, therefore for this test for both conditions we will use the same email used for test #1 condition A.
The third, and last thing, that is changed in test #2 is the data collection in the Google Spreadsheet. With test #1, the data entry is only saved as soon as the recommendation is loaded in. However, to gain more insights in the flow of the users, this data is now stored after every section (introduction, problem selection, habit feedback and product recommendation).

For test #2 a requirement of 50 entries per version is necessary to define any significant differences. Via the database of the startup a potential of 2000 users can be reached out to. By sending out the link for test #2 in batches of equal sizes, either the 50 entries per version are reached, or the maximum of 2000 users is reached. In the next chapter, the results, the outcomes of the tests are shown and analyzed.

Figure 58. The send email from Mailchimp to the respondents.

7: Results

In this chapter, all results of the experiment are discussed. First, the criteria described in chapter 6 are examined to determine whether they have been achieved and whether the test can be considered significant. These criteria are discussed in the section Entry data, where the exact numbers of respondents are also discussed. After that, the flow of the experiment and the stimulus material is tested in the chapter 'flow analysis'. After this section, a short analysis is done on the problems that the respondents have filled in, after which an analysis is also performed on the products that the respondents have chosen.

Entry data

This section of the results chapter discusses whether the criteria of the experiment have been met and discusses how many respondents ultimately completed the experiment compared to how many people the experiment was sent to. The first criterion that has been set for the experiment to be successful is that at least 100 people have to perform the experiment. As discussed in the previous chapter, 2 versions of the digital application have been made for the experiment. One version, version A, does not contain additional tailored health communication, in this case habit feedback. The other version, version B, does contain this habit feedback. The criteria is that at least 50 respondents have to complete the test in both versions. A total of 597 mails were sent to startup customers for version A and B 1090. This brings the total number of mails to customers to 1687 mails. For version B, more mails were sent because there was a larger drop off before the entries were completed, which meant that more respondents were needed. Of all the people who received the mail, a total of 633 people opened the mail of which 248 were for version A and 385 for version B. This brings the total number of opens of the mail to 633. Of these 633 people, a total of 175 people clicked on the link of which 81 were for version A and 94 for version B. Of these clicks, 149 people finally completed the test, of which 65 people completed version A and 84 people completed version B. The first criterion of the experiment has thus been met, since both numbers of respondents are higher than 50.

The second criterion of the experiment is that at least 5 percent of the respondents have to put something in the shopping cart after passing the test. This percentage is determined on the basis of the conversion ratio on the website of the startup. In both versions of the digital application, this percentage was achieved. In version A this percentage is 27,89% with 65 entries and 18 'add to carts' and in version B this percentage is 10,71% with 84 entries and 9 'add to carts'. From these data it can be concluded that also criterion 2 has been achieved. The percentages 27.89 and 10.71 are more than the 5% that was taken as a starting point.

The third criterion of the experiment is that there must be at least a difference of 10% between the two versions to make the difference significant. This criterion was also met, as the difference between the two versions is more than 10%, namely 16.98%.

On the basis of the three criteria it can be concluded that the test was successful and that the results within the test can be found to be significant. In the following chapters, the further results regarding the flow, the problems and the products are discussed.

	A	B	Combined
Email receivers	597	1090	1687
Opens	248	385	633
Clicks	81	94	175
Entries	65	84	149
Add to carts	18	9	27
Conversion	27.69%	10.71%	18.12%

Figure 59. Entry data from the experiment.

Flow analysis

Because the application is digital and built on the website, it is interesting to look at, and analyze the user flow that was followed by the respondents during the experiment. This is done with the help of Google Analytics with which an extensive analysis can be performed which gives more insight into how the respondents deal with the digital application. In the following paragraphs, the main focus will be on the exit pages, the pages where the user leaves the website. After that, the amount of time the users spend on completing the experiment is also evaluated.

In general, of course, it is hoped that people will go through the whole experiment before they leave the page. Unfortunately, this is not always the case, which is why checks are made where people leave the page most often. The results of this can be found in figure 60. What is striking is that most people just went through the whole experiment and only left the experiment at /finish. The page that has the most exits after that, namely 15.38%, is the habit feedback. This is the page, which only appears in version B, where the respondent gets feedback about the habits he or she filled out in the questions before. This could have been caused by the long list of feedback so people did not realize that they could click further to the next screen and thought they had already reached the end of the experiment.

	Pagina	Uitstappunten	Paginaweergaven	Uitstappercentage
		212 % van totaal: 2,43% (8.711)	4.137 % van totaal: 11,95% (34.608)	5,12% Gem. voor dataweergave: 25,17% (-79,64%)
1.	/nl/survey/finish	46 (21,70%)	122 (2,95%)	37,70%
2.	/nl/survey/a/finish	45 (21,23%)	140 (3,38%)	32,14%
3.	/nl/survey/habit-recommendation	24 (11,32%)	156 (3,77%)	15,38%
4.	/nl/survey/a	16 (7,55%)	183 (4,42%)	8,74%
5.	/nl/survey/	15 (7,08%)	220 (5,32%)	6,82%
6.	/nl/survey/step/1	13 (6,13%)	232 (5,61%)	5,60%
7.	/nl/survey/a/step/4	8 (3,77%)	102 (2,47%)	7,84%

Figure 60. The exit pages in the survey.

Figure 60 also shows that a number of users got out before the test started, for version A and for version B. These percentages are 8.74% and 6.82% respectively. This also explains why the number of clicks from the mailings sent is a bit higher than the number of entries in both versions.

Besides the exit pages, it is also important to look at the overall flow of the experiment. Therefore we looked at the average time spent on each part of the experiment. This was also found using Google Analytics. The Introduction part is the same for both versions and consists of 4 steps, namely the name, age, gender and email. The average time spent by a user in part 1, the introduction, is 10.59 seconds in version A and 17.44 seconds in version B. This does not affect the rest of the test as they were both exactly the same steps in both versions.

After the introduction for both versions came part 2, the problem selection. The average time that people were in this part is six seconds for both versions. The average time of six seconds for the problem selection can be explained by the fact that people have to think for a while before they can decide which problems they are experiencing. This takes on average one second per problem.

After the problem selection, in the case of version B, there is the habit feedback section. In this part, one is engaged for an average of 59.90 seconds, with an average of 10 seconds for each problem that has been indicated, with three questions for each problem. After the questions came the habit feedback, where people stayed for an average of 19.31 seconds. This page is also the page where the users got stuck the longest in the whole experiment. This can be explained by the amount of text that appears on this page, after people have filled in the questions. What can be deducted from this, is that the habit feedback is read seriously.

After the habit feedback in the case of version B and after the problem selection in the case of section A, comes the product recommendation. Here, people get their product recommendation based on the problems they have selected in the problem selection. Here in version A, an average of 7.61 seconds was spent, whereas in version B this was an average of 6.01 seconds spent.

In total, people took an average of 24.40 seconds to complete version A and an average of 108.63 seconds to complete version B. This is an enormous difference which will be discussed in chapter 8, the conclusion. In the following paragraphs, the results of the problems the respondents filled in and the products they chose in the experiment, are discussed.

Problems

In both version A and B, users are asked to indicate the problems they experience in section 2, the problem selection. For both versions this part is exactly the same and therefore the problems can be added together. Figure 61 shows all problems and the number of times a respondent has indicated to recognize this problem.

	Yellow Teeth	Bad Breath	Tooth Sensitivity	Cavities	Gums issue	Dry Mouth	Total
Entries	80	52	76	29	80	35	149

Figure 61. All problems and the number of times a respondent indicated to recognize this problem.

What is striking is that yellow teeth, tooth sensitivity and gums issues are at the top with 80, 76 and 80 respectively. A lot lower were bad breath, cavities, and dry mouth issues, with 52, 29, and 35 respondents, respectively, experiencing the problem. Another interesting statistic arises when these problems are taken against the total number of completions.

	Yellow Teeth	Bad Breath	Tooth Sensitivity	Cavities	Gums issue	Dry Mouth
Percentage	53.69%	34.90%	51.01%	19.46%	53.69%	23.49%

Figure 62. Percentages of the occurance of the problems.

What is striking here is that the highest score of yellow teeth corresponds to almost 54% of the respondents. This means that 54% of the respondents experience, or want to know more about, the problem of yellow teeth, which is particularly high. In addition, almost 54% also experience or recognize gums issues and also 51% of the respondents experience or recognize sensitive teeth. It can be concluded from these figures that many respondents chose more than 1 problem. This ratio can be found in figure 63 below. This shows that 21.48% of the respondents chose 1 problem, 37.58% chose 2 problems, 30.20% chose 3 problems and 10.74% chose more than 3 problems.

Amount of problems	1	2	3	4	5	6
Occurrence	32	56	45	9	5	2

Figure 63. The numbers of problems occurred per respondent.

Remarkable is that no respondent filled in 0 problems. This is because everyone who entered 0 problems cannot reach the end of the test. The respondents were actually forced in the experiment to select a problem in order to continue. That is why not everyone who entered the problem will actually be bothered by the problems, but may just be interested in the problem. In the following paragraphs, the products selected by the respondents based on the above problems will be discussed.

Products

At the end of both version A and version B, based on the problems selected by the respondents in the problem selection, a number of products are displayed as recommendations. The respondent can then remove a number of these products at the 'product recommendation' step by clicking the cross in the corner of the product. When the respondent has chosen the products and clicks on the 'add' button, the products are imaginary added to the shopping cart and the selection of the respondent is sent to the Google Spreadsheet where all data is collected. In the graph below, the total number of selected products per version can be seen.

Version	Toothpaste Sensitive	Toothpaste Whitening	Mouthwash	Whitening Strips	Supplements	Floss	Breath Spray	Products
A	9	11	7	11	2	8	6	48
B	6	4	1	3	1	7	1	22
Total	15	15	8	14	3	15	7	70

Figure 64. The numbers of products purchased in both versions.

What is noticeable is that both toothpastes, the sensitive and the whitening toothpaste, together with the floss and the whitening strips scored the highest and were added to the respondents' imaginary shopping cart 15, 15, 15 and 14 times respectively. In addition, the mouthwash and breath spray are often added as well, namely 8 times for the mouthwash and 7 times for the breath spray. The supplements are the least popular, these are only added 3 times to the shopping cart. As can be seen in this table, it is also noticeable that version A sells many more products in total, compared to version B, i.e. 48 versus 22 products. This will be discussed in more detail later in the discussion and conclusion.

Another interesting result to look at is the number of selected problems versus the number of products added to the shopping cart. By filling in how many times the problems have been selected it is possible to calculate how many products in total are shown in the recommendations. In the table below it can be seen how often the different products are displayed in the recommendation.

	Toothpaste Sensitive	Toothpaste Whitening	Mouthwash	Whitening Strips	Supplements	Floss	Breath Spray
Recommendation	132	80	111	80	29	109	111

Figure 65. Number of recommendations to the repsondents per product.

Here, it is notable that the sensitive toothpaste has been shown very often as a recommendation, namely 132 times. This means that the sensitive toothpaste was shown in 88.59% of the recommendations. Also the mouthwash, the breath spray and the floss are often shown, namely 111 times for the mouthwash and the breath spray, which is 74.50% for both products, and 109 times for the floss, which is shown to 73.15% of the respondents. In addition, the whitening toothpaste, the whitening strips, and the supplements were shown to respondents 80, 80, and 29 times respectively, resulting in 53.69% for the whitening toothpaste and the whitening strips, and 19.46% for the supplements. Another interesting comparison is how often these products were chosen compared to how often they were served to the respondents.

	Toothpaste Sensitive	Toothpaste Whitening	Mouthwash	Whitening Strips	Supplements	Breath Spray	Floss
Recommendation count	132	80	111	80	29	111	109
Conversions	15	15	8	14	3	15	7
Conversion %	11.36%	18.75%	7.21%	17.50%	10.34%	13.51 %	6.42%

Figure 66. Conversion rates per product.

What is remarkable is that the toothpaste whitening, the whitening strips and the breath spray have a remarkably higher conversion rate than the other products. These conversion rates are 18.75% for the whitening toothpaste, 17.50% for the whitening strips and 13.51% for the breath spray. In addition, the toothpaste sensitive has been shown very often, namely 132 times, but relatively little chosen, namely only in 11.36% of the times the product was shown. After the sensitive toothpaste, the supplements were chosen the most with 10.34% of the time. What is noticeable is that the floss and mouthwash were chosen very little compared to how often they were shown. With the percentages of 7.21% for the mouthwash and 6.42% for the floss, these products were relatively the least frequently chosen compared to how often they were shown to the respondents.

In the next chapter, conclusion, the results are discussed in detail and an answer is given to the research question and the sub-questions.

8: Conclusion

This chapter discusses the results and answers the main question and the sub-questions. The goal of this research is to answer the main question: Can a digital application support preventive oral care? This was tested by means of an experiment in which two different versions were used: one version with extra tailored health communication, namely habit feedback, and one version without the extra tailored health communication. In the following paragraphs the results of the experiment will be discussed after which all sub questions and the main question will be answered.

The better version

It was expected that the version with the tailored health communication would work much better and would therefore create more awareness among users and evoke a higher buying intention. When looking at figure 59 on page 54 it can be concluded that this is exactly the other way around. The version without the added feedback, version A, has a conversion rate of 27.69% compared to a percentage of 10.71% in version B with the habit feedback. This difference can be explained retrospectively by 3 possible reasons. The first reason for the less effective functioning of version B with feedback is the drop off in the habit feedback discussed in the chapter flow analysis in the results. At the screen where the respondents got the feedback on their habits, there was an exit percentage of 15.38%. This means that at least 13 out of 84 people haven't even seen the product recommendation and therefore haven't been able to put any products in the shopping cart. The next explanation for the lower conversion rate is the lead time of the survey. The average time for version A is 24.40 seconds, whereas for version B it is on average 108.63 seconds. This is more than 4 times as long. Because the experiment for version B takes so much longer, people will be less inclined to think about buying products afterwards and click through or leave the test quicker. Finally, the last explanation why version A works better for the conversion rate than version B is that the respondents for version B have to go through a lot more steps than for version A. In general, in e-commerce it is applied that the more steps the consumer has to go through to complete a conversion, the more the consumer can be distracted or decides not to complete the conversion anyway. This could also be a logical explanation why version A eventually resulted in a higher conversion rate than version B. Now that it is clarified which version worked better and why, the following paragraphs discuss the results of the problems and the products in detail.

Problems & products

In these paragraphs, the results of the products and the problems are discussed in detail. First the data from the experiment is discussed, after which the meaning of this data for the startup is discussed.

According to the data discussed in Chapter 7, of all 149 respondents who completed the test, 80 experienced yellow teeth and thus 53.69% experienced yellow teeth or were interested in learning more about yellow teeth. The other problems such as Tooth sensitivity (51.01%) and Gums issues (53.69%) also occur in more than 50% of the respondents or are problems they are interested in. Furthermore, it was noted that a total of more than 67% of the respondents experienced 2 or 3 problems, i.e. 101 out of 149 respondents. In addition, 32 respondents experienced only 1 problem, 9 respondents experienced 4 problems, 5 respondents experienced 5 problems and 2 respondents experienced all 6 problems. Nevertheless, all this data is somewhat biased. The respondents could not continue the experiment if they did not select any problems. However, it is noticeable that the respondents are very interested in the problems and the solutions to these problems, as they did go through the entire experiment and are eventually even willing to purchase products to solve these problems.

Besides the data about the problems, a lot of interesting data came out of the product recommendations. A total of 70 products were put in the shopping cart by the respondents. What is interesting about the results is that the Sensitive toothpaste, the whitening toothpaste, the whitening strips and the floss were the most popular. When looking at the conversion rates per product, the toothpaste whitening comes out highest with a percentage of 18.75%. Next come the whitening strips with 17.50%. What emerges from these results is that people benefit most from whitening products that can solve their common problem of yellow teeth.

For the startup the above results are very interesting. The data on the problems shows that Boombrush' customers are particularly interested in

the problems they are experiencing and are certainly willing to solve them by, for example, purchasing products or following tips. The startup could respond to this by focusing more on the problems that people experience and the solutions that can be offered by writing informative blogs or introducing products. The data of the products and the problems helps the startup to prioritize the topics and to take a first step towards full service oral care by solving the problems through products. It is now clear to the startup that this focus, when looking at the data, can for now mainly be focused on whitening products. People experience the yellow teeth as the biggest problem and are most willing to also purchase products to solve this problem, as shown by the conversion rates of the whitening products.

However, based on the results of the experiment, no final decision can be made from the startup to introduce whitening strips and toothpaste as the first upselling product. This requires more preliminary research and more data, but it is a good start! In the following paragraphs, the research question and the sub-questions are answered.

Answering the research questions

The goal of this research was to answer the research questions: "Can a digital application support preventive oral care?" This is done by answering four sub-questions that are discussed in the following paragraphs.

The first sub-question to be addressed is "How to educate people on preventive oral care? This question is answered in chapter 3. In chapter 3, the current preventive oral care market is first outlined, which shows that preventive oral care does not receive much attention at the moment. The only thing that happens is that the dentist, during a six-monthly check-up, tells you that you should brush your teeth every day and preferably also floss and pick between your teeth. In addition, preventive oral care is also not covered if you have dental insurance. Besides the dentist, there are a few information platforms with blogs about preventive oral care, but these are only offered when people are actively looking for it. Therefore, in this research, research has been done on how people can learn the best way to get their preventive oral care in order. Three ways were mentioned, namely E-health, M-health and tailored health communication. In the end, it turned out that tailored health communication will work best to teach people preventive oral care, because it is where they are most involved in the habits they have, and what they can do to learn the bad habits and good habits.

In the next chapter, chapter 4, the following sub-question was answered by means of product research and a pretest: "Via which product assortment can preventive oral care best be practiced? After conducting literature research and the pretest with a total of fourteen products and eight problems, a selection of seven products finally resulted in six problems that were chosen and occurred the most. The six problems that were most experienced by the respondents are: Yellow teeth, tooth sensitivity, bad breath, cavities, gums issues and dry mouth. These problems belong to the following seven products that were chosen the most: toothpaste whitening, toothpaste sensitive, Whitening strips, mouthwash, supplements, breath spray and floss. The problems and the products that came out of this pretest have been incorporated into the experiment in chapter 6.

Chapter 5 discusses the combination between education and products, and answers the following sub-question: "How can education and products be communicated in a digital application? In this chapter, we investigate by means of a brainstorm and eventually six different concepts, which of the concepts for the digital application will work best. In this chapter, by means of user testing and prototype testing, it is determined that the concept of habit feedback, in which the user gets feedback on the habits that cause certain problems, works best. This digital application will be further elaborated in chapter 6.

The digital application answers the last sub-question: "Does this digital application increase awareness and purchase intention towards preventive oral care? The results of the test can be found in chapter 7. These results show that adding the tailored health communication in the form of habit feedback does not necessarily lead to a higher awareness and/or purchase intention. On the contrary, the experiment revealed exactly the opposite: users were more interested in the products that could help them solve certain problems than in tailored advice per habits they indicated. From this, it can be concluded that a digital application can provide

more awareness and purchase intention, but not in the form of the habit feedback that was applied. The awareness will certainly be more triggered by the habit feedback, but the purchase intention is significantly less high than with the digital application without habit feedback.

Finally, with the help of all these subquestions, an answer is conducted on the main question: “How to educate people on preventive oral care?". It is true that people are willing to adopt the solutions offered by buying the products, but the experiment has not shown enough that this specific way of habit feedback actually helps to teach current customers about preventive oral care. Perhaps this group is not yet interested in learning about oral care from the startup. However, the experiment is a step in the right direction to find out how best to learn and how best to link this to products. Perhaps this can be done by using feedback, but perhaps in a different way. More attention will be paid to this in chapter 9, the discussion.

9: Discussion

In the following paragraphs, the limitations and improvements are discussed. Also the further research possibilities, but also the further development from the startup, are discussed.

Limitations and improvements

In the study, a total of three limitations and improvements can be mentioned, these are discussed in the following paragraphs.

The biggest difference between version A and version B is that version A has a much higher conversion rate and generally performs much better than version B. This is against expectations. However, it can be questioned how valuable the different 'add to carts' are in both cases. There are two reasons for this. The first reason is the turnaround time, which in version A is about 25 seconds on average, while in version B it is over 100 seconds. The 'add to carts' that are made after 100 seconds are a lot more conscious than those after 25 seconds of interaction. The second reason is the number of screens that need to be clicked through. As discussed earlier, for digital applications, the more steps, the more dropoff. Because the version with feedback has many more steps, the conversion is automatically lower.

Another point of improvement is the link between the habit feedback and the product recommendation. This can be discussed on two levels, namely the link and the clarity in the app.
A possible improvement would be a better bridge or integration between the habit feedback and the product recommendation. In theory, the products themselves are not a direct result of the questions about the habits. A possible way to do this is by offering the products directly on the basis of the questions, and giving some feedback on the habits. In this way, the products get a much more central role. Another point of improvement is that it is not clear that after the habit feedback page there will be another product recommendation page. This is also apparent from the exit pages, after the screen on the habit feedback more than 15% of the users leave the application instead of going on to the habit feedback. A possible reason for this could be that the button to proceed to the product recommendation is not clearly visible. When a lot of habit feedback parts are loaded, this button is not visible anymore because all feedback habits have to be scrolled through first. In figure 67, you can see a dotted line in the middle, this is the average fold, or to where a screen is displayed when the page is loaded.

The final limitation and improvement that could be argued is that giving the habit feedback does not yet suit the company. The company is currently not known to its customers as a full-service oral care company, but only as a toothbrush company. It could be argued that there is therefore very little interest in habit feedback and more interest in just buying the products.

Figure 67. The long habit feedback part in the digital application.

Further development

The following paragraphs discuss where the future development opportunities lie for the startup with the application. First, we will discuss what the potential is in the short term, and then in the long term.

Short term

In the short term, the goal of the startup was to collect data as evidence for the sales of these products. Despite the fact that the conversion of the application is very good, namely 18% compared to the 5% of the current website, there is still too little evidence for the products. In total, a maximum of 15 add to cards have been done for one product. This does not yet provide enough data to start up a production. Despite this, not all mails from the database of the startup have been used yet, more than 50% has been used already. This would mean that the current add to carts can still be about two times. This is still not enough to start a production.

Long term

In the long run, the tool offers tremendous value, when there is an extensive product range, the tool can in fact help to guide the consumer in making a choice. Also, the habits can be better linked to the products to make the tool even more effective.

Research possibilities

In order to be able to answer the research question even better, more extensive research could be done into different methods for the transfer of oral care education. In chapter 5, many different concepts have been discussed, all of which can be a possible variation on the habit feedback part of the digital application. For possible follow-up research, several different concepts can be tested. In this way the number of screens should be about the same and the lead time should also be about the same. In this way, the concepts can be better compared to each other than in the research that has been done now where these 2 parameters differed strongly from each other. The concept that can be worked out and tested first will be the quiz, because it came out second best during the user testing as well, in chapter 5. A follow-up research will then test the functioning of the digital application in which one version contains the habit feedback and the other version the quiz.

10: Reflection

Carrying out this research and writing this thesis was not an easy job. Especially since the writing of this thesis is done in combination with maintaining the general activities of the startup. While working on the thesis, but also while working in the startup, my thoughts were constantly jumping back and forth. One of the main difficulties I experienced is that I have two positions within the thesis, on the one hand I am the student doing his thesis research, but on the other hand I am the client, in this case the startup. In the following paragraphs the research process and the learning process execution are discussed.

Research process

One of the main difficulties I have experienced during the research process is the setting up and defining the right research questions. What I often encountered is that I made assumptions which the reader of this thesis would not necessarily make. This is because I am so deeply into the problems of the startup that knowledge of the startup can be a standard for me, but is completely new for the reader. Because of this, I often go very fast in my explanation and skip important steps. When the steps I make in my head are not written down on paper step by step, it soon became unclear to the reader.

A similar event, I noticed during the design process. First, I went for the idea that was first in my head. I skipped exploring the other possibilities for the most part. Skipping this step is a mistake that I made repeatedly in my design career on industrial design. However, after the urgent advice of my coaches to pay close attention to this, I came to the realization that this can help me enormously to better shape the final design. In the end I went for a similar idea as my first idea, but with a large number of improvements which I discovered during the exploration of other concepts. What I mainly learned from this is that it is never too late in the design process to go back to the start. By putting all your options side by side you will always come to new insights. Despite the fact that my research process was not the purest process, I learned a lot. This is discussed extensively in the next paragraph.

Learning process

Precisely because the research process was so interesting and unique, I think I can perhaps describe this thesis as one of the most insightful projects of my career at TU Delft. One of the most important take-aways I would like to mention is the importance of a clear research approach and structure. As designers, we are trained to solve problems. But what if the problem is not well defined or is simply not a valid problem. Then the design to solve that problem will also be of low added value. When I read back my motivation and personal ambition from my thesis letter, I saw two parts that I had mentioned in my personal learning goals; 1) testing with digital prototypes and 2) setting up digital products. Another goal which is not specifically described in this briefing, but which has been a personal learning goal within my master's for a long time, is to become more intellectual. This is a skill I miss within my work experience. Often within work projects I get back from people around me that there are many incorrect sentences or spelling mistakes in my texts and that the story I'm trying to convey is unclear.
The first learning goal of the brief, testing with prototypes, has worked out well. Within the project, I learned a lot about the software Adobe XD and its different prototyping possibilities. This was a very nice and fun process to go through.

The second goal, the goal regarding learning more about building the application, I learned less than I expected. This is mainly because I chose to do it the way I already manage it right now. Due to a limited time, I could not dive into it as much as I wished to do. This is not necessarily a missed opportunity, because I want to develop many more applications with the startup in the near future, so I will definitely have the time to work on this. What I have learned most from the project, correlates with the objective of my master in general, learning how to describe complex problems and processes in a clear and structured way. In my bachelor, but also in my master, I learned a lot about visual design, design methodology and oral presentation. However, if this had to be expressed in a textual report it was always very limited from my point of view. What really helped me in this process is to be extremely precise and to come back to your structure and what you want to tell again, again, and again. I am glad that I was able to increase this skill a lot just before I finished my master's degree. I think this is an experience that will always stay with me.

Lastly

Despite the fact that this is my own project, I don't feel like I did it all by myself. First of all I would like to thank my girlfriend for her patience and listening to this story of this research over and over. Also both my housemates play an important role in this. I also want to thank the coaches for their patience and trust, but also their support during the more difficult periods of the thesis. Corona has caused that we never met in real life, but I don't think that has been at the expense or the quality of the coaching and the project.
During my Bachelor's and Master's I learned a lot about all the different parts of the design world, but I'm glad I was able to add a lot of academic skill within this project.
Thank you,

Elias Clemens Louis van der Linden,

Rotterdam 26/11/2020

11. Appendix

1.Bibliography

1.1. Websites

Boombrush B.V. (2020). BOOMBRUSH. https://www.boombrush.com

Rademakers & Kinsbergen, (2020) https://www.rademakersenkinsbergen.nl/

American Dental Association, (2020) http://ada.org/

Allesoverhetgebit, (2020) www.allesoverhetgebit.nl

1.2. Website Articles

Retrieved at: 18/09

Grandview research, Oral Care Market Size, Share & Trends Analysis Report By Product (Mouthwash/Rinse, Toothbrush, Toothpaste, Denture Products, Dental Accessories), By Region, And Segment Forecasts, 2018 - 2025, Retrieved from https://www.grandviewresearch.com/industry-analysis/oral-care-market

123dentist (2012, October 7) 7 Habits that are bad for your oral health. Retrieved from www.123dentist.com. https://www.123dentist.com/7-habits-that-are-bad-for-your-oral-health/

DHSV (2020, September 18) General dental advice: how to brush your teeth. Retrieved from https://www.dhsv.org.au/dental-health/general-dental-advice/how-to-brush-your-teeth

Corinne O'Keefe Osborn (2018, December 28) Eating ice: it is bad for you? Retrieved from https://www.healthline.com/health/eating-ice#complications

Summer Fanous (2019, March 8) Does Coffee Stain Your Teeth? Retrieved from
https://www.healthline.com/health/dental-and-oral-health/what-does-coffee-do-to-your-teeth
https://crest.com/en-us/oral-health/conditions/teeth-stains/yellow-teeth-causes-how-to-whiten-yellow-teeth

Retrieved at 03/09

Kristeen Cherney (2019, March 8) 11 Ways to Keep Your Teeth Healthy Retrieved from
https://www.healthline.com/health/dental-and-oral-health/best-practices-for-healthy-teeth#Take-care-of-your-teeth

Colgate (2020, September 3) Three good oral hygiene tips to help break bad habits Retrieved from https://www.colgate.com/en-us/oral-health/life-stages/adult-oral-care/three-good-oral-hygiene-tips-to-help-break-bad-habits-0414

Retrieved at 015/08

Kiara Anthony (2019, April 5) Home Remedies for Sensitive Teeth Retrieved from https://www.healthline.com/health/sensitive-teeth-home-remedy#treatment

AnaMaria Glavan (2019, November 26) 15 Products For Anyone Who's Sick Of Having Bad Breath Retrieved from https://www.buzzfeed.com/anamariaglavan/things-thatll-make-your-breath-the-freshest-its-ever-been-1

MediResource Clinical Team (2020, August 15) Why use mouthwash?Retrieved from https://www.medbroadcast.com/channel/oral-care/oral-health-problems/why-use-mouthwash

Crest (2020, August 15) Choosing the Best Toothpaste for Sensitive Teeth Retrieved from https://crest.com/en-us/oral-health/why-crest/toothpaste/choosing-best-toothpaste-sensitive-teeth

Crest (2020, August 15) Choosing the Best Toothpaste for Sensitive Teeth Retrieved from https://crest.com/en-us/oral-health/conditions/cavities-tooth-decay/cavities-tooth-decay-symptoms-causes-treatment

Kaleigh Fasanella (2020, June 12) The Best Oral Care Products for Fresh Breath, According to Dentists Retrieved from https://www.allure.com/gallery/fresh-breath-products-and-tools

James Brains (2020, August 15) The best teeth whitening kits Retrieved from https://www.businessinsider.nl/best-teeth-whitening-kit?international=true&r=US

1.3 Literature

Association between soft drink consumption, oral health and some lifestyle factors in Swedish adolescents, Agenete Hasselkvist, Anders Johansson & Ann-Katrin Johansson, 2014.

Breaking 'bad habits': a dynamical perspective on habit formation and change, Jager, W. (2003) retrieved from Human Decision Making and Environmental Perception. Understanding and Assisting Human Decision Making in Real-life Settings. Liber Amicorum for Charles Vlek. Groningen: University of Groningen.

Diet and nutrition implications for oral health, Betsy Hornick, Journal Dental Hygiene 76(1):67-78; quiz 79-81, december 2002

de Ridder, M., Kim, J., Jing, Y., Khadra, M., & Nanan, R. (2017). A systematic review on incentive-driven mobile health technology: As used in diabetes management. Journal of Telemedicine and Telecare, 23, 26–35.

Eysenbach, G. (2001). What is e-health? J Med Internet Res 2001;3(2):e20.

Good Oral Health and Diet, G. A. Scardina and P.Messina, Section Oral Sciences, Department of Surgical and Oncological Disciplines, University of Palermo, 21 October 2011

Haumschild, M. S., & Haumschild, R. J., The Importance of Oral Health in Long-Term Care. Journal of the American Medical Directors Association, 10(9), 667–671, January, 2009

Hawkins, R.P., Kreuter, M., Resnicow, K., Fishbein, M., & Dijkstra, A. (2008). Understanding tailoring and communicating about health. Health Education Research, 23(3), 454–466.

Kreuter, M.W., & Wray, R.J. (2003). Tailored and targeted health communication: Strategies for enhancing information relevance. American Journal of HealthBehavior, 27(3), S227-S232.

Oral Habits A Behavioral Approach, John E. Peterson, Paul E. Schneider, Pediatric Clinics of North America-Vol. 38, No.5, pp. 1289 - 1307, October 1991

Preventive Care: Do We Practice What We Preach?, N. Lurie,W. G. Manning, C. Peterson G. A. Goldberg, Charles A. Phelps, L. Lillard. ,July 1987

Rimer, B. K., & Kreuter, M. W. (2006). Advancing Tailored Health Communication: A Persuasion and Message Effects Perspective. Journal of Communication, 56(suppl_1), S184–S201.

Rothman, A. J., Bartels, R. D., Wlaschin, J., & Salovey, P. (2006). The Strategic Use of Gain- and Loss-Framed Messages to Promote Healthy Behavior: How Theory Can Inform Practice. Journal of Communication, 56(suppl_1), S202–S220. doi:10.1111/j.1460-2466.2006.00290.x

Smoking and drinking in relation to oral cancer and oral epithelial dysplasia, Douglas E. Morse, Walter J. Psoter, Deborah Cleveland, Donald Cohen, Mireseyed Mohit-Tabatabai, Diane L. Kosis, Ellen Eisenberg, Cancer Causes Control (2007) 18:919–929, 24 July 2007

Smoking and Oral Health in Older Adults, David Locker, Canadian Journal of Public Health / Revue Canadienne de Sante Publique, Vol. 83, No.6, pp. 429-432, December 1992

Tailoring entity resolution for matching product offers, H. Köpcke A,Thor S. Thomas E. Rahm, March 2016

Wood, W., Quinn, J. M., & Neal, D. (2005). The power of repetition in everyday life: Habits and intentions guide action. Manuscript submitted for publication.

1.3. Expert feedback

Expert feedback From annika S. teacher at Radboud university Nijmegen.

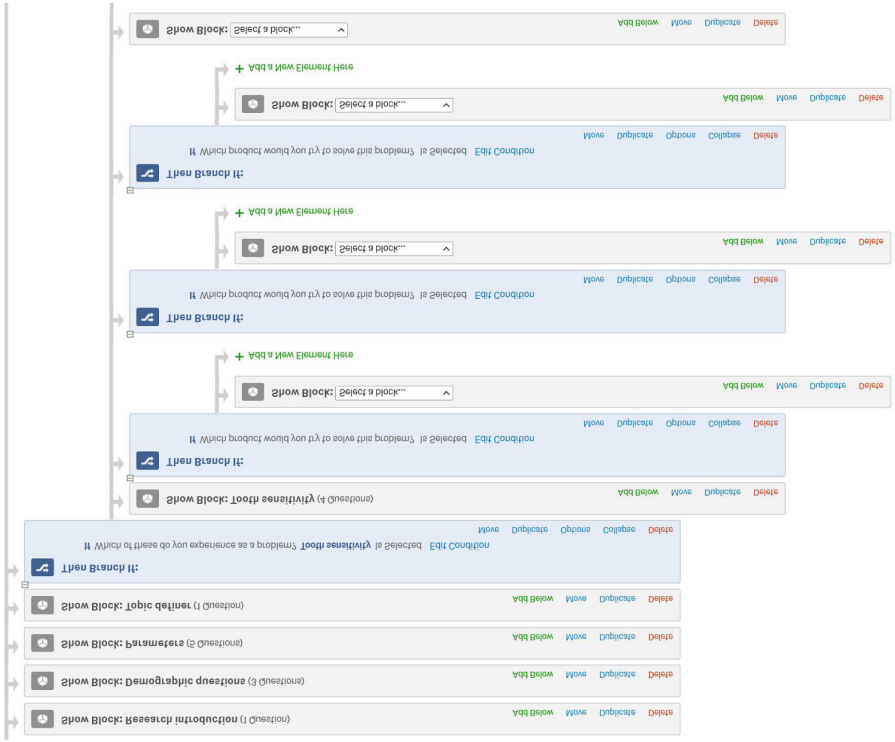
Nr	Factor	Effect	Consequentie
1	Te hard poetsen	Schade aan tandvlees en glazuur	Blootliggende tandhalzen welke extra gevoelig zijn voor gaatjes en gevoelig kunnen worden voor koude
2	Minder dan 2x per dag met fluoride tandpasta poetsen	Minder schoon gebit, minder fluoride in de mond	
3	2x per week flossen		Caries schrijf je dus als caries
4	Spoelen na het poetsen	Spoelt de fluoride weg, je hebt daardoor niet minder glazuur	Grotere kans op caries omdat fluorde wordt weggespoeld en niet kan inwerken
5	45 graden	Minder schoon gebit	Kans op tandvlees ontsteking (gingivitis) en caries lang de tandvleesrand
6	Te veel tandpasta	Is niet slecht voor glazuur, is alleen niet goed om door te slikken	-
7	Heel lastig, want dat ligt dus aan je borstelkop.		
8			Op de bovenkant van de tand/kies zit geen tandvlees dus de consequentie bloedend tandvlees is incorrect, tooth decay is hetzelfde als caries
9			Tooth decay = caries
10	Nagelbijten (valt eerder onder behaviour dan eating)	Slijtage	Stukjes van de tand/kies kunnen afbreken. Vullingen/kronen zijn kwetsbaar en kunnen zo loskomen
14	Hoge suiker intake		Caries – geen gevoelige tanden
17	Weet ik niet zo zeker of dat wel zo is		
18	Weet ik niet		
20	Wijn	Zuur, erosie	Oplossen van je glazuur, gevoeligheid. Natuurlijk ook verkleuring
22	Frisdrank	Zuur, erosie,	Erosieve slijtage (oplossen van je glazuur) en caries
23	Duimen/speen	Invloed op groei van de kaak en tandstand	Onderontwikkelde kaak en verkeerde tandstand
25	Roken	Roken an sich zorgt niet voor caries, wel risicofactor voor gingivitis/parodontitis	Gevolg van parodontitis is vervolgens verlies van kaakbot/ondersteuning van je kies en dus verlies van tanden en kiezen op termijn. Verminderde doorbloeding in de mond, slechtere genezing van wondjes etc

			slechtere genezing van wondjes etc
27	Het is tegenwoordig niet meer standaard om 2x per jaar naar de tandarts te gaan ; wordt heel individueel bepaald adv risicoprofiel van de patient.		

	Advies is regelmatig tandartsbezoek, zonder tijdsaanduiding		
28	knarsen		Spierpijn in de kaak, verlies van tandweefsel, breken van kiezen/tanden, loskomen van vullingen/kronen

2. Pretest

2.1 Qualtrics flow



2.2 SPSS Data

Statistics

		Which of these products would you buy? supplements	Which of these products would you buy? Folic acid
N	Valid	6	4
	Missing	106	108
Mean		1,00	1,00

		these topics do you experience as a problem? (multiple topics are possible) Sensitive teeth	which of these topics do you experience as a problem? (multiple topics are possible) Bad breath	which of these topics do you experience as a problem? (multiple topics are possible) Yellow teeth	these topics do you experience as a problem? (multiple topics are possible) Bleeding gums	which of these topics do you experience as a problem? (multiple topics are possible) Toothache	which of these topics do you experience as a problem? (multiple topics are possible) Cavities	which of these topics do you experience as a problem? (multiple topics are possible) Mouth sores	which of these topics do you experience as a problem? (multiple topics are possible) Dry mouth
N	Valid	53	35	54	30	20	33	10	24
	Missing	59	77	58	82	92	79	102	88

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Sens_problematic	53	1,00	7,00	3,1698	1,28206
Sens_solve	53	1,00	6,50	4,3208	1,28637
Sens_purchase_intention	53	1,00	7,00	4,3208	1,31227
Badbreath_problematic	35	2,00	7,00	4,5143	1,51699
Badbreath_solve	35	2,00	7,00	4,6714	1,06373
Badbreath_purchase_intention	35	2,00	6,50	4,4143	1,05361
Yellowteeth_problematic	54	3,00	7,00	5,2685	1,11047
Yellowteeth_solve	54	1,00	7,00	4,8426	1,32759
Yellowteeth_purchase_intention	54	2,00	7,00	4,8611	1,14684
toothache_problematic	20	1,00	6,00	3,1000	1,56104
toothache_solve	20	2,00	7,00	4,9500	1,25551
toothache_purchase_intention	20	1,00	7,00	4,8000	1,50787
bleedingums_problematic	30	1,00	6,50	3,2667	1,36289
bleedingums_solve	30	1,50	6,00	4,3333	1,22004
bleedingums_purchase_intention	30	1,50	7,00	4,2167	1,28441
drymouth_problematic	24	1,00	5,00	3,6667	1,07001
drymouth_solve	24	1,00	7,00	4,1458	1,38689
drymouth_purchase_intention	24	1,00	6,50	3,5417	1,39031
cavities_problematic	33	1,00	7,00	4,0758	1,68227
cavities_solve	33	2,50	7,00	4,7727	1,16653
cavities_purchase_intention	33	2,50	7,00	5,1970	1,10354
mouthsores_problematic	10	1,00	5,00	2,6000	1,24276
mouthsores_solve	10	2,00	7,00	4,5500	1,77091
mouthsores_purchase_intention	10	1,50	6,00	4,3000	1,51291
Valid N (listwise)	1				

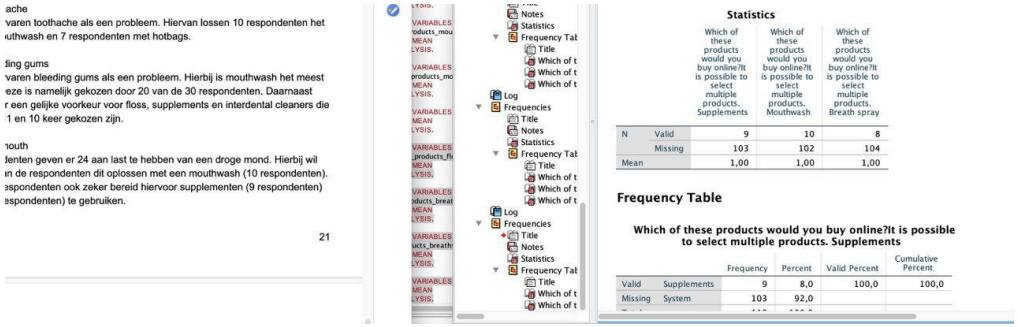
Statistics

Number_topics

N	Valid	112
	Missing	0
Mean		2,31

Number_topics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	7	6,3	6,3	6,3
	1	29	25,9	25,9	32,1
	2	31	27,7	27,7	59,8
	3	23	20,5	20,5	80,4
	4	16	14,3	14,3	94,6
	5	3	2,7	2,7	97,3
	6	2	1,8	1,8	99,1
	8	1	,9	,9	100,0
	Total	112	100,0	100,0	



Statistics

		Which of these products would you buy online?It is possible to select multiple products. Supplements	Which of these products would you buy online?It is possible to select multiple products. Mouthwash	Which of these products would you buy online?It is possible to select multiple products. Floss	Which of these products would you buy online?It is possible to select multiple products. Interdental cleaners
N	Valid	11	20	12	10
	Missing	101	92	100	102
Mean		1,00	1,00	1,00	1,00

Statistics

		Which of these products would you buy online?It is possible to select multiple products. Supplements	Which of these products would you buy online?It is possible to select multiple products. Mouthwash	Which of these products would you buy online?It is possible to select multiple products. Breath spray
N	Valid	9	10	8
	Missing	103	102	104
Mean		1,00	1,00	1,00

Statistics

		Which of these products would you buy online?It is possible to select multiple products. supplements	Which of these products would you buy online?It is possible to select multiple products. Mouthwash	Which of these products would you buy online?It is possible to select multiple products. Breath spray
N	Valid	10	24	7
	Missing	102	88	105
Mean		1,00	1,00	1,00

Statistics

		Which of these products would you buy online?It is possible to select multiple products. Hotbags	Which of these products would you buy online?It is possible to select multiple products. Mouthwash
N	Valid	7	10
	Missing	105	102
Mean		1,00	1,00

Statistics

		Which of these products would you buy online?It is possible to select multiple products. Whitening kit	Which of these products would you buy online?It is possible to select multiple products. Whitening strips	Which of these products would you buy online?It is possible to select multiple products. Mouthwash	Which of these products would you buy online?It is possible to select multiple products. Toothpaste
N	Valid	26	21	34	37
	Missing	86	91	78	75
Mean		1,00	1,00	1,00	1,00

Statistics

		Which of these products would you buy online?It is possible to select multiple products. Tongue scraper	Which of these products would you buy online?It is possible to select multiple products. Breath spray	Which of these products would you buy online?It is possible to select multiple products. Moutwash	Which of these products would you buy online?It is possible to select multiple products. Chewing gum
N	Valid	8	12	27	16
	Missing	104	100	85	96
Mean		1,00	1,00	1,00	1,00

3. Survey data

3.1 Qualtrics flow

Date	Name	Age	Gender	Version	Notify	Yellow	Bad Bre	Tooth S	Cavities	Gums is	Dry Mo	Occurat	Toothpaste	Toothpaste	Mouthwash	Whitening	Supplemen	Floss	Breath Spra	Do you rinse aft	How much coffe	Do you smoke?	How much wate	How much toot	Are you on a sp	How many food	How much alcol	Do you eat man	Do you floss yo	Do you often ea	Do you brush e	Do you bite you	Do you get enot	Do you ever use	How much wate	Do you ever rin
10-11-2020	Marielle	47	Female	a	No	No	No	No	No	Yes	No	1																						More than two lit	No
10-11-2020	Monique	50	Female	a	No	Yes	No	Yes	No	Yes	No	3								Yes	More than 1 cup	Never	Between 1-2 litre	5mm	No	Between 5-7						No, never	I eat 2 pieces of f	Yes		
10-11-2020	Marielle	47	Female	a	No	No	No	No	No	No	Yes	1																						More than two lit	No
10-11-2020	Monique	50	Female	a	No	Yes	No	Yes	No	Yes	No	3								Yes	More than 1 cup	Never	Between 1-2 litre	5mm	No	Between 5-7						No, never	I eat 2 pieces of f	Yes		
12-11-2020	Bernd	24	Male	a	No	No	No	Yes	No	Yes	No	2												10mm	No	More than 7						No, never	I eat 2 pieces of f	No, never		
12-11-2020	Klaas	45	Male	a	No	Yes	Yes	Yes	Yes	Yes	Yes	6								Yes	More than 1 cup	Never	Between 1-2 litre	5mm	No	Between 5-7	More than 3 glas	Yes, every day	Yes I do, at least	Yes, every day	I think so, but ma	No, never	I eat 1 piece of fr	Yes	About 2 liters	No
12-11-2020	Zay	21	Female	a	No	Yes	Yes	No	No	No	No	2								Yes	About 1 cup eacl	Never	Between 1-2 litres				1 glass a week	Sometimes								
12-11-2020	fleur	20	Female	a	No	Yes	No	Yes	No	No	No	2								Yes	I don't drink coffe	Never	Between 1-2 litre	5mm	No											
12-11-2020	Laureth van den	27	Female	a	No	No	No	Yes	Yes	No	Yes	3												10mm	No	Between 5-7			Yes I do, at least	A few times per v	Yes I'm sure				Less than two lit	No
12-11-2020	mick	27	Male	a	No	No	No	No	No	Yes	No	1	Yes					Yes														Yes, on a regular	I eat 1 piece of fr	Yes		
12-11-2020	Jari	25	Male	a	No	Yes	No	Yes	No	No	No	2								Yes	More than 1 cup	Casually	Less than 1 liter	10mm	No	Less than 5										
12-11-2020	Janiek	28	Female	a	No	No	Yes	No	Yes	Yes	No	3										Never					1 glass a week	Yes, every day	Almost never	Yes, every day	Yes I'm sure	No, never	I eat 1 piece of fr	No, never		
12-11-2020	Eli	35	Female	a	No	No	No	Yes	No	Yes	No	2												10mm	No	Between 5-7						No, never	I eat 2 pieces of f	Yes		
12-11-2020	Jari	25	Male	a	No	No	No	No	Yes	Yes	No	2																	Almost never	A few times per v	Yes I'm sure	Sometimes	I eat less than 1	Yes		
12-11-2020	justin	23	Male	a	No	Yes	No	No	No	No	No	1								Yes	I don't drink coffe	Casually	More than 2 litres													
12-11-2020	Christiaan	29	Male	a	No	Yes	No	No	No	Yes	No	2								Yes	More than 1 cup	Never	Between 1-2 litres									No, never	I eat 1 piece of fr	Sometimes		
12-11-2020	Tineke	26	Female	a	No	No	No	Yes	Yes	Yes	Yes	4												5mm	No	Less than 5			Sometimes, may	A few times per v	I think so, but ma	No, never	I eat 1 piece of fr	Yes	Less than two lit	Yes
12-11-2020	Ron	44	Male	a	No	No	Yes	No	No	Yes	No	2										Never					3 glasses a week	Sometimes				No, never	I eat 2 pieces of f	Yes		
12-11-2020	Tee	24	Female	a	No	No	No	Yes	No	Yes	No	2												10mm	No	Less than 5						Sometimes	I eat 1 piece of fr	Yes		
12-11-2020	Desley	34	Female	a	No	No	Yes	Yes	No	Yes	No	3										Yes		5mm	No	Less than 5	1 glass a week	Sometimes				No, never	I eat 1 piece of fr	Yes		
12-11-2020	Miran	47	Female	a	No	No	No	No	No	Yes	Yes	2																				No, never	I eat 2 pieces of f	Sometimes	About 2 liters	Sometimes
12-11-2020	Kayleigh	20	Female	a	No	Yes	No	No	No	Yes	No	2	Yes	Yes		Yes		Yes		Yes	I don't drink coffe	Never	Between 1-2 litres									No, never	I eat 1 piece of fr	Yes		
12-11-2020	Jaap	34	Male	a	No	Yes	Yes	Yes	Yes	No	No	4								Yes	More than 1 cup	Never	Between 1-2 litre	15mm	No	Between 5-7	More than 3 glas	Yes, every day	Yes I do, at least	A few times per v	Yes I'm sure					
12-11-2020	Tanja	46	Female	a	No	Yes	No	Yes	No	Yes	No	3								Yes	I don't drink coffe	Never	Less than 1 liter	10mm	Other	Less than 5						No, never	I eat less than 1	Sometimes		
12-11-2020	Thomas Boot	22	Male	a	No	No	No	No	No	Yes	Yes	3								Yes	More than 1 cup	Casually	Between 1-2 litres									Sometimes	I eat 2 pieces of f	No, never	About 2 liters	Yes
12-11-2020	Etienne	22	Male	a	No	Yes	Yes	Yes	No	No	No	3								No	More than 1 cup	Never	More than 2 litres	10mm	No	Between 5-7	More than 3 glas	Yes, every day								
12-11-2020	Joel	28	Male	a	No	No	Yes	Yes	No	No	No	2										Never		10mm	No	Less than 5	1 glass a week	Yes, every day								
12-11-2020	Margot	69	Female	a	No	No	No	Yes	No	No	No	1												10mm	No	Between 5-7										
12-11-2020	Bernd	24	Male	a	No	No	No	Yes	No	Yes	No	2												10mm	No	More than 7						No, never	I eat 2 pieces of f	No, never		
12-11-2020	Klaas	45	Male	a	No	Yes	Yes	Yes	Yes	Yes	Yes	6								Yes	More than 1 cup	Never	Between 1-2 litre	5mm	No	Between 5-7	More than 3 glas	Yes, every day	Yes I do, at least	Yes, every day	I think so, but ma	No, never	I eat 1 piece of fr	Yes	About 2 liters	No
12-11-2020	Zay	21	Female	a	No	Yes	Yes	No	No	No	No	2								Yes	About 1 cup eacl	Never	Between 1-2 litres				1 glass a week	Sometimes								
12-11-2020	fleur	20	Female	a	No	No	No	Yes	Yes	No	No	2								Yes	I don't drink coffe	Never	Between 1-2 litre	5mm	No											
12-11-2020	Laureth van den	27	Female	a	No	No	No	Yes	Yes	No	Yes	3												10mm	No	Between 5-7			Yes I do, at least	A few times per v	Yes I'm sure				Less than two lit	No
12-11-2020	mick	27	Male	a	No	No	No	No	No	Yes	No	1	Yes					Yes														Yes, on a regular	I eat 1 piece of fr	Yes		
12-11-2020	Jari	25	Male	a	No	Yes	No	Yes	No	No	No	2								Yes	More than 1 cup	Casually	Less than 1 liter	10mm	No	Less than 5										
12-11-2020	Janiek	28	Female	a	No	No	Yes	No	Yes	Yes	No	3										Never					1 glass a week	Yes, every day	Almost never	Yes, every day	Yes I'm sure	No, never	I eat 1 piece of fr	No, never		
12-11-2020	Eli	35	Female	a	No	No	No	Yes	No	Yes	No	2												10mm	No	Between 5-7						No, never	I eat 2 pieces of f	Yes		
12-11-2020	Jari	25	Male	a	No	No	No	No	Yes	Yes	No	2																	Almost never	A few times per v	Yes I'm sure	Sometimes	I eat less than 1	Yes		
12-11-2020	justin	23	Male	a	No	Yes	No	No	No	No	No	1								Yes	I don't drink coffe	Casually	More than 2 litres													
12-11-2020	Christiaan	29	Male	a	No	Yes	No	No	No	Yes	No	2								Yes	More than 1 cup	Never	Between 1-2 litres									No, never	I eat 1 piece of fr	Sometimes		
12-11-2020	Tineke	26	Female	a	No	No	No	Yes	Yes	Yes	Yes	4												5mm	No	Less than 5			Sometimes, may	A few times per v	I think so, but ma	No, never	I eat 1 piece of fr	Yes	Less than two lit	Yes
12-11-2020	Ron	44	Male	a	No	No	Yes	No	No	Yes	No	2										Never					3 glasses a week	Sometimes				No, never	I eat 2 pieces of f	Yes		
12-11-2020	Tee	24	Female	a	No	No	No	Yes	No	Yes	No	2												10mm	No	Less than 5						Sometimes	I eat 1 piece of fr	Yes		
12-11-2020	Desley	34	Female	a	No	No	Yes	Yes	No	Yes	No	3										Yes		5mm	No	Less than 5	1 glass a week	Sometimes				No, never	I eat 1 piece of fr	Yes		
12-11-2020	Miran	47	Female	a	No	No	No	No	No	Yes	Yes	2																				No, never	I eat 2 pieces of f	Sometimes	About 2 liters	Sometimes
12-11-2020	Kayleigh	20	Female	a	No	Yes	No	No	No	Yes	No	2	Yes	Yes		Yes		Yes		Yes	I don't drink coffe	Never	Between 1-2 litres									No, never	I eat 1 piece of fr	Yes		
12-11-2020	Jaap	34	Male	a	No	Yes	Yes	Yes	Yes	No	No	4								Yes	More than 1 cup	Never	Between 1-2 litre	15mm	No	Between 5-7	More than 3 glas	Yes, every day	Yes I do, at least	A few times per v	Yes I'm sure					
12-11-2020	Tanja	46	Female	a	No	Yes	No	Yes	No	Yes	No	3								Yes	I don't drink coffe	Never	Less than 1 liter	10mm	Other	Less than 5						No, never	I eat less than 1	Sometimes		
12-11-2020	Thomas Boot	22	Male	a	No	Yes	No	No	No	Yes	Yes	3								Yes	More than 1 cup	Casually	Between 1-2 litres									Sometimes	I eat 2 pieces of f	No, never	About 2 liters	Yes
12-11-2020	Etienne	22	Male	a	No	Yes	Yes	Yes	No	No	No	3								No	More than 1 cup	Never	More than 2 litres	10mm	No	Between 5-7	More than 3 glas	Yes, every day								
12-11-2020	Joel	28	Male	a	No	No	Yes	Yes	No	No	No	2										Never		10mm	No	Less than 5	1 glass a week	Yes, every day								
12-11-2020	Margot	69	Female	a	No	No	No	Yes	No	No	No	1												10mm	No	Between 5-7										
12-11-2020	Marieke	42	Female	a	No	Yes	No	No	Yes	No	No	2								Yes	I don't drink coffe	Never	Less than 1 liter									No, never	I eat 1 piece of fr	Sometimes		
13-11-2020	Bastiaan	38	Male	a	No	Yes	No	No	No	No	No	1								Yes	More than 1 cup	Never	Between 1-2 litres													
13-11-2020	Jasper	30	Male	a	No	Yes	Yes	No	No	No	No	2								Yes	I don't drink coffe	Never	More than 2 litres				3 glasses a week	Sometimes								
13-11-2020	Maud	28	Female	a	No	Yes	No	Yes	No	Yes	No	3								No	I don't drink coffe	Casually	More than 2 litre	10mm	No	Between 5-7						Sometimes	I eat 2 pieces of f	Yes		
13-11-2020	Pauline	30	Female	a	No	No	Yes	Yes	No	Yes	Yes	4										Never		10mm	No	Between 5-7	3 glasses a week	Yes, every day				No, never	I eat 1 piece of fr	No, never	More than two lit	No
13-11-2020	M	34	Female	a	No	No	No	Yes	No	Yes	Yes	3												10mm	No	Less than 5						No, never	I eat 2 pieces of f	Sometimes	About 2 liters	No
13-11-2020	Juliette	24	Female	a	No	Yes	Yes	Yes	Yes	No	Yes	5								Yes	More than 1 cup	Never	More than 2 litre	10mm	No	Less than 5	More than 3 glas	Sometimes	Yes I do, at least	A few times per v	I think so, but maybe	I don't use the right technique			More than two lit	Sometimes
13-11-2020	J	29	Female	a	No	No	Yes	No	No	Yes	No	2										Never					1 glass a week	Yes, every day				No, never	I eat less than 1	Sometimes		
13-11-2020	Ben	48	Male	a	No	Yes	No	No	No	No	No	1								Yes	More than 1 cup	Never	Between 1-2 litres													
13-11-2020	Judith	45	Female	a	No	No	No	No	No	Yes	Yes	2																				No, never	I eat less than 1	Sometimes	Less than two lit	No
13-11-2020	Inge	29	Female	a	No	No	Yes	Yes	No	Yes	No	3										Never		10mm	Vegetarian / vegi	Less than 5	1 glass a week	Sometimes				No, never	I eat 2 pieces of f	No, never		
13-11-2020	paulina	53	Female	a	No	No	No	No	Yes	Yes	Yes	2																				No, never	I eat 1 piece of fr	Yes	More than two lit	Sometimes
13-11-2020	Nancy Janssen	40	Female	a	No	No	No	No	No	No	Yes	1																							Less than two lit	No
13-11-2020	Jikke	20	Female	a	No	Yes	No	Yes	No	No	Yes	3								Yes	I don't drink coffe	Never	Between 1-2 litre	10mm	No	Less than 5									More than two lit	No
13-11-2020	Yvonne	49	Female	a	No	Yes	No	Yes	Yes	No	No	3								Yes	More than 1 cup	Never	Less than 1 liter	5mm	No	Between 5-7			Almost never	Yes, every day	Yes I'm sure					
13-11-2020	Cil	24	Female	a	No	No	No	No	Yes	No	No	1					Yes	Yes											Yes I do, at least	A few times per v	I think so, but maybe	I don't use the right technique				
13-11-2020	Hannah	20	Female	a	No	Yes	No	No	No	Yes	No	2								Yes	More than 1 cup	Never	Between 1-2 litres									Yes, on a regular	I eat 2 pieces of f	No, never		
13-11-2020	Loes	27	Female	a	No	Yes	Yes	No	No	No	No	2								No	About 1 cup eacl	Never	More than 2 litres				3 glasses a week	Yes, every day								
13-11-2020	Niels	31	Male	a	No	No	Yes	No	Yes	Yes	Yes	5								Yes	More than 1 cup	Casually	Between 1-2 litre	10mm	No	Less than 5			Yes I do, at least	A few times per v	I think so, but ma	No, never	I eat less than 1	Sometimes	About 2 liters	No
13-11-2020	Max	32	Male	a	No	Yes	Yes	Yes	No	No	No	3								Yes	About 1 cup eacl	Never	Between 1-2 litre	10mm	Vegetarian / vegi	Between 5-7	3 glasses a week	Sometimes								
13-11-2020	Jess	43	Female	a	No	Yes	Yes	Yes	No	No	No	4								Yes	More than 1 cup	Never	Between 1-2 litre	10mm	No	Between 5-7	1 glass a week	Yes, every day				No, never	I eat 2 pieces of f	Yes		
13-11-2020	Anna	22	Female	a	No	Yes	No	Yes	No	Yes	No	3	Yes	Yes		Yes		Yes		No	More than 1 cup	Never	Between 1-2 litre	10mm	Vegetarian / vegi	Less than 5						No, never	I eat 2 pieces of f	Yes		
13-11-2020	Martine de Moei	46	Female	a	No	No	No	No	Yes	Yes	Yes	3												5mm	No	Between 5-7						No, never	I eat 2 pieces of f	Sometimes	Less than two lit	Sometimes
13-11-2020	Yvonne	29	Female	a	No	No	No	Yes	No	Yes	No	2	Yes					Yes						10mm	Vegetarian / vegi	Less than 5						Sometimes	I eat 1 piece of fr	Yes		
13-11-2020	Ryanne	22	Female	a	No	Yes	No	Yes	Yes	No	No	3		Yes						No	About 1 cup eacl	Never	Between 1-2 litre	5mm	No	Less than 5			Almost never	A few times per v	Yes I'm sure					
13-11-2020	Stefanie	34	Female	a	No	No	No	No	Yes	Yes	No	2																	Sometimes, may	A few times per v	I think so, but ma	No, never	I eat 2 pieces of f	Yes		
13-11-2020	Marike	42	Female	a	No	Yes	No	Yes	No	No	No	2								Yes	More than 1 cup	Never	Less than 1 liter	10mm	No	Less than 5										
13-11-2020	Corina	57	Female	a	No	Yes	No	Yes	No	Yes	No	3								Yes	More than 1 cup	Never	Less than 1 liter	5mm	No	Between 5-7						No, never	I eat 2 pieces of f	Yes		
13-11-2020	Laura Verschuun	24	Female	a	No	No	Yes	No	No	No	No	1			Yes				Yes			Never				More than 3 glas	Yes, every day								
13-11-2020	Mona	23	Female	a	No	No	Yes	Yes	No	No	No	3								Yes	I don't drink coffe	Never	Less than 1 liter				1 glass a week	Yes, every day							Less than two lit	Sometimes
13-11-2020	Michèle	59	Female	a	No	No	No	Yes	No	No	No	1												10mm	No	Between 5-7										
13-11-2020	Anja	38	Female	a	No	No	No	No	No	Yes	No	1																				No, never	I eat 2 pieces of f	Sometimes		
10-11-2020	Tim	30	Male	b	No	No	No	Yes	No	Yes	No	3																								
10-11-2020	Geertje	19	Female	b	Yes	Yes	Yes	Yes	Yes	Yes	No	5	Yes	Yes	Yes	Yes	Yes	Yes	Yes																	
10-11-2020	Desiree	31	Female	b	No	No	Yes	No	No	No	No	1																								
10-11-2020	Michael van der	48	Male	b	No	Yes	Yes	No	No	No	No	2																								
10-11-2020	Marleen	34	Female	b	Yes	Yes	No	Yes	No	Yes	No	3				Yes																				
10-11-2020	Sara	25	Female	b	No	Yes	No	Yes	Yes	No	No	3																								
10-11-2020	Charlene	21	Female	b	No	Yes	Yes	No	No	No	Yes	3		Yes	Yes	Yes			Yes																	
10-11-2020	Amy	23	Female	b	No	Yes	Yes	Yes	No	No	No	3																								
10-11-2020	Mildred	48	Female	b	No	Yes	Yes	No	No	Yes	No	3																								
10-11-2020	Myrthe	21	Female	b	No	Yes	Yes	Yes	No	No	No	3																								
10-11-2020	Martijn	25	Male	b	No	No	No	No	Yes	Yes	No	2																								
10-11-2020	Johan de Graaf	45	Male	b	No	No	No	Yes	No	Yes	No	2	Yes					Yes																		
11-11-2020	Moira	24	Female	b	No	No	No	No	No	No	Yes	1			Yes																					
11-11-2020	Dionne Fulop-La	25	Female	b	No	No	Yes	No	Yes	No	No	3																								
11-11-2020	Stef	35	Female	b	No	Yes	No	Yes	No	No	No	2																								

Date	Name	Age	Gender	Version	Notify	Yellow '	Bad Bre	Tooth S	Cavities	Gums is	Dry Mo	Occurai	Toothpaste	Toothpaste	Mouthwash	Whitening s	Supplemen	Floss	Breath Spra	Do you rinse aft	How much coffe	Do you smoke?	How much wate	How much toot	Are you on a sp	How many food	How much alcol	Do you eat man	Do you floss yo	Do you often ea	Do you brush e	Do you bite you	Do you get enot	Do you ever use	How much wate	Do you ever rin
12-11-2020	Kim	23	Female	b	No	No	No	No	No	No	Yes	1																								
12-11-2020	Arjan	44	Male	b	No	Yes	No	No	No	No	No	1																								
12-11-2020	Lisa	18	Female	b	No	Yes	Yes	Yes	No	No	No	3																								
12-11-2020	Martijn	41	Male	b	No	Yes	Yes	No	No	No	No	2																								
12-11-2020	Johan	42	Male	b	No	Yes	Yes	No	No	No	No	2		Yes	Yes	Yes			Yes																
12-11-2020	Esther broers	44	Female	b	No	Yes	Yes	Yes	No	Yes	No	4																								
12-11-2020	Shawn	42	Male	b	No	No	Yes	No	No	Yes	Yes	3																								
12-11-2020	Richard	40	Male	b	No	No	No	Yes	Yes	No	No	2																								
12-11-2020	Marc	30	Male	b	No	Yes	No	Yes	Yes	No	No	3																								
12-11-2020	Cheryl	30	Female	b	No	No	No	No	No	Yes	No	1																								
12-11-2020	Arno	29	Male	b	No	Yes	No	No	No	Yes	No	2																								
12-11-2020	Martijn	40	Male	b	No	Yes	No	Yes	No	Yes	No	3																								
12-11-2020	michelle	35	Female	b	No	Yes	Yes	No	No	Yes	No	3																								
12-11-2020	Mirte	18	Female	b	No	Yes	No	No	No	Yes	No	2																								
12-11-2020	Thom Van Dong	21	Male	b	No	No	No	No	No	Yes	No	1																								
12-11-2020	Charlotte	32	Female	b	No	No	No	Yes	No	Yes	No	2																								
12-11-2020	Taika	28	Female	b	No	No	No	Yes	No	Yes	No	2	Yes					Yes																		
12-11-2020	Pieter	61	Male	b	No	No	Yes	No	No	Yes	Yes	3																								
12-11-2020	Dominique	21	Female	b	No	Yes	Yes	Yes	Yes	No	No	4																								
12-11-2020	Merel	20	Male	b	No	Yes	Yes	Yes	No	Yes	Yes	5	Yes	Yes	Yes	Yes		Yes	Yes																	
12-11-2020	Joke	63	Female	b	No	No	No	No	No	Yes	No	1																								
12-11-2020	Esther	50	Female	b	No	Yes	No	Yes	No	No	No	2																								
12-11-2020	Mark	27	Male	b	No	Yes	Yes	No	No	Yes	No	3																								
12-11-2020	Jannette	59	Female	b	No	Yes	No	Yes	No	No	No	2		Yes																						
12-11-2020	Bart V Coenen	35	Male	b	No	Yes	No	Yes	Yes	Yes	No	4																								
12-11-2020	J	24	Male	b	No	Yes	Yes	Yes	No	Yes	Yes	5																								
12-11-2020	Thea	36	Female	b	No	Yes	No	No	No	Yes	No	2	Yes	Yes		Yes		Yes																		
12-11-2020	Anneloes	38	Female	b	No	No	Yes	Yes	No	No	Yes	3	Yes																								
12-11-2020	Kirstin	32	Female	b	No	Yes	No	No	No	No	No	1																								
12-11-2020	Max	20	Male	b	No	Yes	No	No	No	No	No	1		Yes		Yes																				
12-11-2020	Linda	36	Female	b	No	Yes	No	No	Yes	No	No	2		Yes		Yes	Yes	Yes																		
12-11-2020	Danielle	35	Female	b	No	Yes	No	Yes	No	No	No	2																								
12-11-2020	Lenore	30	Female	b	No	No	Yes	No	No	Yes	Yes	3	Yes		Yes			Yes	Yes																	
12-11-2020	Sem	21	Female	b	No	No	Yes	No	No	No	No	1																								
12-11-2020	Lau	54	Female	b	No	No	No	Yes	No	No	Yes	2																								
12-11-2020	Susan	48	Female	b	No	Yes	No	No	No	No	No	1																								
12-11-2020	Floor	23	Female	b	No	No	No	Yes	Yes	Yes	No	3																								
12-11-2020	Floor	23	Female	b	No	No	No	Yes	Yes	Yes	No	3																								
12-11-2020	Rian	23	Female	b	No	No	Yes	Yes	No	Yes	No	3																								
12-11-2020	Bianca	38	Female	b	No	No	No	No	No	No	Yes	1																								
12-11-2020	Nancy	39	Female	b	No	No	Yes	No	No	No	No	1																								
12-11-2020	Anissa	21	Female	b	No	Yes	No	Yes	No	No	No	2	Yes	Yes		Yes																				
12-11-2020	Manon	23	Female	b	No	Yes	No	No	No	Yes	No	2	Yes	Yes		Yes		Yes																		
12-11-2020	Anneliek	25	Female	b	No	Yes	No	No	No	Yes	No	2																								
12-11-2020	Romy	27	Female	b	No	No	No	No	No	Yes	No	1																								
12-11-2020	A	29	Female	b	No	No	No	No	No	No	Yes	1																								
12-11-2020	A	29	Female	b	No	Yes	No	No	No	No	Yes	2																								
12-11-2020	Tom	25	Male	b	No	Yes	No	No	No	No	No	1		Yes		Yes																				
12-11-2020	Tom	25	Male	b	No	No	Yes	No	No	No	No	1			Yes				Yes																	
13-11-2020	Koen	26	Male	b	No	No	Yes	Yes	No	No	No	2																								

	A	B	Combined
Email receivers	597	1090	1687
Opens	248	385	633
Clicks	81	94	175
Entries	65	84	149
Add to carts	18	9	27
Conversion	27.69%	10.71%	18.12%

	Yellow Teeth	Bad Breath	Tooth Sensitivit	Cavities	Gums issue	Dry Mouth	Total
Entries	80	52	76	29	80	35	149
A	42	26	47	18	49	22	84
B	38	26	29	11	31	13	65

	Yellow Teeth	Bad Breath	Tooth Sensitivit	Cavities	Gums issue	Dry Mouth
Percentage	53.69%	34.90%	51.01%	19.46%	53.69%	23.49%

Amount of problems	1	2	3	4	5	6
Occurrence	32	56	45	9	5	2

Version	Toothpaste Sensitive	Toothpaste Whitening	Mouthwash	Whitening Strips	Supplements	Floss	Breath Spray	Products
A	9	11	7	11	2	8	6	48
B	6	4	1	3	1	7	1	22
Total	15	15	8	14	3	15	7	70

	Toothpaste Sensitive	Toothpaste Whitening	Mouthwash	Whitening Strips	Supplements	Floss	Breath Spray	
Yellow Teeth		x		x				
Bad Breath	x							
Tooth Sensitivity			x				x	
Cavities					x	x		
Bleeding Gums	x					x		
Dry Mouth			x					
	Toothpaste Sensitive	Toothpaste Whitening	Mouthwash	Whitening Strips	Supplements	Floss	Breath Spray	Entries
Yellow Teeth		80		80				**80**
Bad Breath	52							**52**
Tooth Sensitivity			76				76	**76**
Cavities					29	29		**29**
Bleeding Gums	80					80		**80**
Dry Mouth			35				35	**35**
Recommendation	**132**	**80**	**111**	**80**	**29**	**109**	**111**	
	Toothpaste Sensitive	Toothpaste Whitening	Mouthwash	Whitening Strips	Supplements	Floss	Breath Spray	
Recommendation	**132**	**80**	**111**	**80**	**29**	**109**	**111**	

	Toothpaste Sensitive	Toothpaste Whitening	Mouthwash	Whitening Strips	Supplements	Floss	Breath Spray
Recommendation count	132	80	111	80	29	111	109
Conversions	15	15	8	14	3	15	7
Conversionrate	11.36%	18.75%	7.21%	17.50%	10.34%	13.51%	6.42%

Page	Page Views	Avg. Time on Page	Unique Page Views	Entrances	Bounce Rate	% Exit	F
/nl/survey/a	183	1.61	80	79	0.00%	8.74%	
/nl/survey/a/step/1	156	2.54	69	3	0.00%	4.49%	
/nl/survey/a/step/2	140	2.00	62	0	0.00%	0.71%	
/nl/survey/a/step/3	146	1.19	63	2	0.00%	0.68%	
/nl/survey/a/step/4	102	3.24	41	0	0.00%	7.84%	
		10.59					
/nl/survey/a/step/5	146	6.20	57	0	0.00%	0.00%	
/nl/survey/a/finish	140	7.61	64	7	0.00%	32.14%	
totaal A							
/nl/survey/	220	8.10	104	104	0.00%	6.82%	
/nl/survey/step/1	232	2.80	105	2	0.00%	5.60%	
/nl/survey/step/2	206	1.92	94	1	0.00%	0.97%	
/nl/survey/step/3	208	1.37	92	0	0.00%	0.48%	
/nl/survey/step/4	132	3.26	60	0	0.00%	3.03%	
		17.44					
/nl/survey/step/5	214	5.97	87	1	0.00%	3.74%	
/nl/survey/step/6	170	3.85	79	0	0.00%	0.00%	
/nl/survey/step/7	168	2.40	78	0	0.00%	0.60%	
/nl/survey/step/8	162	2.14	75	0	0.00%	0.00%	
/nl/survey/step/9	148	2.52	68	0	0.00%	0.00%	
/nl/survey/step/10	134	16.99	60	0	0.00%	1.49%	
/nl/survey/step/11	126	3.02	56	0	0.00%	0.00%	
/nl/survey/step/12	90	3.24	41	0	0.00%	0.00%	
/nl/survey/step/13	66	2.47	32	0	0.00%	0.00%	

/nl/survey/step/8	162	2.14	75	0	0.00%	0.00%
/nl/survey/step/9	148	2.52	68	0	0.00%	0.00%
/nl/survey/step/10	134	16.99	60	0	0.00%	1.49%
/nl/survey/step/11	126	3.02	56	0	0.00%	0.00%
/nl/survey/step/12	90	3.24	41	0	0.00%	0.00%
/nl/survey/step/13	66	2.47	32	0	0.00%	0.00%
/nl/survey/step/14	58	3.33	28	0	0.00%	0.00%
/nl/survey/step/15	42	2.74	19	0	0.00%	0.00%
/nl/survey/step/16	22	4.14	10	0	0.00%	0.00%
/nl/survey/step/17	16	2.94	8	0	0.00%	0.00%
/nl/survey/step/18	10	1.90	4	0	0.00%	0.00%
/nl/survey/step/19	10	2.30	4	0	0.00%	0.00%
/nl/survey/step/20	6	1.67	3	0	0.00%	0.00%
/nl/survey/step/21	4	1.75	2	0	0.00%	0.00%
/nl/survey/step/22	4	2.50	2	0	0.00%	0.00%
/nl/survey/habit-recommendation	156	19.31	75	1	0.00%	15.38%
		79.21				
/nl/survey/finish	122	6.01	60	8	0.00%	37.70%
totaal B		108.63				
/en/survey]	2	1.50	1	0	0.00%	0.00%
/en/survey/	2	1.00	1	1	0.00%	0.00%
/nl/survey	46	1.53	17	9	0.00%	6.52%
/en/survey/b	8	28.75	1	0	0.00%	0.00%
/en/survey/a/finish	20	91.14	6	1	0.00%	30.00%
/en/survey/finish	8	40.57	3	0	0.00%	12.50%