Creating a safe space for women in an in-app online community to increase engagement of a mobile health application

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Abstract

Online communities are becoming more popular over time. Members of online communities always provide support to each other as communities are focused on a particular subject. Therefore, online health communities have started to appear in various forms, from websites to social platforms. It was discovered that women need more support with their health as they suffer from hormonal conditions from an early age and live along with it for most of their lives. However, as online health communities for women's health exist, there is a lack of moderation on what is being posted in these communities. It has been realised that women suffer from hateful speech and discrimination when sharing their personal experiences seeking help from others. Based on literature and interviews, this paper focuses on creating a tool that will provide women with a safe space to share their personal experiences and knowledge and receive the support they need. The paper yielded three different yet similar design concepts that provide feedback to women in the online health community when posting, seeking new knowledge, or sharing knowledge. A user test evaluated three types of feedback: textual feedback, animated character feedback, and audience-oriented feedback.

Acknowledgment

I would like to thank Rúben Gouveia for his time, continuous support and extensive feedback throughout the project's development, and I would like to thank Armağan Karahanoglu for the feedback and for being the critical observer of the project.

Table of Contents

1.0 Introduction

There has been a widespread usage of digital health tools nowadays, especially for helping women with their normal hormonal conditions such as their menstrual cycles and hormonal imbalance. According to the U.S. Food and Drug Administration (2020), digital health tools offer an immense potential to increase our ability to detect and treat diseases properly and facilitate the effectiveness of personal health care. Digital health technology enables users to make more educated decisions about their personal health. It provides new alternatives for aiding prevention, early detection of life-threatening illnesses, and severe illness treatment outside of the typical healthcare environments. In addition, these tools' success is because of allowing its people to share data and information with other users who have experiences with similar conditions. As 61% of American adults use digital health tools to treat their personal health, around 25% of American adults have used information posted by other members of online health communities (Yu, 2011). Digital health tools such as Healthline, the most significant health information property in the U.S., offer individuals support by providing trustworthy and straightforward health information to the public. Resulting in the importance of online health communities that users exchange medical information, receive support from others, and improve their own health.

The chance to be in association with a support system is noteworthy. Members of online health communities have reported emotional support received from other members, responsibility from the community for fulfilling their health objectives, inspiration from other community members, and guidance from members who have previously experienced similar conditions (Newman et al., 2011). Online health communities provide patients with plenty of medical information. More than 50% of users who are part of PatientsLikeMe say the site is either mildly or highly beneficial for their symptoms, over half say it helps them manage their symptoms and understand its treatments (Wicks et al., 2011). Most members of any kind of community have a common goal to seek help and support.

A critical medical subject that should be addressed and taken care of is women. Women account for the majority of healthcare spending. They make up just over half of the population, but they make three-quarters of healthcare decisions and spend almost two-thirds of healthcare insurance premiums (Finn et al., 2005). That is mainly as they regularly live with hormonal conditions after the age of puberty, resulting in 60% of all physician visits(Finn et al., 2005). According to Hennegan et al. (2020), a significant limitation of research to date has been the lack of proper evaluation methods in the study of hormonal and menstrual health. However, there has been no investigation of current measurements to find areas for development. Particularly as women seek healthcare providers' advice, self-tracking remains an essential part of the majority of treatments (Costa Figueiredo et al., 2017). Hence, a safe space for women with hormonal conditions can lead both end-users, patients, and experts to provide support and treatment to diagnose an occurring hormonal condition. These online health communities should ensure that these communities provide a safe space for women by providing emotional support and ensure a safe exchange of information experience.

The internet has many medical solutions for women facing hormonal conditions that can be found on websites, blogs, articles, and any other platform that provides helpful information for the population. The internet has helped patients share their data and experiences to gain others' information with similar interests on social platforms. A valuable resource for the health sector to enhance service is to exchange information/data, experiences, and knowledge of patients with other online community members(patients or specialists) (Åkesson, Saveman, & Nilsson, 2007). Nevertheless, just searching for treatment on the internet does not help women diagnose themselves from hormonal conditions. Medical help might be needed, and each person has a different treatment depending on factors such as background and culture (Schaefer, 2021).

Therefore, the health community focusing on women's health can be essential for finding the support and essential treatment they need. Most women spend most of their lives with

hormonal conditions they have to face regularly. According to Osborn (2020), conditions such as PCOS (Polycystic Ovary Syndrome) or any kind of hormonal imbalance that women face are mistreated. It may affect their health and behaviour in the long term and result in severe medical conditions such as diabetes. Women's health has been defined as health issues such as hormonal imbalance that either affects women or are more frequent or severe in the population (Costa Figueiredo et al., 2017).

Those who seek just health information online have lower risks than those who offer advice and information to other community users. However, many advantages of membership in the online health community arise only from full participation in the community, including information exchange. Online communities can develop and contain negative emotions around users, while its purpose is to help and support its members (Solberg,2014). Hence, moderation of comments and posts is essential to create a safe space and develop an influential online community (Harris, 2018). Without comments and posts moderation, any community will be open to spam, abuse, hate speech, and will all turn customers away from being part of the community (Harris, 2018). By providing moderation over what community members are posting, should help to build a safe space through the use of self-reflection and feedback on their posts. In evaluation situations and feedback, positive and negative emotions are experienced, and their importance is unclear (Peterson, Brown, & Jun, 2015).

There is little knowledge of social emotions like appreciation in the context of learning. According to Pekrun et al. (2010), we know those pleasant emotions are notably on the subjects of the critical aspect, work effort, self-regulation, strategic usage, and motivation are enhanced by academic learning and success generally. In comparison, negative emotions can in many situations also be helpful for effort and motivation. The project focuses on studying how to design a system that supports self-reflection and emotion regulation of users when commenting in the online community, and creating a safe space where women are free to share their past experiences with hormonal conditions. The idea is to create a tool that notifies users of their tone when typing anything in the community and how other community

members can perceive what is posted. Users will be able to write posts or comment on other's posts but respectfully and appropriately. Using three different designs to distinguish what users of the online community will prefer, and user tests will decide which design is suitable for the them and will affect their posts and comments.

1.1 Objectives

The project's primary goal is to create a safe space for women in an in-app online health community that would change the user's behaviour when engaging and posting, by designing a tool that moderates posts and comments in the online community to support women to pursue a healthier lifestyle using emotion regulation. The project's objective is divided into three parts: Firstly, analyse relevant literature on topics such as health applications, online communities, user engagement, and comment moderation. Secondly, develop designs or tools that moderates community interactions using self-reflection to support women and create a safe space using relevant literature. Afterwards, find recommendations on possible improvements and design changes of the in-app community function in light of the reviewed literature and evaluation results.

Health Ventures, a young start-up that develops an app to revolutionize women's healthcare and provides each woman with the treatment she needs. The telemedicine company is a women's online medical service that provides digital prescriptions, online medications, and contraception. They are still working on psychological methods to help women feel better in the long term. Using a mobile period monitoring app, the company gathers data on women's wellbeing, medical problems, and contraceptive side effects. Health Ventures hopes to create an algorithm based on the data collected to prescribe appropriate contraception and lifestyle improvements to relieve women's discomfort. Health Ventures has assigned a project to develop new ideas that will ensure user engagement and a behavioural change of members in the online health community.

1.2 Target Audience

This paper seeks to focus on the online community aspect to improve women's health. In addition, Health Ventures are currently focussing only on the application for women with hormonal conditions, and pursue to expand their services for all conditions in the near future. However, the tool designed is to be used only by women and can be adjusted for other populations.

1.3 Research Question(s)

Main research question: *What are potential solutions that might improve the quality of commenting in online health communities?*

Sub research question 1: *How can different designs tools be used to create a safe space for women and influence them to share their experiences with others without feeling concerned?*

Sub research question 2: *How can emotion regulation of posts and comments create a safe space for women with hormonal conditions and help them pursue a healthier lifestyle*?

2.0 Context and Background

2.1 Literature review

The literature review aims to better understand the potentials, challenges, and features of online health communities for supporting women's health. The research intends to collect different insights into how online health communities work, increase user engagement, maintain user activity, and moderate content shared in the community. To investigate this, a few aspects must be looked at and understood. The project will explore how online communities can improve user engagement, motivate women to track their hormonal conditions regularly, and create a safe space using content moderation. The literature review should open up to new ideas and solutions that can help women have a safe space where they can share their thoughts and experiences for other community members to engage with.

2.1.1 Online communities

This review is essential to understand and define online health communities' features and what constructs them. Online health communities are interactive social spaces where people gather and provide knowledge or social support (Benders et al., 2011). These communities are primarily patients or individuals with medical concerns and can be a separate sub-forums of a bigger social media platform (Yan et al., 2016). They are recognized to connect as many online users/patients to doctors or other users who can provide help or support, with a driving force of many attracted to a community with the same intention (Yan, 2015).

According to Yan et al. (2016), online communities help people connect and receive support from others and usually focus on specific topics, such as health and wellbeing, sports, or fashion. Newman et al.(2010) have stated benefits of online health communities over other social platforms e.g., Facebook, to achieve objectives such as health-related goals

and motivation from other members of the community, as it is the objective of Facebook to speak the idea that they are always positive and not struggling. Looking specifically at health and wellbeing, online communities have shared a basic understanding of personal treatment facts and address their concerns and anxieties. Bunchanan and Coulson (2007) further claim that users feel encouraged to confront their anxieties, concerns, and fears by sharing personal information with others on online communities. People use online communities to gain recognition from other members, form relationships, and find comfort in finding similarities with other people going through similar problems, allowing users to grow and learn from their problems together.

2.1.2 Examples of online health communities

Sharing personal information online can be dealt with differently depending on the purpose of the community. Online health communities vary in their ways of helping patients share their personal experiences with others (Chen et al., 2018). In PatientsLikeMe, the majority of health data is highly organized. Online health communities allow patients to openly access the journals and charts of other patients on the online health communities subscription network. HealthBoards includes a drug-specific website where patients can share their drug-use experiences. The forum posts, on the other side, are often written in natural language. MedHelp hosts symptom-based websites for patients to address related issues, as well as public message boards for doctors from hospitals and medical research institutions. DailyStrength is a social network centered around support groups. Online patients may provide emotional support to other patients by sharing their personal struggles and accomplishments. WebMD is well-known for delivering up-to-date and reliable health-related news. It offers dependable health information, supportive communities, and comprehensive health reference materials. HealthUnlocked employs health-specific artificial intelligence to assist patients in fully controlling their health by recommending relevant and customized health material, skills, and services. The network provides peer support for a variety of health issues and promotes patient empowerment by directly involving patients in the management of their own health care.

2.1.3 Ensuring an active online community and user engagement

One critical component of online communities is interactivity. A community is only thriving if it is active and if the information and personal experiences are shared among its members (Campo Woytuk, 2019). Interactivity is described by Rafaeli and Sudweeks (1997) as a way in which messages communicate with one another, meaning the online communication between two or more people having an interest in the same topic. Secondly, online communication becomes interactive as people respond to their conversation partners, such as using face-to-face communication. The rate at which people react to each other's messages and posts on message boards is referred to as interactivity. The higher the level of interactivity, the more people respond to other people's messages. This builds a feeling in a community and affects them psychologically. They are in an integrated community that helps users become more open in their issues and engage more.

In the paper of Chen et al. (2018), the authors discussed practical functions that support user engagements and interactivity. These functions are used differently in each community, depending on their target goal. Visitors may have a matched opinions in the content of a website by incorporating interactive features such as (1)message boards, (2)search modules, (3)blogs, (4)talks, (5)support groups for help (FAQ), (6)sales of drugs and supplements to pursue a healthy lifestyle, (7)health tools, and (8)news from experts (van Varik & van Oostendorp, 2013). These functions support interactivity and engagement between users and increase the application usage between a community's users.

Dressler (2017) further mentions some qualities for ensuring user engagement in online communities, such as the implementation of hashtags, push notifications, organizing events and activities, gamification, allowing users to mention one another, and personalizing information for all users, and moderators to the community to control information and guidelines. Each of the qualities helps user engagement in different approaches in online communities or social platforms:

Hashtags – Hashtags help people find posts around a topic. According to research by Agorapulse, Instagram posts with one hashtag gets 70% more likes and 392% more comments than posts without hashtags (Animalz, 2019). This increases engagement of the app and eases for users to search for posts they are interested in.

Push-notifications – By sending notifications at the appropriate time for the user to interact with the app, rather than opening the app with nothing in mind. Notifications help users get attached as developers know when is the right time for users to engage with the app based on their preferences.

Events and activities – organizing events and activities brings people together and builds relationships between community members to increase their engagement with all members participating.

Gamification – gamification puts a challenging outlet to the user. E.g., how many people interacted with your post, the number of likes a post has received, amount of posts.

Personalized information – personalized information will increase users' engagement since they will mostly see what is helpful for their personal needs depending on their interactions in the community.

Moderation – moderation helps users share their experiences without fear of receiving hateful comments. This will ensure that users will keep posting safely in the community and receive appropriate comments safely.

Nevertheless, most online communities only have a distinct number of active members, and not all members post in these communities. A study by Nielsen (2006) has shown that 90% of online community users are inactive, they do not open topics or post messages to other users. This group's only activity is to read posts others have published. This group of people are

named by Varik and Ostendorp (2013) as 'lurkers', lurkers are people who do not engage and interact with their community. Also, the amount of lurkers differ from the community's subject, Preece & Nonnecke (2000) show that the number of lurkers in a group varies depending on the community's theme, with almost half of the users in health communities and 82% in technology-related communities. That is a considerable number of inactive users that rarely contribute with others in the community, which could be because of various reasons. Ahonen (2017) mentioned a few reasons why people do not engage in the communities:

- **The reach mentality** - some people focus on the post's reach other than their benefits from joining a community, resulting in false information.
- **Community goals** – having many members shouldn't be a goal, but having a small focused target group that enhances engagement, loyal, and are using the community for their own to receive support.
- **Uninspired discussions** – discussions that are out of topic that lead to less engagement.
- **Fear** – fear of losing control over the community. Having members who criticize or engage but in an inappropriate way.

These reasons are usually are what fails a community. Communities need to ensure comfort and a need for opinions to allow more people to engage. By creating a safe space, the user will find themselves a place where others feel safe and respected.

2.1.4 Safe Spaces in online communities

A safe space is a formal or informal setting where people feel safe emotionally without the fear of abuse (Heijningen & Clief, 2017). Having a women's only space is useful when women are in need of support especially in emergencies (Crisis & Bazaar, 2017). Women commonly described safe space as allowing for discourse and debate, which allowed for learning and understanding. As the UNFPA (United Nations Population Fund, 2014) stated, that safe spaces should be trustworthy and be sure that all technologies used are secure. Whatever is going to happen

with the data users provide, all should be clear to members; when will it be used, how it will be used, and why it will be used?

Anonymity is a solution to create a safe space when sharing experiences and information with others. However, sharing health information anonymously to medical experts is quite hard to diagnose without knowing the patient's condition (Wicks et al., 2010). Hence, systems are developed that ensure that the expert will only have access to the patient's condition without other community members or users knowing who the person is (Lian et al., 2019). Anonymity, on the other hand, has the potential to be violated. For example, in a genuinely anonymous scheme, the user can copy and duplicate his membership and spread it to others, effectively copying his identity. Though some systems allow users to share their identities, cloning a user's identity is generally not allowed in real-world scenarios. Due to system rules and capabilities, many systems do not enable multiple clone identities of a single member to be online at the same time (Lian et al., 2019). However, it all depends on the targeted aim of the community.

Safe spaces offer women a safe entry point for emergencies as well as a location to acquire information. Safe places also allow users to interact with one another, create critical contacts, show solidarity and support for other women, exchange information, and restore community networks and support Crisis & Bazaar, 2017). Although comment moderation procedures are recognized to increase the quality of online comments, they have been criticized for being either ineffective or inappropriate (Ruckenstein & Turenen, 2020). An unsafe space is a space where all the above procedures are not taken into account. Data is not secure, others can access personal data of members of the community without their consent.

Members who join a community are most likely to believe what the community's description claims. Once those people have joined the community, you may reassure them that registering was the right option by greeting them, assisting them with their requirements, and offering to introduce them to people who share their interests, difficulties, or ideas. Hence, there should

be characteristics of a safe space and why it is considered safe for women. These are some characteristics obtained from understanding what is considered a safe space:

- The capability to preserve a safe distance, if not full secrecy.
- Online personas that allow individuals to develop and form friendships.
- Keeping it professional
- Show people of similar experiences and interests
- Moderation of posts and comments

2.1.5 Content Moderation

Safe spaces are widely used nowadays. Most social media platforms try to create a safe space for its users to get the most of what they find interesting in the platform. Although all platforms try to consider a safe space, all use different approaches to create one—for example, Twitter. Twitter is widely used as it does not have many restrictions when posting inappropriate tweets compared to other platforms. However, Twitter handles offensive and explicit tweets by warning users that it might be inappropriate to see such posts and asks for their consent to show the tweet. Safe environments have been defined by Lewis et al. (2015) as allowing to "be yourself," talk and be listened to, learn and improve intellectually, and express emotions freely. A study by Beard et al. (2014) shows adverse effects such as worry and dubious prospects of assessment and feedback. Another study by Rowe et al. (2014) has highlighted joy, appreciation, anger, fear, pride, confusion, and guilt as crucial to how individuals react to feedback. These emotions and feelings respond to diverse successes, while academic and social concerns relate to feedback evaluation and support tools.

Women have referred to safe spaces as facilitating debate, hence facilitating learning and understanding. Such discussions in women's opinions necessitate listening, sharing, and respect; "just speaking up and expressing" (Lewis et al., 2015). This can be done by tracking

what users are writing and what other community members would feel towards what is being typed.

2.2 Recommendations based on literature

Anonymity of users

Values of anonymity. Anonymity creates a safe space for communities when support is needed. It makes members feel free to talk about sensitive topics, and makes it feel self-contained. It should be confidential and feels private to members of the community. The community moderator should have in have track of IP addresses to manage risk whenever the community is breached. However, many problems could result from the anonymity of members in an online health community. Clone identities of members using the same account. Genuinely difficult to build relationships between anonymous members.

Posts and Comments Moderation

An icon that tracks text written by the users in the community, to ensure respectful and appropriate discussions. Self-reflecting on their behaviour in the community and receive emotional support. An icon is located in the textbox of the post and gives feedback to the user to change what is being typed. This should create a safe space for women and warn users of any hate speech, abuse, or spam.

Security certificate

Having an approved security certificate for the community to show that the information shared in the community is secured and safe, and will not be used without letting the members know how it will be used and when it will be used. It should be in the community whenever members want to post a message and when signing up to be a community member.

Star contributor

Showing other community members the star contributor that has been the most engaging with other members and has an important role for replying and showing support to other member's posts. It's powerful and crucial to show other members what a star contributor consists of and how they subsidise to the community. Features of how a star contributor can be used in the online health community for women's health.

- A top contributors list that shows who to follow
- Have a weekly post from the team on who's the top contributors to the community and what makes them the top contributors
- A special badge next to the name of the start contributor, which they will receive when they meet the requirements for a star contributor

Weekly Checkbox

Have a weekly check box of the hormonal imbalance symptoms. A list containing all kinds of symptoms that hormonal imbalance includes, e.g. strong or irregular periods, pain during sex, headaches, and if there's sudden signs that might result from an hormonal imbalance condition e.g. fatigue, irregular heartrate, and depression. This list or checkbox is sent weekly to an expert to track the patient's health. This will keep track of the member's wellbeing and make sure they are always notified when something is wrong. If it's serious conditions the expert should get in touch with the patient for more personal help and diagnose the condition. Then blood tests or other tests might be required from the doctors in order to treat the patients, e.g. blood tests and ultrasound. An upload of the tests to the doctors will give more room to the doctor to treat the patient professionally. This weekly checkbox will make sure that the medical experts know well how their patient's health is improving or getting worse overtime.

2.3 Discussion

This review has contributed new knowledge to the project by understanding how online communities function and what are the critical features to form a safe space online health community. It has expanded realisation in dealing with online communities from both end users and how to ensure an a active community to create a safe space for women. It is important to take into consideration features in other online health communities that ensure engagement between users and the app. The points mentioned below are techniques and concepts to be taken into account that other online health communities have applied and used.

- Personal account
- Support groups
- Message boards to experts & other patients
- Push notifications
- Interactivity and engagement between members
- Content moderation
- Safe space
- Anonymity

The review suggested that although little research on women's health was discussed in the introduction of the review for the motive and its importance on why to build the community for the targeted users. The literature review has expanded knowledge in online communities; how online communities work, what ways can ensure an active community and increase user engagement, how to develop a safe space in the community, and how to moderate interactions of users within the community.

For further research in building a community, the main point of research is how to design an online health community that is safe for women and supports them to pursue a healthier lifestyle.

2.4 Conclusion

In conclusion, online health communities are more effective and efficient than other forms of online platforms in supporting its members in providing support to its members. Online communities build relationships between users since most users are interested in a focused topic. Its importance in one's life is indeed significant, to seek support and help from medical experts and other patients with sharing knowledge and past experiences to build a relationship and receive supportive responses from other members. With features correctly set in place for users to help increase their engagement, interactivity, and maintain a safe space for sharing personal stories and data, resulting to responses that help members identify and treat their condition. Features that ensure interactivity between members in a community such as support groups, blogs, and message boards that supports behaviour change and increase user engagement with the help of push notification, that notifies users if something is shared that is relevant to their health. Personal accounts are essential to personalize treatments for patients based on their current and previous health condition. Nevertheless, clone identities are then made if the same account is shared with others (e.g. with friends), and can cause mis-treatment. Despite, the main takeaway of an online health community is users sharing their personal information online, the information can be sensitive to be shared with others. Hence, medical experts won't be able to personalize diagnoses without the patient's personal information. This demonstrates the gap of research on how doctors can diagnose a patient with anonymity. Further research should investigate how can users safely share information and experiences anonymously to educate and diagnose their personal health.

3.0 Methods and Techniques

Design process

The creative technology design process

For this project, a design process was constructed specifically to help creative technology students in the process of designing prototypes, A Design Process For Creative Technology by Angelika Mader and Wouter Eggink (2014). The design process helps having a solid structure on steps when design or creating a prototype. Its goal is to develop a design process for new and innovative products and applications being developed. The creative technology method consists of four phases; ideation phase, specification phase, realisation phase, and evaluation phase.

The *ideation* phase is the first phase of the design process and focuses on generating and collecting ideas from the design question. The ideas gathered are formed through tinkering, literature research, interviews, and brainstorming. Then after choosing or picking one or more of the ideas, the specification phase takes place.

The *specification* phase aims at getting the idea from the ideation phase and exploring more into that idea. Exploration includes designing of lo-fi prototypes, and test how the user experience leads to. The use of scenarios and story boards are highly appreciated in that phase that will lead to a more structures design and requirements.

Afterwards, the *realisation* phase, this is when the specifications is given and can be comprehended. Combining all knowledge and having a ready prototype to be user tested. This prototype is then improved using feedback of user testing.

Lastly the *Evaluation* phase. In this phase the developer evaluates the system and compared to other similar systems. Developer test their prototype with the targeted users and analyse the results. Then the prototype is be improved based on the results of the user testing session.

4.0 Ideation

4.1 Interviews

The interview aims is to explore if it's common for women to join women communities or groups and explain whether it was effective and safe or not. Interview 1 was with one of the founder of HealthTech Ventures, Lisa Schaffers. As she is a woman and a co-founder, she is a valuable source of information to provide information on her vision and insights on the project HealthTech Ventures are working on. Interviews 2-4 consisted only of two questions, that tries to collect qualitative data from women who has previously joined online health community. These interview aim to know their experiences and what problems could arise from joining an online health community. Firstly whether they have joined an online health community or group before and what things made them uncomfortable or unsafe in a community and vice versa. These insights are then to be used to influence and inform the design of the safe space. The results of the interviews will be used to inform the design that is to be created based on researched literature and past experiences of the interviewees; the targeted users.

Interview 1: This was an unstructured interview via a conference call. The aim of this interview was to understand the importance of online health community for women and why women need such community to pursue a healthier lifestyle. One of the points Lisa mentioned was that, to book an appointment with a gynaecologist takes time. "For emergencies it is pretty hard to find medical help and support right away, additionally it is expensive. That are two main reasons why building an online community for women with hormonal conditions is essential. In an online community, help is pretty much there and is much cheaper than getting medical support. However, this does not mean that online health communities are replacing medical staff, it is just a tool to support women as we face regular hormonal conditions."

Interview 2: "I haven't joined a women's only health community, but I have joined several Facebook groups which women discuss their personal stories or ask their questions. One of the

groups had no moderation which lead to some group members to criticise some posts which didn't make me feel safe to share my experiences. However, I joined another group before but for skincare. Doctors were part of the group and they introduce themselves before commenting to let the members trust what is being said. Everything was moderated by the admins approving posts before posting them with the group members, and if it was out of topic they don't share it."

Interview 3 "I joined a women's group before on Facebook which women discuss if they were cheated on. I didn't feel safe at all because everyone was so vulgar, exposing people and using hateful words. I joined it because it was funny, and left after a week. "

Interview 4: "I was part of a women's only fashion and products group. It was a complete mess. People were making fun of each other's looks and the products they use. Discussions were always going off topic. I didn't like it at all and never thinking of sharing my opinion or asking for support."

4.2 Brainstorming

As it is the first stage of the ideation phase, I have brainstormed on some problems women have faced in online communities. These brainstorming points are based on literature and interviews with women who have an experience with women's online communities.
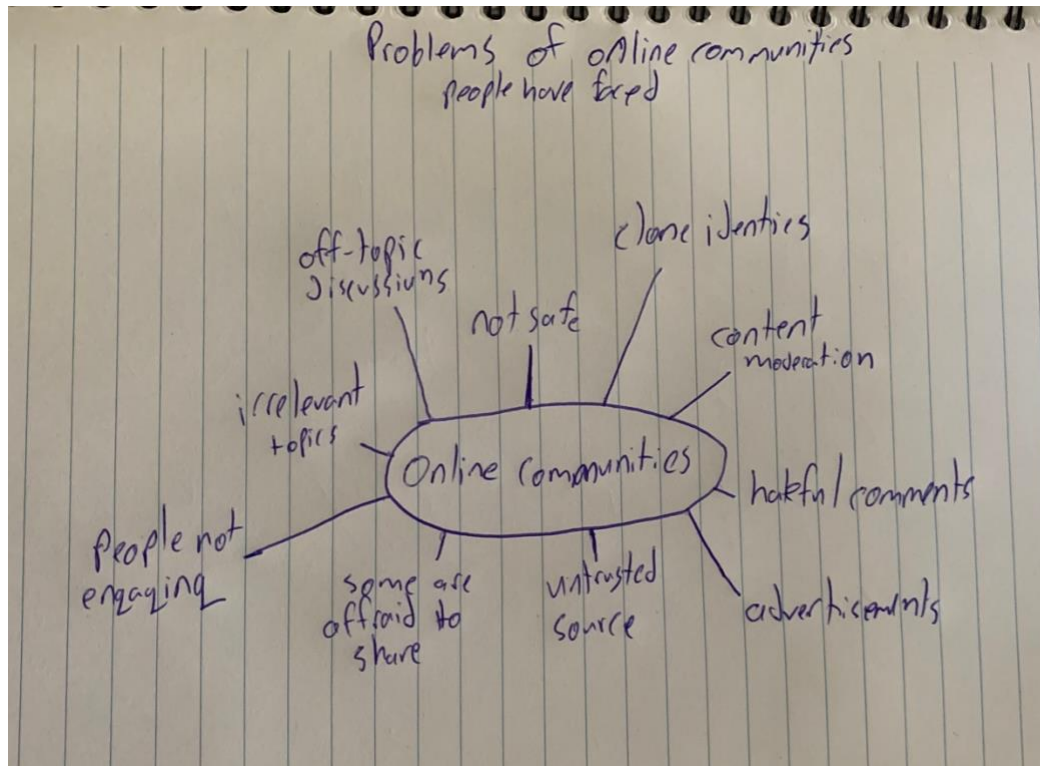
Figure 1: brainstorming of ideation phase

Figure 1 shows some of the problems people who were part of online health communities have experiences. These problems were collected based on research and interviews.

4.3 Discussion

The interviews were conducted to understand and learn how online health communities work from an expert's view, and problems and experiences of women who have previously joined online communities. It showed that most online communities that they have joined do not have moderation on what is being posted by members of the community, and that made them not posting and sharing their experiences online. However, they still use these online communities as an alternative source of facts and information about their health. Other interviewees had

The interviews has expanded my knowledge in things to take into account when designing the online community and what members are looking for in a women's only online community. Developing a tool that moderate hateful and harmful comments right away can solve one of the main problems online health communities have. Moreover, as members of such communities face hateful comments, people posting these hateful comments should get a feel of that harm they caused others to.

5.0 Specification

5.1 Dependencies and Assumptions

Firstly, the tool must be available on different platforms, for easy access. Assuming that age, weight, height, personal health information, etc., will determine the appropriate health diagnosis and suggestions per user accurately. Then, assuming users will share their personal experiences to the community's platform and benefit from the interaction between other members for their own sake. This is a really important point since the community depends on users to post content in the community so that the tool becomes viable and to provide the feedback needed for members of the community.

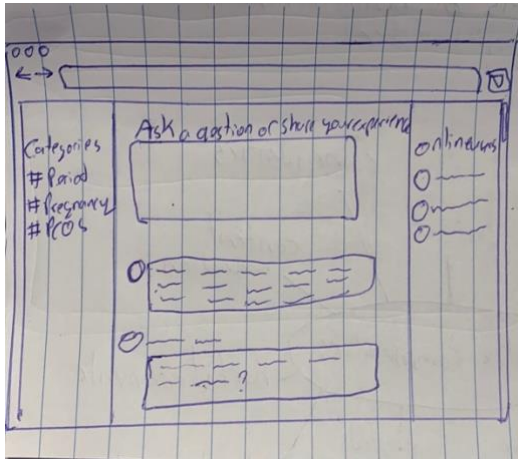## 5.2 Lo-fi prototype

5.2.1 Walkthrough and storyboard

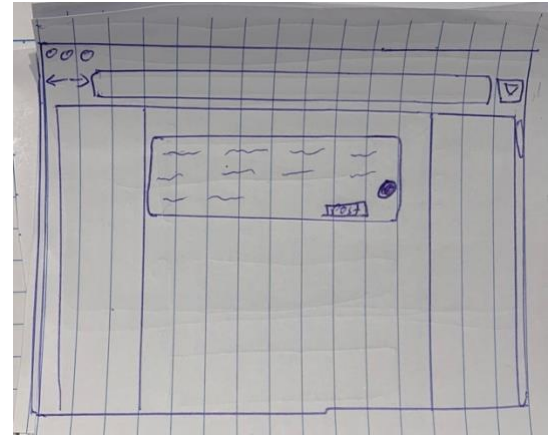Figure 2: Paper prototype step 1
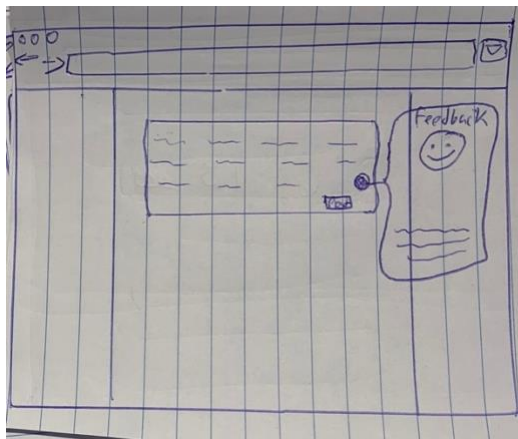

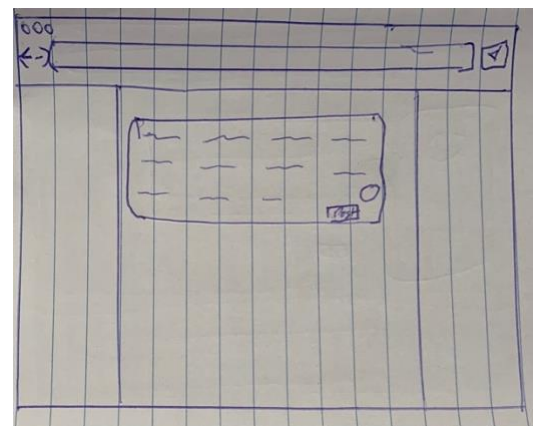Figure 3: Paper prototype step 2

Figure 4: Paper prototype step 3

Figure 5: Paper prototype step 4

Figures 2-4 shows the interface in a lo-fi paper prototype of the tool. This paper prototype is a rough draft that goes through the steps of the interface, it is not a detailed prototype as it is open to improvements while testing the main function of the tool. Figure 2 shows the home page of the online community, in the middle there is the text box which users type to post in the community. Afterwards in figure 3, the user has typed and the solid icon in the text box appears to alert the users. Then in figure 4 a window appears with feedback to the user, with

an emoji and text that describes what is to be changed in the post. After the user changes the text of the post based on the feedback given by the system, the window disappears and the icon fades away to show that the text has been fixed based on the feedback by the user.

5.3 Lo-fi user testing

The user testing session was performed with two participants, both are bachelor student in University of Twente. The COVID-19 situation limited the user test from performing with more participants to have a wider view on opinions. However, results were collected from the participants by interviewing them and learning their experience and remarks for improvement.

Each of the participants walked through the paper prototype with my help of explaining each of the designs since they are low in fidelity. Afterwards, I asked them in an semi-structured interview approach:
- How they feel about the window popping out on the right side of the text box.
- If the concept of having the tool in a form an icon in the text box is suitable for receiving feedback and the community's interface.
- To what extent is the way of presenting the feedback with the emoji suitable to receive feedback.

5.4 Lo-fi user testing conclusion

The user testing session of the lo-fi prototype has helped in placing and locating various features in the interface. Features such as the icon's place in the text box, both participants did not mind its location. As the icon did not bother their attention while typing in the text box and did not block any other parts of the online community page. However, the window popping on the right side has got one of the participant's attention, she felt like it was blocking the

background of the interface. On the other hand, the way feedback was presented was appreciated by both participants as it is simple, catchy and creates understanding for the users.

6.0 Realisation

6.1 Hi-fi prototype

Designing of hi-fi prototype

Three protypes were created, all have the same concept of giving the user feedback on the content of the post or comment. However, each approach it in different ways. The first design uses textual feedback to inform the user about their tone. Second design uses animated characters to show the emotion of how other may perceive the comments. The third design shows other members of the community and their reaction in text to the user.

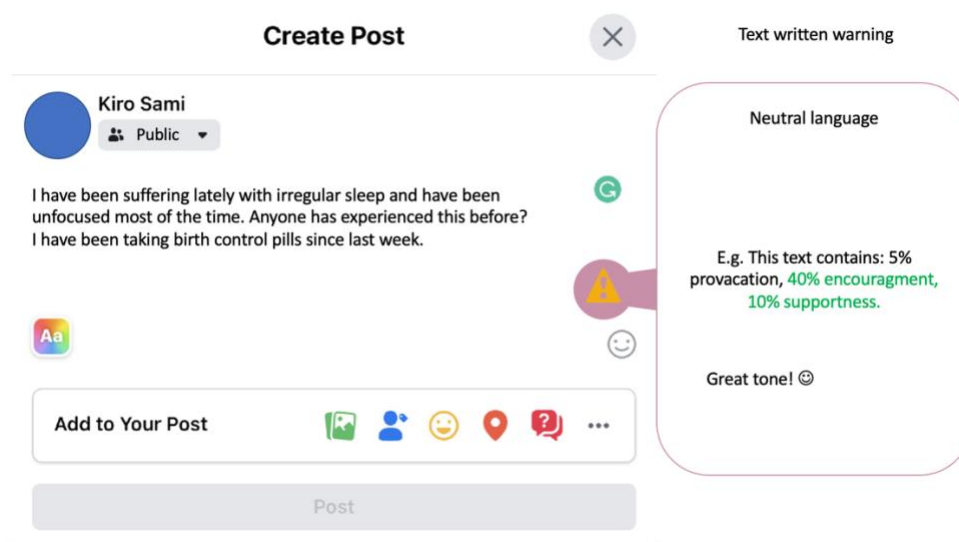**Design 1: Text oriented warning feedback**

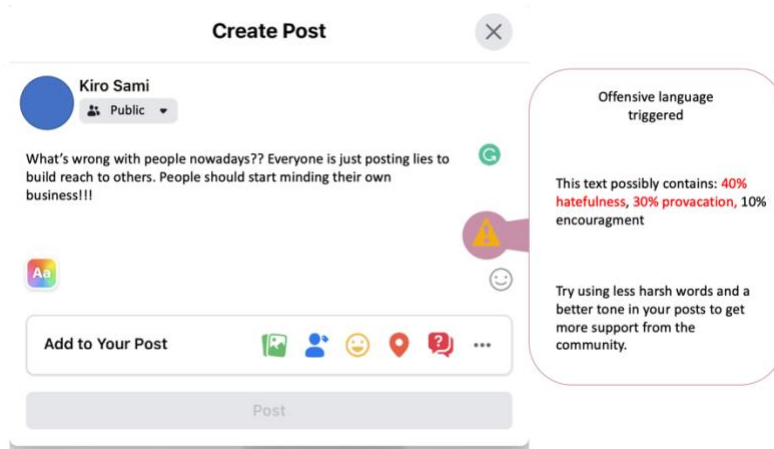*Figure 6: textual feedback warning prototype (positive)*

Figure 7: textual feedback warning design (negative)

Textual feedback is mostly used to provide users with feedback with everyday language and for people which find reading graphs and tables quite difficult (Peters, 2012). The feedback given is in text and gives an analysis of how others may perceive what the user is writing. The use of textual feedback is important since it can make users acknowledge how they write and what is considered appropriate or inappropriate in their sentences(Consolvo, 2012). This form of feedback is used since the start of text messaging, which promotes behaviour change and users understand it well .

This design includes a plug-in notification shown on the side of the text field when typing in the comment section, when clicked a pop-out notification window opens which shows the text with feedback within the window. This design warns the users on the way the text is written, and the way other might perceive the post/comment. It shows percentages of how other might perceive the post by having a database with words. This design provides precise numerical data as feedback, which might annoy the members and can be received as a formal way to give feedback. Figures 6 and 7 shows the prototype of the textual feedback design

Design 2: Animated characters feedback

In the second concept, animated characters are used to give feedback to the users on their posts. As this type of feedback is more emotionalised since it shows reactions of faces of a character. Based on Ray & Merle (2020) this type of feedback engages more with people and is more likely for users to react with rather than text written feedback.

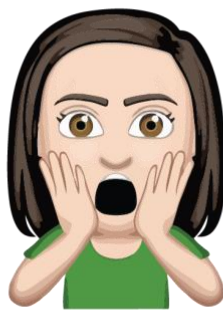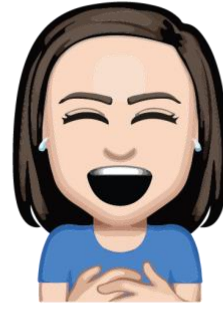|		
Figure 8: neutral emotion	Figure 9: emotion frightened	Figure 10: funny emotion
Figure 11: happy emotion	Figure 12: angry emotion	Figure 13: unsatisfied emotion

Animated characters are used to show the user that the community care if something inappropriate is being written. A study made Stange et al. (2016), stating that respondents of the study processed images of the emojis differently than text. They spend more time in figuring out what the text actually means, while the emojis give them an instant understanding of the text. It gives a sense of gamification to the users that might attract users to change their

behaviour instead of just textual feedback. Emotions nowadays are translated digitally into emojis. Emojis are increasingly growing in popularity, most social platforms use it as a non-verbal way of communication (Ray & Merle, 2020) because of its instant understanding.

Each of the above characters figures 8 – 13, shows an expression of how others might feel towards what the user posts. Each character expresses a different emotion that should let the user acknowledge what others might perceive their post/comment based on their written text. These character where made through the Emoji Me app. Expressions and looks are customizable.
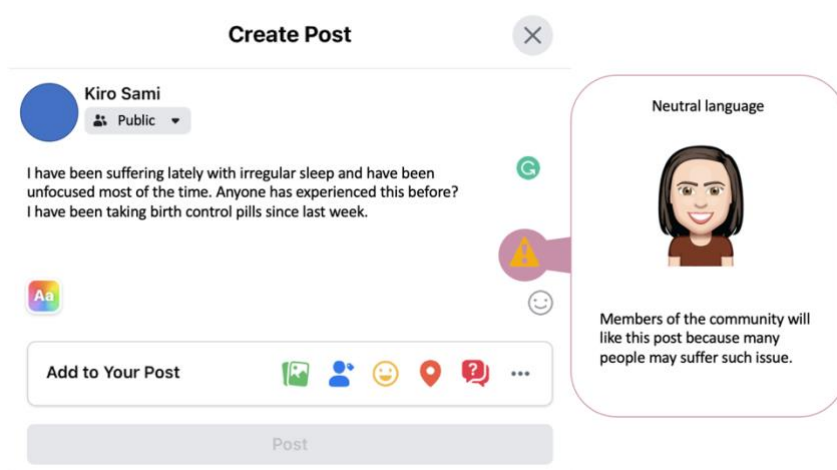

Figure 14: animated character design (positive)
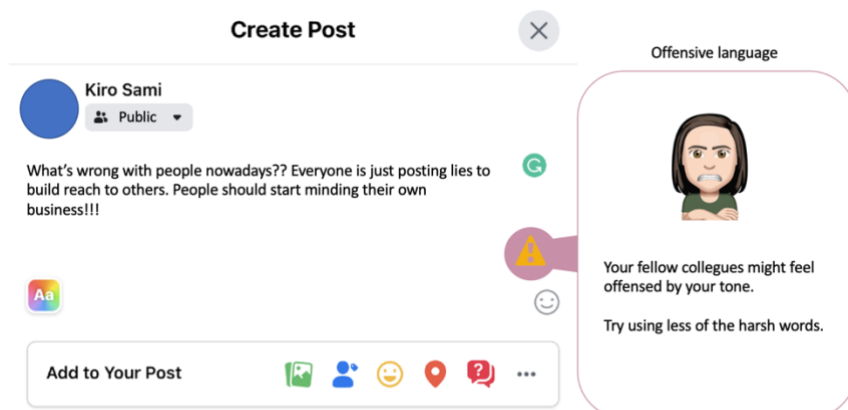
Figure 15: animated character design (negative)

Similar to design 1, this design uses the same concept as to give feedback to the users of the community based on what's written. The difference is the characters, these characters plants a gamified sense to the community and making it a little fun for the users. Additionally, Guyer (2019) has used an elaboration likelihood model to prove that facial expressions can affect behavioural change in low elaboration situations. Non-verbal source behaviour may influence attitudes by altering the quantity of problem-related thinking, provision of simple signals between people, biased thinking mood, and argumentations.

Design 3: Audience feedback

Figure 16: audience feedback design (positive)

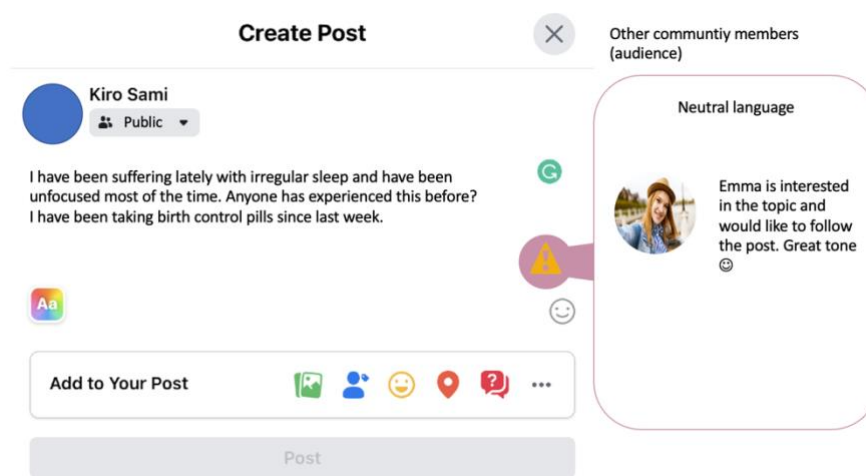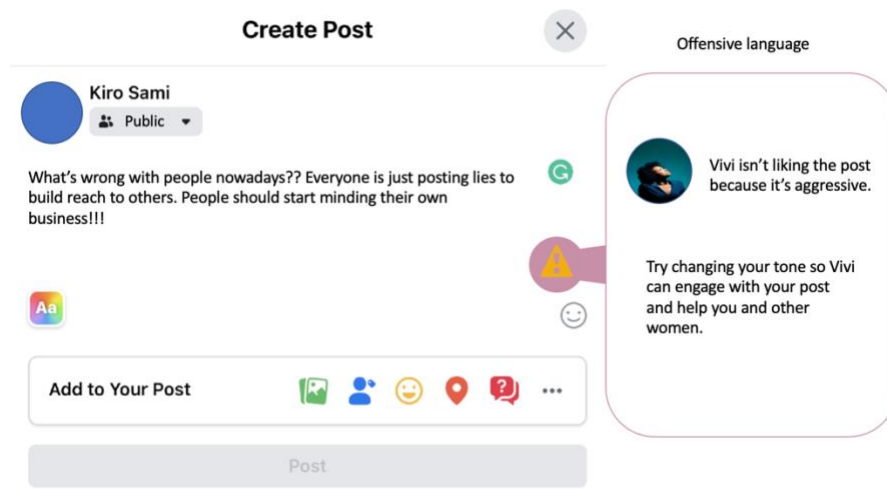*Figure 17: audience feedback design (negative)*

The concept behind this design is to let users posting know that other community users feel towards the post/comment. This design concept would create more empathy with other users, as it will show the profile picture of other members of the community and what they feel about what is being posted. Similarly, this design will show how other community members might feel but with other members' profile pictures and names, instead of animated characters that might be a little childish for some users. The design includes a title-like above the feedback to express the emotion behind the post, additionally a sentence with the reasoning of the emotion to convince the user to change their behaviour of text. This design should make members more engaged as if they were pointing out their view and feedback towards the post/comment. The expected outcome of the this design concept is to build relationships between community members by providing the support needed.

7.0 Evaluation

7.1 Study Plan

Background

The study plan aims to understand the major points of the user experience using the prototype that focuses on creating a safe space and would change the user's behaviour while using the app.

The usability testing is performed to follow the user's experience using the prototype and the issues they would encounter when posting in the community. I will be using general testing techniques to understand better the community user's experience and the challenges they would encounter while using the prototype.

7.2 Objectives

- Understand how users will interact with the prototype
- Track the user's reactions while using the app
- Evaluate the points of action the user takes
- Learn how the users feel based on the feedback given by the app
- Evaluate the results of each of the three designs
- Understand why one design surpasses the other designs

Research Scope

For this study plan, individual interviews will be conducted for around 30 minutes each to discuss and evaluate the user's experience on the app. The secondary method is the questionnaire, to better understand the user's experience and to have a clear view on their likes and dislikes.

7.3 Walk Through and User-testing Plan

4-6 users will be needed for the testing session to have a successful user testing session. Each participant will individually test the designs, to avoid bias and to make sure all answers are honest. After exploring each design, the participant will try one of the designs first and receive a questionnaire to answer. The users will answer the questionnaire to collect the qualitative result and learn which design impacted their behavior most. The user will not receive any help during the session and their behaviour will be monitored while using the app.

7.4 Method

To evaluate the prototype, a user testing should be performed. However before testing, there are some goals to define and expect to learn from this session. One of the evaluation aims was to understand how each of the designs could make people reflect on their online commenting behaviors. Additionally, understand which design concept of the three designs users would like to see in the interface of the online community.

A user testing was performed in order to assess the three designs with the targeted users. The user test included five women participants, table 1 shows the characteristics of each user:

User	Age	Occupation	Past experiences with women's community
User 1	21	Bachelor student	No
User 2	29	Full-time job	Yes
User 3	49	Housewife	Yes
User 4	24	Masters student	Yes
User 5	41	Full time job	No

Table 1: User-testing participants characteristics

The session started by introducing what the project is and what this user testing aims to achieve in order for them to entirely focus on which of the designs are more effective. Each user was given 15 minutes to test and explore each of the three designs. After 15 minutes of testing the first design, the user receives a 5-minute questionnaire to answer before heading to the next design. After around an hour of testing each of the three designs and answering the questionnaire for each, the user receives another general questionnaire which examines all three designs and gives insights on which of the designs is more effective to the user's point of view.

Questionnaire

The questionnaire's goal is to know what the user has experienced and their feedback on the designs they have tested. The questionnaire should result in having one final design that the users prefer. Here are some of the questions to be asked for each design:

Questions for each design 1,2,3:
- Was there any difficult step to proceed in the prototype?
- What are things that you liked or disliked going through the design?
- Is there anything you found challenging to understand?
- Was the feedback given in the pop-up window understandable?
- Did you agree with the feedback given? Why?
- Is there anything else you would like to point out that can help improve the design of the prototype?

End of session questions:
- Which form of feedback (designs 1,2, or 3) had more impact on changing your text?
- Which of the designs you liked the most? Why?
- Is there any suggestions of improvement you would like to add or remove from the design you chose?

The first set of questions are used to let users analyse the design and feedback of each design alone to not form any kind of biased answers if asked at the end of the evaluation session. The second set of questions is asked at the end of the session, which focuses on recognizing how each of the designs could make users reflect on their online commenting behaviours.

The qualitative data received from the participants during the user tests were used to improve the prototype based on the results of the user testing session. The table in Appendix A shows a thematic analysis of the user testing results. A thematic analysis is a qualitative method that highlights essential words and phrases in a data set that best defines the content and identifies patterns of meaning from the results. The thematic analysis requires knowledge of the data, emphasises of essential words and phrases that express the content best, inspect patterns or topics in highlights of interviews or questionnaires, and then analyse these results.

Additionally for the questionnaire, highlighting keywords and inspecting patterns of the answers for each of the three designs. Afterwards, the results obtained from the thematic analysis is added to a table divided into themes of focus to distinguish similarities of answers between users and the designs easily. Themes include design, feedback, and further improvements.

7.5 Results

Design

Overall, all five users liked the simplicity of the three designs. They mentioned that it is clean, simple, and good colour choice. However, users 1 and 4 suggested that the hazard sign on the plugin icon should be removed or replaced with a logo. User 1 mentioned that it gave a feeling of fear and the other user did not like the hazard sign as a sign to provide feedback on a post. However, for users 2, 3, and 5 the hazard sign did not bother them as it is important to adhere to the community's guidelines and have a respectful community. Users 1,2, and 5 agreed that the pop-up window outline is too simple and might need a little bit of design added. User 1

suggested increasing the tool's feedback and asking for more insights if needed as sometimes reasoning to change behaviour is essential. However, users 2 and 5 didn't mind the amount of feedback given but suggested to improve the pop-up window design. User 3 didn't like the animated character design but really like the third design of the profile picture of other members as it can "really change my mind" since it shows empathy from a real member of the community. Users 2 and 5 mentioned that the animated character feedback is childish, but it's good if the community has young members.

Feedback & User Behaviour

Three types of feedback were given; design 1: textual feedback, design 2: animated character feedback, design 3: other member's profile picture feedback. Users 1,2, and 5 chose the third design as it has more impact to change their behaviour. User 5 mentioned that showing the profile picture of other members of the community has created empathy between the participant and the community member and is the more realistic one compared to the other two designs. Users 1 and 2 stated that the picture and the feedback of design 3 gives them a sense of support and engagement with community members that they don't know. User 3 didn't like design 3 since the feedback gave her a strong sense of judgement on what she wrote. However, user 3 was engaged with the first design, textual feedback, since it is easier to understand, straightforward, and gives honest and straight quantitative feedback on what is being posted. User 4 liked the second design, as it gives a gamified aspect to the community and from her point of view, it was the most effective and fun type of feedback between all three designs. User 4 mentioned that this can attract young women to join and be part of the community.

Improvements

For this section, the user testing was the most useful for improving the interface. As it gives room for suggestions and improvement for things participants would like to see in the future. Users 1, 2, and 5 suggested the same improvement on the third design, which is to have a an option to message the member who gave the feedback in case the user wants more insights or

just to get to know other members of the community. User 1 would like to see more feedback on what to change since in some cases it won't be clear enough to what should be changed. User 4 has a suggestion to improve the animated character feedback design 2, she suggested to have a animation clip of the emotion of the character instead of a steady character. User 3 would like to see an improvement to have the textual feedback added to the design three as a way to support what the members suggest to change in the post. Since these two types of feedback are the most effective and together both design support one another. User 4 mentioned to combine the textual feedback and the animated character feedback into one form of feedback, so it has the gamified aspect as well as a quantitative feedback to support and convince the user. Below is a summarized list of improvements participants would like to be included in the designed tool:

- Option to message users who provide feedback
- More detailed feedback
- Combination of two design concepts; textual feedback and audience oriented feedback/animated character clip and textual feedback
- Animated character clip instead of a still image of the animated character

8.0 Discussion

Design

All participants liked the simplicity and non-complicated design, it resembled a minimal interface with not much buttons and information. It is a straightforward design as the participants' reasoning is that it shouldn't be extensive not to forget the community's purpose and just focus on what is being typed. Two participant remarks was that they didn't like the trigger warning design since it was visible even when they have not yet finished typing their post, they would appreciate it more after they finish typing their post. Some minor results for the participants' questionnaire were about the overall design was to improvise on the window design, to have more solid design image. Hence, taking in consideration only appearing the hazard sign at the end of what is being typed. As a result, a complicated tool design can be too overwhelming for some users of an online health community. As three out of five participants liked the simplicity of the design

Feedback and User Behaviour

After collecting the results of each of feedback design from the user testing sessions, it was a tough call to decide which design is more suitable for the targeted users and the goal of the community. The final verdict in my opinion for this section is a tough one, the COVID-19 situation has not helped in testing with more participants as to have a solid idea what fits the majority of the users. However, based on the results, design 3 was the most chosen type of feedback by the participants as it created empathy between members and support. Additionally, the other two designs received great feedback but was not as effective as design 3. Therefore, combining design 1 and design 2 into one type of feedback that contains the animated character and the textual feedback. Together both designs combined will have stronger effect to the user's behaviour based on the participants' answers. This demonstrates that combining two types of feedback would support each other and have a much stronger argument for users to change their behaviour.

8.1 Discussion of results

As stated before in the introduction, women live with health-related issues for most of their lives. Dealing with issues such as menstrual cycles or hormonal imbalance can be quite different for each person (Schaefer, 2021). Thus, a solution for women seeking support and help could be to have an online health community, share previous experiences, educate and support each other. However, online communities might not be a safe space for women to share their personal health issues or experiences with people they might not know, as sometimes they receive hateful and harmful comments on their posts. Therefore, a solution geared up from the literature review is to moderate the behaviour of members on how they post and comment in the community to create a safe space for all users, and encourage them to post safely in the community.

The goal of the evaluation session was accomplished, it gave me more insights and room for improvements. During the user tests, all participants were thinking about how their text is perceived to other members. Since all they were asked to do is to share any personal experiences or come up with a sensitive situation. Three out of five participants preferred the audience profile picture feedback type. As this type of feedback created empathy and a feeling of support for the user, as well as a more substantial reason to change their behaviour. This means that design 3 had the more impact on the users, as it makes them feel connected to others and see what others would feel about their posts and comments.

As a result, I would highly suggest that designers of content moderation systems to design tools using concepts where empathy is then created between community members to try impacting people's behaviour. It makes users feel connected, engaged, and supported in the virtual world, while they are strangers in the real world.

However, there is no ideal system resulted from the user test. Each participant had a different view on what is ideal for them. This can denotate that moderation systems should be personalised and adapted to the community and the user's needs.

9.0 Conclusion

In the beginning of the paper, the research has introduced how online communities work and gave more insights into women's health. As a result, the literature has provided knowledge on problems with online health communities and them not being a safe space for sharing personal experiences and the lack of support received by women in the community. It helped building the tool needed to create a safe space for women with hormonal conditions.

During the ideation phase, it was identified that women find it difficult to share their experiences online as sometimes they receive harmful comments regarding their posts in online health communities as there is a lack of content moderation.

My research question was " What are potential solutions that might improve the quality of commenting in online health communities?". So I started studying how online communities are designed and how they deal with situations of inappropriate posts, and how online platforms use posts and comment moderation to create a safe space for its users. I have combined all ideas into three designs which all include the concept of moderation plugin icon that appears while posting in the community. The users have found it interesting to have since their main problem with online health communities is they don't feel safe to share their personal experiences due to hateful and harmful speech and other various reasons. Hence, I answer the research question by having performing user tests with three similarly but different designs. Each design focuses on a different way to deliver the feedback to the user to change their behaviour.

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Appendix A

	Overall design	Feedback & User Behaviour			Improvements		
		Design1	Design2	Design3	Design1	Design2	Design3
User 1	Clean design, there's room for improvement Didn't like hazard sign, it gives a sense of fear			Had more impact on considering changing the text with the profile picture of other members and the text below that shows engagement			Allow messaging to the user who provided feedback to as for more detailed feedback
User 2	Simple, colours seem to match well		I find it a bit childish considering the subject of the community	Showing a picture of other users giving feedback showed more engagement between members			Would like to get more insights from the feedback given, a way to contact the person would be appreciated
User 3	Okay design, suits the purpose of the community	Really liked this design. straightforward and honest feedback with numbers.		Not the best of all three, it gave me a sense of judgement on what I'm posting			Combine textual feedback with the audience oriented design
User 4	Not bad, should consider removing the hazard sign and much more room for improving the design		Showed a sense of gamification and it was more fun than the other two designs		Combining of design 1 and design 2	Improve the animated character to an animated clip	
User 5	Good design, simple window design			Has created more empathy and would consider changing my text			Messaging the person in the profile picture to know more about the community