Raising Osteoporosis awareness for women 40+ using technology, gamification methods and investigation.

By

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Declaration

I hereby certify that the material submitted in this thesis towards award of the Masters in UX and Interaction Design and has not been submitted for any academic assessment other than part-fulfilment of the award named above.

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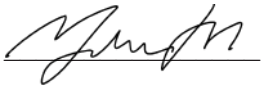
Signature: 

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My most wonderful children Stephen and Layla, who tirelessly inspire me to achieve new goals. Massive thank you to my parents and my sister - my best friend – I have received many life Lessons and love from you. I hope one day I can return twice as much.

This year was incomparable to others. Many things have changed, which left a footprint on the planet and made us realize what is truly valuable.

Abstract

This research aims to explore how aware women over 40 living in Ireland are of the dangers of Osteoporosis and its connection with menopause and to determine whether technology can raise the awareness.

From the questionnaire conducted by this research, it turns out that one-third of the female population living in Ireland aged 40+ are not aware of the relationship between Osteoporosis and Menopause, which is a problem primarily for women in the long term. The online survey shows that 100% of the participants use a mobile phone and spend an average of 2-3 hours a day; this was the primary indicator when choosing a device as a tool to help eduction women on the link between Osteoporosis and Menopause. This research is set to investigate if technologies can improve awareness about Osteoporosis using gamification methods, thereby connecting user with information on a more emotional level.

This study focuses on preliminary primary stage - the first stage of habit formation - when there is no intention to change particular behaviour in the near future (about six months), people may not know that there is a problem behaviour they will have to face, or they are not sure that it needs to be changed (Prochaka et al. 1983). By raising awareness, using the technology, and using the structure of Norman's emotional design, this study hopes to contribute to further research of unawareness about the Osteoporosis condition in women 40+.

Keywords: Osteoporosis awareness, menopause, gamification and education in app, ethnography design

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Chapter 1

Introduction

“Knowing is not enough; we must apply. Willing is not enough; we must do.” - Johann Wolfgang von Goethe, (1749-1832). It is no secret that knowledge is not enough to implement a change to something; a person also needs to apply the appropriate action. Habits formed over time can lead to the aggravation or development of specific condition that does not let us know about themselves until a certain point in life. The preliminary research determined that osteoporosis awareness is slightly lacking in women over 40, and this research is determined to investigate the best way to raise awareness using technology and gamification. This research is motivated and driven by Johann Wolfgang von Goethe’s quote and will study how much women aged 40+ are aware of the relationship between Osteoporosis and Menopause and how willing they are to change their habits.

“Theoretical Education and Counselling in Osteoporosis Prevention Program for Women: A Randomized Controlled Study”, by Kalkim and Daghan (2017), aimed to investigate the impact of Osteoporosis prevention program based on the Health Belief Model for women aged 30 to 45 at risk of Osteoporosis, and showed positive out-

comes of the impact of an Osteoporosis prevention education and counselling program on a health belief model conducted by nurses. The counselling part of Kalkim and Daghan (2017) study was performed using physical visits, phone calls and email. This study seeks to examine the awareness of women over 40 living in Ireland of the dangers of Osteoporosis and its connection with menopause and determine whether technology is a tool to help educate women on the link between Osteoporosis and Menopause. This information will contribute to further studies that aim to educate and motivate women to look after their bone health.

Value and Limitations

Finding the GPs/Doctors who are specialising in this area to complete a survey/questionnaire. Face to face interviews may still be problematic due to the COVID.

Goals and objectives

The purpose and objective of this study are to find the most appropriate way to inform and familiarise the age group of women 40+ about the problems of Osteoporosis and how it is associated with Menopause. When talking about participants in this research it is referred to women 40+ living in Ireland.

Structure of Thesis

A total of 107 days for this research is broken down into four phases, indicating what happens at each phase, submission dates, supervisor meetings, taken into consideration and outlined the workdays. The dedicated time spent on research is Friday, Saturday, Sunday (half day), Monday, Tuesday.

The first phase (through May) is the planning phase, finding the exact direction for this research, finalising the research question (backbone for the research). The Second phase (June) is dedicated to the State-of-the-Art Literature Review, refining and writing the chapters for this thesis. Each topic is broken down into roughly how many

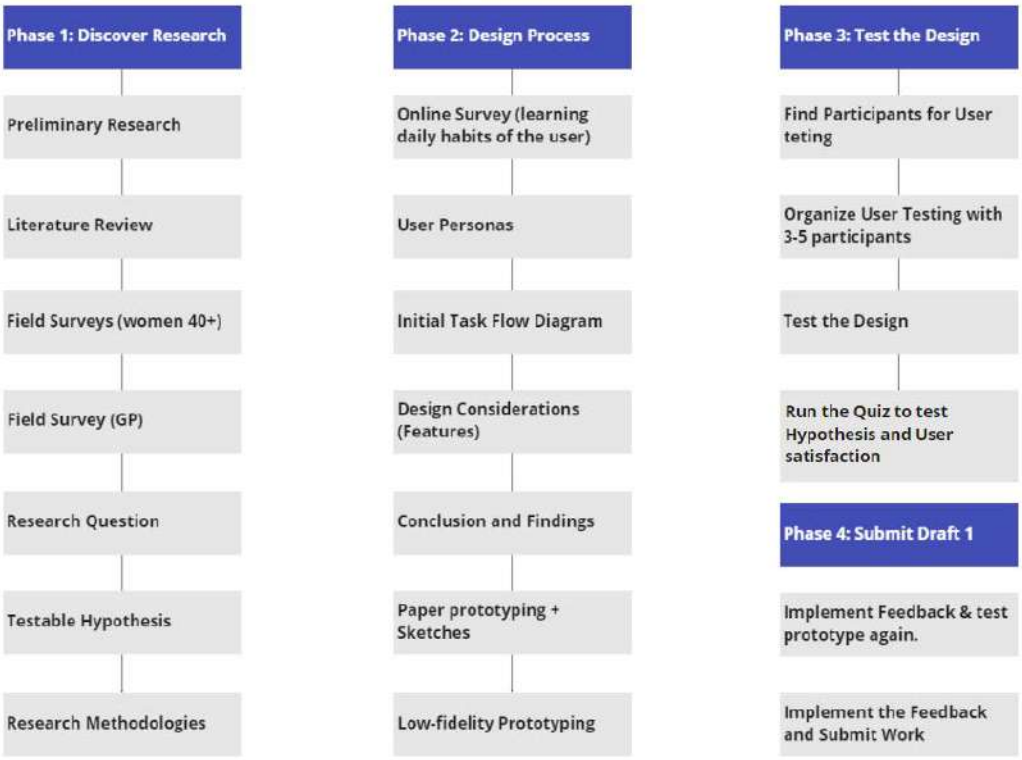

Figure 1: Thesis Structure, produced by researcher using Miro Boards.

words are expected from each chapter. (Appendix I for brainstorming)

Phase three (July) – Involves building the artefact, user testing, evaluation, and updates. Each topic was broken down into the expected word count. Phase four is the final; Thesis Draft (all chapters) submited for feedback; while awaiting the Feedback, there will be sufficient time to improve the artefact performance. Once the Feedback is received, implementations and any changes until August 30th can be made to the research project. Figure 1 demonstrates the visual presentation of thesis structure.

Chapter 2

Preliminary Primary Research

Introduction

This research examines the awareness of women aged 40+ regarding Osteoporosis and if the knowledge of this information triggers women to consider changing their habits. Based on the short survey conducted to validate the research question, it turns out that one-third of women (living in Ireland, 40+ years old) are not aware that Osteoporosis and Menopause are related to each other. There are currently many resources available on the Internet, such as blogs, books, magazines, and leaflets when visiting a Doctor or GP for preventing or reducing the risk of developing this disease. It is human nature to only deal with problems when the problem is at the doorstep and ready to get in through the door or already there in the living room, making itself comfortable. However, even when presented with new information related to health improvement, people are prolonged to adopt new habits even though it will potentially affect their quality of life (McCloskey et al. 2020). This study aims to look at how to present this information to stick with people and lead to new healthy habit formation.

Validation of the Research Question

Field Survey, conducted on 28.05.2021

Validating the research question, a field survey was carried out. The survey consisted of two questions only which will help to determine the direction of this research.

Questions asked (link):

1.Are you aware of the dangers of Osteoporosis and how it is linked with Menopause? (Options: Yes, No)

2.Where would you find your information regarding this issue? (Options: Doctor or

GP, Blog Post, Books, Magazine, App)

This questionnaire was published using personal LinkedIn and Facebooks accounts and multiple forums, asking participants to participate in this questionnaire.

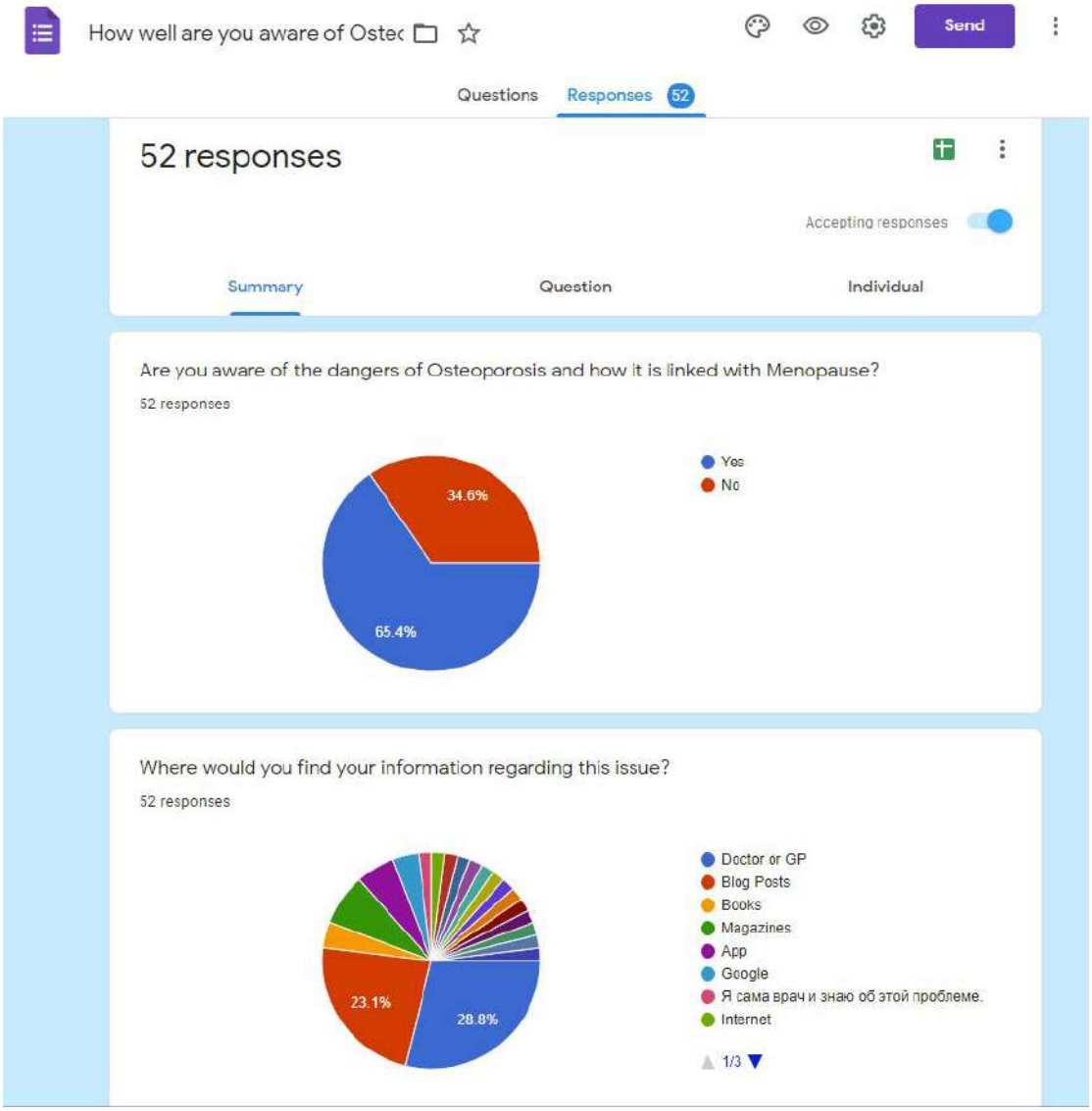

Figure 2: Thesis Structure, produced by researcher using Miro Boards.

The results (from 52 participants) reveal that 18 (34.6%) are not aware that Osteoporosis and Menopause are linked. Also, 15 women (28.8%) are looking to find information from a doctor or GP, eight women (23.1%) use blog posts as a source of knowledge and multiple different answers for the rest of the participants.

Findings from survey 1, 2, 3 and the themes that emerged.

Survey 1. Based on the short field survey directed to participants living in Ireland (results can be found in Appendix A), using social media such as Facebook and LinkedIn, it turns out that 34.6% (18 participants) are not aware that Osteoporosis and Menopause are linked. From the same questionnaire also follows that 28.8% (15 participants) would prefer to learn about this information from their General Practitioner. In comparison, 23.1% (12 participants) use blog posts as a source of information, 7.7% (four participants) use magazines to learn about this information. The rest of the participants are widely varying in their responses. Because the preferred method of obtaining information is by a general practitioner, a second questionnaire has been launched aiming at general practitioners.

Survey 2. Aimed at General Practitioners (Ireland)

This survey was conducted to understand the current situation better and determine when doctors inform women about Osteoporosis. Scanning the Cervical Check website to collect General Practitioners email addresses, focusing on different regions of Ireland such as Dublin, Donegal, Cork, Galway, Tipperary, Laois, Carlow, Cavan, and Clare, in total 35 emails were collected. An individual email was sent out to invite GPs to fill out this questionnaire. Unfortunately; due to the recent Ransome attack on the HSE that took place in May 2021, the majority of the Irish systems were down, due to this attack, it was assumed that most people would add caution to opening "unknown" links. It was considered more viable to use a printed correspondence instead of electronic means of communication to improve the percentage of responses from general practitioners. Also, the email was sent out to the Irish Medical Organisation and Irish College of General Practitioners ICOGP, asking to distribute this questionnaire for the research purpose. The response from the ICOGP came back positive, and one doctor has completed the questionnaire and mentioned it would share with the

Patient information regarding the Osteoporosis condition									
Questions	Answers	1	2	3	4	5	6	7	8
When do you inform a female patient about the potential development of Osteoporosis condition?		Aged 50	At menopause	Around MP	55 years	After DEXA scan results	Premature MP	In the Pre Menopause	In her early 50's
			Has illness that can cause OP	Younger if low daily intake	Chronic disease			Low BMI	
					Starting specific medication			Ladies with Celiac disease	
Do you use any other means to present this information, such as a leaflet?		No (discussion)	Sometimes	No	No	Report to patient	No	No	I direct them to the website irish osteoporosis society
In an ideal world what would be the best way to deliver this information?	Face to face appointment								
	By a leaflet								
	By email								
	By a phone call								
	Consultation with the practice Nurse								
	Blog or Website								
	Workshops to educate women								
	Phone application								
	When a female turns a certain age an automatic text would be sent to inform them to make an appointment								
	Other								

Table 1: GP survey results, produced by researcher using Google Spreadsheets.

larger group. Additionally, this questionnaire has been printed and sent to 14 clinics, including the enclosed envelope with a stamp and a return address, to ensure enough data for this research, containing the following three questions.

The answers are organised using Google spreadsheets - this is the link. (more details can be found in Appendix B),

Question 1: When do you inform a female patient about the potential development of Osteoporosis condition?

The results show a variety of different answers, three GP's out of eight will inform a patient when she is 50+. Also, four out of eight GPs mentioned when the patient is around Menopause or Pre Menopause, plus three out of eight GP's would inform the

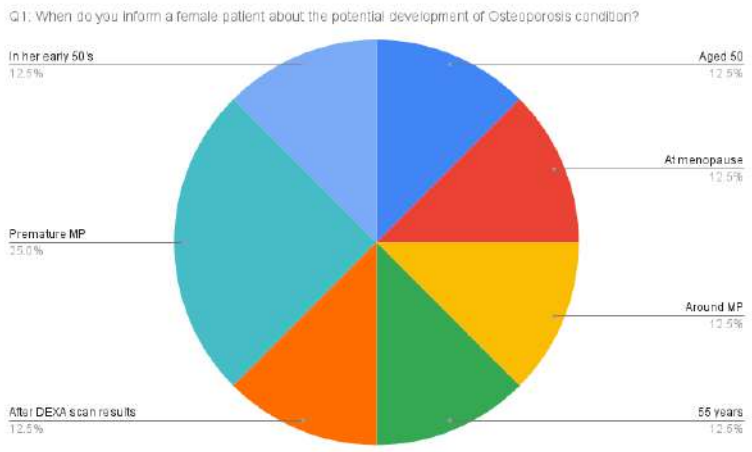

Figure 3: Question 1, Results. from Survey for GP.

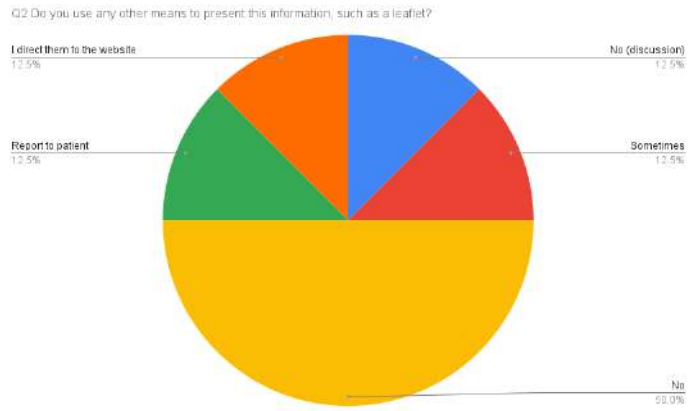

Figure 4: Question 2, Results. from Survey for GP

patient of Osteoporosis if she has an illness that can cause Osteoporosis or if starting a specific medication.

Question 2: Do you use any other means to present this information, such as a leaflet? The Results: Five out of eight GPs do not use any other means to present this information (for example, a leaflet). One answer indicates that sometimes other means are used. One answer indicates that the patient is being directed to the website of the Irish Osteoporosis Society, and one GP out of eight would report to the patient. (Figure 4)

Question 3: In an ideal world, what would be the best way to deliver this information? (Figure 4.1)

List of options: a) Face to face appointment, b) By a leaflet, c) By email, d) By a

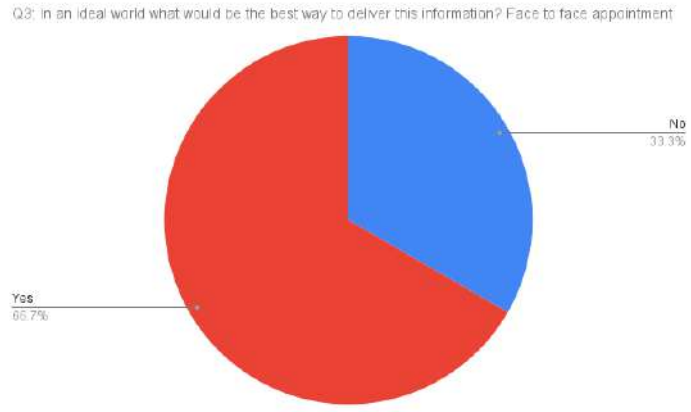

Figure 4.1: Question 3 (face to face appointments), Results. from Survey for GP

phone call, e) Consultation with the Practice Nurse, f) Blog or Website, g) Workshops to educate women, h) Phone application, i) When a female turns a certain age an automatic text would be sent to inform them to make an appointment.

The Results: Five out of eight GPs would prefer to use face to face appointments (figure 4) to inform their patient. Two out of eight would prefer an automated message to inform them to make an appointment (when a female turns a certain age) - workshops to educate women – two out of eight. Table 1 demonstrates organised returned forms from general practitioneers.

Survey 3 "Survey for Women 40+ living in Ireland". Link

This survey was conducted to understand user's daily habits better. Along with multiple questions related to the daily habits, the question – "Are you aware of the dangers of Osteoporosis and how it is linked with Menopause?" has been purposely repeated to confirm the assumption that there is a need for this research. The total summary of results has changed – 29.3% (out of 92 participants) are not aware of this problem, comparing to the first Survey showing 34.6% (out of 52 responses) who are not aware.

However, after the further investigation of Survey 3, the responses were checked individually because the age of participants varied from 40-45, 46-51, 52-57 and other (up to 70 years of age), and it is worth knowing the percentage of unawareness of the

				Count	Column N %
age	40 - 45	aware of Osteoporosis	No	16	41.0%
			Yes	23	59.0%
	46 - 51	aware of Osteoporosis	A little bit but not much	1	3.2%
			No	10	32.3%
			Yes	20	64.5%
	52 - 57	aware of Osteoporosis	No	1	6.7%
			Yes	14	93.3%
	58	aware of Osteoporosis	Yes	2	100.0%
	59	aware of Osteoporosis	Yes	1	100.0%
	60	aware of Osteoporosis	Yes	2	100.0%
	65	aware of Osteoporosis	Yes	1	100.0%
	70	aware of Osteoporosis	Yes	1	100.0%

Table 2: Unaware of Osteoporosis 40 - 51 years of age, SPSS

younger group (40-45 and 46-51 years old). As a result of this, it turns out that 46.1% (out of 39 participants aged 40-45) are not aware of this problem. Also, 31% (out of 31 participants aged 46-51) are not aware of Osteoporosis and Menopause being linked. An average of 40.8% (71 participants, aged 40-51) is not aware of Osteoporosis and Menopause linked. See table 2 for results.

Only one (6%) participant out of 10 are not aware of this problem from the 52-57 age group. According to the GPs responses, anyone aged above 50 should have been informed of this issue and recommended taking lifestyle precautions. (see Appendix C)

Chapter 3 - Literature Review

Introduction

Osteoporosis and, consequently, fractures caused by low bone density leads to a change in the quality of life and sometimes fatal outcomes. It also puts significant pressure on health systems and the general population. One of the reasons for this condition is ageing. However, it is also noted by Clynes et al. (2019), Cooper et al. (2011), Boutayeb (2006), that in developing countries, the Western lifestyle prevails, which leads to an aggravation of the situation of Osteoporosis worldwide. Some choices which are influenced by lifestyle itself can become a habit, which can be detrimental to one's health in the long term.

It is vital to adjust the lifestyle in a healthy way, so it improves populations health and habits rather than the widespread increase of fast eating, high alcohol consumption, and low activity levels, which are contributing factors in increasing the chance of Osteoporosis. "The epidemiology of Osteoporosis" study by Clynes et al. (2019) - concludes that only a small proportion of people with Osteoporosis are being treated. Therefore, resources should be focused on identifying those most affected by Osteoporosis to decrease the risk of fracture.

This conclusion coincides with an Irish study by Carey et al. (2021) - "Vertebral Fractures in Ireland: A Sub analysis of the DXA HIP Project" (a total of 1296 participants aged 40 and above, including 1042 women). The study highlights that the presence and importance of Vertebral Fracture for patients are grossly underestimated. It is common for healthcare professionals to dismiss patients with milder symptoms before finally getting imaging to confirm their diagnosis. The study by Carey et al. (2021) also notes the Osteoporosis has steadily increased with age, especially among women,

from 16.1% among those aged 40-49 to 41.3%.

This literature review is divided into five theme areas. Each theme is contributing relevant information and findings based on the previous research.

- Education through technology – explores what methods have been proven to succeed in educating older adults using technology.
- Motivation methods in female adults using technologies – Examines and compares motivational methods used to encourage female adults to adopt a change in their lifestyle.
- Methods used for behavioural change in female adults – look at techniques used across different areas to support women in behavioural change.
- Gamification in Behavioural Design and Emotion – explores findings of previous research in the area of gamification and its connection to emotions.
- Technology review - supports the decison for device.

The themes for the literature review were selected based on the following factors. The field study conducted during this research supports that 34.8% (out of 52 participants) are not aware that Menopause and Osteoporosis are linked. Therefore, education through technology could be a vital link in spreading the information to the right target audience and is something worth observing. In addition, Prochaska & DiClemente 1986, points to five stages of changes. The first three (Preliminary, Preparation, Reflection and Preparatory Stages) are crucial to inform and make the user think about changes to the lifestyle for example. With the right and timely impact, it is possible to translate these stages into advanced stages (the action stage is the behaviour in a new way, but less than six months and the maintenance phase is when the new behaviour is repeated for more than six months). Awareness of the problem can provoke the first stage of changes, preliminary preparation.

The next theme that emerges from education through technology is the - “Motivation

methods in female adults using technologies" - (Knippenberg et al. 2021) exploring this area will help identify significant factors that can help change the attitudes. According to Norman (2003), the attitudes act as a gate to decision making and are a root cause for behaving in a certain way; thus, adjusting this can trigger an individual to reconsider their behaviour.

"Knowing is not enough; we must apply. Willing is not enough; we must do." - Johann Wolfgang von Goethe (1749-1832), German Philosopher. It is no secret that knowledge is not enough to implement a change to something; a person also needs to apply the appropriate action. Thus, observing the "Habit formation for female adults" theme is a logical and required link.

The theme of Gamification in Behavioural Design and Emotion emerged for this thesis for the following reasons. First, the study "The importance of Psychosocial Aspects in the Formation of New Healthy Lifestyle Habits in Adult Women: A Qualitative Study" by Palevičiūtė et al. (2021) shows how much impact emotions have on the habits that women choose to develop. Second, a study by Knippenberg et al. (2020) perceived that seniors expressed a sense of joy, stating that they liked the "game", which means a gaming environment can create a positive experience.

1. Education through Technology

1.1 The Osteoporosis treatment gap in patients at risk of fracture in European primary care: a multi-country cross-sectional observational study.

This cross-sectional observational study by McCloskey et al. (2020), conducted in eight European countries (Ireland was one of those eight countries), found a substantial gap in the treatment of women ≥ 70 years old with an increased risk of fracture. Approximately 500 patients were enrolled from each country, with 18-25 locations.

The study by McCloskey et al. (2020), Kanis et al. (2017), Cipriani et al. (2018), link this gap to a low level of diagnosis of Osteoporosis. The absence of Osteoporosis diagnosis plays an important contributing factor for fractures (McCloskey et al. 2020). Overall, a half were at increased risk of fracture, of which three-quarters did not receive any Osteoporosis medication. However, Ireland showed the lowest gap in treating patients with prior hip fracture, with Switzerland (88%) and Germany (94%) being the highest (McCloskey et al. 2020). This conclusion contradicts the Irish study by Carey et al., (2021) - "Vertebral Fractures in Ireland: a sub-analysis of the DA HIP project" (a total of 1,296 participants aged 40 years and older, including 1,042 women). According to this study, Ireland shows one of the highest rates of hip fractures in the world. Also, clinical fractures impact the quality of life, morbidity, and mortality as hip fractures Cauley et al. (2000), Nevitt et al. (2000), Svedbom et al. (2018). According to Schousboe (2016), Jackson et al. (2000), Kendler et al. (2016), Kelly et al. (2020) the presence and importance of vertebral fractures are significantly underestimated.

It is important to note that inadequate media information related to Osteoporosis and its treatment is also associated with low awareness of the disease and, as a result, low treatment rates (Compston et al. 2019 and Carey et al. 2021). Meaning the new strategies will likely need to be implemented to close the treatment gap, especially in older women. Raising awareness, facilitating risk assessment and treatment are likely to play a prominent role in achieving lower rates of Osteoporosis - (Compston et al. 2019, Carey et al. 2021, Clynes et al. 2020). For example, establishing fracture liaison services in primary or secondary care settings increases BMD (bone mineral density) uptake. The impact of treatment is associated with a reduced risk of fractures. Solutions based on education and information technology can contribute to the destruction of risk assessment and can be an essential step.

1.2 Theoretical Education and Counselling in Osteoporosis Prevention Program for Women

"A patient education program is one way of involving patients in medical decision-making" – (Nielsen et al. 2010, page 155). A study - "Patient education in groups increases Osteoporosis knowledge and adherence to treatment; A two-year randomized controlled trial" by (Nielsen et al., 2010) concludes; that no increase in knowledge is associated with more significant commitment. It also shows that learning is not a simple transfer of knowledge. This can mean that to achieve good results from learning new knowledge, a repetition of new habit should be performed. Further research on individual experiences in educational programs and their benefits will help get to the expected results (Nielsen et al. 2010).

A study by Asli Kalkim, RN, PhD, (2016), showed that after the training and counselling program, there was a significant increase compared to the control group in the mean scores of the intervention group on the Osteoporosis Knowledge Test. The outcome showed the impact of an Osteoporosis prevention education and counselling program on a health belief model conducted by nurses. The counselling part of Asli Kalkim, (2016), study was performed using physical visits, phone calls and email. The next study will investigate the counselling and motivation methods using technology, examining how effective this method is regarding in forming new habits to offset/prevent Osteoporosis. This information will contribute to further studies that aim to educate and motivate women to look after their bone health.

2. Motivation methods in female adults using technologies

According to Ryan & Deci, (2000), there are two types of motivation known: intrinsic motivation and extrinsic motivation. Intrinsic motivation is explained as behaviour

performed for internal satisfaction and not for any particular result. When a person is internally motivated, he/she acts on the behaviour because of pleasure, not because of external pressure or prizes. Extrinsic motivation refers to the moment at which an action is performed to achieve some divisible result. Accordingly, extrinsic motivation itself differently concerning intrinsic motivation, which hints at acting only for the sake of happiness about the action itself, as opposed to its instrumental value.

2.1 Behaviourism and Conditioning.

Behaviourism was formally founded by John B. Watson in 1913.
Behaviourism is known as behavioural psychology, is a learning theory based on the belief that all behaviours are obtained through conditioning. Conditioning occurs through interaction with the environment. Behaviourists believe that our responses to external stimuli shape our actions (Krapfl, 2016). According to this thought, behaviour can be studied in an observable way independently of internal mental states (Abramson, 2013). Also, according to this point of view, observed behaviour should be considered - cognitions, emotions and moods are too subjective.

Strict behaviourists believe that any person can be trained in any task, regardless of genetic origin, personality traits and inner thoughts, within the limits of their physical capabilities. It only requires correct conditioning.
According to behavioural psychology, two main types of conditioning exists classical conditioning and operant conditioning.

Classical conditioning is often used in behavioural learning that combines a neutral stimulus with a natural incentive. Eventually, the neutral stimulus elicits the same response as the natural stimulus, even without performing the natural stimulus itself. Throughout three different phases, the associated stimulus becomes known as a conditioned stimulus and learned behaviour as a conditioned response (Rouleau et al.,

2016). The classic conditioning process works by establishing an association between an environmental stimulus and a natural stimulus.

In classic experiments by physiologist Ivan Pavlov, dogs associated food delivery (what naturally and automatically triggers a salivary response). First with the sound of a bell and then with the appearance of a white lab technician's coat. After all, the lab coat alone triggered a salivary reaction in the dogs (Vanelzakker et al., 2014).

A response is established and amplified during the first part of the classic conditioning process known as acquisition. Factors such as the importance of incentives and presentation timing can play an essential role in how quickly an association is formed. When the association disappears, it is called disappearance, with the result that the behaviour gradually diminishes or disappears. Factors such as the strength of the initial reaction can play a role in how quickly extinction occurs. For example, the longer response has been conditioned, the longer it may take for it to fade (Kehoe 2006).

The **operant conditioning** is a teaching method accomplished through reinforcement and punishment. Through operant conditioning, a link is established between a behaviour and the consequences of that behaviour. When the desired outcome follows an action, this behaviour is more likely to repeat itself in the future. On the other hand, reactions followed by unfavourable consequences are less likely to repeat in the future (Staddon et al., 2003). The behaviourist B. F. Skinner described operant conditioning as to how learning can occur through reinforcement and punishment (Staddon 2003). Notably, a person learns by forming an association between a particular behaviour and the consequences. For example, if a parent compensates their child with praise each time, they clean up their toys, the aspired behaviour is consistently enhanced. Resulting in the child is more inclined to clean up the mess. Reinforcement plots are essential for operant conditioning. The process seems straightforward — observe the behaviour and then offer a reward or punishment. However, Skinner found that the timing of these rewards and punishments has an important influence on how quickly

new behaviours are acquired and the strength of the response (Staddon 2003).

Continuous reinforcement includes rewards for each behaviour. It is often used at the beginning of the operant conditioning process. However, as a person learns the behaviour, the graph may switch to partial reinforcement. Partial reinforcement means offering a reward after a series of responses or after a specified time. Sometimes, partial amplification occurs on a sequential or fixed schedule. In other cases, a variable and an unpredictable number of responses must occur before reinforcement is received.

Influence and impact

Several thinkers have influenced the psychology of behaviour. In addition to those already mentioned, several eminent theorists and psychologists have left an indelible mark on behavioural psychology. These include Edward Thorndike, a pioneering psychologist who described the law of effect, and Clark Hull, who proposed the drive theory of learning.

There are some behavioural psychotherapeutic methods. Although behavioural psychology has become more secondary after 1950, its principles are still important. Even today, behaviour analysis is used as a therapeutic method to help children with autism, and developmental delays acquire new skills. For example, this often includes processes such as shaping (encouraging a closer approximation to the desired behaviour) and linking (breaking a task into smaller pieces, then learning and combining the next steps) (Schreibman et al., 2015).

3. Habit formation for female adults.

According to Rubin (2015), a habit is a repetitive action that usually develops without much awareness or intentional and is achieved by repetition. Habit (automatic response to specific signals) and its formation depend on behaviour. Habit formation is

dependent on each individual (Lally & Gardner 2013). Nevertheless, research has also shown that approximately 66 days is when it takes to form a habit (Laly et al. 2010). A study by McCloskey and Johnson (2019) argues that habit development depends on three individually functional elements – frequency of behaviour, contextual stability, and reward, which were first mentioned in Wood and Neal (2016). As mentioned earlier, each element can work individually, but if all three elements are included in the habit formation process, the habit will most likely develop. Their article shows significant evidence that rewards influence habit formation (Wood & Neal 2016).

3.1 The importance of Psychosocial Aspects in the Formation of New Healthy Lifestyle Habits in Adult Women: A Qualitative Study.

"The importance of Psychosocial Aspects in the Formation of New Healthy Lifestyle Habits in Adult Women: A Qualitative Study" by (Palevičiūtė et al. 2021) has shown that women who were joyful and happy wanted to repeat and continue their chosen habits. An analysis of the diaries showed that self-efficacy was more critical in the first month of habit formation. Thus, as Shi et al. (2015) argued, it can be assumed that when a person is in the maintenance phase[1], or a habit becomes an everyday behaviour, self-efficacy[2] is no longer necessary. Self-efficacy after exercise is significant in affective states, which means that both are interdependent. This study also shows that the influence of emotional factors on actual work is independent of self-efficacy, although the two are related. Participants frequently mentioned the need for social support from family, friends in the diaries. Women wrote how well they feel when supported by friends, family members, or loved ones. Social support is an essential psychological aspect that guides women towards a comfortable and happy life (More-

[1] **Maintenance phase** – "A regimen intended to preserve benefit. Compare: compliance, adherence. The extent to which the patient continues good health practices without supervision, incorporating them into a general lifestyle. Maintenance. 2012. TheFreeDictionary.com. Available from: https://medical-dictionary.thefreedictionary.com/maintenance [Accessed July 30, 2021].

[2] **Self-efficacy** – "Is the belief in one's own ability to successfully accomplish something" (Bandura, 1994) - How important is self-efficacy to our students' success? 2018. Perspectives in Teaching & Learning. Available from: https://sites.wit.edu/lit/how-important-is-self-efficacy-to-our-students-success/ [Accessed August 3, 2021].

no-Murcia et al. 2017).

The result also demonstrates that the motivation is consistent with (Linenbrink-Garcia et al. 2016) asserting how motivation informs us about abilities, desires, and attitudes toward goal achievement. However, emotions tend to be much more intense and are associated with behavioural outcomes or ongoing performance (Perkun et al. 2007). This study shows how much of impact emotions have on the habits that women choose to develop; either anger, sadness, joy, surprise, or fear; all emotions influenced whether to carry out the habit or not. For example, pleasure is a positive emotion associated with intrinsic forms of motivation (Deci & Ryan 2002; Linnenbrink-Garcia et al. 2016). People who are externally motivated tend to be less active and more likely to give up what they started (Standage et al. 2003; Yli-Piipari et al. 2009).

3.2 Habit formation and change

Carden et al. (2017), looks at how our conception of how to change a habit is transformed by research on self-control and how environmental forces contribute to habit change. Also, the study highlights recent research using innovative technologies to learn about the formation and change of habits outside the laboratory.

According to the habit discontinuity[3] effect, behaviour change interventions are more moving during life course change that disrupt habit cues, such as moving house, having a child, and changing jobs – (Walker et al. 2015). This can mean that women around the age of 40 are close to irreversible age-related change; menopause - potentially means that women around this age can be ready to adopt new habits to promote longevity.

Innovative technology such as a smartwatch can effectively change a habit because it can act almost as a coach, reminding the user to perform the activity (Carden et

[3] **Habit discontinuity** - The article by Verplanken B, Roy D – "Empowering interventions to promote sustainable lifestyles, testing the habit discontinuity hypothesis in a field experiment" (Environ J. Psychol, 2016), describes a field experiment that tested the effect of breaking habits - measures to change habits are more effective during life cycle changes (for example, moving to a different home). 800 households were randomly assigned to conduct sustainable behaviour interventions. The intervention was more effective for those who have recently moved.

al. 2017). When a reward is being experienced, sensory representations that predict reward are prioritized. The sensory representations can reflect stimuli, from simple visual objects and locations to complex objects and scene semantics and various sensory modalities – (Anderson 2016).

4. Emotional Design and Gamification

4.1 The art of emotion – Norman's three levels of emotional design

Donald A. Norman argues that the emotional side of design may be more critical to a product's success than its practical elements. The book "Emotional Design Why We Love (Or Hate) Everyday Things" by Norman (2003) highlights the three different aspects of design (figure 5).

- Visceral design – concerns itself with appearance,
- Behavioural design – has to do with the pleasure and effectiveness of design,
- Reflective design – considers the rationalization and intellectualization of a product (Norman 2003).

Emotions complete the experience of functional design, along with aesthetics, attractiveness, and beauty. Reasoning and emotional reaction may have different (argue with each other) opinions. Norman points out that the problem is that we still let logic

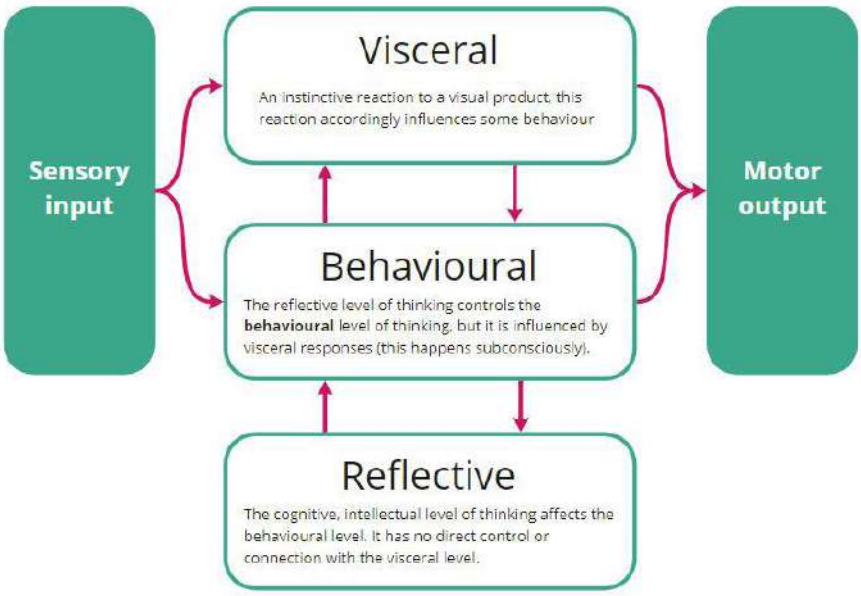

Figure 5: Three levels of Emotiona Design ("Emotional Design Why We Love (Or Hate) Everyday Things" *Norman 2003).*

make decisions for us. Without emotions, the decision-making would be impaired. The neurochemicals modify perception, decision-making, and behaviour. Emotions and the nervous system go hand in hand. The emotional design comes out of studies of affective science; it is based around an idea of how emotion is elicited and how the concept can be applied in the design process.

Affect – In English, the word "affect" means "to make a change." In science, and especially in psychology, "affect" refers to a special kind of influence — the ability of something to influence your mind in a way that is related to your body. In modern psychology - "affect" refers to the mental analogue of internal material representations associated with emotions, actions involving a certain degree of motivation, intensity, and strength. (Barrett and Bliss-Moreau 2009).

Visceral – is all about automatic prewired condition or state inside of someone's brain, unconscious response to an image or a picture. The visceral element considers the appearance, how the product looks, the colours, the typography used a range of different visual elements, how they feed into the product, and how this appearance might be relevant to someone's emotions (Norman, 2003).

Behavioural – is about the part of the brain that engages with behaviour, eliciting action from someone. The behavioural design considers the pleasure and effectiveness of using the product; this can be a particular sound while using a product or materials of the product, how the features feel when the user interacts with them. (Norman, 2003).

Reflective – is more contemplative, something that might repeat, something that people might consider after they have experienced something. The reflective design considers self-image; it is a relationship between the visceral and behavioural re-

sponses and how the user thinks and feels after using the product (Norman, 2003). It is relevant to personal satisfaction and memory. (Norman, 2003).

The above three elements, visceral, behavioural, and reflective, should be considered at the design stage. The emotional design aims to create a positive association with the product which in return will retain the users.

4.2 Gamification

Definition: *"The word refers to incorporating game elements, like point and reward systems, to tasks as incentives for people to participate. In other words, gamification is about making something potentially tedious into a game. Gamification is effective because it taps into people's natural desires for competition and achievement. Teachers, managers, and others use gamification to increase participation and improve productivity. Gamification is also often an essential feature in apps and websites designed to motivate people to meet personal challenges, like weight-loss goals and learning foreign languages; tracking the progress is more fun if it feels like a game"*. - Merriam-Webster Dictionary. 2021. Merriam-webster.com. Available from: https://www.merriam-webster.com/dictionary/gamification#note-1 [Accessed August 9, 2021].

Gamification is used to create positive behavioural changes in social change (Recyclebank, 2004) or education (Stack Overflow 2008; Decker & Lawley 2013). It may even seem that if the action is framed to look like a game, some positive feedback can be obtained (Lieberoth 2015).

Good design builds on the experience-driven approach as suggested by designers (Hunicke et al. 2004; Garrett 2010; Huotari and Hamari 2012), which directly considers the end-user experience.

"Gamification tactics that rely on linear functions leading to external rewards that are not related to the activity do not provide the long-term benefits of gamification to users; they focus on increasing the organization's bottom line in the short term." – Nicholson (2012).

4.3 Gamification as a way of facilitating emotions during information-seeking behaviour: a systematic review of previous research.

Gamification refers to converting systems, services, products, organizational structures, or implicitly any activity that produces an experience similar to that used by games in game design (Hamari 2020). The use of technology can be closely related to affective processes, both with the help of technologies that change the emotional state and emotions that change the patterns of using technology (Ahmed and Johnson 2021).

For positive intrinsic motivation, various methods of encouragement have been identified, such as visual demonstration of the consequences of behaviour in the game, text feedback, praise or reproach from game characters, forms of external audio or visual motivators (Witt, et al. 2012; Burke et al. 2014; Hamari et al. 2015). Findings related to the consequences of an agreement on behaviour, emotional engagement, and perceived pleasure of the player (individual user) are the most studied similar context during emotional interaction. (Amira et al. 2021).

The gamified system has played a vital role in positive user attitudes, resulting in effective learning outcomes (Deterding et al. 2011; Jibril et al. 2013; Hamari et al. 2015; Hamari et al. 2017; Chou et al. 2016; Du et al. 2019; Landers 2014). Six records reported that gamification provides emotional connection and engagement when applied to various scenarios, such as empathy for customers, employee performance, and a positive system assignment (Ahmed and Johnson 2021).

When people are happy with their activities or have positive emotions in completing gamified tasks, they tend to do their job better. This is reflected in their behaviour, fun, entertainment. (Deterding et al. 2011; Jibril et al. 2011; Hamari et al. 2015; Landers 2014).

Results relate to user experience, perceived positivity, challenge, and vulnerability and arise from the interaction of individuals with their gamified environment. (Deterding et al. 2011; Hamari et al. 2017; Chou, et al. 2016). In particular, this feedback is related to whether their expectations were met or not (Ahmed and Johnson 2021). For example, studies by Wolf et al. (2018) and Du et al. (2019), specifically identified a positive outcome for user's sense of self-efficacy, while Jibril et al. (2013) focused on the negative outcome of fatigue or boredom. In addition, research by Zhang et al. (2008) and Liu et al. (2017) found that gamification elements created competing conditions and positively affected the cooperation of individuals in e-learning.

4.4 The Octalysis Gamification Framework

The Octalysis Gamification Framework (Figure 10) implies eight main aspects, representing the necessary elements for creating a user experience. After many years of testing and tweaking, Yu-kai Chou believes that, apart from the ninth hidden drive

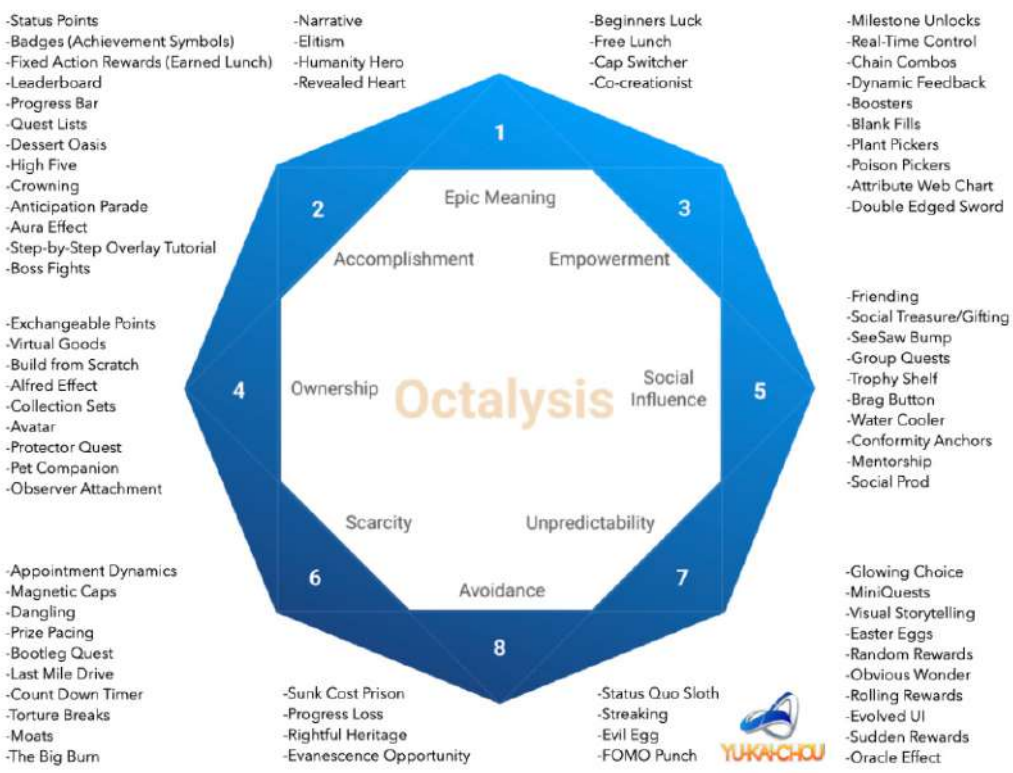

Figure 10: Octalysis: Complete Gamification Framework - Yu-kai Chou. 2020. Yu-kai Chou: Gamification & Behavioral Design. Available from: https://yukaichou.com/gamification-examples/octalysis-complete-gamification-framework/ [Accessed August 3, 2021].

called “Sensation”, everything the user does is based on one or more of the eight main drives. - Yu-kai Chou (2021).

“Gamification is designed that places the most emphasis on human motivation in the process. In essence, it is Human-Focused Design (as opposed to “function-focused design”)” - Yu-kai Chou (2021).

Generally, to apply this framework, it is recommended to include at least one of the core drivers demonstrated below.

For this project following core-drivers are considered for the application.

1. ***Epic Meaning and Calling***

- Narrative - this is a Drive-in in which the player believes that he is doing something more than himself or “chosen” for something. (Yu-kai Chou 2021)

2. ***Development and Accomplishment, using the following features.***

- Progress Bar
- Step-by-step overlay tutorial
- Badges
- High five

The word “challenge” plays an essential role because badges or trophies bring meaning when they are earned by overcoming a challenge. (Yu-kai Chou 2021)

3. ***Empowerment of Creativity and Feedback***

- Instant feedback
- Milestone unlocks.

People need to see the results of their efforts, receive feedback, and respond to it. (Yu-kai Chou 2021)

4. ***Ownership and Possession***

- Avatar
- Virtual Goods

“This is the drive that users are motivated on because they feel like they have earned

something." - Yu-kai Chou, 2021. When the user spends extra time customizing their profile, the user feels more ownership towards it. (Yu-kai Chou 2021)

5. ***Social Influence and Relatedness***

- Brag Button
- Friending

This drive includes all the social elements that drive people, including acceptance, social reactions, friendships, competition, and jealousy. (Yu-kai Chou 2021).

6. ***Scarcity and Impatience***

- Countdown Timer - It is the urge to want something because the user cannot have it. The fact that users cannot get something right now motivates them to think about it all day. (Yu-kai Chou 2021).

7. ***Unpredictability and Curiosity***

- Visual Storytelling - If the user does not know what to expect or what will happen, their brain is busy; and often think about it. (Yu-kai Chou 2021).

8. ***Loss and Avoidance***

- Progress Loss - This tendency is based on avoiding something negative. On a small scale, this would be done to avoid losing previous progress. (Yu-kai Chou, 2021).

4.5 Where do you starts when designing for behavioural change?

Prochaska et al. (1983), identified different levels of "change readiness", introducing the concept of five to six different stages of change. Having information about how ready someone is, it is possible to conclude what to expect, meaning that the situation can be managed more efficiently. Insisting on actions that people are not ready for can lead to resistance.

Five stages of change (illustrated on Figure 11).

1. **Preliminary preparation:** when there is no intention to change a specific behaviour soon (about six months), people may not know that there is problematic

behaviour to face or lack the confidence to change. This stage is the most difficult.

2. **Contemplation:** people become more aware of the need for change, intend to take some action over the next six months (this does not always mean that they will) and ponder everything in their heads.
3. **Preparation:** unlike reflection, at this stage, people have a solid intention to act over the next month and even take concrete steps towards change, rather than just

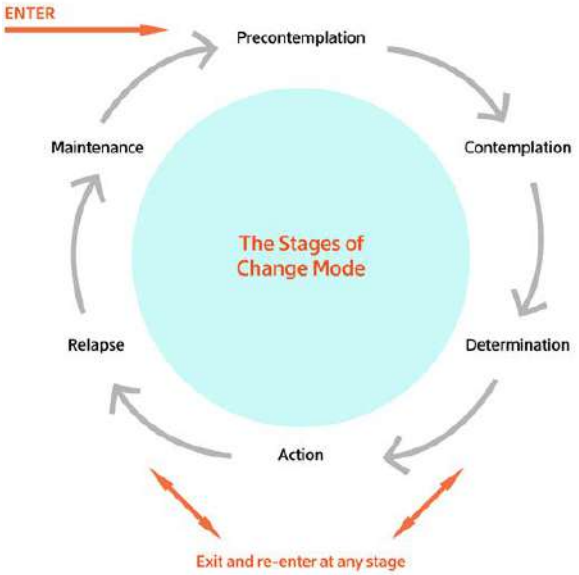

Figure 11: five satges of change

thinking it through.

4. **Action:** when people began to behave in a new way but less than six months.
5. **Maintenance:** includes those who behave this way for more than six months. It is crucial to develop solutions for those at the beginning of behavioural changes and

Age group	Number of patients	Percentage
40–49	8	2.7%
50–65	80	26.7%
66–79	133	44.4%
80+	79	26.3%

Table 3: Break down of participants by age group. Ali ZC, Shakir S and Aslam TM. Perceptions and use of technology in older people with ophthalmic conditions [version 2; peer review: 2 approved]. F1000Research 2019, 8:86 (https://doi.org/10.12688/f1000research.17181.2)

encourage them towards adapting to the new habits.

5. Technology Review for Women 40+

5.1 Perception and use of technology

The objectives of the study "Perception and use of technology in older people with ophthalmic condition" by Zaria et al. (2019) were to evaluate the perception and use of common computer technologies by any ophthalmological patient 40 years of age

Age group	% of participants in each age group that use technology,
40–49	100%
50–65	98.4%
66–79	88.5%
80+	58.6%

Table 4: Break down of participants by age group. Ali ZC, Shakir S and Aslam TM. Perceptions and use of technology in older people with ophthalmic conditions [version 2; peer review: 2 approved]. F1000Research 2019, 8:86 (https://doi.org/10.12688/f1000research.17181.2)

or older. The methods used were interviews using questions designed to measure the patient's perceptions, attitudes and experiences with technology. However, the main focus group was patients over 50 years; for comparison reasons, the patients over 40 were also included; this is the main focus group for this research. Of 300 recruited

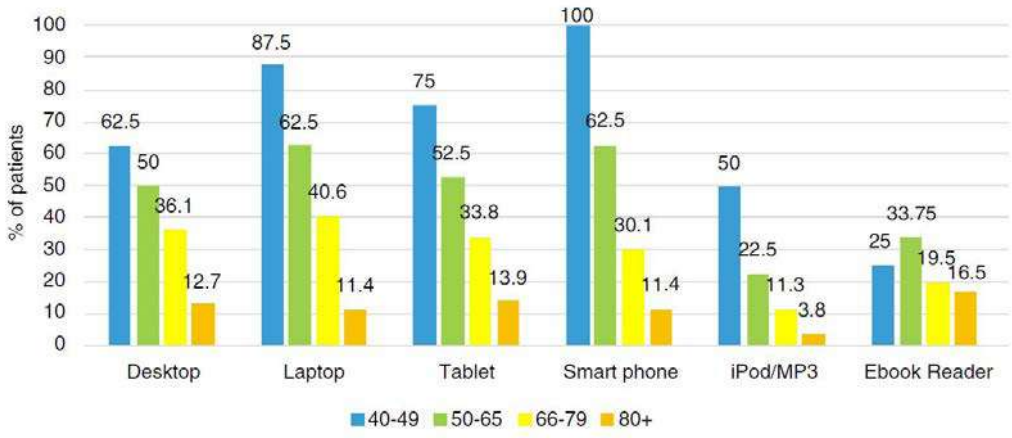

Figure 6: Technology devices used by different age groups. Ali ZC, Shakir S and Aslam TM. Perceptions and use of technology in older people with ophthalmic conditions [version 2; peer review: 2 approved]. F1000Research 2019, 8:86 (https://doi.org/10.12688/f1000research.17181.2)

patients, 2.7% (eight patients) were 40-49 years old (of 8 patients, 4 are female - table 3), (Table 4 shows that 100% of the 40-49 age group use technology).

To answer the second question: “Which of the following devices do you own?” - (Zaria et al., 2019), which was asked to determine the most useful device. The participant could select one of four choices for each device.

- own and use
- own but do not use
- plan to buy
- do not need

Figure 6 demonstrates that 100% of the 40-49 age group use a mobile phone (this

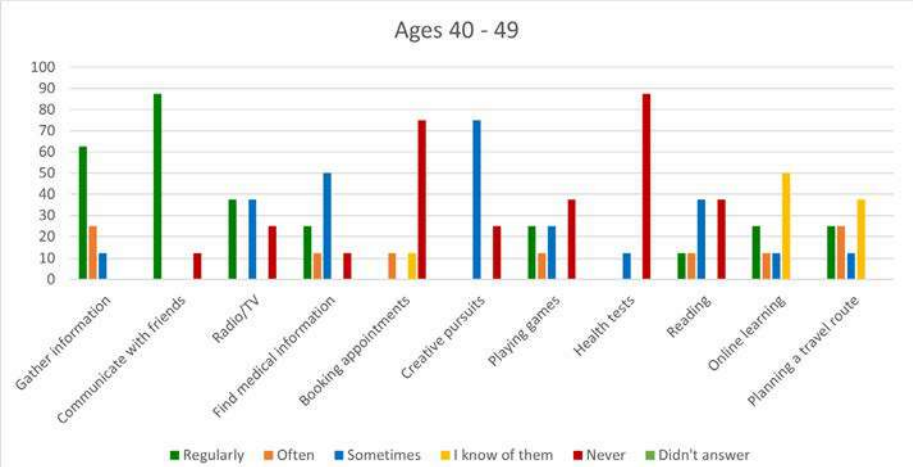

Figure 7: Technology devices used by different age groups. Ali ZC, Shakir S and Aslam TM. Perceptions and use of technology in older people with ophthalmic conditions [version 2; peer review: 2 approved]. F1000Research 2019, 8:86 (https://doi.org/10.12688/f1000research.17181.2)

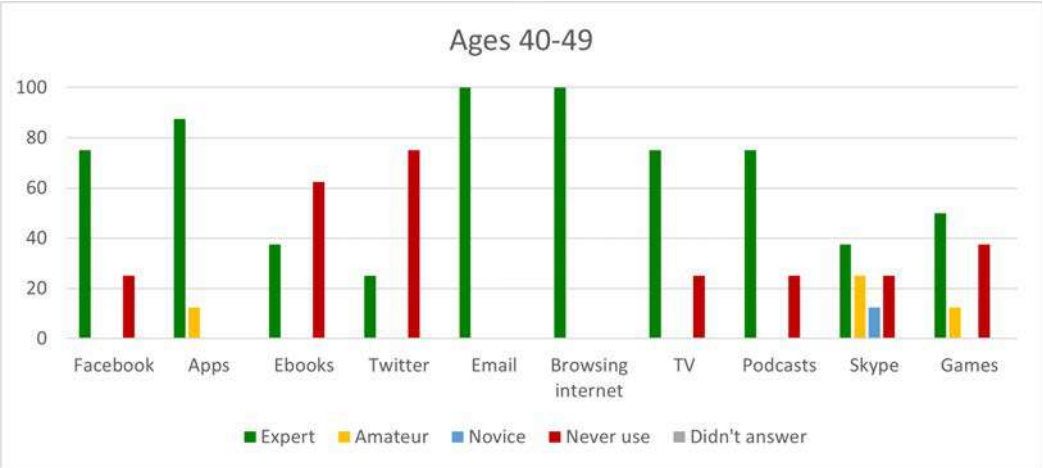

Figure 8: Technology devices used by different age groups. Ali ZC, Shakir S and Aslam TM. Perceptions and use of technology in older people with ophthalmic conditions [version 2; peer review: 2 approved]. F1000Research 2019, 8:86 (https://doi.org/10.12688/f1000research.17181.2)

coincides with this research), 87.5% use a laptop, 75% use a tablet, 62.5% use a desktop, 50% use an iPod, and 25% use an eBook.

The study "Perception and use of technology in older people with ophthalmic condition" by Zaria et al. (2019) kindly included links to the raw data not included in the research. The researcher accessed the data and particularly paid attention to the focused age group (40-49). Question three (figure 7) demonstrates different purposes that the desired age group is using technology. Table 8 shows the most common platforms that the 40-49 age group is using. Also, it was discovered that Question seven, was not discussed in the paper; this question represents how the user feels about the technology and appears very helpful for this research see figure 9.

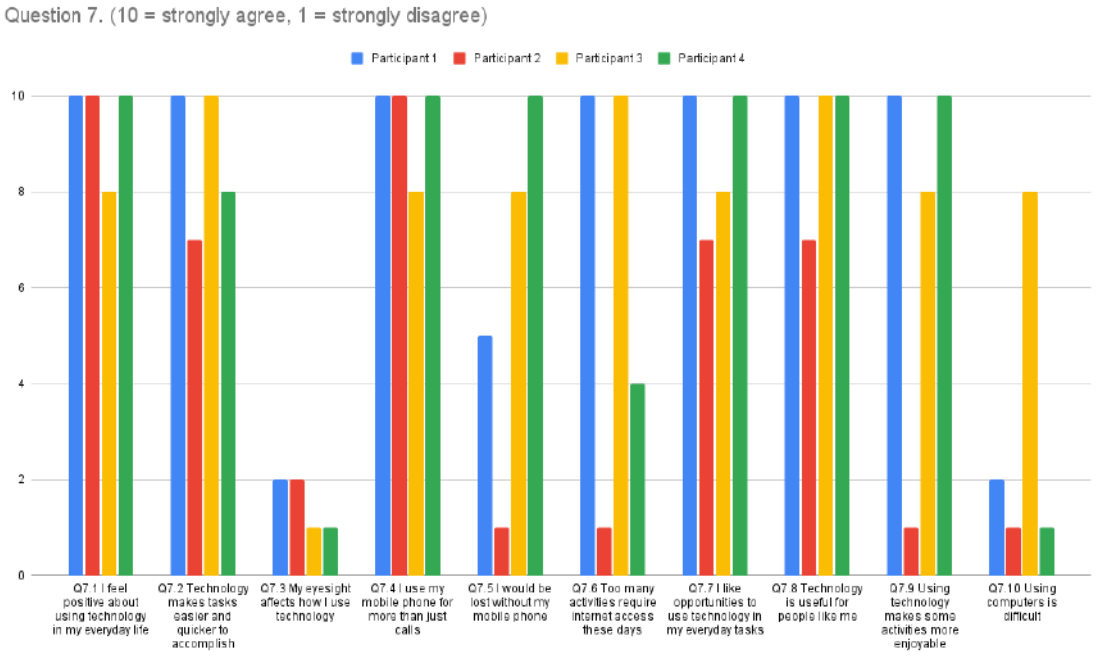

Figure 9: Technology devices used by different age groups. Ali ZC, Shakir S and Aslam TM. Perceptions and use of technology in older people with ophthalmic conditions [version 2; peer review: 2 approved]. F1000Research 2019, 8:86 (https://doi.org/10.12688/f1000research.17181.2)

The results obtained from Zaria et al. (2019) show that the mobile device is the most widely used when designing for this age group. Unfortunately, the sample group for the desired demographic is small. However, it demonstrates that the younger patient

groups (40-49) who regularly referred to the use of the technology also reported minimal difficulty in using a mobile device (Zaria et al. 2019).

5.2 Rise in search for mHealth apps 2021.

Organization for the Review of Care and Health Apps (ORCHA) is the world's leading application review service and provides application libraries for 70% of the National Health Service UK (NHS). (Report shows a rise in search for digital mental health apps 2021).

The report provides an insight into the country's national sentiment during the lockdown, showing that the search for apps on critical mental health issues has dramatically increased. With an increase in searches for anger, anxiety, and fear, searches for depression rose 156%, OCD rose 422%, and stress rose 113%. Those looking for digital support also looked for relaxation apps (437%) and mindfulness apps (2483% increase) (Report shows a rise in search for digital mental health apps 2021).

Lockdown resulted in a 6,500% increase in the number of doctors looking for applications to recommend and appointments, along with a sharp increase in the number of video and telephone consultations. (Report shows the rise in search for digital mental health apps 2021)

5.3 Mobile Health (mHealth) apps focused on menopause

Gkrozou et al. (2019) study the "Mobile Health (mHealth) apps focused on menopause: Are they any good?" show that women are more likely to use mHealth apps than men (9% vs 4%). The development of mHealth applications will potentially turn smartphones into useful medical tools, inevitably leading to better healthcare systems worldwide (Gkrozou et al. 2019). Providing consumers with medical devices to prevent certain diseases and even self-assess their current condition based on their needs (Gkrozou et al., 2019).

Simultaneously, though, there is an increasing concern about the quality of the infor-

mation provided in these apps (Burgess 2017, McMillan et al., 2015). Apps are popular and easy to produce. Also, most health app developers do not have a medical background. This was demonstrated in the study by Gkrozou et al. (2019), which presents that only 27.3% of the apps had medical staff involved in their design and contents. There is a risk that these apps are of low quality, not helpful and even not safe for the patients (Gkrozou et al. 2019).

However, it is largely agreed that apps can encourage self-management and improve patient's experiences and disease consequences (Gkrozou et al., 2019). Most adults and teenagers use a mobile phone with a camera and a high-resolution screen (Wolf et al., 2013). This enables most users to collect data and send reminders. Smartphones also have multiple sensors, which allow communication in several ways. The above can offer medical providers the opportunity to reach their patients and assess their symptoms at any time, and their care can then be tailored using evidence-based practice. (Burgess 2017, McMillan et al., 2015).

5.4 Patient's perception of mHealth Apps

The study "Patients' Perceptions of mHealth Apps(mobile health applications): Meta-Ethnographic Review of Qualitative Studies" by Vo et al. (2019) notes that several scientific papers have examined the relevance of mHealth applications and solutions for the treatment of specific diseases (Zapata et al. 2015, Kil et al. 2017, Giunti et al. 2018). Other studies have looked at the introduction of eHealth from a physician's perspective (Ross et al., 2016) or the evidence supporting the use of mobile technologies by public health workers (Braun et al. 2018). Based on a review of quantitative surveys available in the literature, Azhar and Dillon modelled the factors influencing the effective use of mHealth applications for self-service purposes (Azhar et al. 2016). However, from the findings of Vo et al. (2019), many users of these applications objected that the quality of the information they provided was questionable (Vo et al., 2019). Patients even explicitly stated that if their supplier recommended the applica-

tion, “it would make a difference” (Riis et al., 2018). Having an app recommended by a physician familiar with evidence-based information is one of the most important criteria for users (Vo et al., 2019).

One of the most important factors highlighted by many of the participants in these studies was the need for more personalization of the content of mHealth applications. Patients believed that since the mHealth apps were built to use them, they should personalize the apps according to their needs (Vo et al., 2019).

6. Summary

6.1 Synthesis of research

Based on the literature review, it is possible to identify some patterns. Clines et al., 2020, notes that the Western lifestyle prevails in developing countries, which exacerbates osteoporosis worldwide. The lifestyle itself can influence our habits, which in the long run can lead to destructive tendencies. Numerous studies indicate the need to use technology to explore the potential benefits of behaviour change further, most importantly, to achieve long-term goals.

It is important to note that insufficient information in the media regarding Osteoporosis and its treatment is also associated with low awareness of this disease and leads to low diagnostic rates, which, in turn, leads to even lower treatment rates (McCloskey et al. 2020). Developing solutions for those at the beginning of behavioural changes and encouraging them to adapt to new habits (Prochaka, 2017) or plant the seeds in their minds by reaching out to and including a population that is not fully aware of this condition can contribute to improving overall health.

6.2 Emotions and Gamification (Octalysis framework)

It follows from the literature review that emotions complement the experience of functional design and aesthetics, attractiveness and beauty. Emotional design plays a

significant role and is based on affective science research; it is based on how emotions are evoked and how the concept can be applied in the design process. For a successful design and is suitable primarily for the user, it is crucial to create positive patterns of feelings in the user's mind (Norman, 2003).

Also, the gamification of the framework Yu-kai Chou believes that in addition to the ninth hidden disk called "Sensation", everything the user does is based on one or more of the eight central disks. - Yu-kai Chou (2021). "Gamification is designed in such a way that most attention is paid to human motivation in the process. This is a human-oriented design (Yu-kai Chou 2021). As a rule, it is recommended to enable at least one of the main drivers shown below to apply this structure.

6.3 Mobile device

The report provides an insight into the national mood in the country during the lock-down, showing that the search for applications on critical mental health issues has increased dramatically. A study by Gkrozou et al. (2019) showed that women are more likely to use mHealth applications than men (9% vs 4%). The development of mHealth applications will potentially turn smartphones into useful medical tools, which will inevitably lead to improved health systems worldwide (Gkrozou et al. 2019). At the same time, there is rising concern about the quality of the information provided in these applications. (Burgess 2017, Macmillan et al., 2015, Vo et al., 2019). This means that it is essential to use truthful information. Patients even explicitly stated that if their provider recommended the use, "it would make a difference" (Riis et al., 2018). Having an app recommended by a doctor familiar with evidence-based information is one of the most important criteria for users (Vo et al., 2019). This confirms the idea that HSE or other credible healthcare institutions should participate in the development of mHealth.

This study aims to place the user in preliminary preparation stage. When there is

no intention to change particular behaviour in the near future (in about six months), people may not know that there is a problematic behaviour to face, or they lack the confidence to change. This research uses the Gamification framework by Yu-kai Chou (2021) and Norman's emotional design lens to create an application that raises awareness for the target audience (women 40+). While considering some factors, for example, the content must be truthful, the personalization of the application also plays a vital role for the user.

6.4 Key Considerations for UX design, to be aware of Osteoporosis for women 40+ First, to approach the UX Design, decisions should be made after forming a defined user persona and an interview stage. Online learners are more intrinsically motivated than offline learners. Solutions based on education and information technology can help destroy risk assessment and can be an essential step. Rewards should be carefully considered. Context and environment as well play an important role in the design aspects. Using the Normans framework of emotional design can connect the user with the solution on a deeper level to create the solution that works well for the user.

The classic conditioning process works by establishing an association between environmental and natural stimuli; this method can form intrinsic motivation. When the person understands the consequences and considers or begins to behave differently, because of understanding the benefit.

Continuous reinforcement includes rewards for each behaviour (extrinsic rewards can be incorporated into continuous reinforcement). It is often used at the beginning of the operant conditioning process. However, as a person learns the behaviour, the graph may switch to partial reinforcement. The visceral, behavioural, and reflective will be the starting point, including Norman's three levels of emotional design. First, to approach the UX Design, decisions should be made after forming a defined user

persona and an interview stage; this is the first stage for behavioural design (Norman 2003). Researching the design style to emotionally surprise and attract the user is fundamental to the visceral level of emotional design (Norman 2003). The reflective level is considered a user's afterthought after the prototype has been tested, so carefully conducted user testing will help receive feedback and reflect on the final design.

Research question

How can technology improve the Osteoporosis awareness for women 40+ via technology using gamification methods?

The technology will likely remain unknown to the public, probably until the person has to face the problem of Osteoporosis, which may be too late to recover appropriately. Instead, the efforts of awareness for the public should be provided by the responsible authority for the health (HSE), this potentially can become as Osteoporosis awareness day. Also, the authority is very credible from the public's eyes and more likely will gain trust, plus it is safer for the public to use credible information.

The Octalysis consists of two types of motivation, extrinsic and intrinsic, this research aims to determine which motivation performs best. Thus, hypothesis one was formed to test which motivation should be used for the application, aiming to inform the public about Osteoporosis. Hypothesis two is set to determine if the application influences the user to consider changing habits and places them into the preliminary preparation stage of change (this is the first stage of changes from five stages)

Hypothesis 1: We believe that Prototype C (intrinsic and extrinsic motivations) is the most effective way to present the information regarding the Osteoporosis condition, this way increasing awareness. After testing the three prototypes with the one user group, the user can compare the three prototypes.

Hypothesis 2: We believe that the user is more inclined to look after their bone health after using the application and considers changing their habits. We will know this is true after conducting a Questionnaire.

Chapter 4

Research Methodologies

Introduction

As this research is being undertaken over a three-month span, it would be unattainable to carry out user testing for behaviour change, at least six months should be given. Instead, the research takes Norman's (2003) emotional design framework as its foundation and suggests connecting the user to a solution at a deeper level; this may help put a user into a position to consider a habit formation for the user's long-term goals.

This chapter contains the key points for the research methods and builds a strategy for shaping this research. Finally, this methodology chapter discusses techniques that will help answer the research question. Taking necessary steps in explaining the reason behind the decision made to back up and support the evidence of findings properly will make this research credible and reliable.

1. Methodology for gathering primary insights.

1.1 Mixed Methods

This study used mixed methods to support valid assumptions. According to Thomas (2017), it is recommended to use mixed methods in a research project, because *"different elements of your research, related to different questions, will almost certainly require different methodological answers from you"* Thomas (2017, p. 311). In addition, since this study concerned several parties, field studies were conducted for both sides (participants and general practitioners) to extract data, further supporting the direction of this research.

This study adhered to Lean UX methodologies in designing, testing, and redeveloping the artefact; this research has used online surveys for participants and for General Practitioners to understand both parties. These surveys resulted in understanding the

user's actual needs, understanding how the user will interact with the product, and defining user personas and empathy maps. Qualitative research methods were used to understand people's behaviour and habits, for example, ethnography and usability testing. Quantitative data was used when the artefact is released; it became possible to measure the design performance.

For this research, three prototypes were built, Prototype A (intrinsic motivation), Prototype B (extrinsic motivation), Prototype C (intrinsic and extrinsic motivation). Because this project was developed using Adobe XD prototyping tool, therefore it was essential to research most suitable tools such as trymyui.com, lookback.io, Google content Experiments and Maze for the user testing. The Maze was selected because it provided the most suitable options. It was easy to set up and minimized the user's time spent; also, it is compatible with the Adobe XD and provides opportunities to set up three free prototypes; also, purchase user testers with required demographic are available. This research used the online surveys for the general practitioners across Ireland and for participants, to identify the general awareness of Osteoporosis condition and get to know the women's lifestyle 40+. The survey was distributed using relevant forums Facebook groups for the proposal to participate in the online surveys, outlining the potential contribution to improving the motivational factors for the prevention of Osteoporosis.

1.2 Survey vs Individual interview

Survey. A short online survey (three questions) was used to carry out the Preliminary research; this helped set direction and tested the grounds for this research. In addition, to explore and learn more about the user, the method of surveys and individual interviews were considered. Since these two methods help contribute to the definition of content and design, plus learn more about the user's desires and needs before deciding on the design. The online survey helped to understand some of the users' charac-

teristics and current habits and insight into their lifestyle. The survey also helped to decide on the type of device or a product that suits best for the user. This survey was circulated via social media posting, Facebook (Women's Cycling in Ireland, personal account) and LinkedIn. A list of Facebook groups (see Appendix C) was researched mainly focused on female groups and women communities and approached with an inquiry to post the survey. Unfortunately, most of the groups refused to do so due to the irrelevant content for their users.

Online Survey. The interview aimed to learn about behavioural patterns and understand the users' expectations regarding the product in more depth than the field survey. For more accurate and thorough answers, the last question in the survey invited the users to participate in the individual user testing. If they are happy to participate, they had to leave their preferred method of contact.

1.3 Data collection methods (Qualitative / Quantitative)

Due to the current COVID-19 restrictions and safety precautions, it is unfortunately still recommended to limit the contact. Consequently, using Google Forms for the field surveys for participants living in Ireland and for the General Practitioners allowed for easy and quick distribution, making it also safe, as the access to the data is only available to the researcher of this project.

Ethnographic research implies the study of humans in their culture. (Hall 2013). Ethnographic research required deep knowledge about the user; this helped to avoid erroneous assumptions. This research has been learning about the user's habits, mental model (their knowledge about the Osteoporosis condition), and physical environment; mentioned points aligned with the ethnographic research.

During the interview, it may have been unethical to ask specific questions, such as age and marital status. Therefore, the survey was conducted online, also indicating

that it is strictly confidential. The survey method helped to learn more about the user. The survey included whether the participant wanted to participate in an individual follow-up interview; to learn more about the user and test prototypes. The survey included open-ended and closed-ended questions. Identified patterns obtained using the mixed method have helped reveal the opportunities for implementing certain features for the future product.

1.4 Qualitative research methods.

Qualitative research is best suited for collecting detailed and in-depth data on a research Topic. (Hall 2013). Qualitative research methods – contains open and conversational research methods; it is crucial to overview the results and consider that an intervention can influence and skew the actual data. For example, ethnography research studies humans in their culture to figure out how and why they behave. What triggers a particular action? To effectively influence behavioural change, it is essential to understand the target audience using ethnography research (Hall 2013; Thomas 2017). The open-ended questions allow for insights from the user, widening the angle and receiving valuable insights for implementation of future features or details for the product.

1.5 Quantitative data.

This method is ideal for measurable data; for example, this research project used several methods, such as field surveys, online surveys, posted surveys. This type of method helped to identify patterns and connects dots. Because the survey completion does not involve direct contact with the participant, the researcher had fewer chances of skewing the results. For ethical reasons, the surveys are being distributed strictly with an unknown audience to the researcher, using Social Media groups, emails, phone calls to arrange to post the printed version of the survey. As well as the initial field survey for participants and the more detailed online survey for participants has

been distributed using different Facebook groups to avoid repetition and potentially skewed results. Because after the first round of surveys, the participants could have educated themselves about the Osteoporosis and Menopause being linked; therefore, other Facebook groups were used. Closed-ended questions allows us to collect data and confirm or reject some of the assumptions about the user or the product we are trying to learn.

1.6 Data analysis methods (Qual analysis / Quant analysis)

Google sheets were used to arrange the responses received by post from the survey for General Practitioners. For initial online surveys, the Google forms were selected for two main reasons first – it is easy to set up and distribute throughout Facebook groups; second – it provides easy-to-read graphical results. Also, SPSS was used to create tables to summarize the data, and to compare the results.

2. Methodology for designing and testing artefact.

2.1 Concept Design

"Every one of us has an imperfect, idiosyncratic map of reality in our heads. Without it, we would be lost" - (Hall 2013, Ch5-7). Mental models play an essential role in decision making; it is a complex chain of reactions that work together to form a belief about something. Therefore, to change a belief about something (for example, a habit of going to bed late and not getting enough sleep), the person should adjust the flow of thought or receive an external influence to start thinking about the habit in a different light (Hall 2013).

Numerous studies "Where do you start when designing for behavioral change?" - (Prochaka 2017), "Gamification as a way of facilitating emotions during information-seeking behaviour: a systematic review of previous research" - (Ahmed et al. 2021), have pointed to potential solution-based information technology, and that

raising awareness for Osteoporosis condition study “The Osteoporosis treatment gap in patients at risk of fracture in European primary care: a multi-country cross-sectional observational study” Compston et al. (2019); Carey et al. (2021); Clynes et al. (2020), should be studied more thoroughly. It is noted that the most successful way to instill new habits is a smartwatch rather than a mobile device (Carden et al. 2017). One of the reasons for this is notifications, which often remind a user of the repetition of the habit, not at the most appropriate time for the user. While smartwatches are successful for instilling new habits, the survey for this research highlighted that only 71.7% of the target group (Figure 13) for this study owned a smartwatch. The online surveys showed that 100% (92 participants) of the user use a mobile device (Figure 12). Therefore, a mobile application will be used to test what motivation - intrinsic, extrinsic or a combination of both is most effective.

The results also showed that seven to eight pm is the ideal time for most users

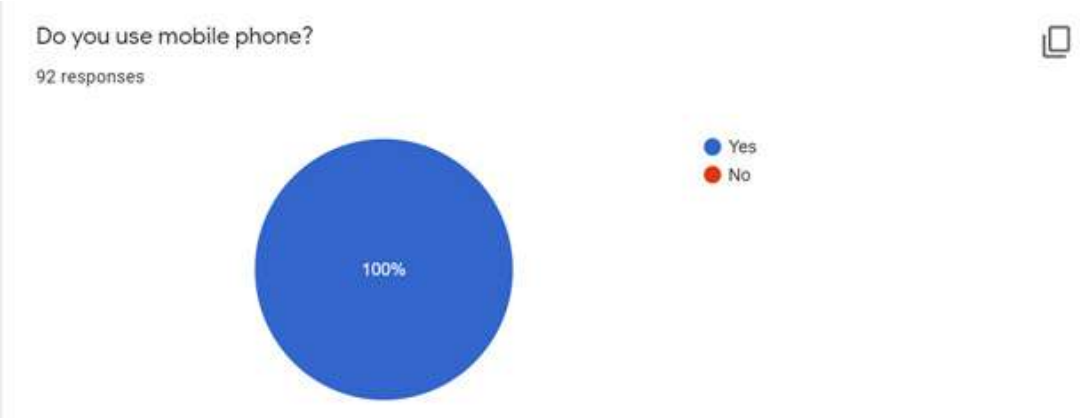

Figure 12: online survey results (question 8), Google Forms

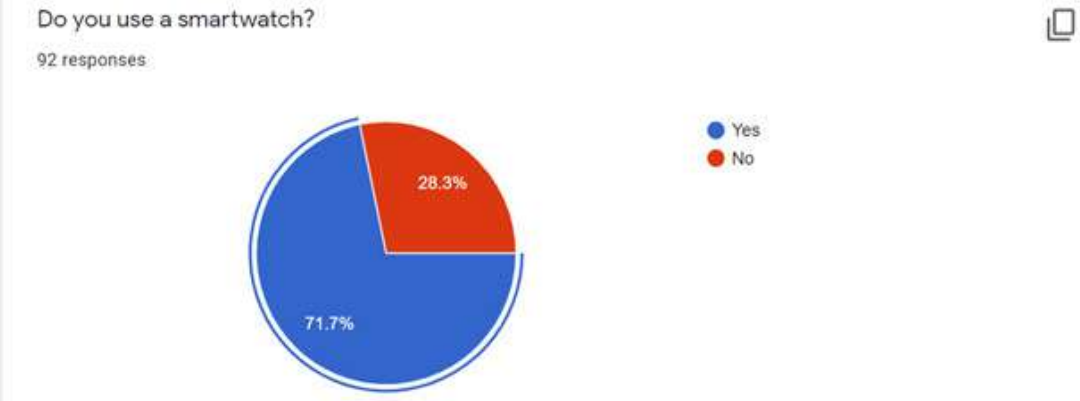

Figure 13: online survey results (question 11), Google Forms

(59.8%); this information will help to use reminder notifications most effectively.

Every design decision should be a well-informed, intentional one that welcomes your intended users rather than pushing them away or making them feel bad (Hall 2013) – meaning, knowing the user's expectations brings the design closer to success. Thus, empathy and emotions are the keys when designing for the ethnography (Norman 2003).

The literature review also demonstrated that it takes about six months to form a habit. Because this research is limited to three months, it is impossible to test the product to its full potential, and further research is more likely needed to conclude whether the product reaches its goal. Based on the research question, this product aims to solve the problem of unawareness of Osteoporosis development at a later stage of life and potentially encourage or trigger adjusting the daily habits for women 40+.

Ethics

This research has taken precaution and careful approach to carry out ethics respectfully towards the users. The researcher's responsibility is to comply with the rules and plan of safeguarding the data, making sure the user fully understands how the data will be used and ask for users' permission to record the activities.

All the users were treated as collaborators rather than subjects. Each questionnaire and survey had a description of what this research is hoping to achieve and why. The method of Online Survey was selected because some of the sensitive questions are easier to answer when no one is watching. The users who have expressed their wish to take part in the second part of the research (the user testing) and had left their email addresses, those emails were carefully stored at all times.

When contacting the users asking to participate in user testing one, all users have received a detailed description of what to foresee from the meeting, how long this

should take and optionally use the camera. The three users who replied to the invitation were able to select the most comfortable time and date. The users were asked how they feel about the meeting being recorded and received the consent form, which then was returned to the researcher. However, some users did not have the option to e-sign the form and confirmed by email that they are happy with the recording. During the meeting, the researcher also informed each participant about how this information will be used. The researcher avoided advising on the condition of Osteoporosis because this is not an area of expertise, and the researcher does not consider herself a doctor. There were no promises made, and no false information was given at any time to avoid users disappointment. All information for the lessons in the prototypes was taken from the Irish Osteoporosis Society - to not mislead the user with false information about the condition of Osteoporosis.

The screenshots from three recorded sessions were used for the presentation of work. The user's identity was purposely blurred out, along with any other tabs revealing their identity or personal information.

Artefact

As a result of this research, the artefact that will be developed in this study should educate participants about the dangers of Osteoporosis to provoke the user and encourage them to change some of their habits. The prototype will be divided into parts. The first is an introduction about the user's benefits, followed by the registration or login into the application. After that, the user will have access to lessons content about Osteoporosis. The content is divided into small portions so that the assimilation of the content is not too difficult.

Along with bite-sized information provided to the user, this information also has been categorized according to its relevance. For example, the first lesson is general information about the condition, and its potential harm, and possible side effects. The second lesson informs the user about lifestyle, what foods contain the essential vitamins,

what foods interfere with the absorption, and best to avoid, the correct type of sports, and BMI advice. The final lesson in this prototype informs the user about the medications, supplements, and the best way to monitor or check this condition. Potentially this application may contain more expanded information about this topic. After the user has obtained the information after each lesson, they are offered to take a "knowledge test", this element in the application is essential and serves as a motivator. Also, it helps to conclude the newly learned information and memorize it.

How to make the product accessible for the user?

The research question is: How can technology improve the Osteoporosis awareness for women 40+ via technology using gamification methods?

During the competitor research, the primary source of Osteoporosis information in Ireland was found; it is a website (Irish Osteoporosis Society) that contains the most relevant information about this disease. Also, from the general practitioner's survey, one response from a doctor to question two: "Do you use any other means to present this information, such as a leaflet?" The response was - "I direct them to the website Irish Osteoporosis society."

Because the HSE provides all of Ireland's public health services in hospitals and communities across the country, thus it is achievable to design an Osteoporosis awareness day in Ireland. Promoting and advertising on a nationwide level will help inform more population; this may also urge the users to download the app and learn the information.

A Cervical screening program: when a woman reaches a certain age, she is invited to make an appointment for a Cervical Check. Similar preventative measures can be created for the DXA scan, which will help determine the current condition of bone mass and take a precaution if the results show low bone density. The scan should be repeated every two years. For the product to evolve, an option to make an appointment for

the DXA scan and a history of previous scans or a notification to remind the users to repeat the scan can improve the application.

Summary

In chapter four, the methods used in this research project were discussed. The difference between qualitative and quantitative methods and in what situation they should be applied. The reasons behind the study decided to conduct surveys online instead of interviews. The final device was chosen for the prototype, and a mobile phone is the most suitable option as an outcome from survey three and findings from literature review. This corresponds to the technology research from Literature Review. Ethics has been carefully thought out and planned; it is imperative to observe ethical rules during ethnographic research. The right tool to measure user testing to confirm the hypothesis of this study was also researched and selected.

Chapter 5

Design Methodologies

1. Introduction

"The Design Methodologies is a little more focused on design specifics. It seeks to articulate the vision for the user experience and connect the dots on how that vision will be brought to life." - The User Experience Team of One by Buley (2013). The Design Brief, sets the tone and strategy for creating a User Persona profile (figure 14).

Whom is it designed for, and what activities is it intended to encourage or enable?

– Based on the research question, this product is designed for participants living in Irelan. This product aims to bring more awareness to the development of Osteoporosis

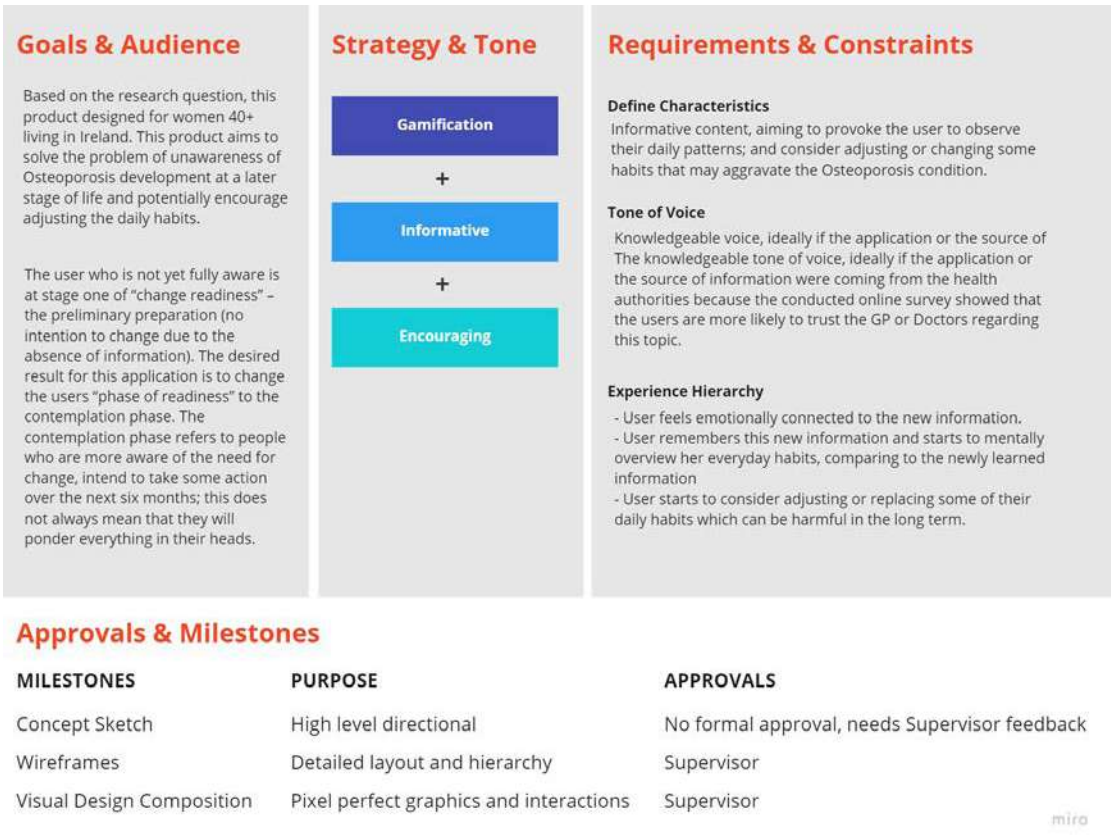

Figure 14: Design Brief

during or before menopause. Potentially encourage the User to adjust the daily habits and encourage sharing and inviting this application with friends. Describe the target design solution - Based on the literature review, gamification and emotional connection will help build motivation and engagement. What are the features and personality of the product? - Features, such as visual demonstration of the consequences of behaviour in the game, text feedback, praise or reproach from game characters, forms of external audio or image motivators (Witt et al. 2012, Burke et al. 2014, Hamari et al. 2015) should encourage a positive intrinsic motivation.

2. Personas

The user who is not yet fully aware is at stage one of "change readiness" – the preliminary preparation (no intention to change due to the absence of information). The desired result for this application is to change the users "phase of readiness" to the contemplation phase. The contemplation phase refers to people who are more aware of the need for change, intend to take some action over the next six months; this does not always mean that they will ponder everything in their heads. Figure 15 demon-

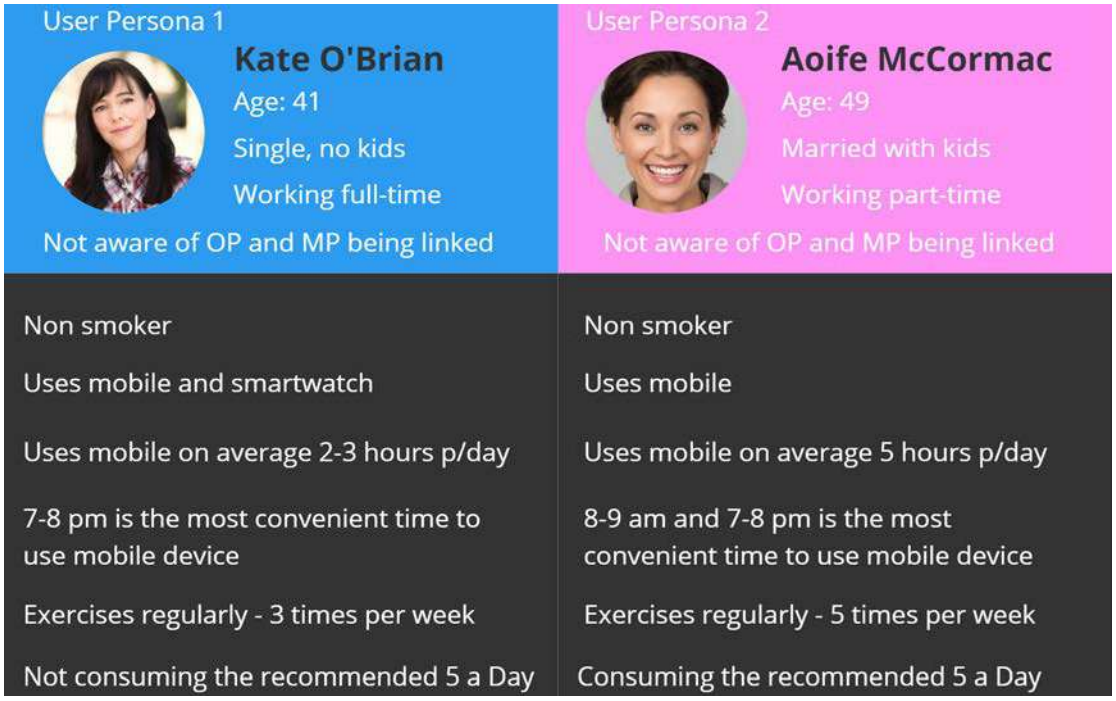

Figure 15: Similarities between user persona 1 and user persona 2

strates the similarities between the two user personas; the Online Survey was used to extract the relevant information regarding the person's age.

2.1 User Persona 1

Kate O'Brian, who has just turned 41 years of age, is currently working full-time for a tech giant company, recently has been promoted. She is not married nor has kids, is entirely focused on her career goals, and constantly upskilling herself in work. Kate does not smoke and uses the gym two to three times per week; however, she does not always have time to eat healthy meals and often missing out on her recommended five a day (fruit and vegetable). As a busy woman, she is a heavy coffee drinker and enjoys fizzy drinks daily; she is unaware that these habits can contribute to bone density. Also, Kate is not aware of Osteoporosis being linked with menopause. Being underweight for her height puts Kate at the risk of developing Osteoporosis. Kate does not know about the DXA scan and has checked her bone density because she has never had a fracture.

2.2 User Persona 2

Aoife McCormac is 49 years of age, recently has changed her job and works part-time, so she has more time to spend with her family. She has two kids, aged seven and ten. Aoife prioritizes keeping herself and her kids active, and she does regular walks at nearby parks. Aoife is not aware that Osteoporosis and Menopause are linked; she is not taking any supplements of calcium or multivitamins. She spends around four hours on the mobile phone; the most convenient time to use the device is 8-10 am and 7 pm to 9 pm. She prepares healthy meals and manages to consume the recommended five a day (fruit and vegetable). However, being so active, she may miss the recommended calcium intake.

2.3 The Empathy Map and the Journey Map

An empathy map (Figure 16) was created based on the Online Survey 3 Results to understand the user's day to day actions and mindset; this also helped define the Journey Map. The journey map (Figure 17) shows a typical day to day flow of the User. Because the User is not aware of this problem, the actual pain points are not experienced to their full potential yet. Because Osteoporosis is also known as a silent disease and contributing factors of mineral loss that results in lowering the bone density cannot be felt until the bone fracture happens. Some symptoms such as sore lower back or change of posture may show the predisposition to Osteoporosis.

2.4 Problem Statement

(WHO) User 1 Kate O'Brian, currently is working full-time for a tech giant company, recently has been promoted. **(WHAT)** Kate is unaware that some of her daily habits can contribute to the loss of bone density. Kate does not know about the DXA scan and has never checked her bone density because she has never had a fracture. **(HOW)** Kate would like to learn about healthy habits without going to the doctor to improve

Figure 16: Figure: Empathy Map (User 1)

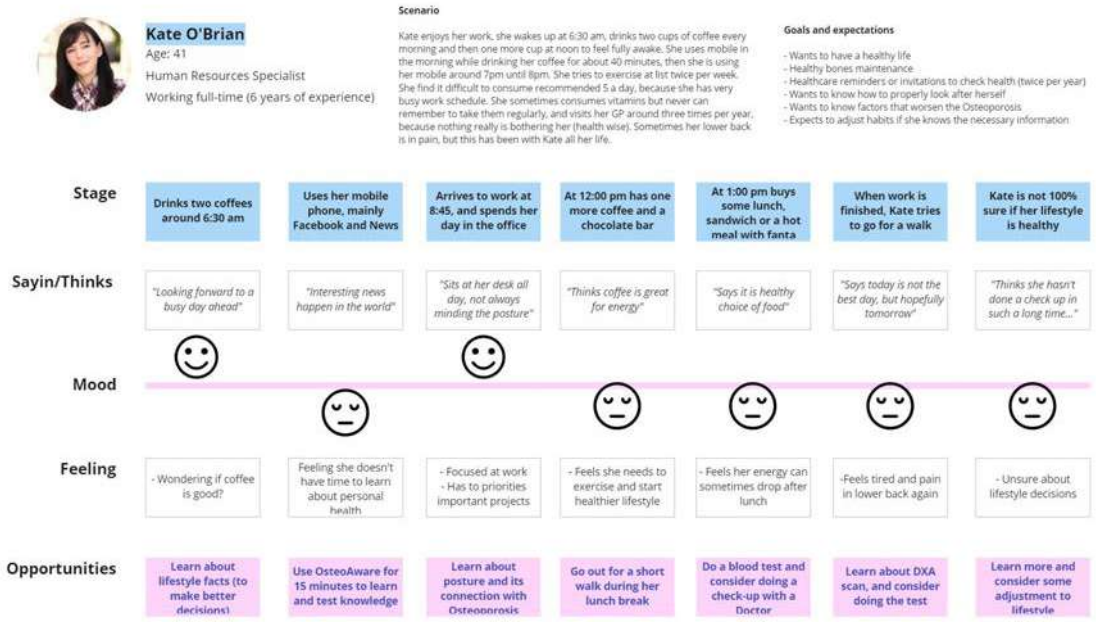

Figure 17: Journey Map (User 1)

her bone density in the long term.

User 2 (Aoife McCormac

(WHO) Aoife McCormac is 49 years of age, recently has changed her job and works part-time, so she has more time to spend with her family. **(WHAT)** Aoife is not aware that Osteoporosis and Menopause are linked; she is not taking any supplements of calcium or multivitamins. Being very active, she may miss the recommended calcium intake. **(HOW)** Aoife would like to know more factors that can improve the Osteoporosis condition; she prefers to use her mobile device for learning new information.

3. Initial Task Flow Diagram

The task flow (Figure 18) forces you to think about how people are using your product. What are the most likely situations that users will follow? Moreover, what are the possible side doors that can be used to end up in the same place? (L. Buley 2013).

4. Design Considerations

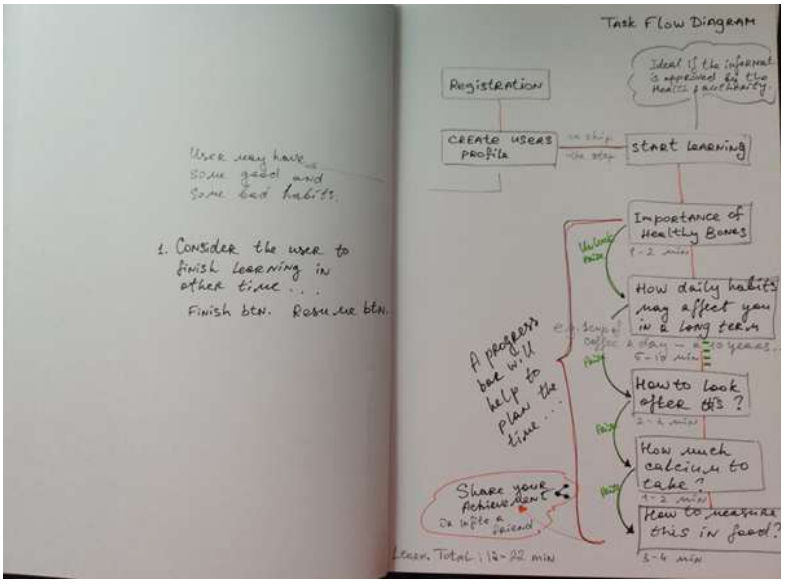

Figure 18: Initial Task Flow Diagram (Sketch)

Style and branding – Simplicity and clean style is most suitable for an application that represents a health sector, with an emphasis on the Neumorphism style. According to Salisbury (2020), the Neumorphism design is a fresh interface that combines usability with a softer aesthetic by limiting some subtleness. Neumorphism is an exceptionally modern design style. Clean, simple and with softer visual access to interactive elements. The appearance is suitable for medical devices, but the subtle nature of the visual design can pose a problem for usability. Some argue that it is not easily accessible (Vo 2020). Care and attention were taken to ensure the Nenumorphism style was accessible by including bold colours for the call-to-action buttons and keeping the typical shadow and clean background.

Typography – an easy-to-read style applied, the body text is Lato (16px), and the Titles are SangBleu OG Serif (24px). The recommendation corresponds to the Design Material.

Content - the written content is fully borrowed from the Irish Osteoporosis Society. Using truthful content is extremely important for this project; this will help avoid confusing the user and teaching them false health information.

4.1 Onboarding

Flawless onboarding is essential for a good user experience and first impression. The

onboarding should inform the user about what to expect in the application. The benefit-oriented onboarding approach demonstrates the benefits of an application or the value that users expected to receive from using the application. This helps describe what the application does without going into details on how to use it. This technique is also used to stimulate intrinsic motivation (Cassells et al. 2019).
Design Principles. What should the experience of using the product feel like? Effortless experience will provide with positive feeling; however, the content should be memorable for the user. Perhaps using humor and the information, appropriate colours interaction, and consistency in design play an essential role in forming a positive user experience.

4.2 Intrinsic Motivators and Extrinsic Motivators

The following core drivers – Accomplishment, Ownership and Scarcity are the extrinsic motivators. The opposite to them – Empowerment, Social Influence and Unpredictability are the intrinsic motivators.

Badges and medals play on feeling and achievement and provide feedback to the user, bringing a sense of reward for completing a task. This reward is motivated to keep working and help offset any negative experiences while completing the task itself. The most used gamification features in product design today are badges, medals, glasses, and tools are some of the standards but specific features (Swainson 2021). Therefore, for these methods to be successful, game mechanics can also be used, including motivation and feelings of users and progress in their user journey through the product. Symbolizing the performance of a unique or complex task will also have better results than rewards for arbitrary actions that can be performed within several different fingers or mouse cursors. - (Swainson 2021).

To answer hypothesis one: “We believe that Prototype C (intrinsic and extrinsic

motivation) is the most effective way to present the information regarding the Osteoporosis condition - this way increasing awareness". We will know this is true after testing the three prototypes with all the users. This way, the user can compare the three prototypes.

5. Workshop

It is essential to learn about user expectations for the features of this application. The workshop with three to five users must determine several design factors, for example, 1. The type of device (IOS or Android), 2. Preferred way of learning information (Visual, Reading or Combined). The application should implement and feature prioritization. From a previously conducted online survey, 16 participants (out of 92) would like to participate in the follow up an individual interview; this means it is possible to split the participants into groups for a workshop and for the user testing.

Group one (6 participants) have received an email inviting each individually for an online discussion of essential features for the user. (Zero replies, possibly due to the holidays season, the email was sent twice with four days apart).

Group two (10 remaining participants) received an email inviting them to participate in user Testing the high-fidelity version of all three prototypes (A, B and C). This is how the users can compare all three and name the most convenient option. Using Maze.co for user testing made the process more organised, and the dashboard's results are visually presented. Also, different Lessons and tests were used to make this more interesting for the user and less repetitive. However, some of the interactivity was lost because using the XD prototype with the Maze.co, a different link was created using the Maze plugin for Adobe. Only two replies came back positive, possibly due to the holidays season. After the unsuccessful recruitment of participants for the Group One testing, a slight change of plan took place. Invitation to participate in the user test-

ing was then published on personal Facebook account, gaining another participant. The remaining two participants were recruited using Maze.co (a paid option, with an opportunity to set required demographics). Overall, making a total of five user testing participants.

5.1 Emotional Design and User Testing

According to Norman (2003), the visceral design triggers the initial reaction means it can be easily studied by placing people in front of a design and waiting for their reaction to come. The designers strive to receive the following reactions from the user; *"What does it do?", "How much it costs?", "I want it"* - (Norman 2003, p. 68). Based on this, it is vital to observe the user during the testing and record the initial reaction to the design.

Unlike the visceral level of emotional design, behavioural design is all about performance and use - *the main components of good behavioural design: function, understandability, usability, and physical feel*. (Norman 2003, p. 70). Behavioural design is also responsible for overseeing different scenarios that can happen along the way and minimize the possibility of the user feel frustrated or lost at any point. User testing included additional questions to understand how the user feels while using the product; the feedback contributed to the improvement of the final design. Observing the user during the testing is essential because it can bring more insights (Norman 2003). Some things that were not obvious may be discovered along the way; this is why research hoped to observe the user as much as possible during the video user testing (by Zoom or other means).

"The reflective design concerns the meaning of a product or its use" (Norman 2003, p. 83). Reflective design can affect a person on a different level. For some users, it can evoke personal memories or the meaning of things, and for others, it is a self-image

(Norman 2003). After the user testing (for each prototype) to reflect on a personal experience, questions linked to user satisfaction were asked to incorporate the feedback into the final version and reflect on the design.

6. Development of Prototypes

6.1 Emotional Design and Development of Prototype

"It's all in the appearance" - (Norman, 2003, p. 68), Effective visceral design must have an immediate emotional impact by combining professionally crafted design solutions; the design should feel aesthetically pleasing to the user (Norman, 2003).

The behavioural design begins at the very start, and the first essential step is to know the user's needs (Norman, 2003). By putting the user in the context, this research aimed to understand how the user will use the product; according to Norman (2003), this is the first step in good behavioural design.

Prototype A (intrinsic motivation) - Figure 19.

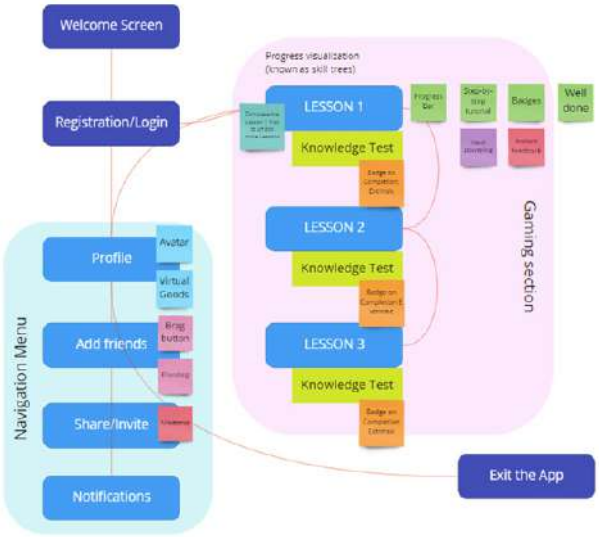

Figure 19: Prototype B (extrinsic motivation)

Prototype B (extrinsic motivation) - Figure 20.

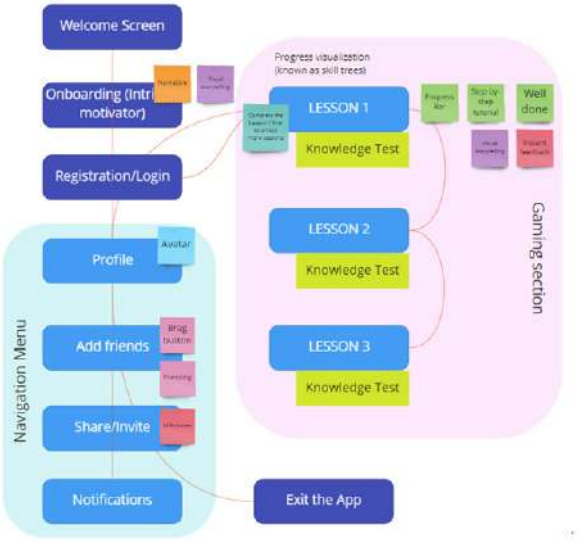

Figure 20: Prototype A (intrinsic motivation)

Prototype C (intrinsic & extrinsic motivation) - Figure 21.

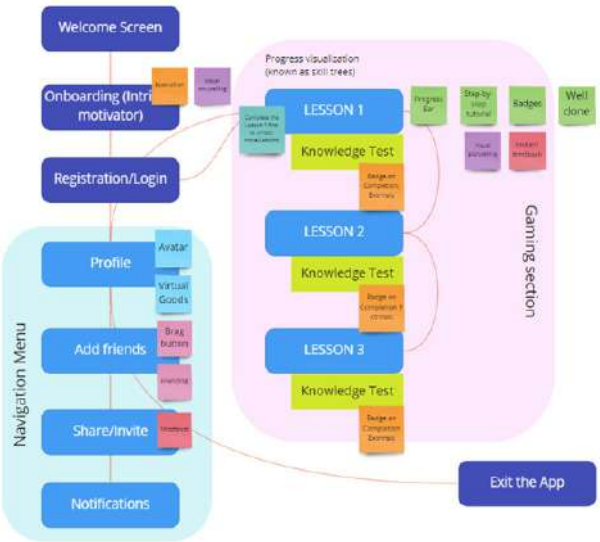

Figure 21: Prototype C (intrinsic and extrinsic motivation)

7. Plan for Testing the Prototypes

7.1 How to test three different prototypes without being overwhelming for the user?

After carrying out research for the right tool to perform the testing and with the feed-

back, the Maze.co was selected as it seems to have checked all the required boxes. However, during the set up it became clear that some of the components (particularly grouped component that use vertical scroll) were not recognized by the Maze.co, this is because the link had to be rendered by the installed XD plugin - Maze to integrate the XD prototype with the Maze projects. This process also influenced the overall prototype interactions and some of the animation. The primary purpose of the testing was to discover which of the three prototypes user finds most efficient and perceives suitable. Prototype A had three missions for the user to complete; after each task, there was a set of questions to answer. The plan was created to test the prototypes with each participant see Figure 22 and scenario description below for each prototype (with a small differences in some questions because each prototype is different).

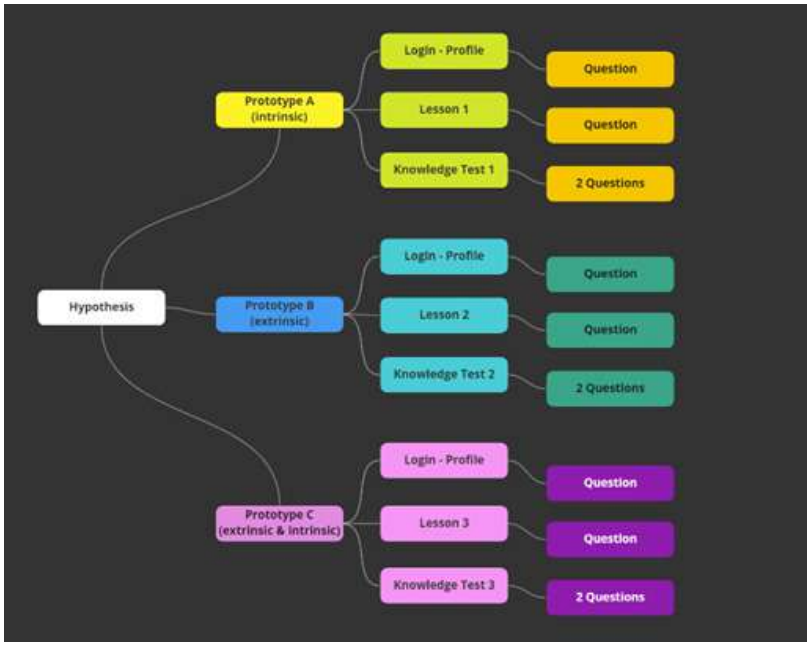

Figure 22: Plan for testing three prototypes

7.2 Scenario and questions for User Testing (Prototypes A, B, C)

Prototype A (intrinsic) Testing Link (5-7 min) - Link

1. **Mission 1:** Explore and followalong with the onboarding, until you land on the Login screen.

- How easy did you find this journey? (1 – Very difficult, 5 – Moderate, 10 – Very Easy)

2. **Mission 2:** Discovering the User Profile and Lesson 1

- How easy is it is to understand the content of the Lesson?
- Is there anything you would like to see different in this section?

3. **Mission 3:** Testing your knowledge after Lesson 1

- How easy or difficult did you find the test?
- How likely would you invite your friends to this application?
- How did you feel when you completed Lesson 1?

Prototype B (extrinsic) Testing Link (5-7 min) - Link

1. **Mission 1:** Login to the application and find the way to the Lesson 2

- How easy did you find this journey?

2. **Mission 2:** Complete Lesson 2

- How easy is it is to understand the content of the Lesson?
- What would you like to see different in this section?

3. **Mission 3:** Testing your knowledge after Lesson 2

- How easy or difficult did you find the test?
- How did you feel after earning the badge?
- How likely would you invite your friends to this application?

Prototype C (extrinsic & intrinsic) (5-6 min) - Link

1. **Mission 1:** Follow the Onboarding and then Login to the application

- How easy did you find this journey?

2. **Mission 2:** Complete Lesson 3

- How aware were you of this information before the Lesson?

3. **Mission 3:** Complete the knowledge test

- How easy or difficult did you find the test?

- How did you feel about the overall experience of this application?
- How likely do you consider changing your daily habits after learning the information related to Osteoporosis?

Summary

This chapter has concluded with the main decisions for the Design of the prototype and its testing and presented with the user persona, their needs, wants, and expectations. Explained the desired outcome for the user after using the application and how the user testing is carried out. The next chapter is analyzing the results and outlines further action for the final prototype.

Chapter 6

User Testing

1. A and B Testing

During the prototype process, there was consideration for several layouts of the screens (Figure 23, 24); the best way to solve and decide on the right option is by conducting A and B testing, measuring the best performance and user satisfaction. A and B Testing was used to compare a section of the high-fidelity prototype to select which section performs better and is more transparent for the user. The A and B testing were conducted on 3 participants, using two XD links with two options for the lesson section, these links were emailed to the participants. One closed-ended question was asked, what prototype did you find easier to use A-B testing (1) or A-B testing (2), see Appendix G for details.

The A-B testing (2) showed better results, compared to another version. Users found more space on version two, and that it was easier to read information. Also, the absence of navigation created the illusion of the user being in a different room.

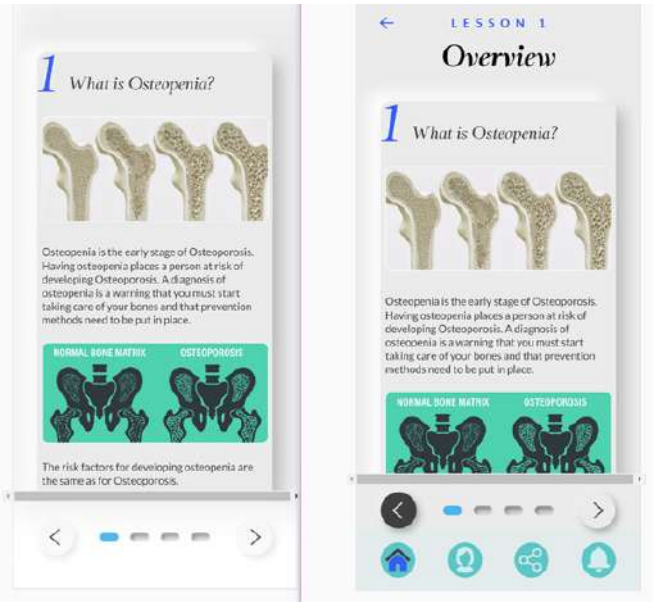

Figure 23: A and B testing (two different layouts)

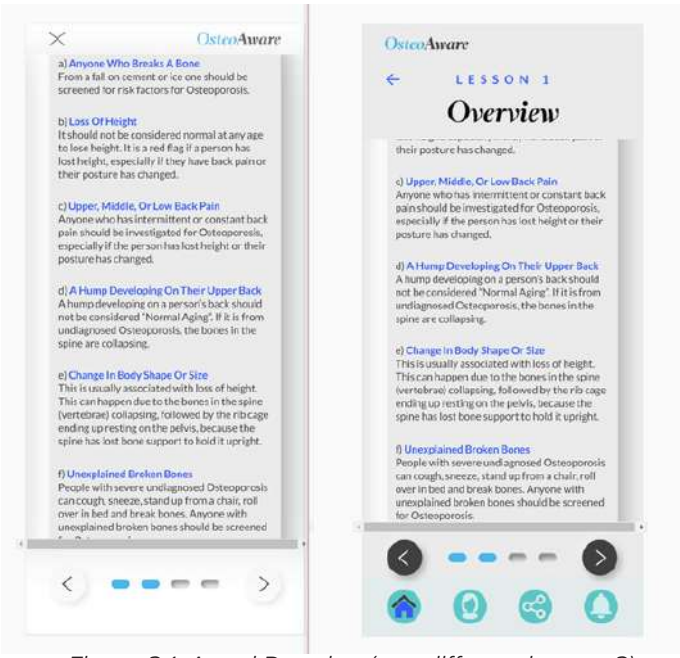

Figure 24: A and B testing (two different layouts 2)

2. Hypothesis 1

Because the research is set to find out if technology can increase the Osteoporosis awareness for participants using Gamification? Moreover, during the research, it became clear that Gamification uses intrinsic motivation, extrinsic motivation, and a combination of both, therefore forming Hypothesis 1, which has been tested using three prototypes.

H1: We believe that Prototype C (intrinsic and extrinsic motivations) is the most effective way to present the information regarding the Osteoporosis condition, this way increasing awareness. After testing the three prototypes with the one user group, the user can compare the three prototypes.

Therefore, three prototypes were tested by five participants, so the participant will be able to compare all variations. Prototype A is built using intrinsic motivation, prototype B is built using extrinsic motivation and prototype C is built using intrinsic and extrinsic motivation. The prototypes are built based on the Octalysis gamification framework (Figure 25). The left side of the octagon uses extrinsic motivation (ac-

complishment, ownership, scarcity), and the opposite side uses intrinsic motivation (empowerment, social influence, unpredictability) (Octalysis: Complete Gamification Framework - Yu-kai Chou 2020).

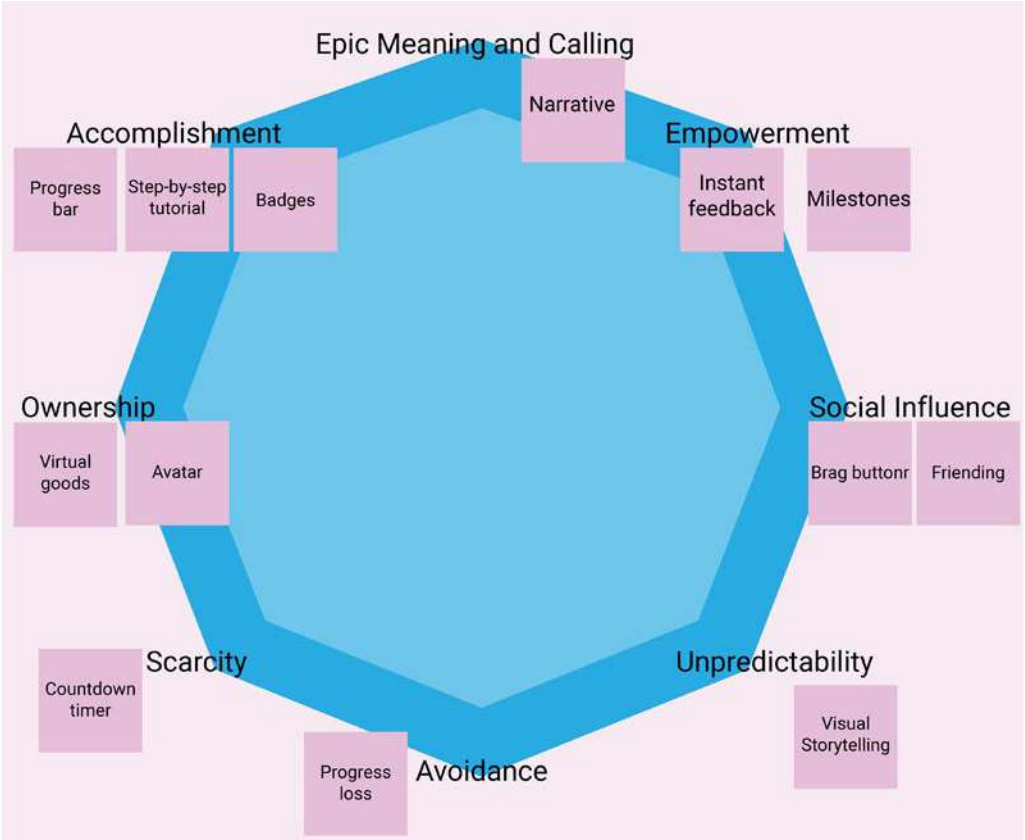

Figure 25: Octalysis principles for OsteoAware application

3. User Testing Results Prototypes A, B and C

One of the best things about using Maze.co is that it gives the breakdown of scores. The Maze.co measures the overall experience of the prototype by calculating key performance indicators: mission success & duration, test exits, and misclicks and calculates the usability score. Scores are based on scale where 1 = very difficult and 10 = very easy. Along with the breakdown of the mission performance, this tool gives a detailed heatmap and statistics for each screen, for example, time spent, misclicks. This information was further analyzed to plan the implementation of changes for the final prototype. Users who agreed to use video recording (Figure 23, 28), were sent with the Zoom meeting link to take part in the user testing.

3.1 Prototype A

Prototype A relied upon intrinsic motivation, explaining to the user through the on-boarding process why the user benefits from learning about Osteoporosis condition and how the changes can benefit in the long term. (see Appendices D for more details)

Results: The link to the report for Prototype A

Usability Score 80

Mission 1: Explore and follow along with the onboarding until you land on the Login screen -.(Figure 26).

- How easy did you find this journey? **Average = 8.6**

Mission 2: Discovering the User Profile and Lesson 1- (Figure 27).

- How easy is it is to understand the content of the Lesson? **Average = 8.5**
- Is there anything you would like to see different in this section? Out of four responses, three said No, One – would like to be explained where to click.

Mission 3: Testing your knowledge after Lesson 1- (Figure 28).

- How easy or difficult did you find the test? **Average = 9.5**
- How likely would you invite your friends to this application? **Average = 9.3**
- How did you feel when you completed Lesson 1? **Average = 9.8 (Happy)**

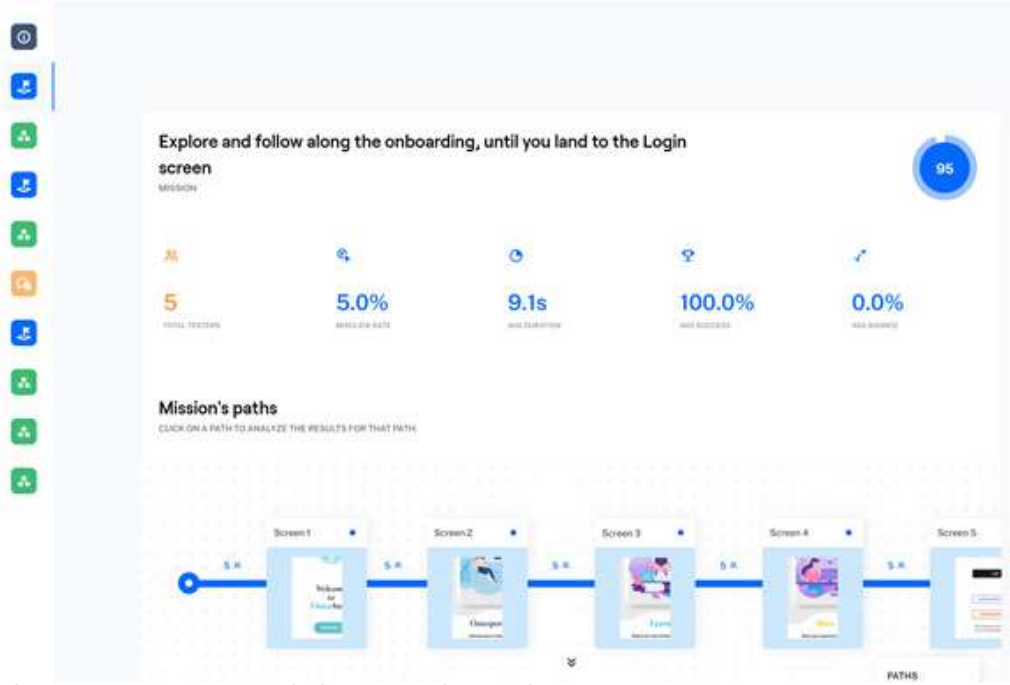

Figure 20: Prototype A, Mission 1, Results Break Down.

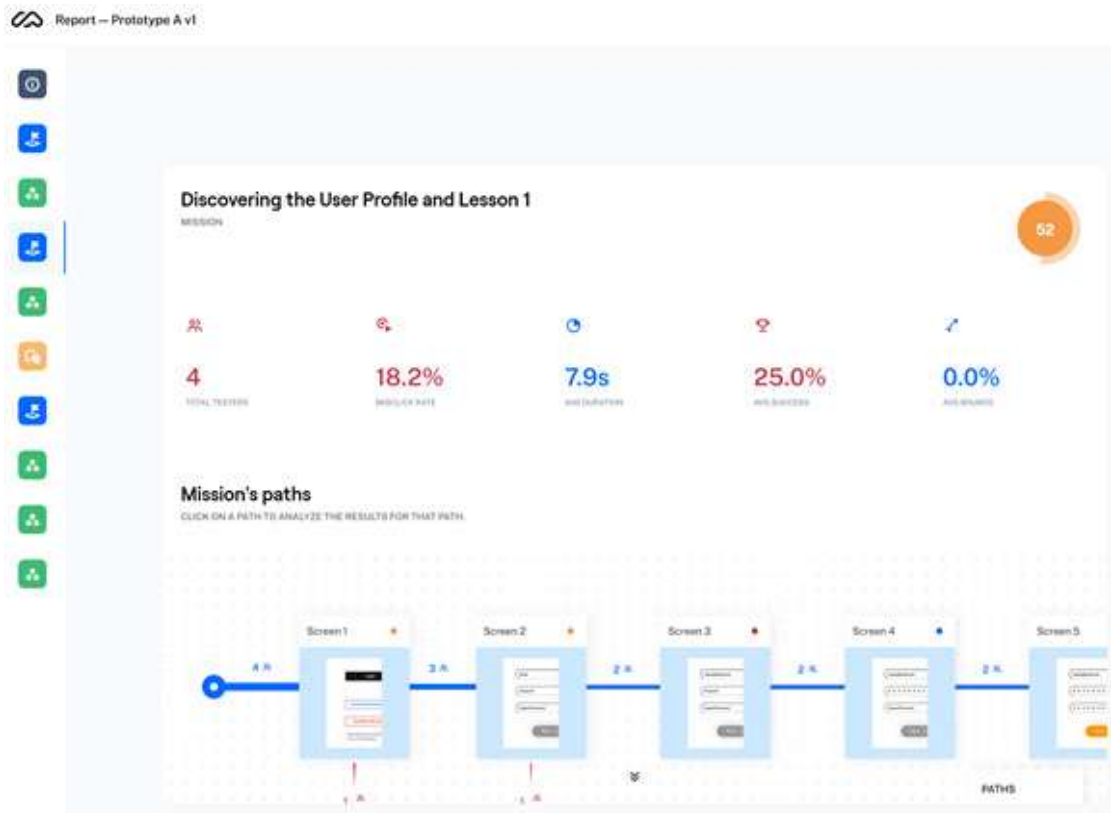

Figure 21: Prototype A, Mission 2, Results Break Down.

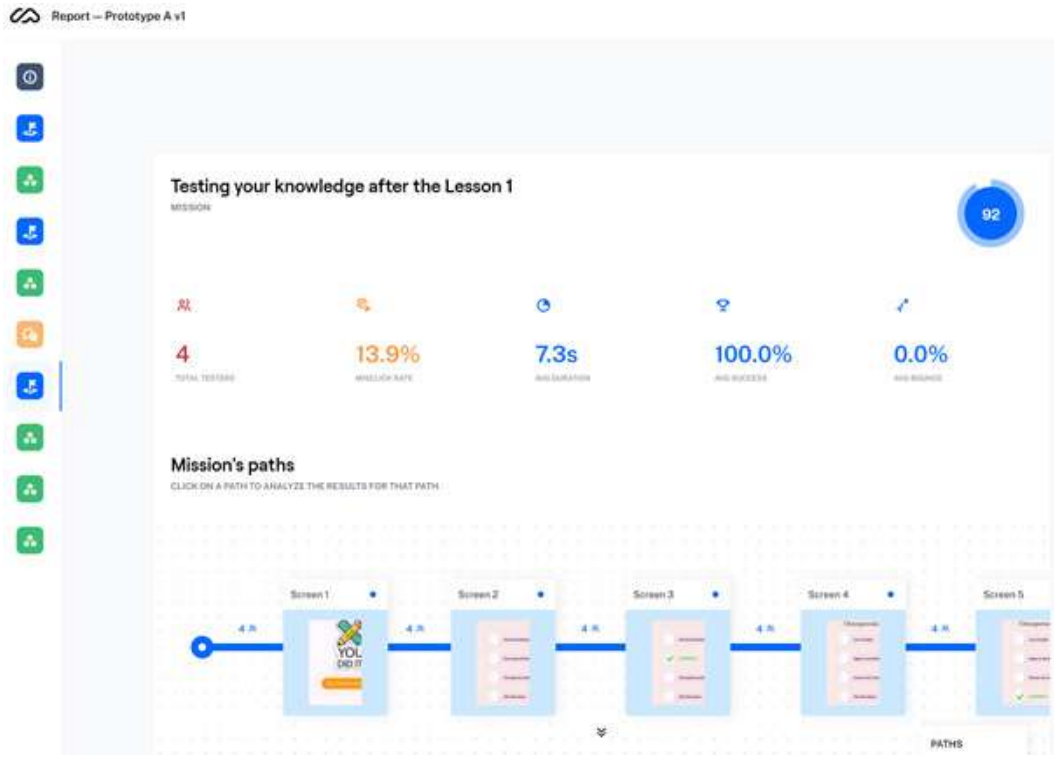

Figure 22: Prototype A, Mission 3, Results Break Down.

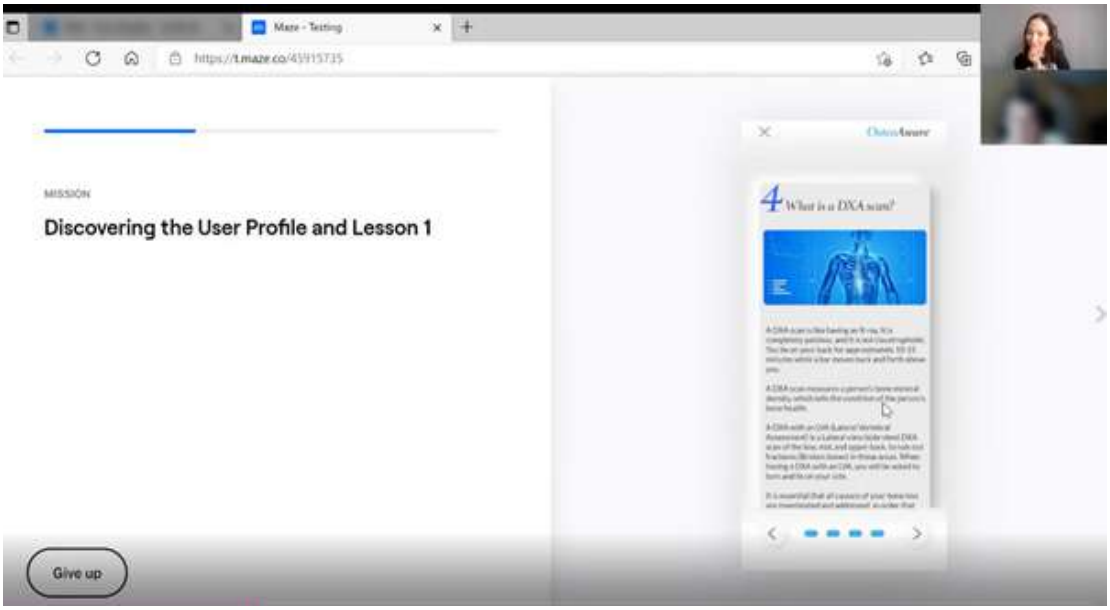

Figure 23: User Testing 1, Prototype A.

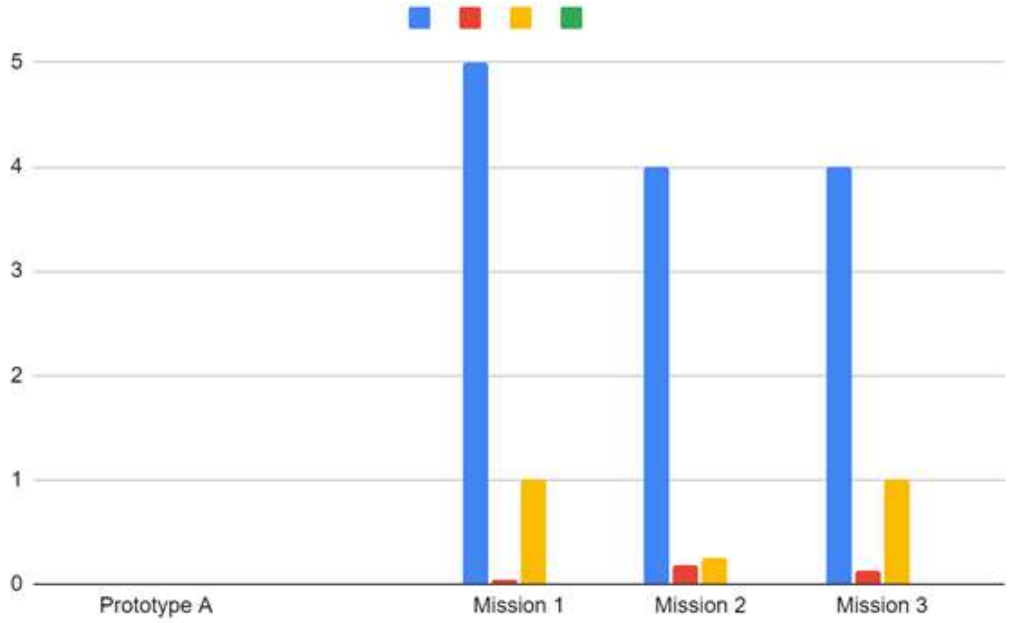

Figure 24: Break down of Results for three Missions

3.2 Prototype B excluded onboarding and instead implemented the badges as a treat after completion of each knowledge test. (see Appendices E for more details)

Results: The link to the report for Prototype B:

Usability Score - 66

Mission 1: Log in to the application and find the way to Lesson 2 - (Figure 25).

- How easy did you find this journey? **Average = 8.6**

Mission 2: Complete Lesson 2 - (Figure 26).

- How easy is it is to understand the content of the Lesson? **Average = 9.2**
- What would you like to see different in this section? Comments from the users: **a.** "I didn't understand the statement about sit-ups", **b.** "That was easier", **c.** "Could not see the Lesson 2", **d.** "Nothing" **e.** "Movement"

Mission 3: Testing your knowledge after Lesson 2 - (Figure 27).

- How easy or difficult did you find the test? **Average = 8.8**
- How did you feel after earning the badge? **Average = 8.6**
- How likely would you invite your friends to this application? **Average = 9.2**

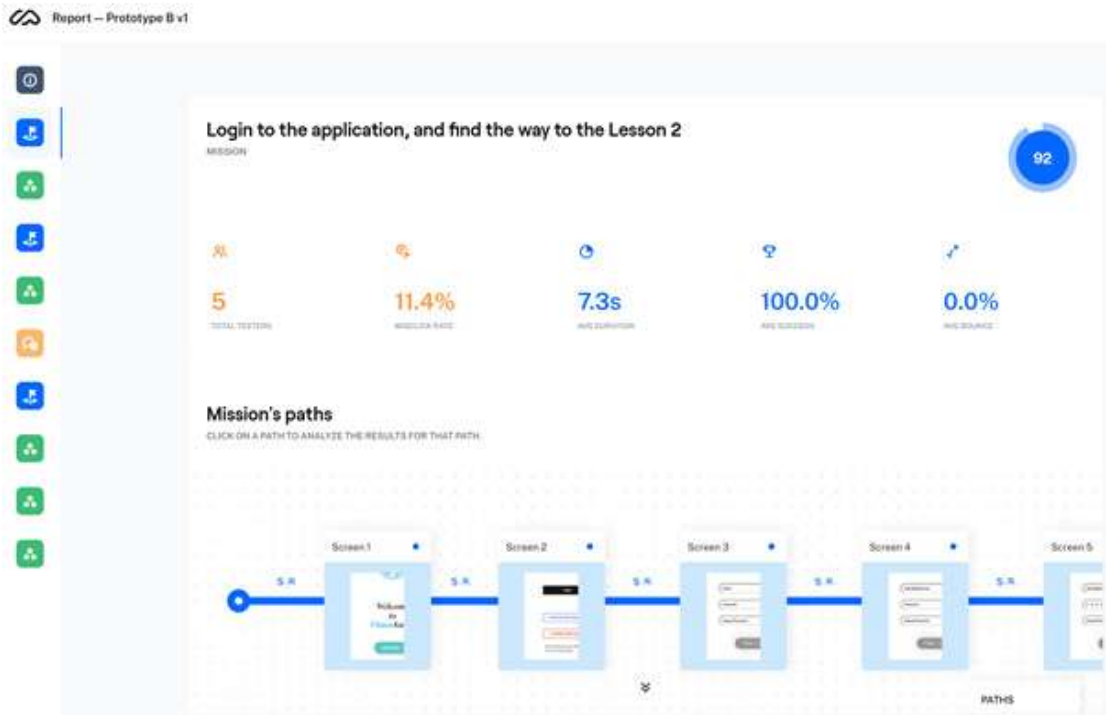

Figure 25: Prototype B, Mission 1, Results Break Down.

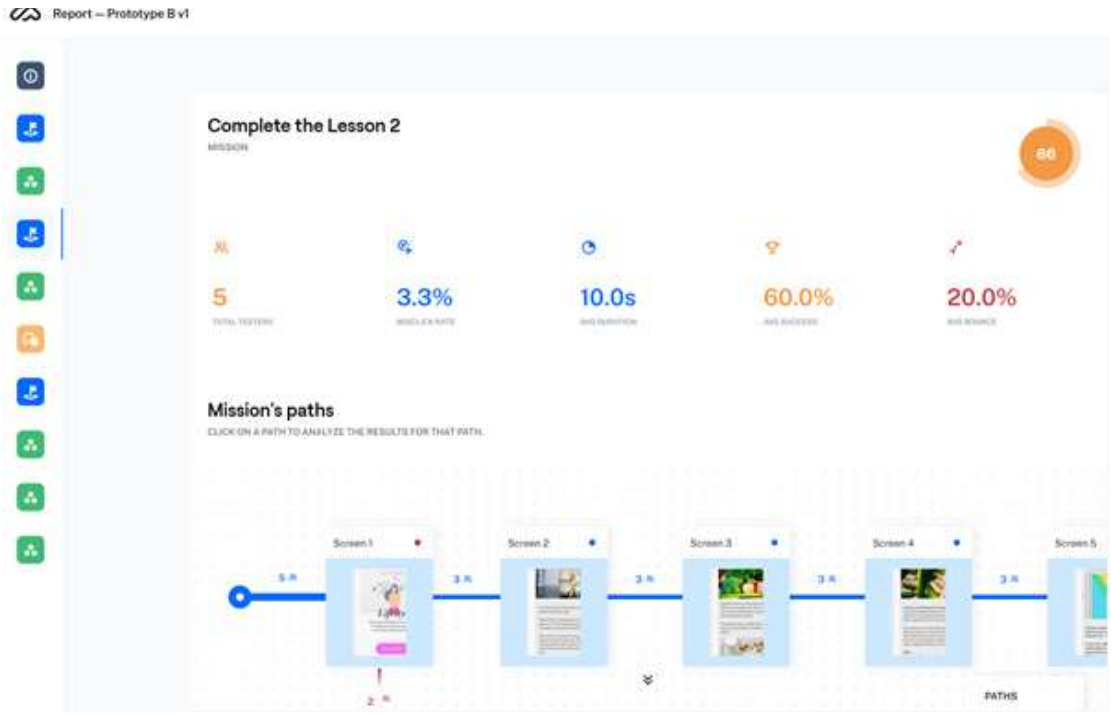

Figure 26: Prototype B, Mission 2, Results Break Down.

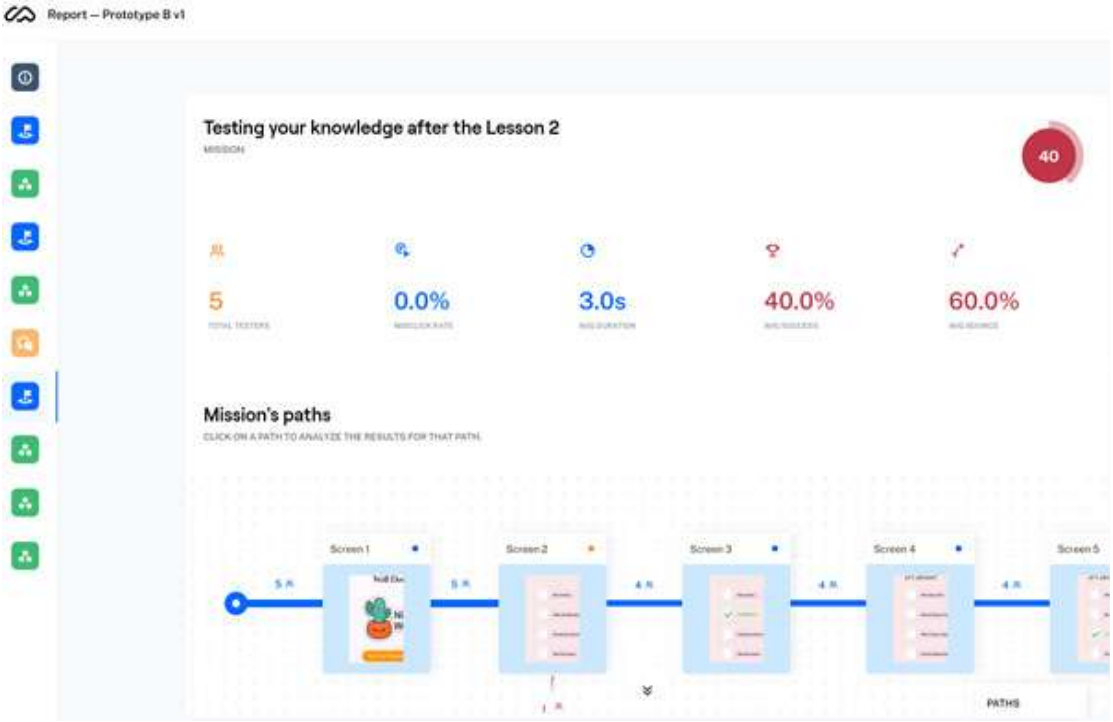

Figure 27: Prototype B, Mission 3, Results Break Down.

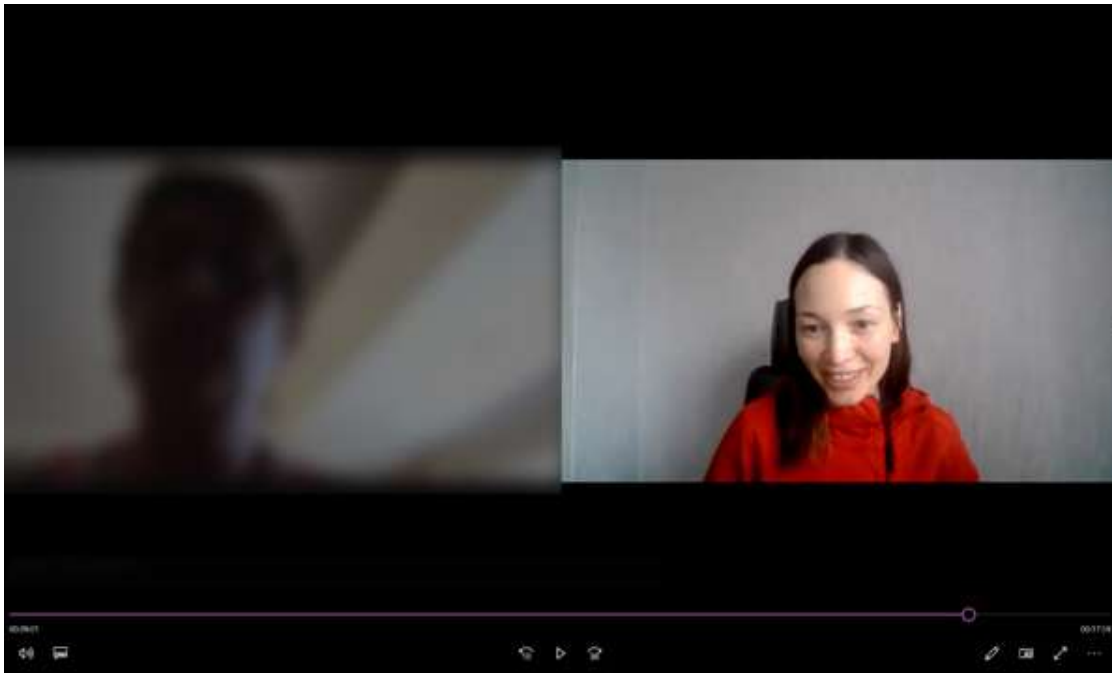

Figure 28: User Testing 2, Prototype B.

3.4 Prototype C was implemented using a combination of the motivations, the badges upon completing the knowledge test and the onboarding outlining the benefits of learning about Osteoporosis. (see Appendices F for more details)

Results: The link to the report for Prototype C:

Usability Score - 82

Mission 1: Follow the Onboarding and then log in to the application - (Figure 29).

- How easy did you find this journey? **Average = 9.8**

Mission 2: Complete Lesson 3 - (Figure 30).

- How aware were you of this information before the Lesson? **Average = 7.4**

Mission 3: Complete the knowledge test - (Figure 31).

- How easy or difficult did you find the test? **Average = 9**
- How did you feel about the overall experience of this application? **Average = 9.5**
- How likely would you invite your friends to this application? **Average = 9.5**
- How likely do you consider changing your daily habits after learning the information related to Osteoporosis? **Average = 9.8**

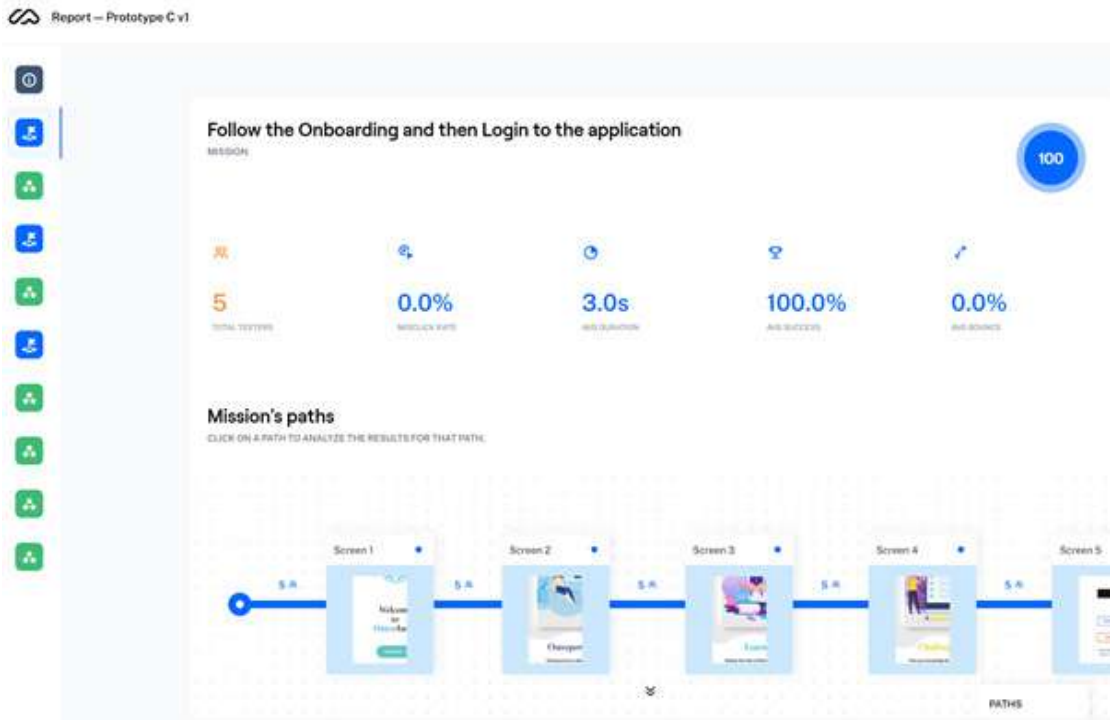

Figure 29: Prototype C, Mission 1, Results Break Down.

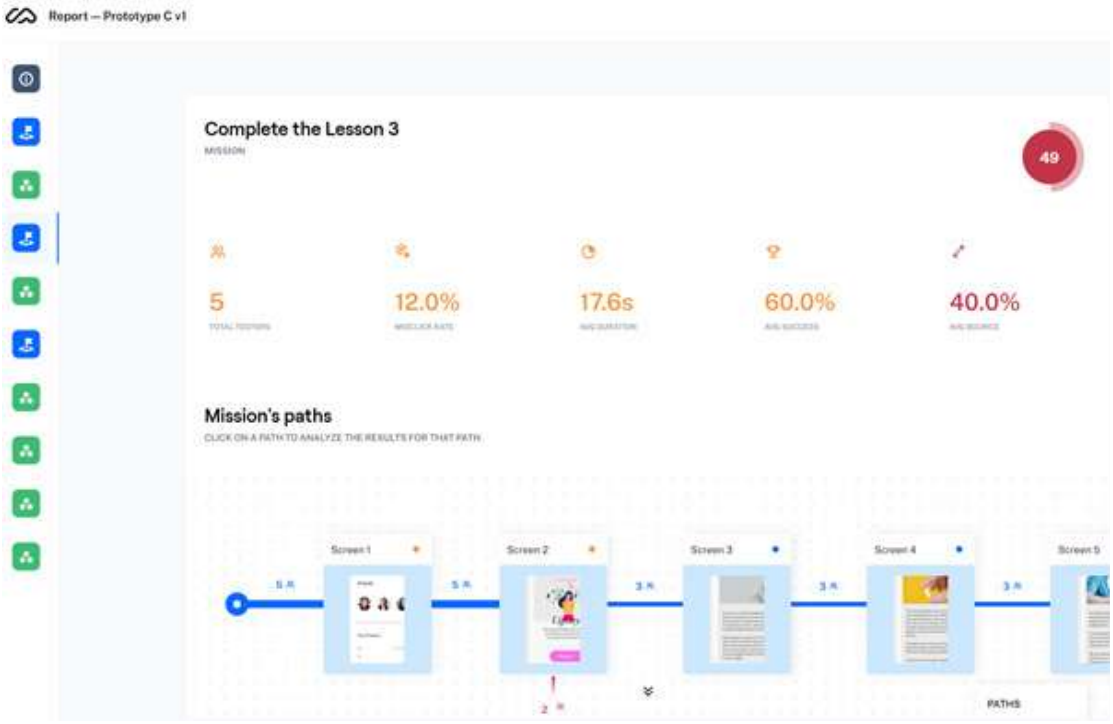

Figure 30: Prototype C, Mission 2, Results Break Down.

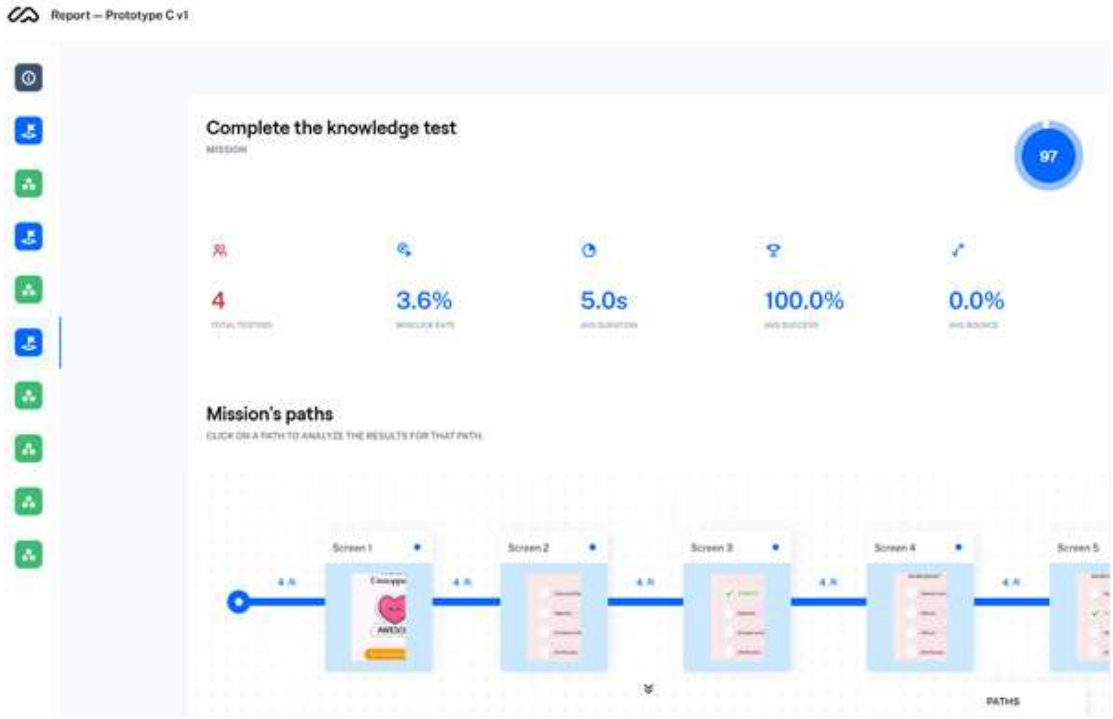

Figure 31: Prototype C, Mission 3, Results Break Down.

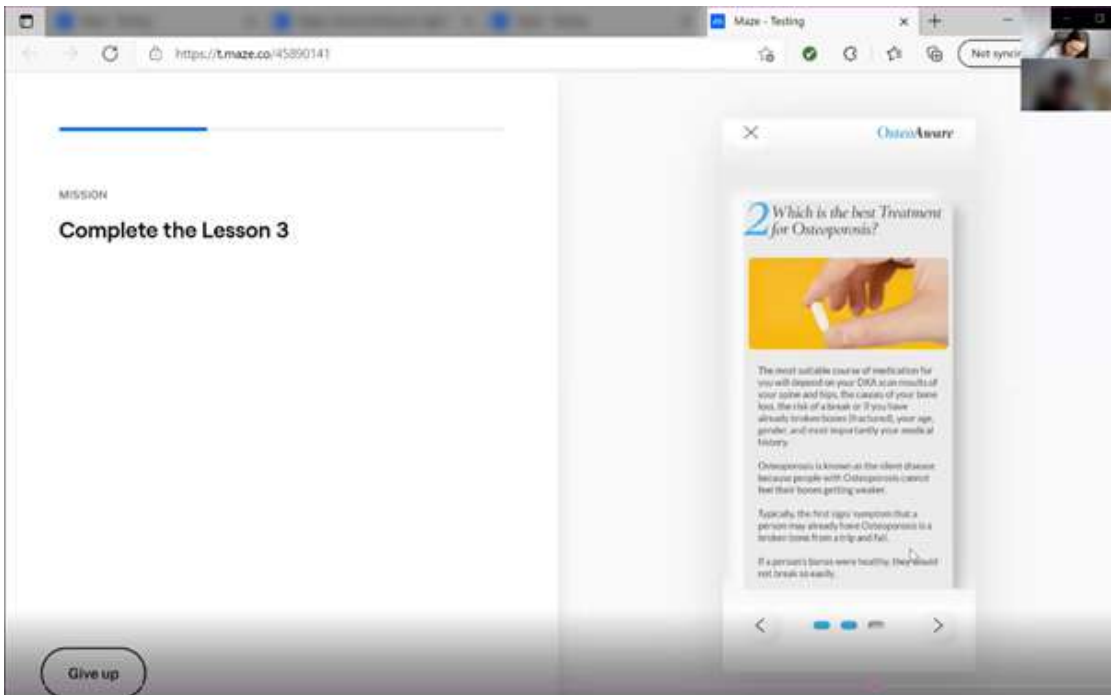

Figure 32: User Testing 1, Prototype C.

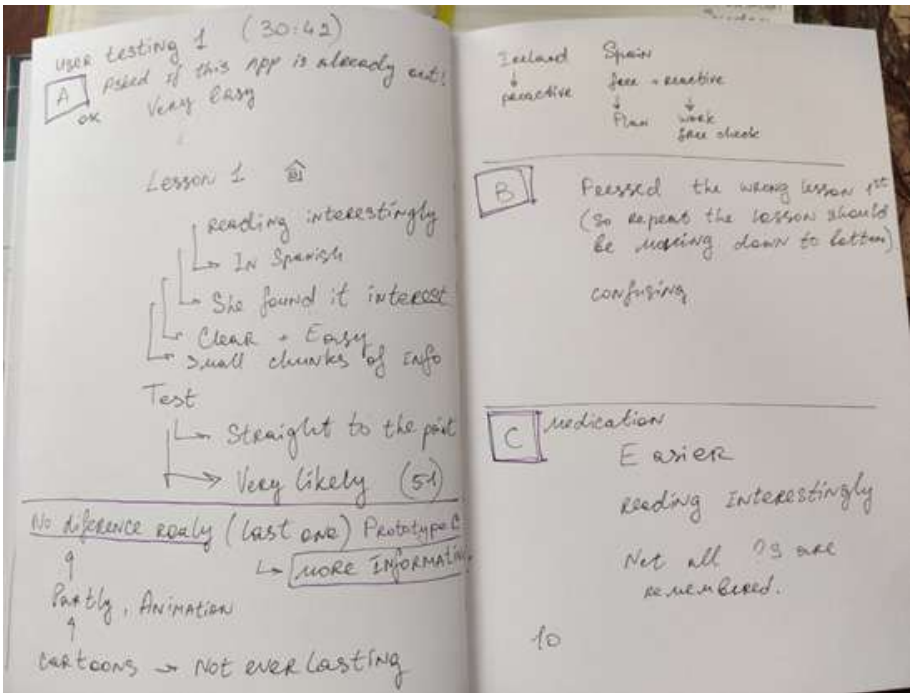

Figure 33: User Testing Notes 1

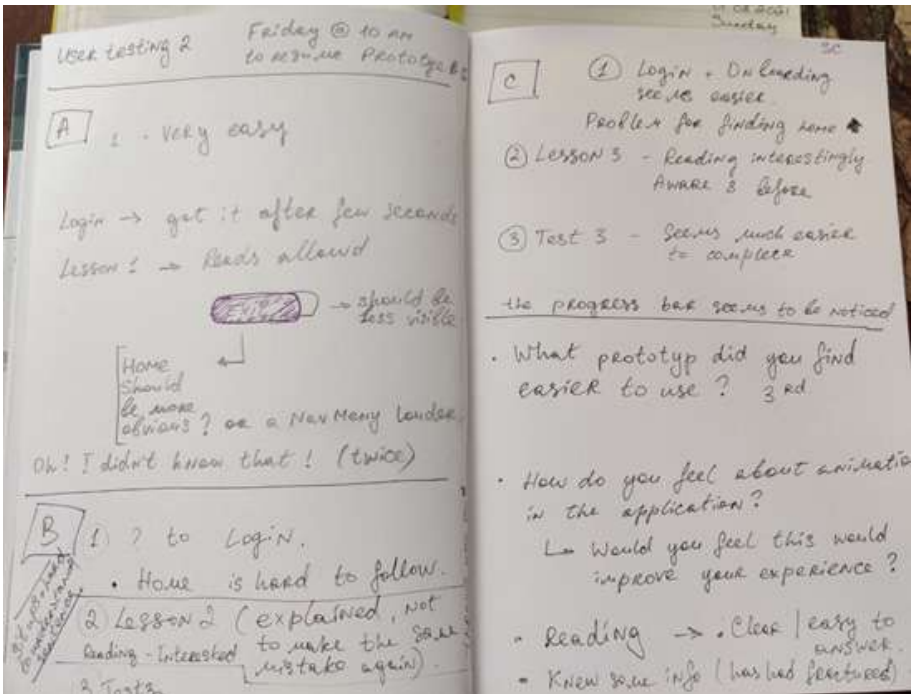

Figure 34: User Testing Notes 2

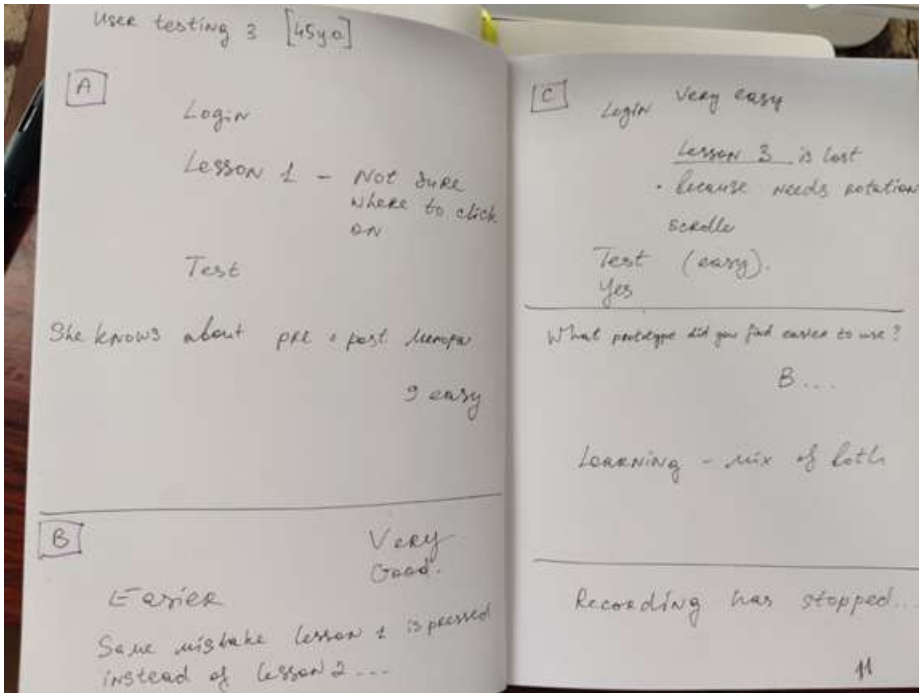

Figure 35: User Testing Notes 3

4. Quantitative Analysis

Tools used to measure the Quantitative Results are the Google Spreadsheet, Maze.co (break down of results).

4.1 Compared Results of Prototypes A, B, C.

Some of the questions between the Missions were different because the three prototypes were different. However, three prototypes had specific same questions, the results of those answers were measured to identify the better percieved prototype by the user. Overall usability score show that Prototype C is more complete and percieved better by the user than prototypes A and B. This answers the hypothesis one of this research.

After the usability testing, four out of five users have selected Prototype C as easier and clearer to understand. One user commented: **"It feels more complete."**, another user said: **"Clear and easy to answer questions"**.

The user testing also identified some of the pain points, which can be improved. The tools such as Maze.co and Google Spreadsheet helped to create a series of charts; tables 4 to 8, and figures 36 to 40, and further analyze the painpoints.

	A	B	C	D
1		Prototype A	Prototype B	Prototype C
2	**Mission 1**			
3	How easy did you find this journey?	8.6	8.6	9.2
4	**Mission 2**			
5	How aware were you of this information before the lessons?			7.4
6	How easy is it is to understand the content of the Lesson?	8.5	9.2	
7	**Mission 3**			
8	How easy or difficult did you find the test?	9.5	8.8	9
9	How likely would you invite your friends to this application?	9.3	9.2	9.5
10	How did you feel when completed the Lesson 1?	9.8		
11	How did you feel after earning the badge?		8.6	
12	How did you feel about the overall experience of this application?			9.5
13	**Total**	45.7	44.4	44.6

Table 4: Overall results using Google Sheets (all questions included)

		Prototype A	Prototype B	Prototype C
17				
18	**Mission 1**			
19	How easy did you find this journey?	8.6	8.6	9.2
20	**Mission 2**			
21	How aware were you of this information before the lessons?			
22	How easy is it is to understand the content of the Lesson?			
23	**Mission 3**			
24	How easy or difficult did you find the test?	9.5	8.8	9
25	How likely would you invite your friends to this application?	9.3	9.2	9.5
26	How did you feel when completed the Lesson 1?			
27	How did you feel after earning the badge?			
28	How did you feel about the overall experience of this application?			
29	**Total**	27.4	26.6	27.7

Table 5: Specific same questions

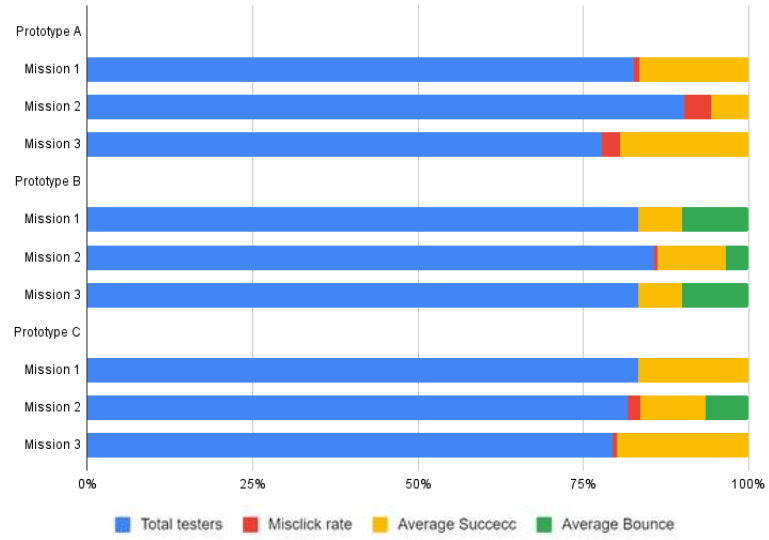

Table 6: Performance overview of Prototypes A, B and C

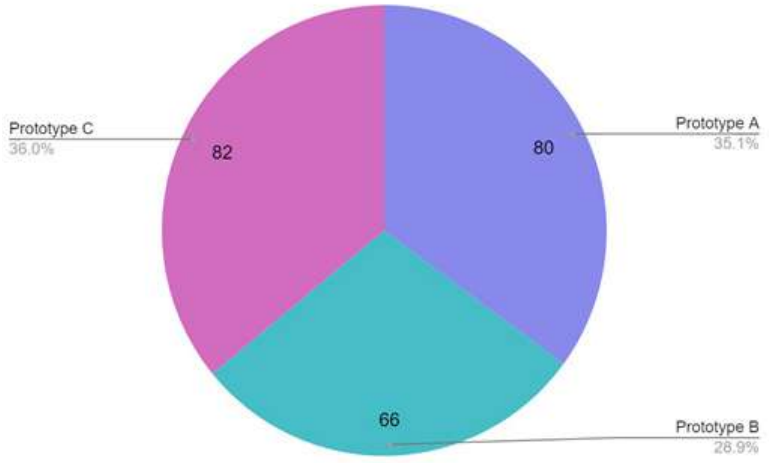

Figure 36: Overall Usability Score for Prototypes A,B,C

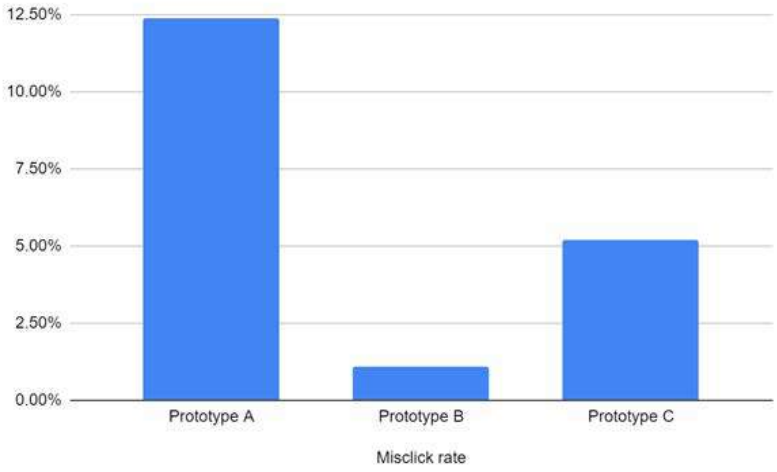

Figure 37: Misclicks rate for Prototypes A, B, C

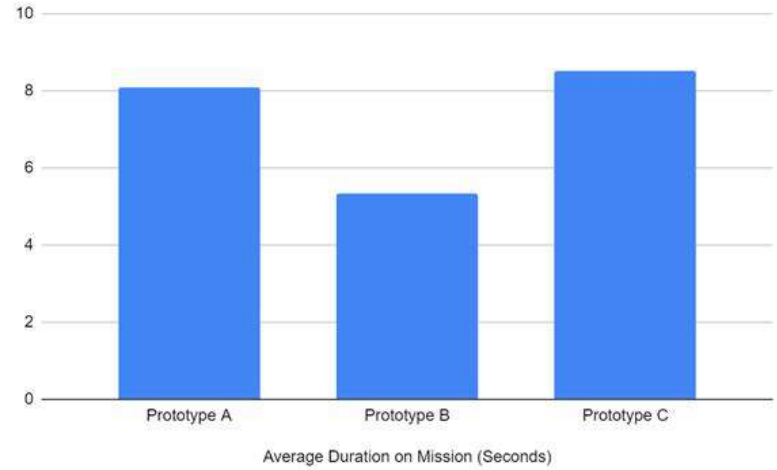

Figure 38: Average Duration on Mission for Prototypes A, B, C

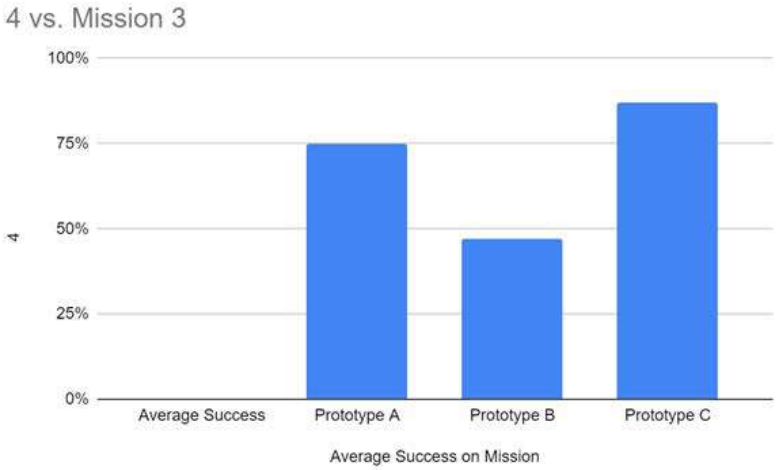

Figure 39: Average Success on Mission for Prototypes A, B, C

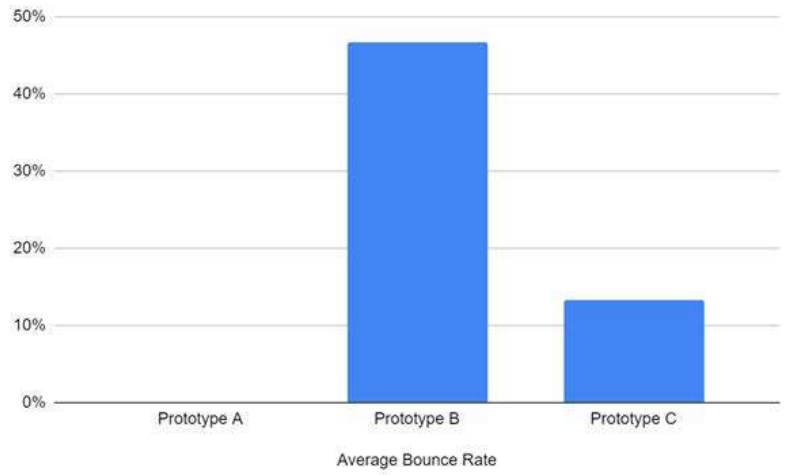

Figure 40: Average Bounce Rate for Prototypes A, B, C

One-Sample Test

Test Value = 10

	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper
Prototype A	-3.176	2	.043	.086	-.8667	-2.041	.307
Prototype B	-6.425	2	.012	.023	-1.1333	-1.892	-.374
Prototype C	-5.277	2	.017	.034	-.7667	-1.392	-.142

Table 7: One Sample Test Prototypes A, B, C

Report

	Prototype A	Prototype B	Prototype C
Mean	9.133	8.867	9.233
N	3	3	3
Std. Deviation	.4726	.3055	.2517

Table 8: Report Prototypes A, B, C

4.2 Qualitative Analysis

Hypothesis 2

H2: We believe that the user is more inclined to look after their bone health after using the application and considers changing their habits. We will know this is true after conducting a Questionnaire.

A question at the end of user testing all three prototypes was asked to prove hypothesis two. The average score of 9.8 out of 10 indicates that with a small sample, that users are more inclined to changes their habits as a result of learning the information about Osteoporosis

General Feedback (Figure 42, 43) - During the user testing, several sections have caused some frustrations for the user and were not easy to understand. For example, when the user had a mission to complete lesson two, lesson one was still at the top, and the user assumed that this is the lesson she must do. A potential fix for this problem is the rotation of the lessons, so once lesson one is completed, it changes its position to the bottom (the user can always repeat that lesson if she wants).

Other problems, such as users finding it difficult to find the location of the Lesson, can be fixed using few methods.

1. After the login screen to send the user straight to the home screen (where the lessons are)

Figure 41: Last question in the User testing

2. To have a small instruction for the use of this application (include as part of the onboarding process)
3. To make the navigation menu stand out a little more.

5. Summary

This chapter has discussed the findings from the user testing and concluded that the results answer Hypothesis 1 of this research. It proves that intrinsic and extrinsic motivations are efficient for educating a woman 40+ about Osteoporosis to increase awareness. The user testing was planned to be carried out on 10 - 16 users. However, due to inadequate responses from the invited participants, the research had five users, three of whom did not mind being recorded and happily submitted their consent form. The next chapter discusses the feedback implementation and provides the results from the second round of testing.

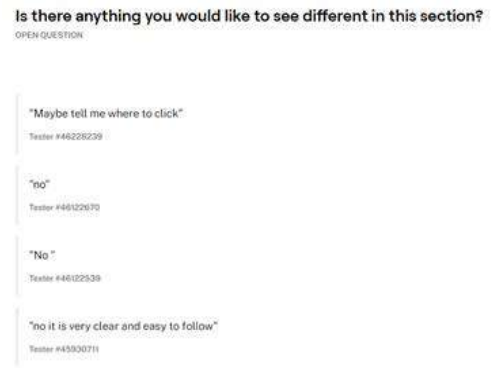

Figure 42: General Feedback - Prototype A

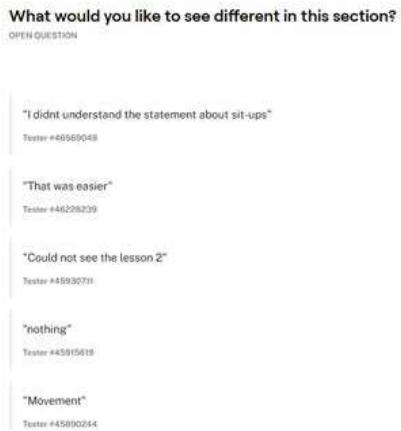

Figure 43: General Feedback - Prototype B

Chapter 7

Feedback Implementation

Introduction

This chapter shows an implementation of feedback based on user testing (chapter six). Discussing identified pain points and offers solutions. This chapter also carries out user testing two and compares the results with the previous prototype C.

1. Pain point - 1

During user testing, several sections were somewhat frustrating and difficult to understand for the user. Users faced difficulties when asked to find a location of the lesson; this can be resolved in several ways.

1.1 Potential Solutions

- After the login screen, send the user directly to the home screen (where the lessons are located)
- Have a small instruction on how to use this application (include in the registration process)
- To make the navigation menu stand out a little more.

2. Pain point - 2

When the user had a mission to complete the second lesson, the first lesson was still at the top, and the user assumed it was a lesson she should complete.

2.1 Potential Solution

- To fix this issue is to rotate the lessons, so after the first lesson is completed, it changes its position to the bottom (the user can always repeat this lesson if she wants by scrolling to the bottom of the home page, where all the lessons are located). .

3. Pain point - 3

The button “Exit” – originally was located at the bottom of the Profile screen. The button was bright blue, and some users, through user testing one did press it impulsively, causing the start over of the process.

3.1 Potential Solutions

- Implement a top menu where the user can manage their settings and exit from the application.
- Make the button grey, so it does not call for action as much.

4. Changes

4.1 Landing on the home screen of the application as soon as the user logs in, for the newly registered user, the application gives an option to start the lesson or to go to the user’s profile. Figure 44 demonstrates the sequence of the screens before the change, and Figure 45 shows the implemented changes.

Final prototype XD link

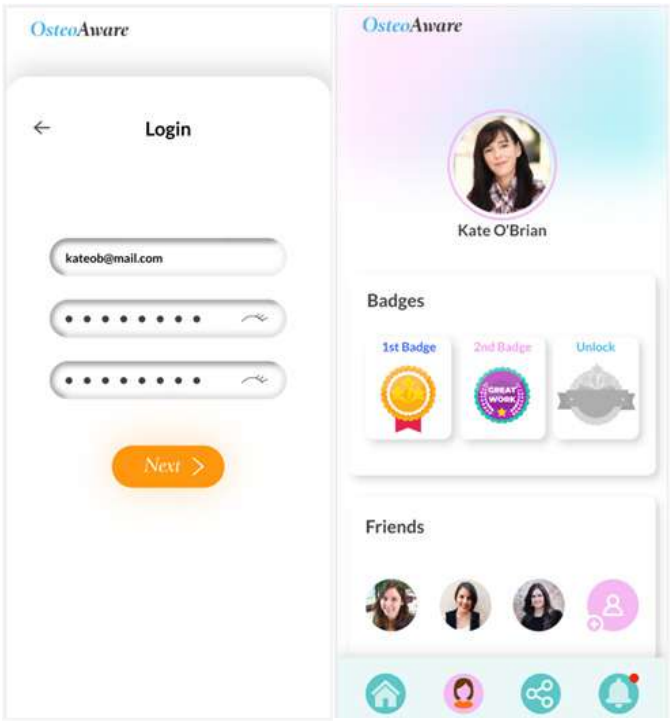

Figure 44: Change of landing page after the Login (before)

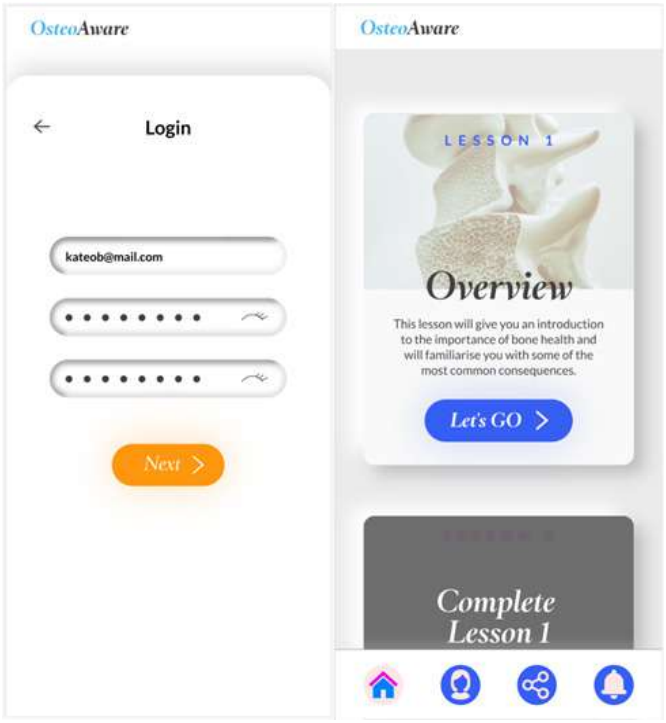

Figure 45: Change of landing page after the Login (after)

4.2 A rotation of completed lessons has been implemented; this should help to avoid misclicking. Figures 46 and 47 show the before and after changes.

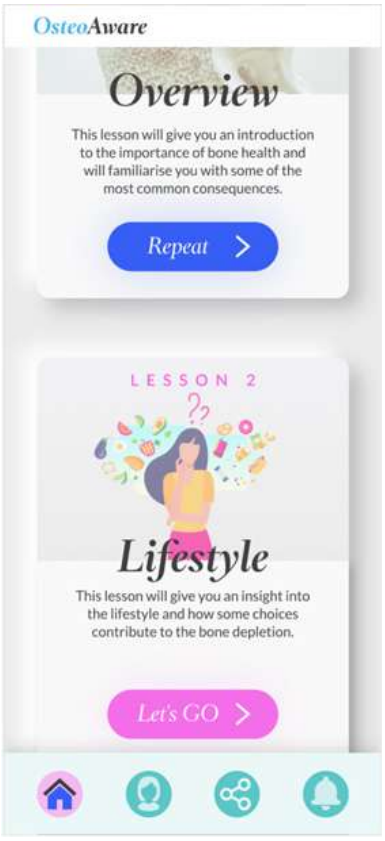

Figure 46: Home page (before)

Figure 47: Home page (after)

4.3 Within the profile screen, a top menu “settings” was implemented. Figures 48 and 49 demonstrate the newly implemented menu; users can use it to log out or change details and passwords, users can also find terms and conditions, privacy and policy.

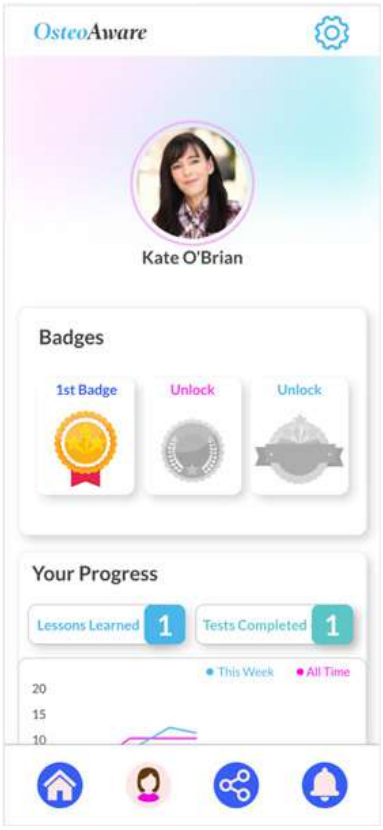

Figure 48: New top menu (1)

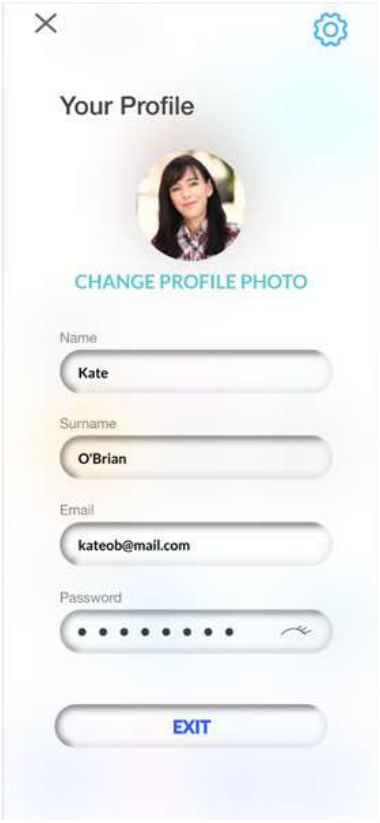

Figure 49: New top menu (2)

4.4 A higher contrast colours were assigned to the Main Navigation (Figure 51); this should result in better noticing by the user. Figure 50 shows the original navigation menu.

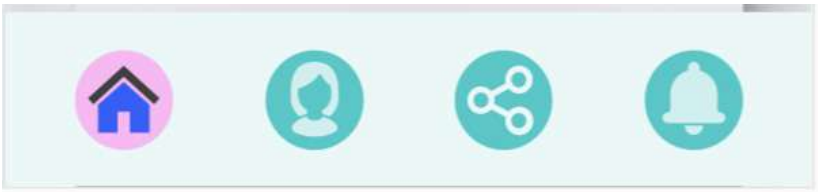

Figure 50: Origina navigation menu

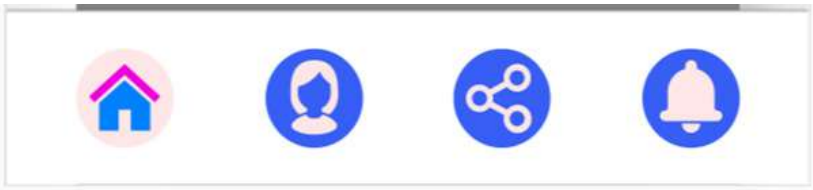

Figure 51: New navigation menu

5. User testing 2

Facebook groups were used to recruit the user testers for this prototype, asking if anyone wishes to participate in this testing to contact the researcher. To receive a consistent result with the previous prototype testing, the Maze.co was also used (repeating the same questions), so it will be possible to compare the results and see the improvement. Along with the previous questions, additional questions were added to test the overall experience and usability. A membership with Maze.co was purchased; this allowed to keep the prototypes A, B and C. The recruitment invitation had zero results; this led to purchasing user testers using Maze.

5.1 Results

Prototype D is the improved version of prototype C, it uses intrinsic and extrinsic motivation. Improvements were implemented based on the user's feedback from the first round of testing. Please see Appendix H for detailed results of each screen.

Results: The link to the report for Prototype D.

Usability Score 83

Mission 1: Follow the Onboarding and then Login to the application.- (Figure 52).

- How did you find this journey? **Average = 10**

Mission 2: Complete the Lesson 1- (Figure 53).

- How did you find this journey? **Average = 10**

Mission 3: Complete the knowledge test 1.- (Figure 54).

- How easy or difficult did you find the test? **Average = 9.7**

Mission 4: Find Profile Screen? - (Figure 55).

- Would you invite your friends to this application? **Average = 7.7**

Mission 5: Find and Complete Lesson 2 - (Figure 56).

- How did you find this journey? **Average = 9.7**

Mission 6: Complete the knowledge test 2.- (Figure 57).

- How easy or difficult did you find the test? **Average = 9.8**
- How aware were you of the information before the two lessons? **Average = 5.7**
- How did you feel about the overall experience of this application? **Average = 9.8**
- Would you like to add anything else to this application? “none” / “I can’t think of anything to add” / “No.” / “on the second part when it was talking about protein, I was not able to scroll down to read it all. Other than that, it worked very well.” / “N/A” / “Sound and interaction is missing”.

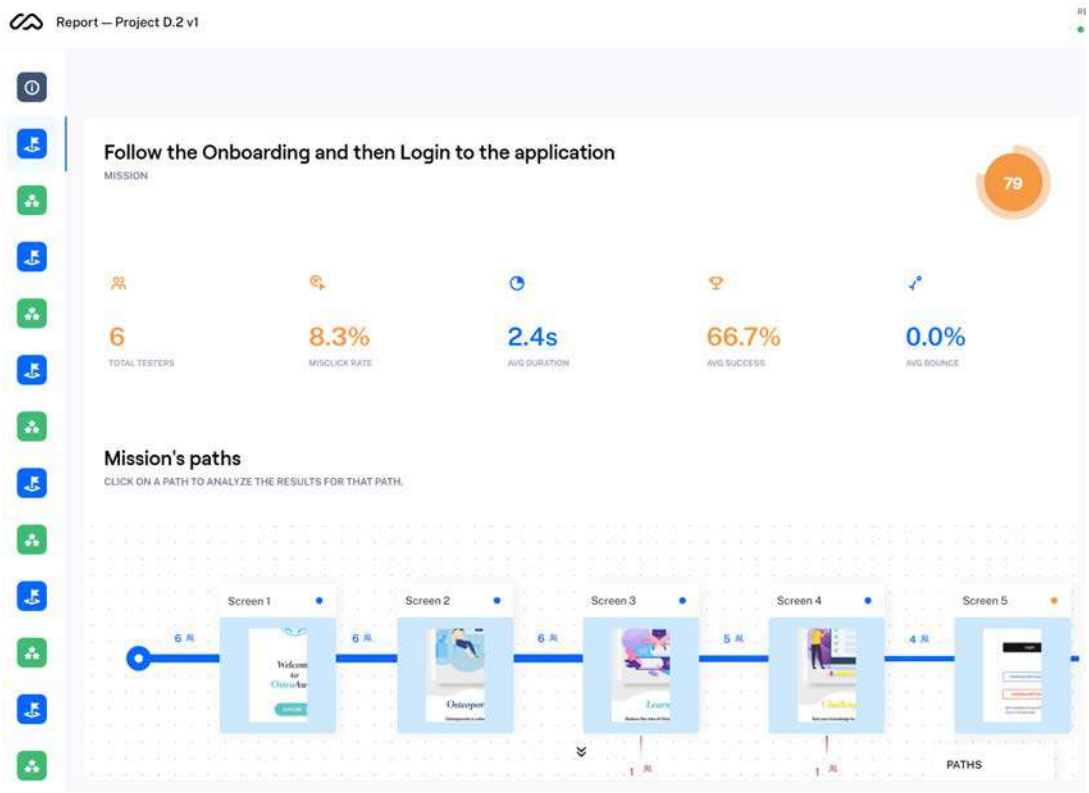

Figure 52: Prototype D, Mission 1, Results Break Down.

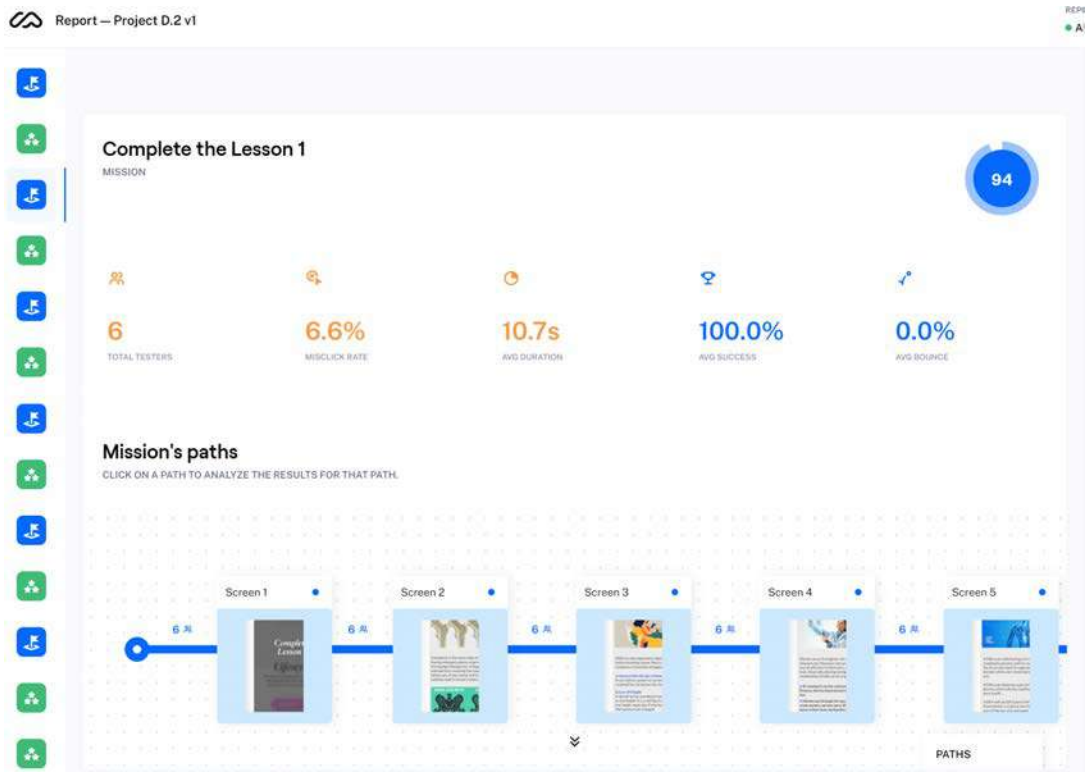

Figure 53: Prototype D, Mission 2, Results Break Down.

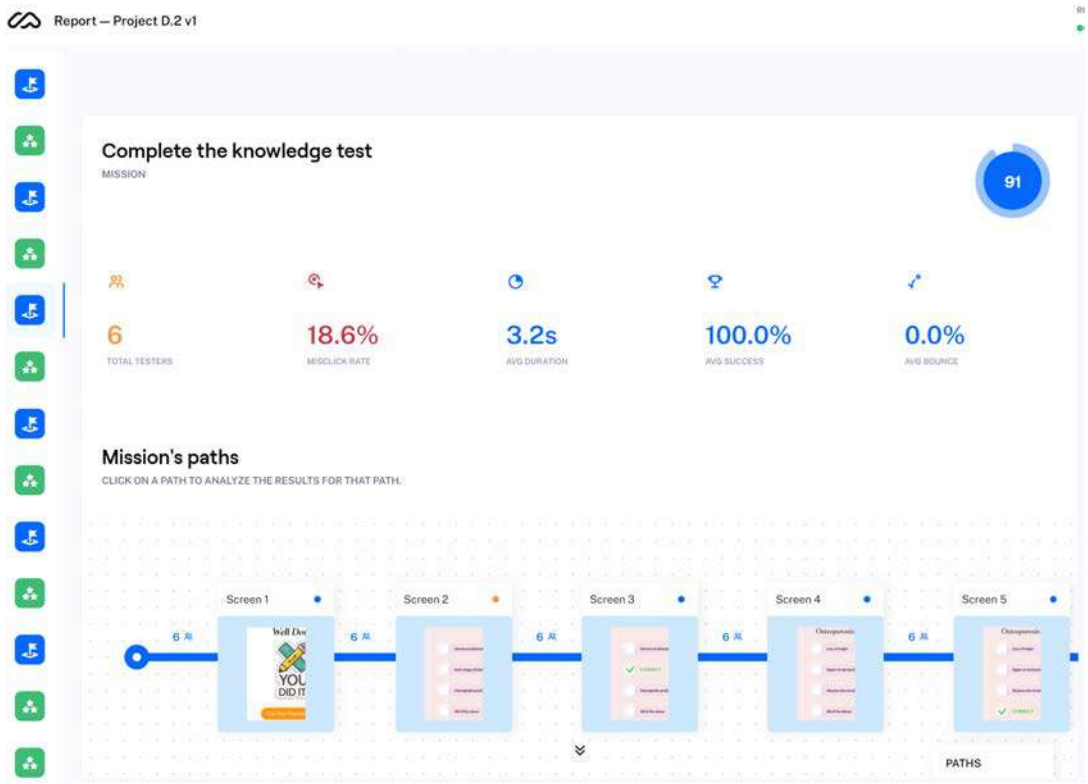

Figure 54: Prototype D, Mission 3, Results Break Down.

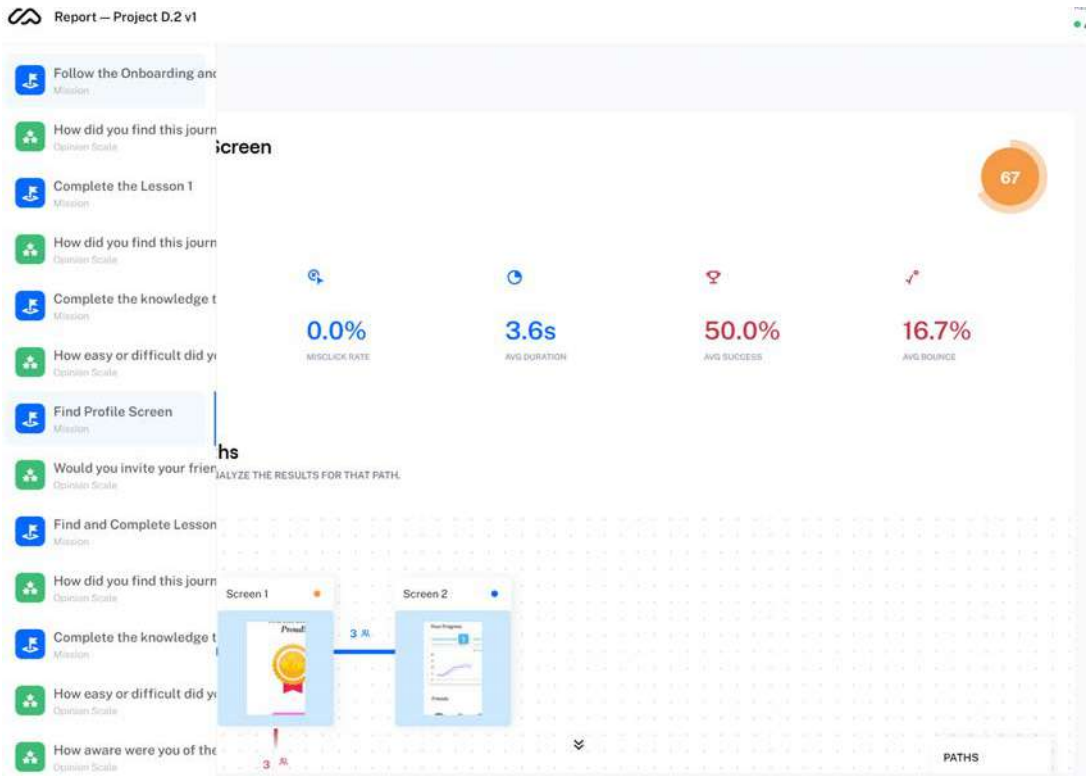

Figure 55: Prototype D, Mission 4, Results Break Down.

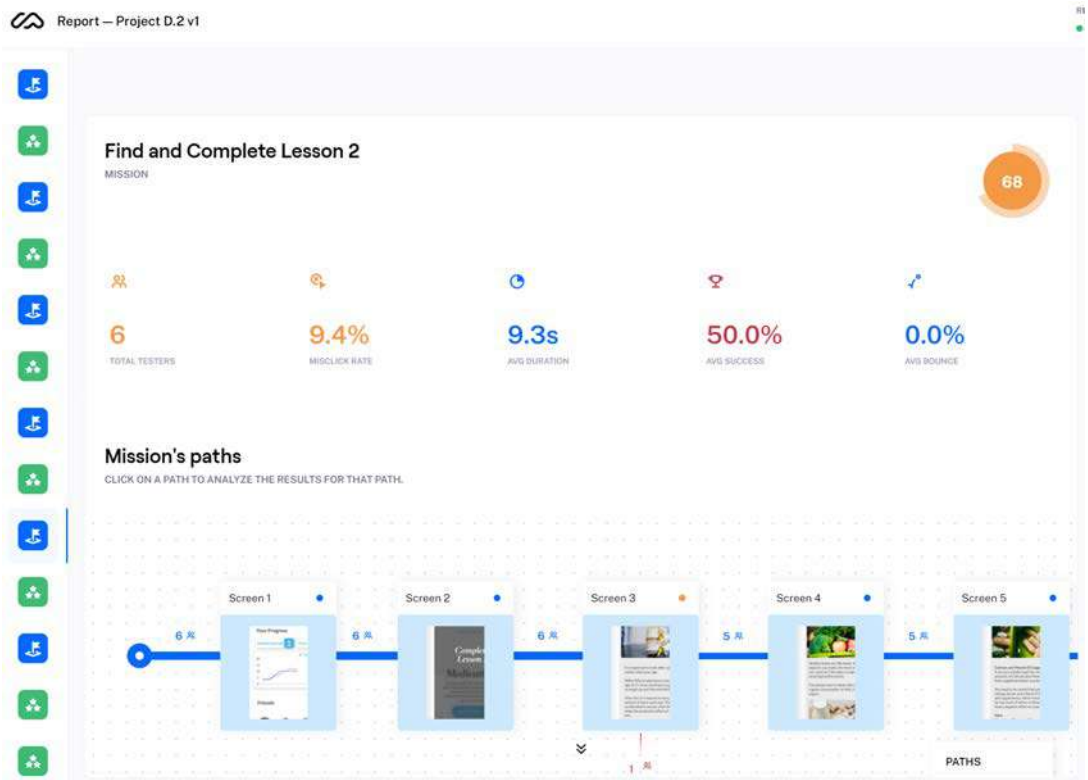

Figure 56: Prototype D, Mission 5, Results Break Down.

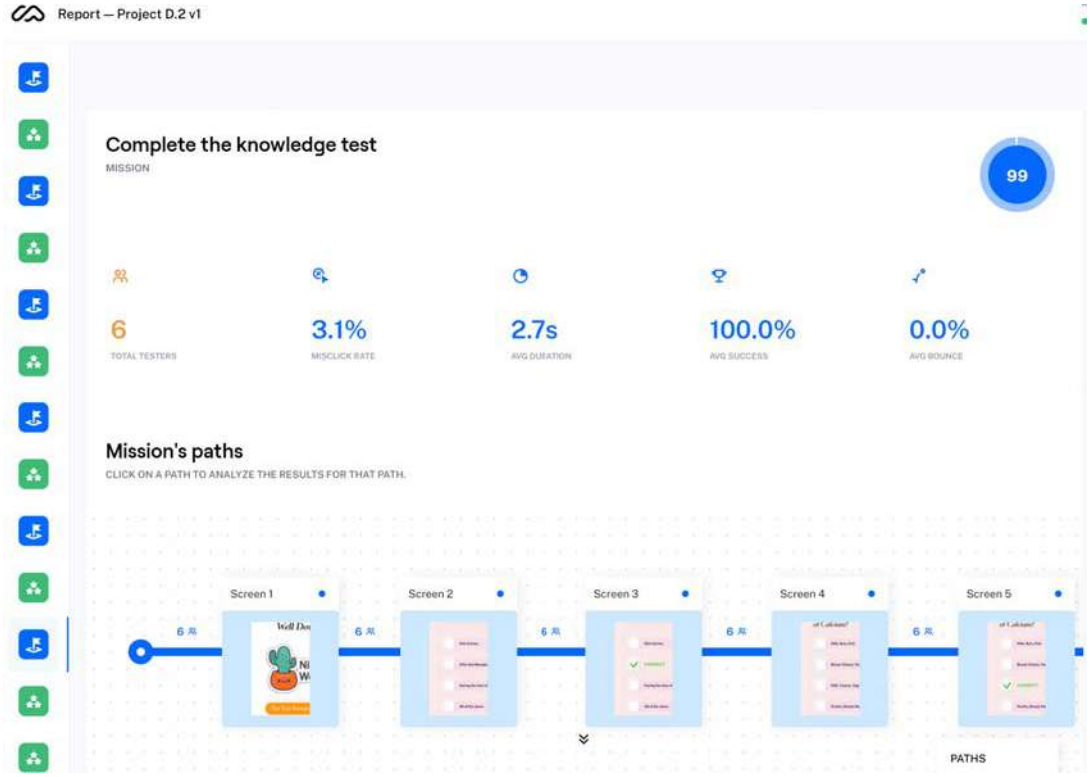

Figure 57: Prototype D, Mission 6, Results Break Down.

6. Summary

The results of the Prototype D show are positive. Unfortunately, some interactivity was lost due to the Maze plugin rendering of the link. The study also highlights that the pool of testers was purchased using Maze paid options. Zero response from invited users led the research to this option. The future research can improve on carrying out the user testing with a larger group of participants, and taking to the next level, use of the original XD or any other prototyping tool can provide the user with a more realistic feel, receiving more insights.

Chapter 8

Conclusion, Discussion, Recommendation

1. Introduction

The main aim of this study was to find the answer if technologies can increase the awareness of 40+ women about Osteoporosis with the help of technologies using gamification methods? Before performing an action and changing habits, a person must realize how the action is interconnected with the consequences. It is clear from the literature review that the lifestyle itself can influence our habits, lead to destructive trends in the long term (Michael A. Klins et al., 2020).

Moreover, one of the most critical decisions is to change behaviour. However, during the literature review, it became evident that it takes at least six months to verify the successful formation of a habit, which is out of reach due to the timeframe for this study. Instead of studying changes in behaviour, this study focuses on the preliminary preparation stage (Prochaka et al., 1983). This study uses the Normans' emotional design framework and Yu-kai Chou's gamification framework (2021) to create an application that raises awareness of the target audience (women 40+).

Preliminary primary research assumed that the problem of Osteoporosis unawareness amongst participants exists and is worthy of further research. The criteria for searching for a literature review were such phrases as; Osteoporosis and awareness in Ireland, Learning through technology, Methods of Motivating adult Women using Technology, Habit Formation in Adult Women, Gamification in Behavioral Design and Emotions. The abstract of the relevant literature for the last five years was scanned

and selected for further study.

2. Findings

This study can confirm that one-third of the female population aged 40 years and older are not aware of the relationship between Osteoporosis and menopause, which is a problem primarily for women in the long term. The online survey shows that 100% of the participants use a mobile phone, and on average, they spend 2-3 hours a day; this was the primary indicator when choosing a device. Technologies can increase awareness of Osteoporosis through gaming methods, thereby connecting the user with information on a more emotional level. The technology review also shows that a mobile device is a preferred method for the target audience. The study "Perception and use of technology in older people with ophthalmic condition" by Zaria et al. (2019) also points out that 100% of the 40-49 aged group (females) used a mobile phone for different reasons. Gkrozou et al. (2019) found that women are more likely to use mHealth apps than men (9% vs 4%). Consumers will be provided with medical devices to prevent certain diseases and even self-assess their current condition based on their needs (Gkrozou et al., 2019).

The report provides an insight into national sentiment in the country during lockdown (during the COVID), showing that the search for applications on critical mental health issues has increased dramatically.

Since HSE provides all of Ireland's public health services in hospitals and communities across the country, the responsibility to inform the public about Osteoporosis in Ireland should primarily come from them or other medical instances. The Online Survey also confirms that women would prefer to receive information about Osteoporosis from general practitioners. Also, based on the research of Burgess (2017), Macmillan et al. (2015), Waugh et al. (2019). There is growing concern about the quality of the information provided in health applications. Patients even explicitly stated that if

their provider recommended the use, “it would make a difference” (Riis et al., 2018). Having an app recommended by a doctor familiar with evidence-based information is one of the most important criteria for users (Vo et al., 2019). This study used The Irish Osteoporosis Society (the national experts regarding bone health) for the content while building the prototypes to provide the user with creditableinformation.

3. Research Question

How can technology improve the Osteoporosis awareness for women 40+ via technology using gamification methods?

The research question can be answered: by introducing tailor-made technology for the user, including fully reliable content, potentially part of a national health program. Normans emotional design lens assists in creating entirely with the user in mind, resulting in a suitable product.

H1: We believe that Prototype C (internal and external motivations) is the most effective way to present information about the state of Osteoporosis, increasing awareness. After testing three prototypes with the help of one user group, the user can compare three prototypes.

Three prototypes were built and tested using Maze.co to find out which motivation is better for the user. The results of these responses were measured to determine the best performance between the three prototypes. After testing the usability, four out of five users have chosen prototype C as more understandable, confirming hypothesis 1. One user commented: “It seems more complete”, “another user said:” It is clear and easy to answer questions.”

H2: We believe that the user is more inclined to take care of their bone health after using the app and consider changing their habits. We will find out that this is true after

surveying users after they learnt about Osteoporosis.

At the end of the user testing of all three prototypes, a question was asked. An average score of 9.8 out of 10 proves the correctness of the study. The user considers the possibility of changing their habits after learning about Osteoporosis, which confirms hypothesis 2 of this study.

4. Recommendations for future research

Some limitations within this research were:

- Difficulty to approach General Practitioners
- Relatively small bank of user testers.

Further research can focus on increasing the scalability; this will help to get a broader perspective. Also, this research can be taken to a different level by examining further steps of behavioural change and exploring different methods other than gamification can gain different perspectives and results.

The structure of this research can further serve as a reference point for further studies in educating people about some factors of everyday habits that could be avoided. Because findings from the Online Survey also suggests that women would prefer to obtain information about Osteoporosis from General Practitioners, this means that a government-funded project involving HSE can increase the public's trust and improve longevity.

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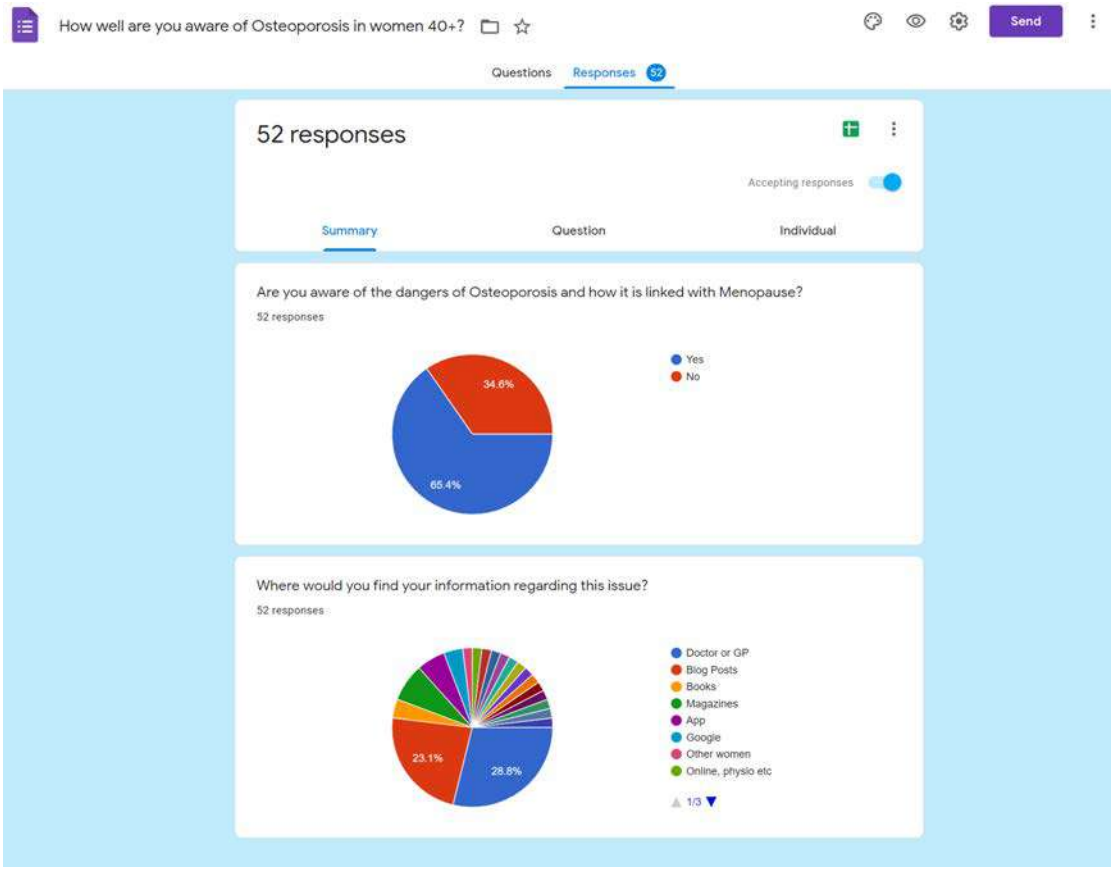
Wang, S. (2019) Fitbit: The UX Behind the Habit of Exercise — a UX Case Study [online], Available from: <https://uxdesign.cc/fitbit-a-usability-case-study-b23e4c-539c3c> [Accessed Dec 6, 2020].

Weinberg, E. (2019) Guide to Onboarding UX Patterns & which One is Right for You [online], Available from: <https://uxdesign.cc/menu-of-ux-onboarding-patterns-and-when-to-use-them-3df2e3880fd1> [Accessed Jul 4, 2021].

Xiong, J. and Zuo, M. (2019) Older Adults' Learning Motivations in Massive Open Online Courses, Informa UK Limited.

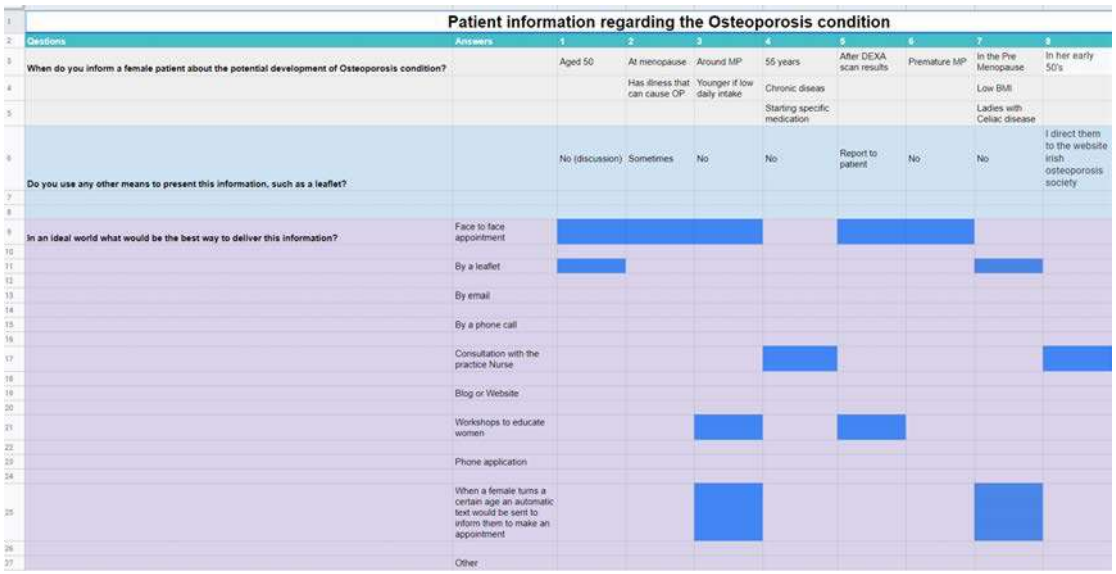
Appendix A

Survey 1 - Field Survey



Appendix B

Survey 2 - GP Questionnaire Results (by post and online)



Patient information regarding the Osteoporosis condition									
Qestions	Answers	1	2	3	4	5	6	7	8
When do you inform a female patient about the potential development of Osteoporosis condition?		Aged 50	At menopause	Around MP	55 years	After DEXA scan results	Premature MP	In the Pre Menopause	In her early 50's
			Has illness that can cause OP	Younger if low daily intake	Chronic diseas			Low BMI	
					Starting specific medication			Ladies with Celiac disease	
Do you use any other means to present this information, such as a leaflet?		No (discussion)	Sometimes	No	No	Report to patient	No	No	I direct them to the website irish osteoporosis society
In an ideal world what would be the best way to deliver this information?	Face to face appointment								
	By a leaflet								
	By email								
	By a phone call								
	Consultation with the practice Nurse								
	Blog or Website								
	Workshops to educate women								
	Phone application								
	When a female turns a certain age an automatic text would be sent to inform them to make an appointment								
	Other								

Survey 2, addressed to GPs (by post)

Patient information regarding the Osteoporosis condition

This information will be used in a research project for the MA in Creative Digital Media.

1. When do you inform a female patient about the potential development of Osteoporosis condition?

   Your answer _____

2. Do you use any other means to present this information, such as a leaflet?

   Your answer _____

3. In an ideal world what would be the best way to deliver this information?

Face to face appointment

By a leaflet

By email

By a phone call

Consultation with the practice Nurse

Blog or Website

Workshops to educate women.

Phone application

When a female turns a certain age, an automatic text would be sent to inform them to make an appointment.

Other _____

Survey 2 (list of addressed, the paper version was sent)

1. Dr Sandra Kehoe, Dr Helen Delaney and Dr Christopher G Moran YES

Dr. Sandra Kehoe, Dr. Helen Delaney, Dr. Christopher Gerard Moran, Dr. AK Murali Nair, Nurse Lara Loughman, Nurse Aoife Reddy

65 Tullow Street

Carlow

Co Carlow

Tel: 059 9130770

2. Centric Health Carlow Medical.

Dr. Sonia Culda, Dr. Irene Le Roux, Dr. Paula Greally, Dr. Heera Bhagat, Nurse Tracy Bermingham, Nurse Maria Galbally, Nurse Kate Attride

Shamrock Plaza, Green Lane, Carlow, Co Carlow 1707

Tel: 059 9133292

Email: mkchoe@centrichealthcarlow.ie

3. Dr Martin Fitzgerald - YES

Dr. Martin Fitzgerald, Nurse Una O Brien Fitzgerald

Medical Centre

Tulla

Co Clare

Tel: 065 6835150

Email: docmafitz@eircom.net

4. Dr Eleanor Jones - YES

Dr. Eleanor Jones, Nurse Jennifer Jones, Nurse Anne Murphy

The Medical Centre

Manor Mall

Brackenstown Road

Swords

Co Dublin

Tel: 01 8956590

5. Tully Family Practice - YES

Dr. Jullie Mc Hugh, Dr. Fiona Magee

Unit 1 Dun Laoghaire Business Park

Pottery Road

Dun Laoghaire

A96 A6P2

Co Dublin

Tel: 01 5510277

Email: info@tullyfamilypractice.ie

6. Dr Charles Bourke - YES

Dr. Charles Bourke, Nurse Margaret Bourke, Nurse Aileen Henry

Killybegs Health Centre

Killybegs

Co Donegal

Tel: 074 9731148

7. Bank Place Clinic - YES

Dr. Fiona Kelly, Dr. Colin Gleeson, Nurse Marie Noel Coleman, Nurse Lily Mc Carthy

Castletownbere

Co Cork

Tel: 027 70209

Email: info@beardoc.org

8. Claddagh Medical Centre - YES

Dr. Rita Halloran, Dr. Eamonn O Shea, Nurse Mary Hogan, Nurse Lu Anne Meiring, Nurse Anna Reilly

The Crescent

H91 EA37

Galway

Tel: 091 582321

Email: thecladdaghmedicalcentre@gmail.com

9. Knocknacarra Family Care – YES

Dr. Shastri Persad

1 Ashleigh Grove

Ballymoneen Road

Knocknacarra

Galway

Tel: 091 590055

Email: info@knocknacarrafamilycare.ie

10. Dr Laura Molony - YES

Dr. Laura Molony, Nurse Una Stapleton, Nurse Bridget Aylward

Castle Street

Carrick on Suir

Co Tipperary

Tel: 051 640527

11. Tramore Medical Clinic – emailed

Dr. Dermot Nolan, Nurse Maria O Neill, Nurse Kate O Donoghue, Dr. Emma Aherne, Dr. Austin Byrne

Summerhill Centre

Summerhill

Tramore

Co Waterford

Tel: 051 386299

Email: admin@tramoremedicalclinic.ie

12. Dr Vincent Brett and Dr Aideen Brides - YES

Dr. Vincent Brett, Dr. Aideen Brides, Nurse Yvonne Keenan, Nurse Pauline Fowler

Waterside Medical Centre

Suite 2

90 Glaslough Street

Monaghan

Co Monaghan

Tel: 047 81986

13. admin@mbmc.ie

14. Dr Grainne Pinaqui - YES

Dr. Grainne Pinaqui, Nurse Jennifer Cullen

The Faythe Medical Centre

178 The Faythe

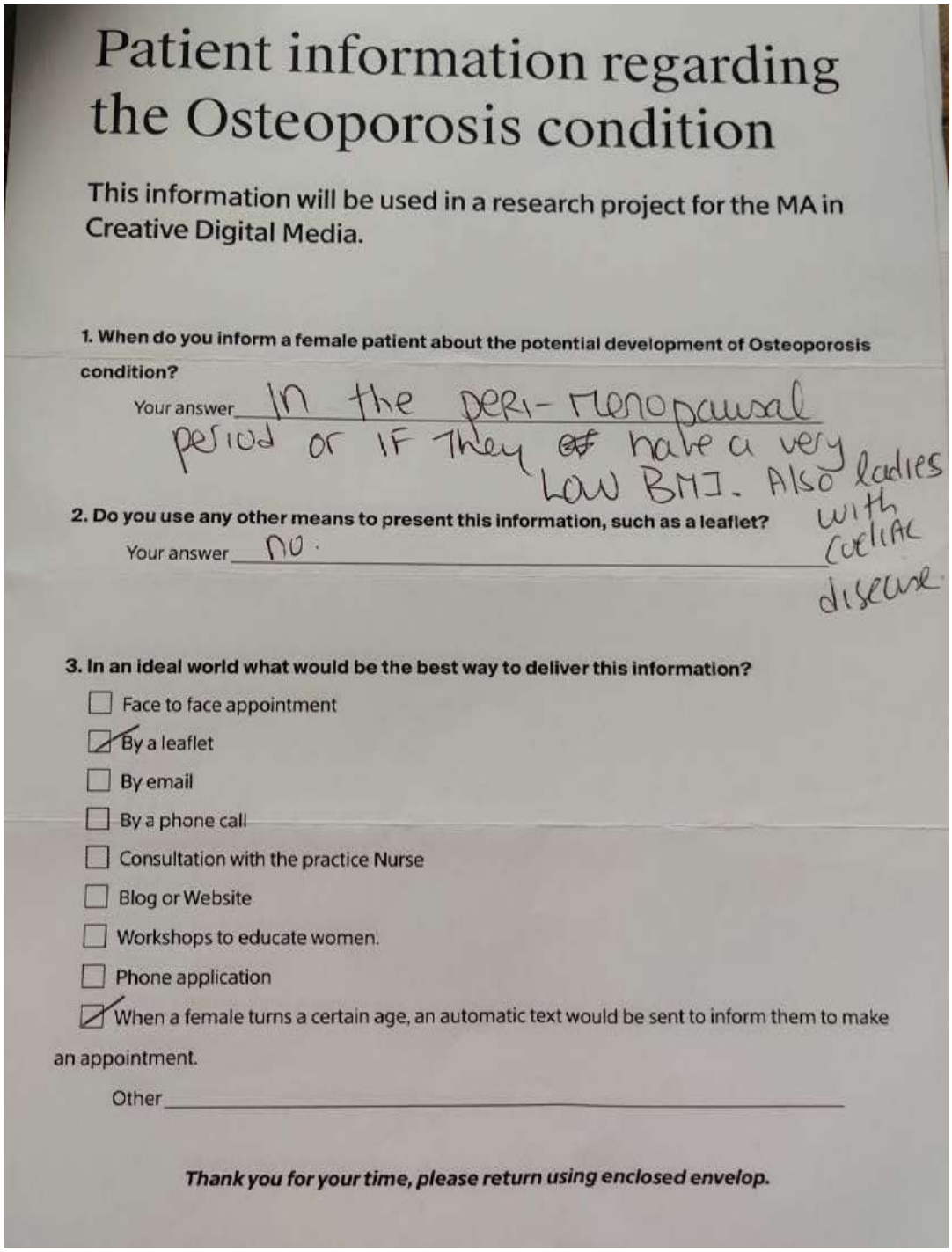
Wexford

Co Wexford

Tel: 053 9142355

Email: info@tfmc.ie

Results, returned by the GPs (using post)



Patient information regarding the Osteoporosis condition

This information will be used in a research project for the MA in Creative Digital Media.

1. When do you inform a female patient about the potential development of Osteoporosis condition?

Your answer In the peri-menopausal period or IF they ~~of~~ have a very LOW BMI. Also ladies with coeliac disease.

2. Do you use any other means to present this information, such as a leaflet?

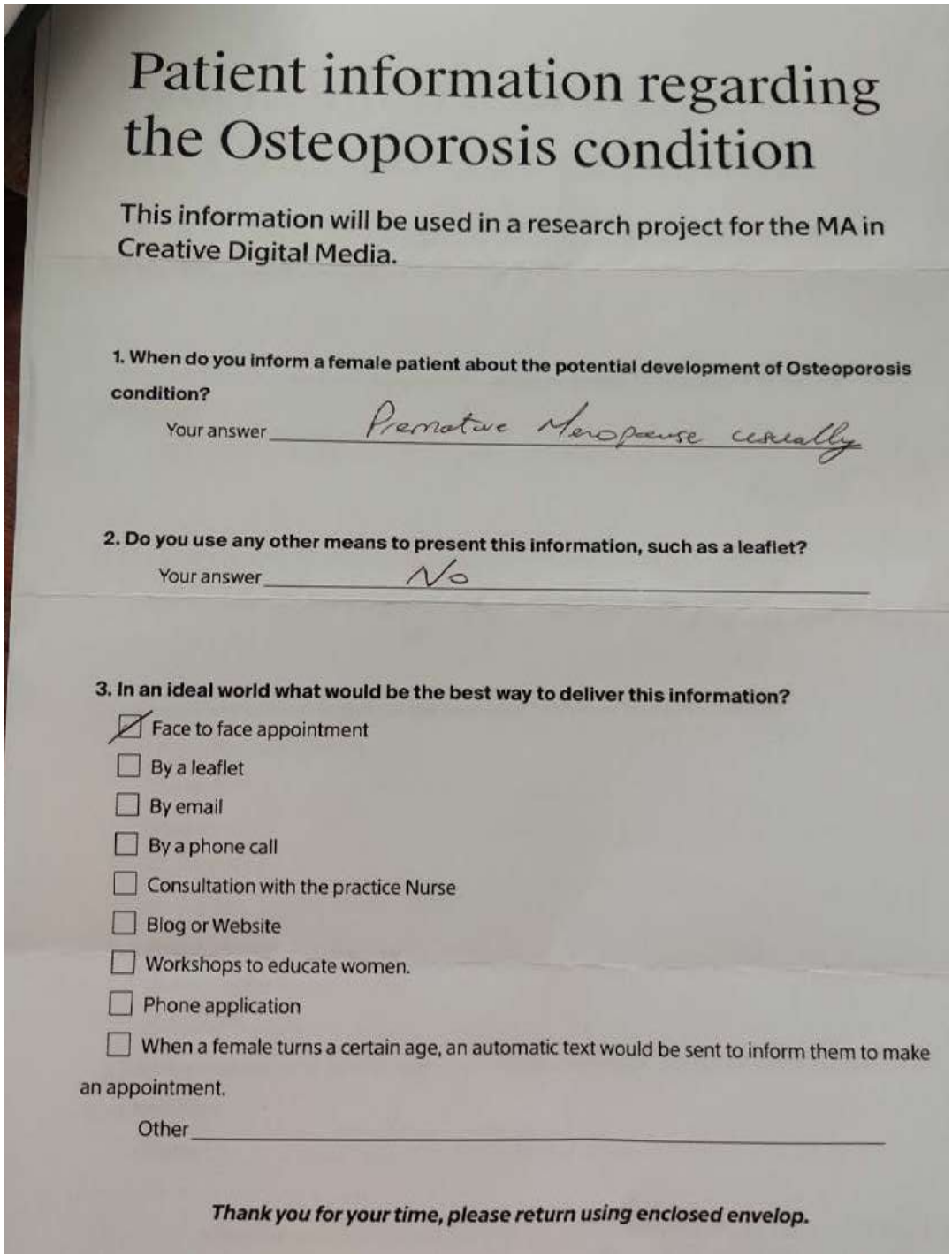
Your answer no.

3. In an ideal world what would be the best way to deliver this information?

- ☐ Face to face appointment
- ☑ By a leaflet
- ☐ By email
- ☐ By a phone call
- ☐ Consultation with the practice Nurse
- ☐ Blog or Website
- ☐ Workshops to educate women.
- ☐ Phone application
- ☑ When a female turns a certain age, an automatic text would be sent to inform them to make an appointment.

Other _____

Thank you for your time, please return using enclosed envelop.



Patient information regarding the Osteoporosis condition

This information will be used in a research project for the MA in Creative Digital Media.

1. When do you inform a female patient about the potential development of Osteoporosis condition?

Your answer Premature Menopause usually

2. Do you use any other means to present this information, such as a leaflet?

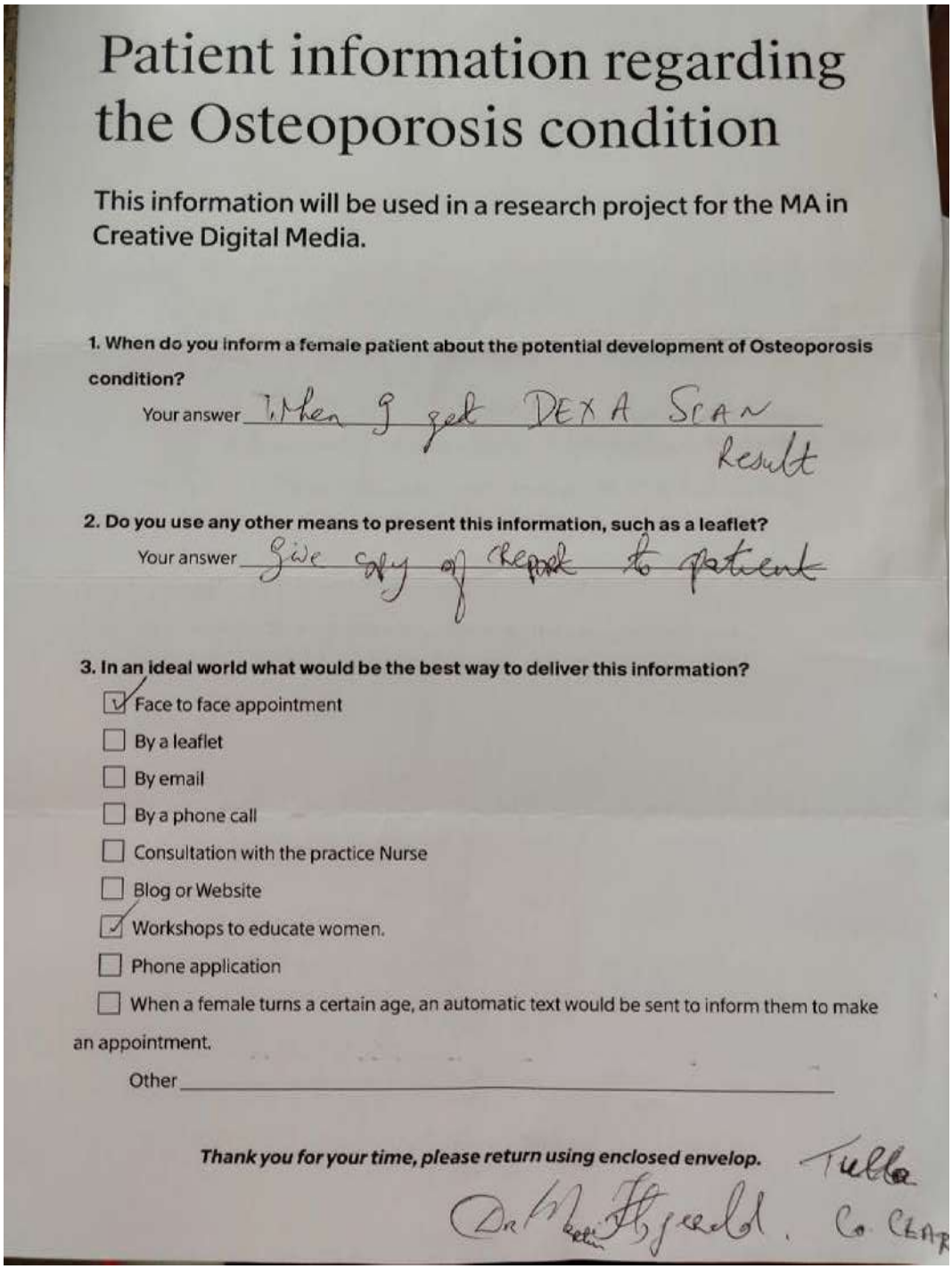
Your answer No

3. In an ideal world what would be the best way to deliver this information?

- [x] Face to face appointment
- [ ] By a leaflet
- [ ] By email
- [ ] By a phone call
- [ ] Consultation with the practice Nurse
- [ ] Blog or Website
- [ ] Workshops to educate women.
- [ ] Phone application
- [ ] When a female turns a certain age, an automatic text would be sent to inform them to make an appointment.

Other _____

Thank you for your time, please return using enclosed envelop.



Patient information regarding the Osteoporosis condition

This information will be used in a research project for the MA in Creative Digital Media.

1. When do you inform a female patient about the potential development of Osteoporosis condition?

Your answer When I get DEXA Scan Result

2. Do you use any other means to present this information, such as a leaflet?

Your answer Give copy of ~~report~~ to patient

3. In an ideal world what would be the best way to deliver this information?

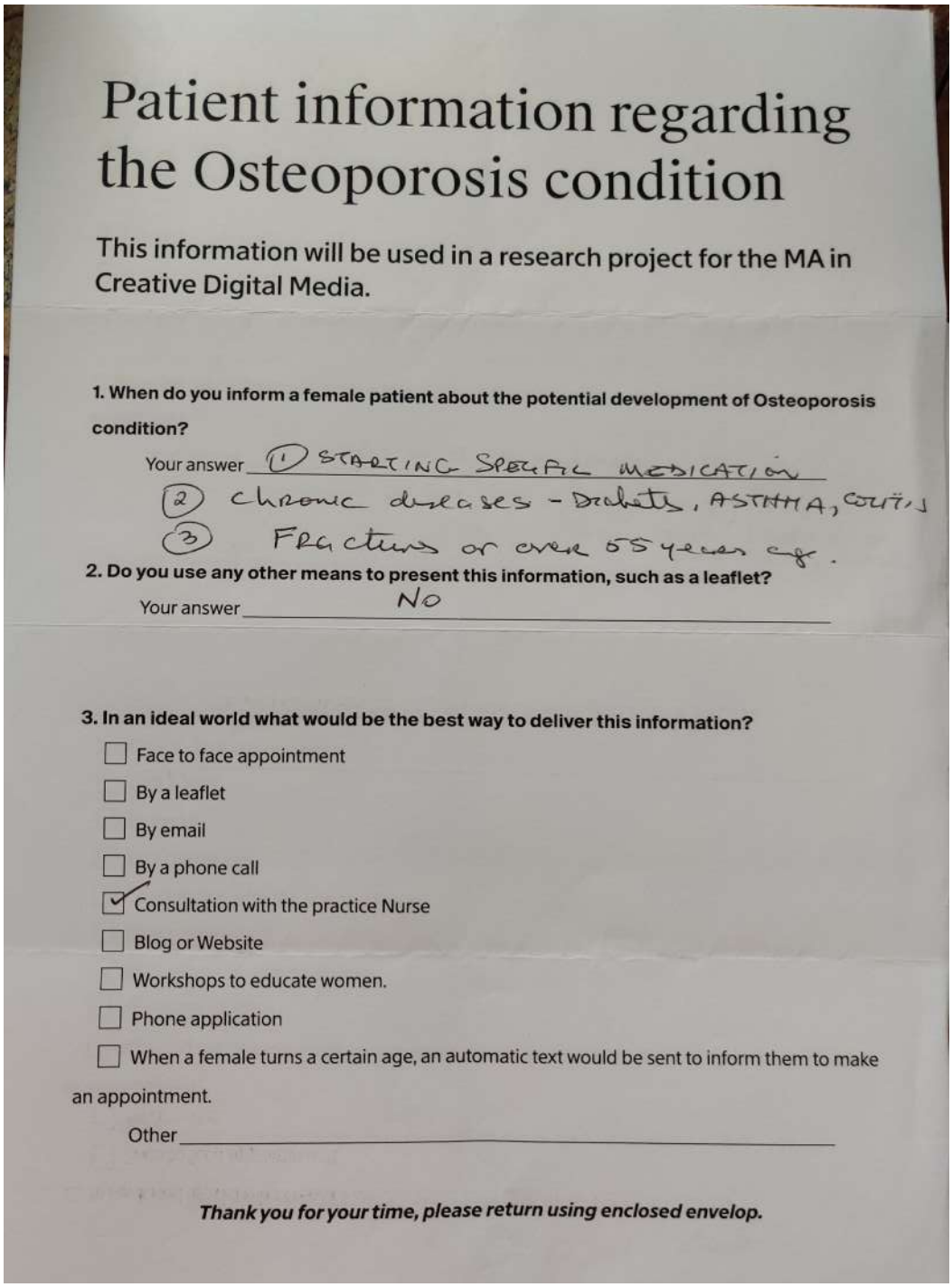
- [x] Face to face appointment
- [ ] By a leaflet
- [ ] By email
- [ ] By a phone call
- [ ] Consultation with the practice Nurse
- [ ] Blog or Website
- [x] Workshops to educate women.
- [ ] Phone application
- [ ] When a female turns a certain age, an automatic text would be sent to inform them to make an appointment.

Other _____

Thank you for your time, please return using enclosed envelop.

Tullamore

Dr Martin Fitzgerald. Co. Clare



Patient information regarding the Osteoporosis condition

This information will be used in a research project for the MA in Creative Digital Media.

1. When do you inform a female patient about the potential development of Osteoporosis condition?

Your answer (1) STARTING SPECIFIC MEDICATION
(2) chronic diseases - Diabetes, ASTHMA, COLITIS
(3) FRACTURES OR OVER 55 years of.

2. Do you use any other means to present this information, such as a leaflet?

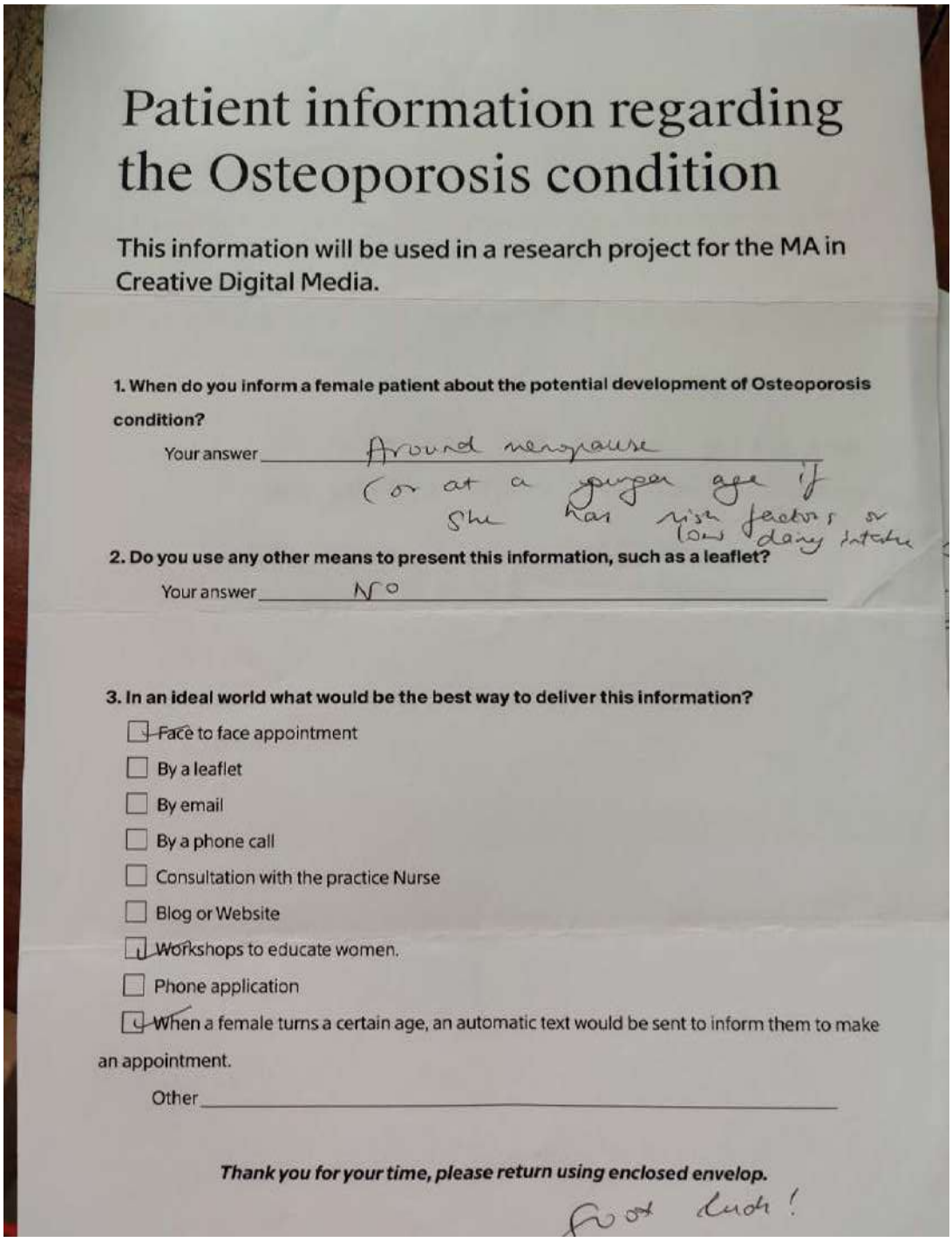
Your answer NO

3. In an ideal world what would be the best way to deliver this information?

- ☐ Face to face appointment
- ☐ By a leaflet
- ☐ By email
- ☐ By a phone call
- ☑ Consultation with the practice Nurse
- ☐ Blog or Website
- ☐ Workshops to educate women.
- ☐ Phone application
- ☐ When a female turns a certain age, an automatic text would be sent to inform them to make an appointment.

Other _____

Thank you for your time, please return using enclosed envelop.



Patient information regarding the Osteoporosis condition

This information will be used in a research project for the MA in Creative Digital Media.

1. When do you inform a female patient about the potential development of Osteoporosis condition?

Your answer Around menopause (or at a younger age if she has risk factors or low dairy intake

2. Do you use any other means to present this information, such as a leaflet?

Your answer No

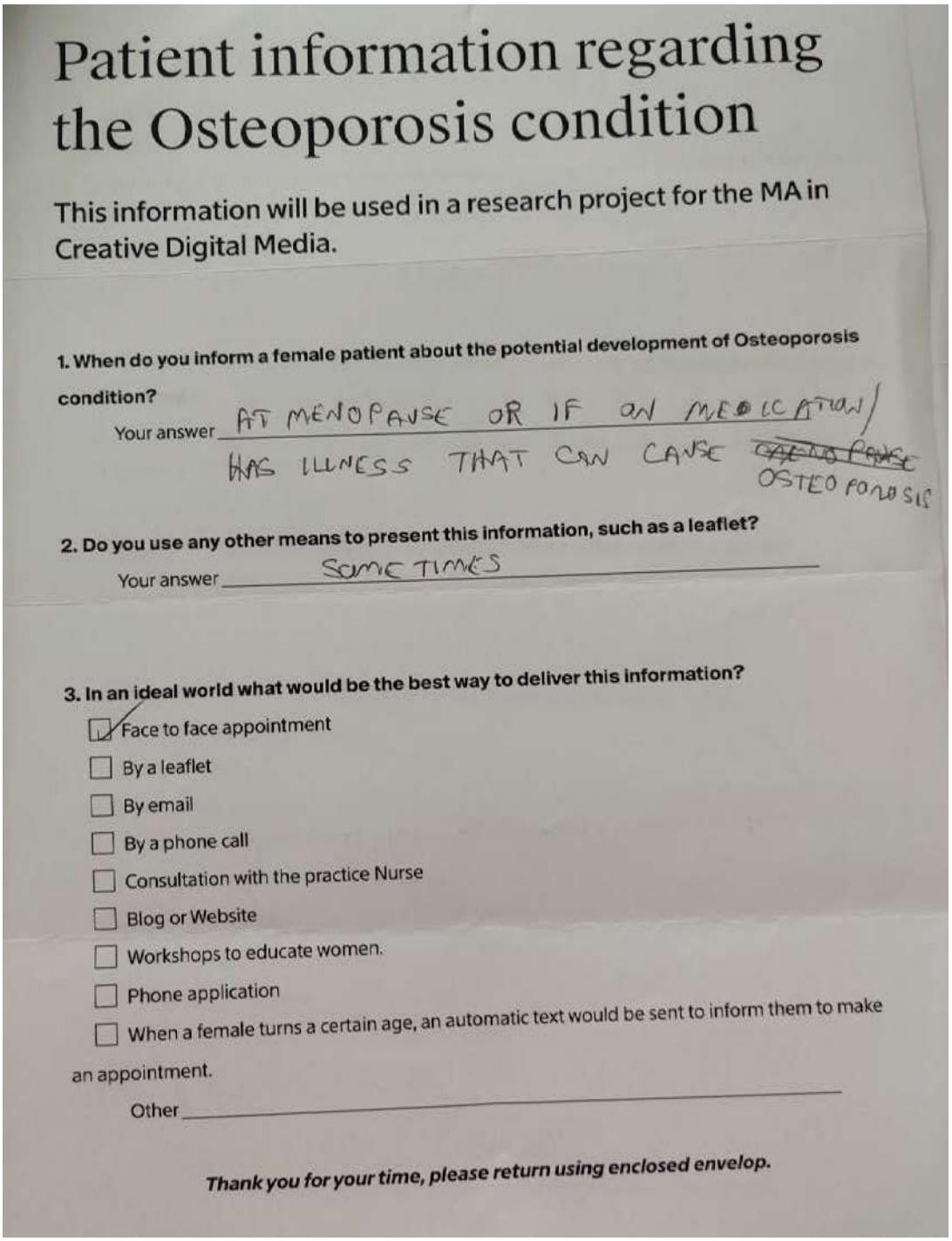
3. In an ideal world what would be the best way to deliver this information?

- [x] Face to face appointment
- [ ] By a leaflet
- [ ] By email
- [ ] By a phone call
- [ ] Consultation with the practice Nurse
- [ ] Blog or Website
- [x] Workshops to educate women.
- [ ] Phone application
- [x] When a female turns a certain age, an automatic text would be sent to inform them to make an appointment.

Other _____

Thank you for your time, please return using enclosed envelop.

Good luck!



Patient information regarding the Osteoporosis condition

This information will be used in a research project for the MA in Creative Digital Media.

1. When do you inform a female patient about the potential development of Osteoporosis condition?

Your answer AT MENOPAUSE OR IF ON MEDICATION/ HAS ILLNESS THAT CAN CAUSE ~~OSTEOPOROSIS~~ OSTEOPOROSIS

2. Do you use any other means to present this information, such as a leaflet?

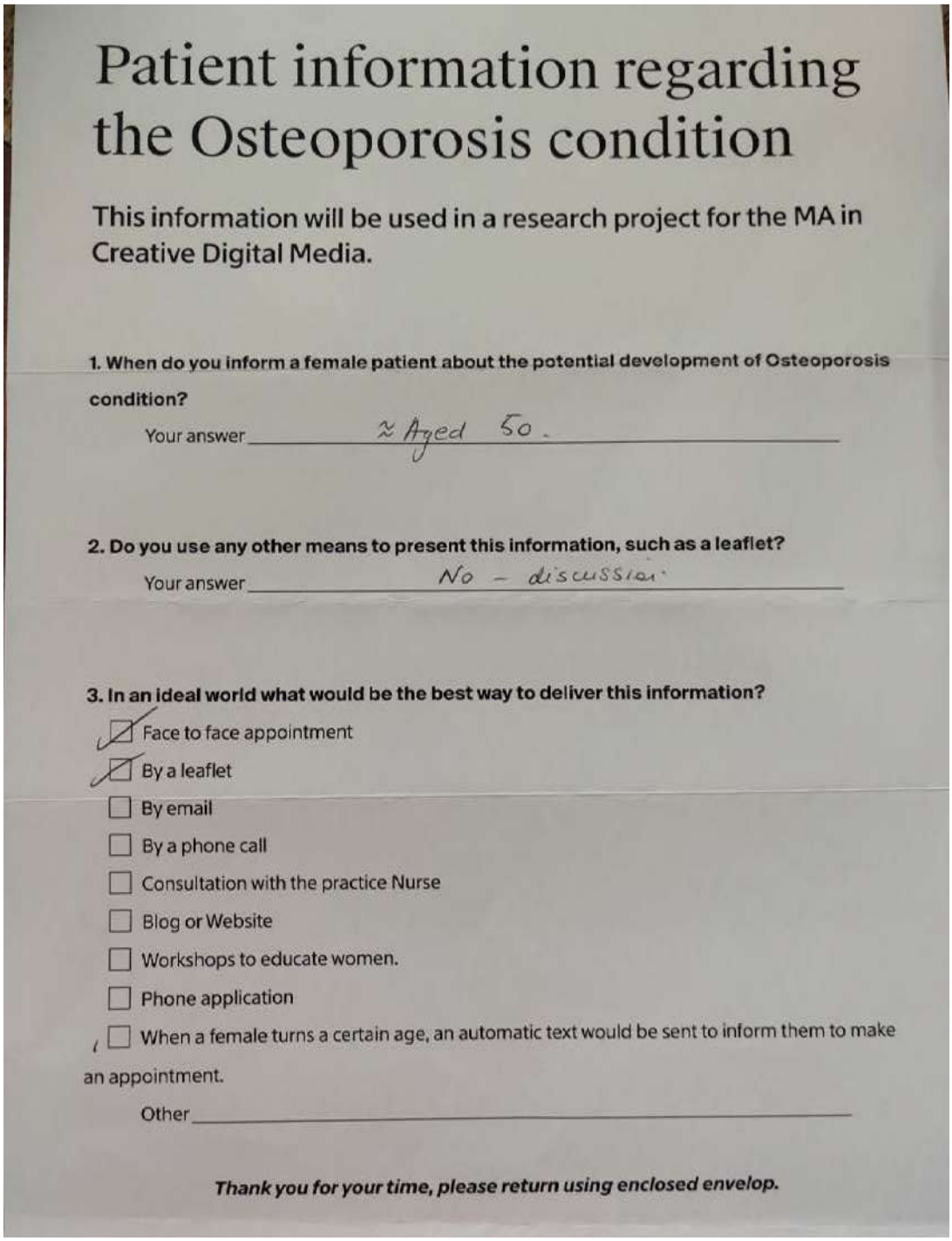
Your answer SOMETIMES

3. In an ideal world what would be the best way to deliver this information?

- [x] Face to face appointment
- [ ] By a leaflet
- [ ] By email
- [ ] By a phone call
- [ ] Consultation with the practice Nurse
- [ ] Blog or Website
- [ ] Workshops to educate women.
- [ ] Phone application
- [ ] When a female turns a certain age, an automatic text would be sent to inform them to make an appointment.

Other _____

Thank you for your time, please return using enclosed envelop.



Patient information regarding the Osteoporosis condition

This information will be used in a research project for the MA in Creative Digital Media.

1. When do you inform a female patient about the potential development of Osteoporosis condition?

Your answer ≈ Aged 50.

2. Do you use any other means to present this information, such as a leaflet?

Your answer No - discussion.

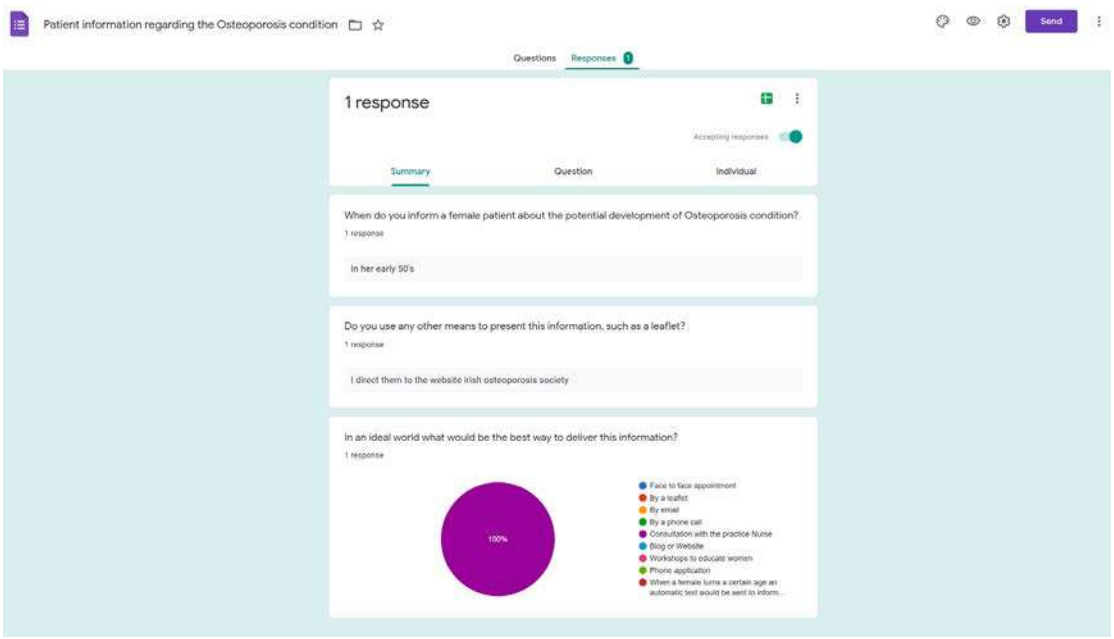
3. In an ideal world what would be the best way to deliver this information?

- [x] Face to face appointment
- [x] By a leaflet
- [ ] By email
- [ ] By a phone call
- [ ] Consultation with the practice Nurse
- [ ] Blog or Website
- [ ] Workshops to educate women.
- [ ] Phone application
- [ ] When a female turns a certain age, an automatic text would be sent to inform them to make an appointment.

Other _____

Thank you for your time, please return using enclosed envelop.

Results, returned by the GPs (using online survey)



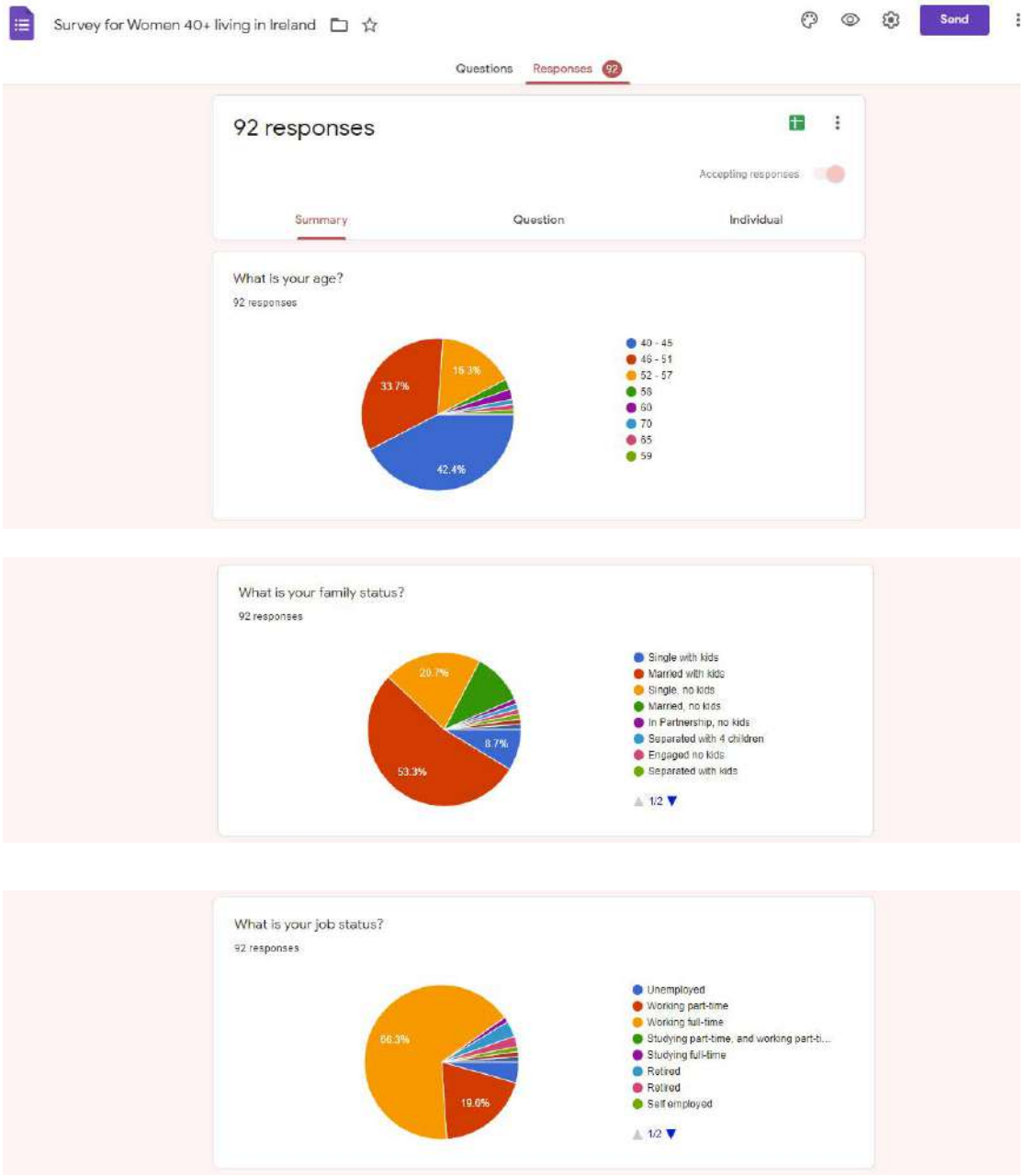
This Website was used to collect GP clinics emails - [Find a GP practice or clinic - Cervical Check]

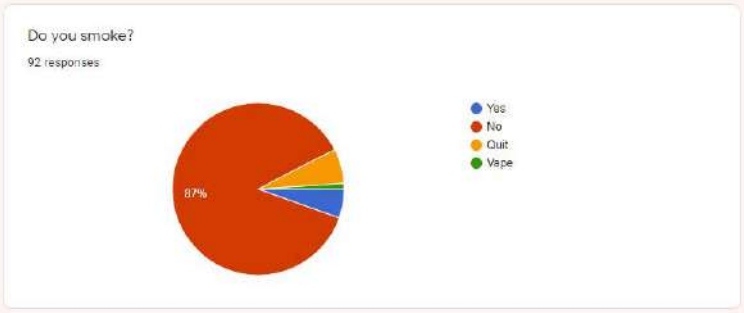
- info@medicalcentreportlaoise.ie (Laois)
- info@medicentre.ie (Laois)
- drsmontague@eircom.net (Laois)
- byrnedoc9@gmail.com (Carlow)
- mkchoe@centrichealthcarlow.ie (Carlow)
- collinsmedicalpractice@gmail.com (Cavan)
- docmafitz@eircom.net (Clare)
- shannonmedicalcentre@gmail.com (Clare)
- roslevanmedical@gmail.com (Clare)
- amarantafamilypractice@gmail.com (Dublin)
- info@citywestmedical.ie (Dublin)
- hamletlaneclinic@gmail.com (Dublin)
- potteryroad@sheehanmedicalpractice.com (Dublin)

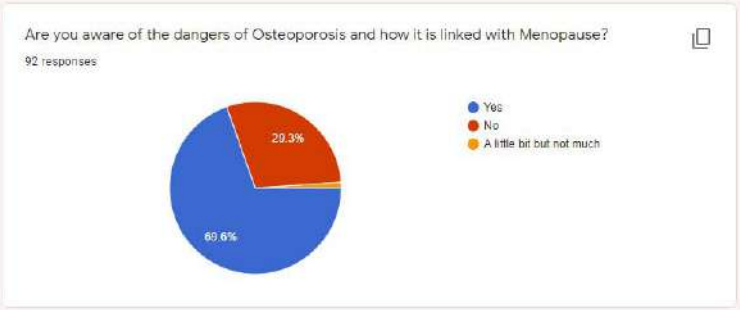
- sinead.conroy@healthmail.ie (Dublin)
- info@boroimhemedical.ie (Dublin)
- info@rushgp.ie (Dublin)
- info@tullyfamilypractice.ie (Dublin)
- liffeyreception@dublinwellwoman.com (Dublin/Woman Centre)
- capelstreetmcll@gmail.com (Dublin)
- arkmedicalcentre@eircom.net (Donegal)
- info@movillegp.com (Donegal)
- info@beardoc.org (Cork)
- practicemanagertheparkclinic@gmail.com (Cork)
- info@uqmc.ie (Cork)
- jobourke@eircom.net (Cork)
- info@knocknacarrafamilycare.ie (Galway)
- lakeshoremedicalcentre@hotmail.com (Galway)
- ballygarhealthcentre@gmail.com (Galway)
- dr.feher.virag@gmail.com (Galway)
- info@galwaybaymedicalcentre.ie (Galway)
- kylecourtclinic@eircom.net (Tipperary)
- info@gssdocs.com (Tipperary)
- premierkickham@yahoo.ie (Tipperary)

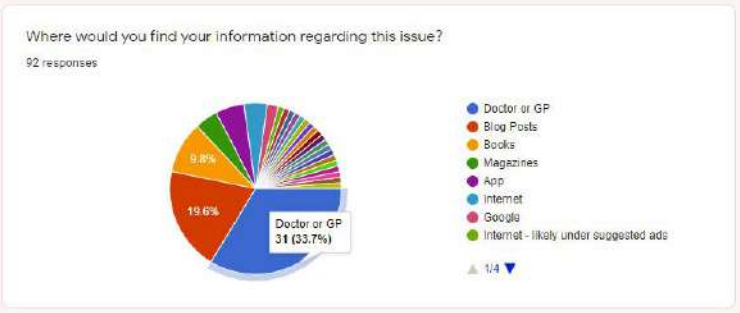
Appendix C

Survey 3 - Online Questionnaire for women 40+

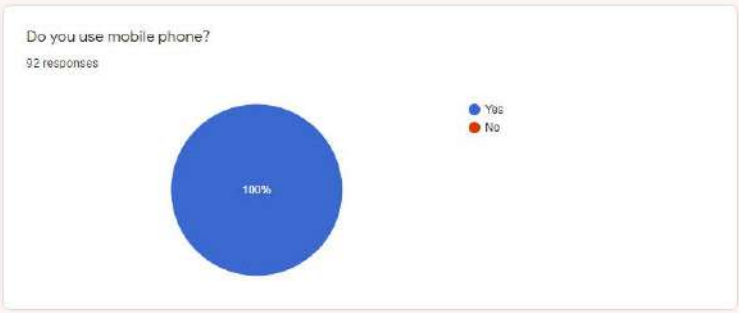


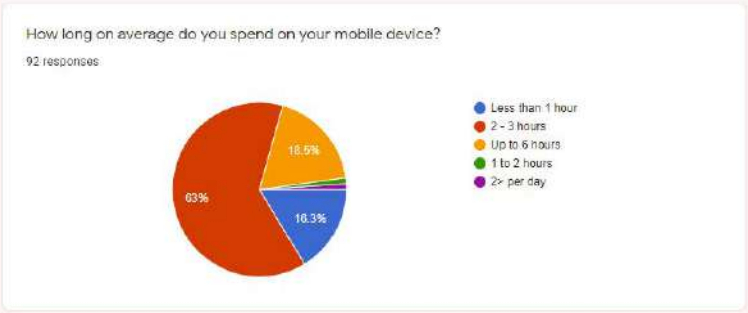

Do you smoke?
92 responses
87%
Yes
No
Quit
Vape

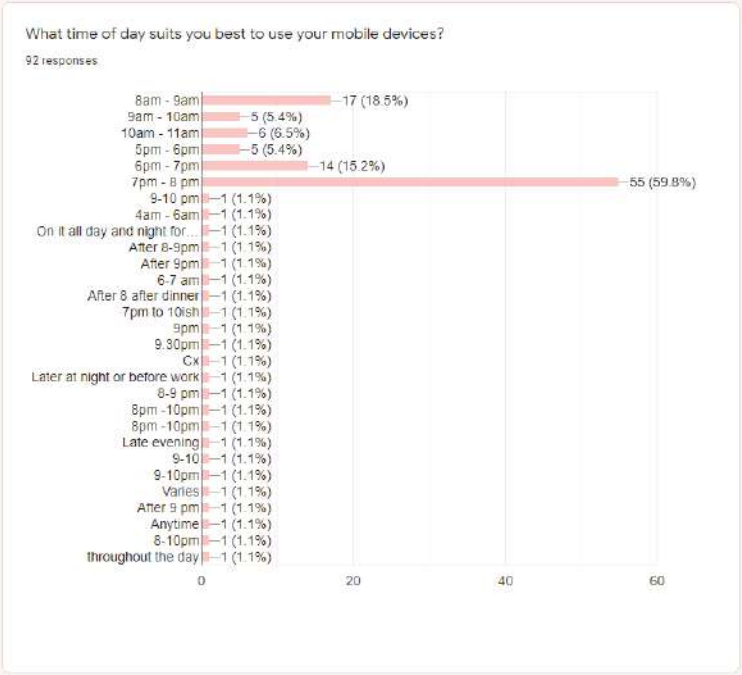

Are you aware of the dangers of Osteoporosis and how it is linked with Menopause?
92 responses
29.3%
69.6%
Yes
No
A little bit but not much

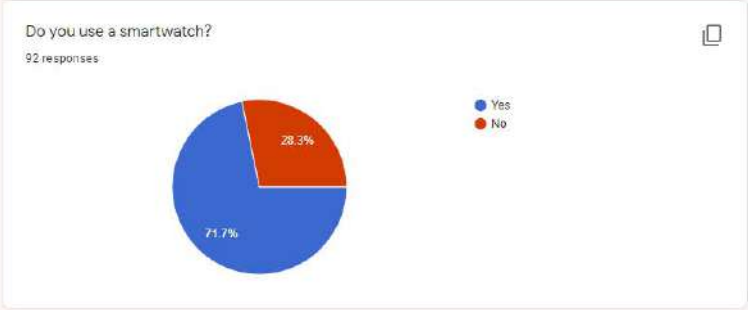

Where would you find your information regarding this issue?
92 responses
9.8%
19.6%
Doctor or GP
31 (33.7%)
Doctor or GP
Blog Posts
Books
Magazines
App
Internet
Google
Internet - likely under suggested ads
1/4

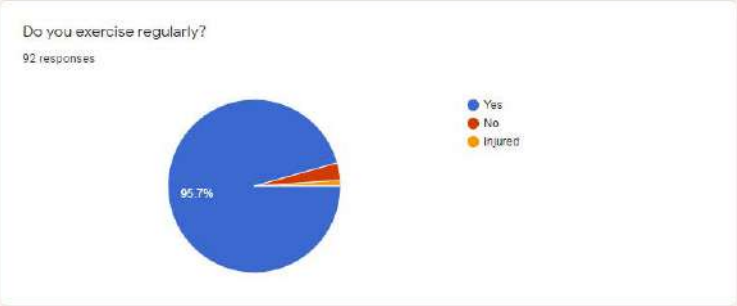

What way is the preferred way to learn information?
92 responses
14.1%
35.9%
16.3%
20.7%
Live Courses
Online Courses
Mobile device
Television
Books
YouTube videos
Online reading and YouTube videos
No single way, but be good to have a...
1/2

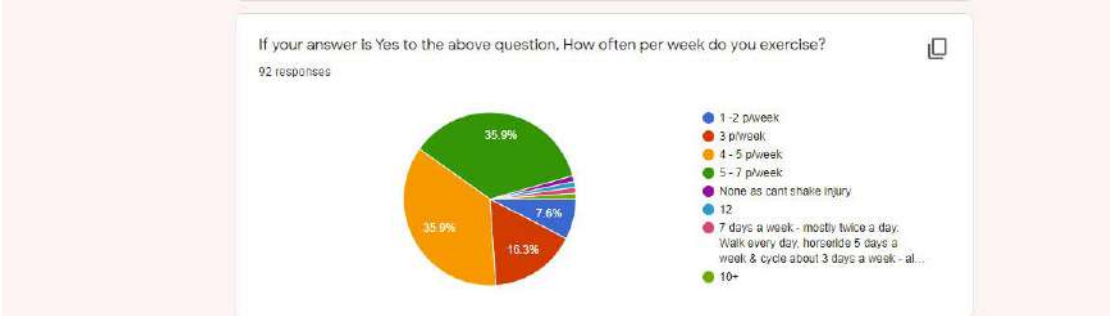

Do you use mobile phone?
92 responses
100%
Yes
No

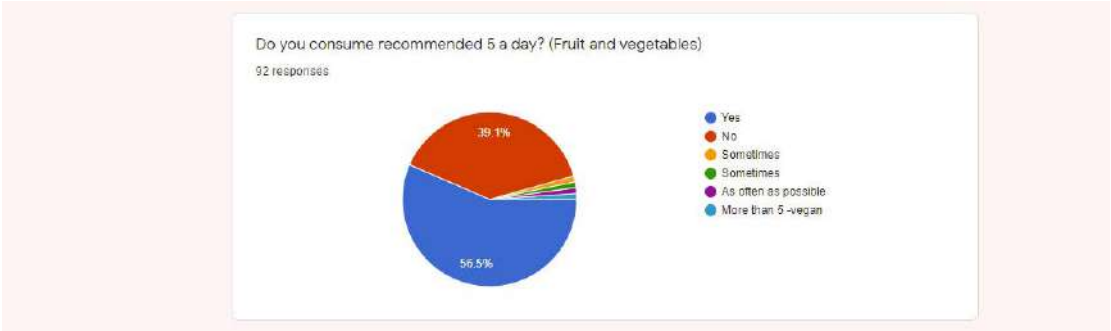

How long on average do you spend on your mobile device?
92 responses
18.5%
63%
16.3%
Less than 1 hour
2 - 3 hours
Up to 6 hours
1 to 2 hours
2> per day


What time of day suits you best to use your mobile devices?
92 responses
8am - 9am 17 (18.5%)
9am - 10am 5 (5.4%)
10am - 11am 6 (6.5%)
5pm - 6pm 5 (5.4%)
6pm - 7pm 14 (15.2%)
7pm - 8 pm 55 (59.8%)
9-10 pm 1 (1.1%)
4am - 6am 1 (1.1%)
On it all day and night for ... 1 (1.1%)
After 8-9pm 1 (1.1%)
After 9pm 1 (1.1%)
6-7 am 1 (1.1%)
After 8 after dinner 1 (1.1%)
7pm to 10ish 1 (1.1%)
9pm 1 (1.1%)
9.30pm 1 (1.1%)
Cx 1 (1.1%)
Later at night or before work 1 (1.1%)
8-9 pm 1 (1.1%)
8pm -10pm 1 (1.1%)
8pm -10pm 1 (1.1%)
Late evening 1 (1.1%)
9-10 1 (1.1%)
9-10pm 1 (1.1%)
Varies 1 (1.1%)
After 9 pm 1 (1.1%)
Anytime 1 (1.1%)
8-10pm 1 (1.1%)
throughout the day 1 (1.1%)
0
20
40
60


Do you use a smartwatch?
92 responses
28.3%
71.7%
Yes
No


Do you exercise regularly?
92 responses
95.7%
Yes
No
Injured





The survey was asked to be posted using Facebook groups below:

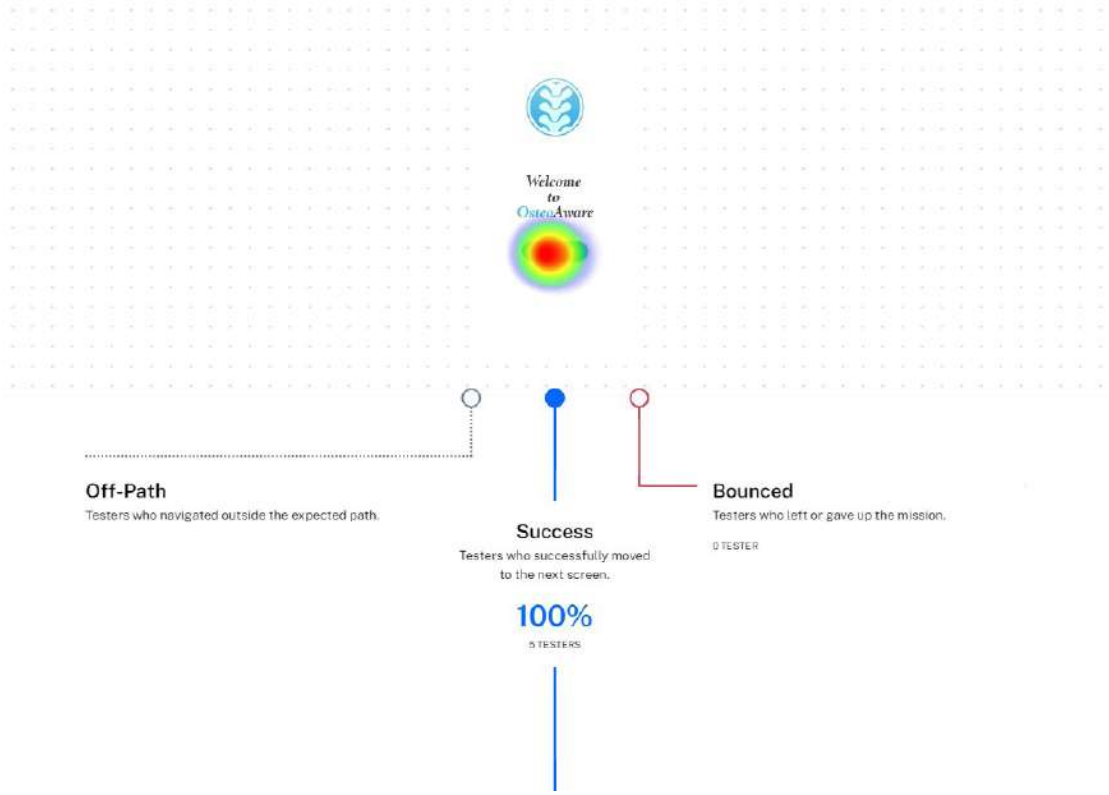
- Irish Culture Public group - 4.4K members
- Irish Heritage - Public group - 2.7K members
- My Heart is in Ireland - Public group - 41.4K members
- The Sanctuary Health & Beauty Clinic, Mountmellick @TheSanctuaryMountmell
- Sharon Leavy Leading Beauty School @sharonleavybeautyacademy
- Flair Beauty Boutique - 6,558 people like this
- Donegal Woman - @dglwoman · Website
- Connected to Ireland - Private group - 22.9K members
- Portarlington (Ireland) News - Public group - 5.2K members
- Work in Ireland - Public group - 13.2K members
- Women's Cycling in Ireland - Public group - 1.8K members – Survey has been

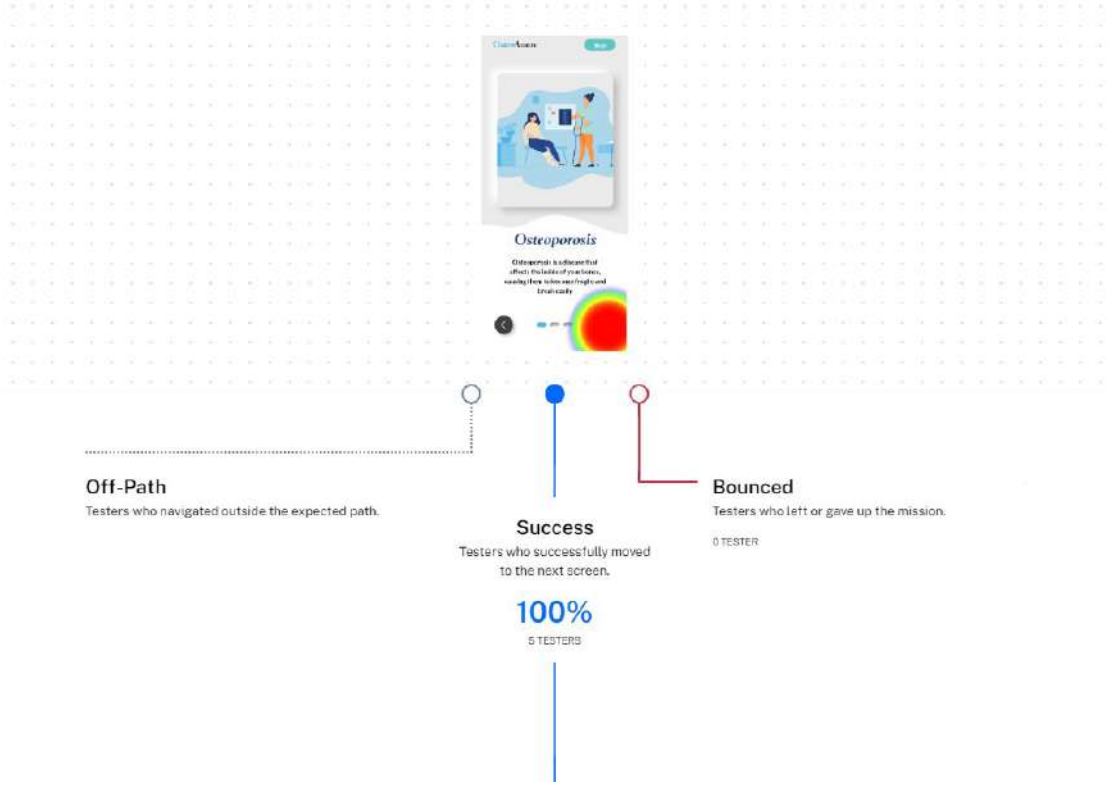
published

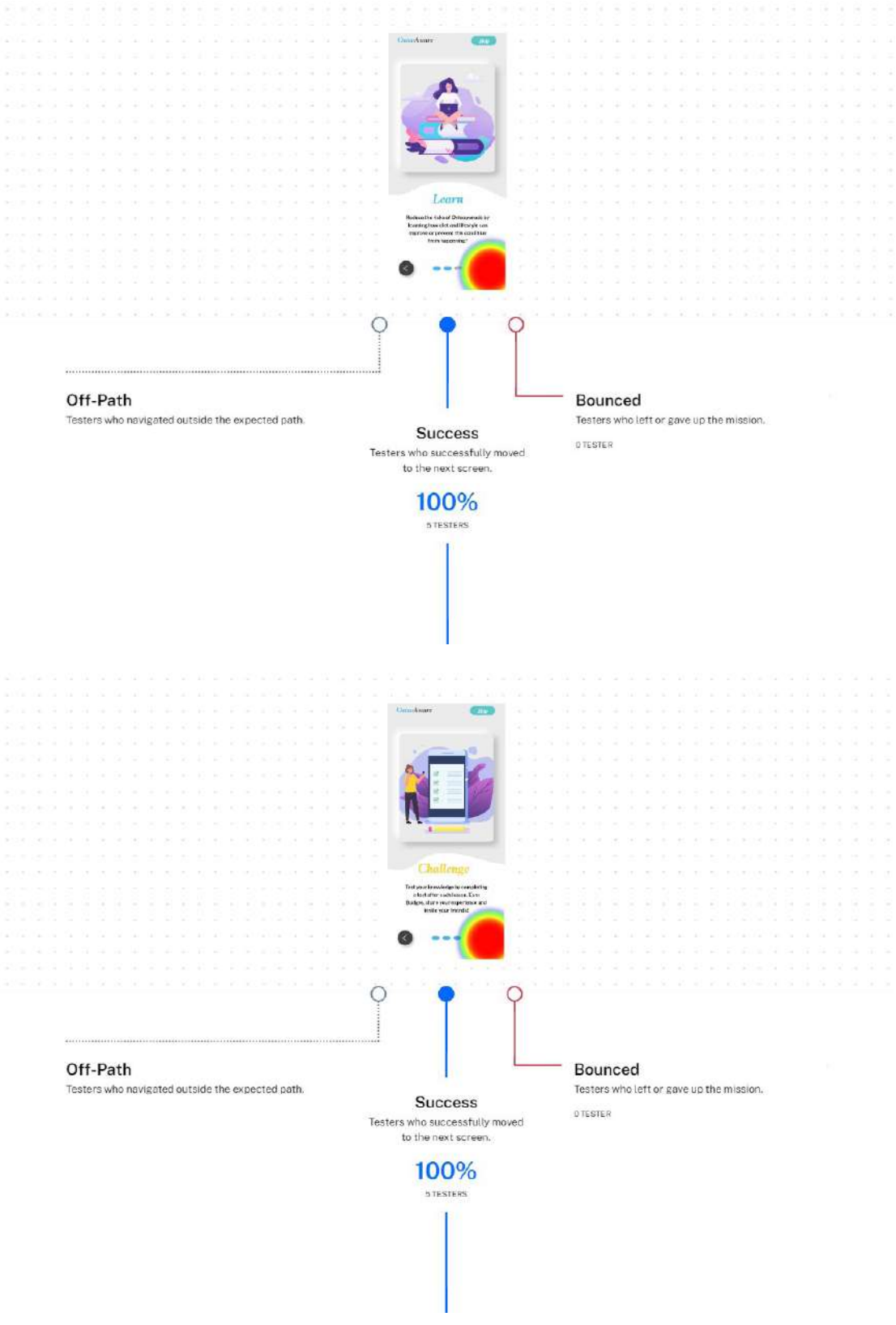
- The Ireland Walking Community - Public group - 1.0K members
- Beautiful Ireland - Private group - 10.8K members
- Women's Health - Fitness, Nutrition, Sex, and Weight Loss - Public group - 11.0K members
- Women in Research in Ireland – WIRI - @womeninresearchireland - Community
- Unislim Galway City - @unislimgalwaycity - Local Business
- Galway Walking Club - @galwaywalkingclub - Community Organization
- Galway for Women's* Health - Public group - 60 members
- Fit For Women - @fitforwomengalway - Fitness Trainer
- National Maternity Experience Survey - @YourMaternityExperience - Public Service
- One Family @OneFamilyIreland - Non-Governmental Organization (NGO)
- Changing Ireland - @changingirelandmedia – Magazine
- Medica – Ireland - @MedicaIreland – Radiologist
- Migraine Ireland - @migraineireland - Non-profit Organization
- Ireland Active - @IrelandActive - Health & Wellness Website
- Healthy Ireland - @healthyireland.gov.ie - Public & Government Service
- Irish Osteoporosis Society - @IrishOsteoporosisSociety - Medical & Health

Appendix D

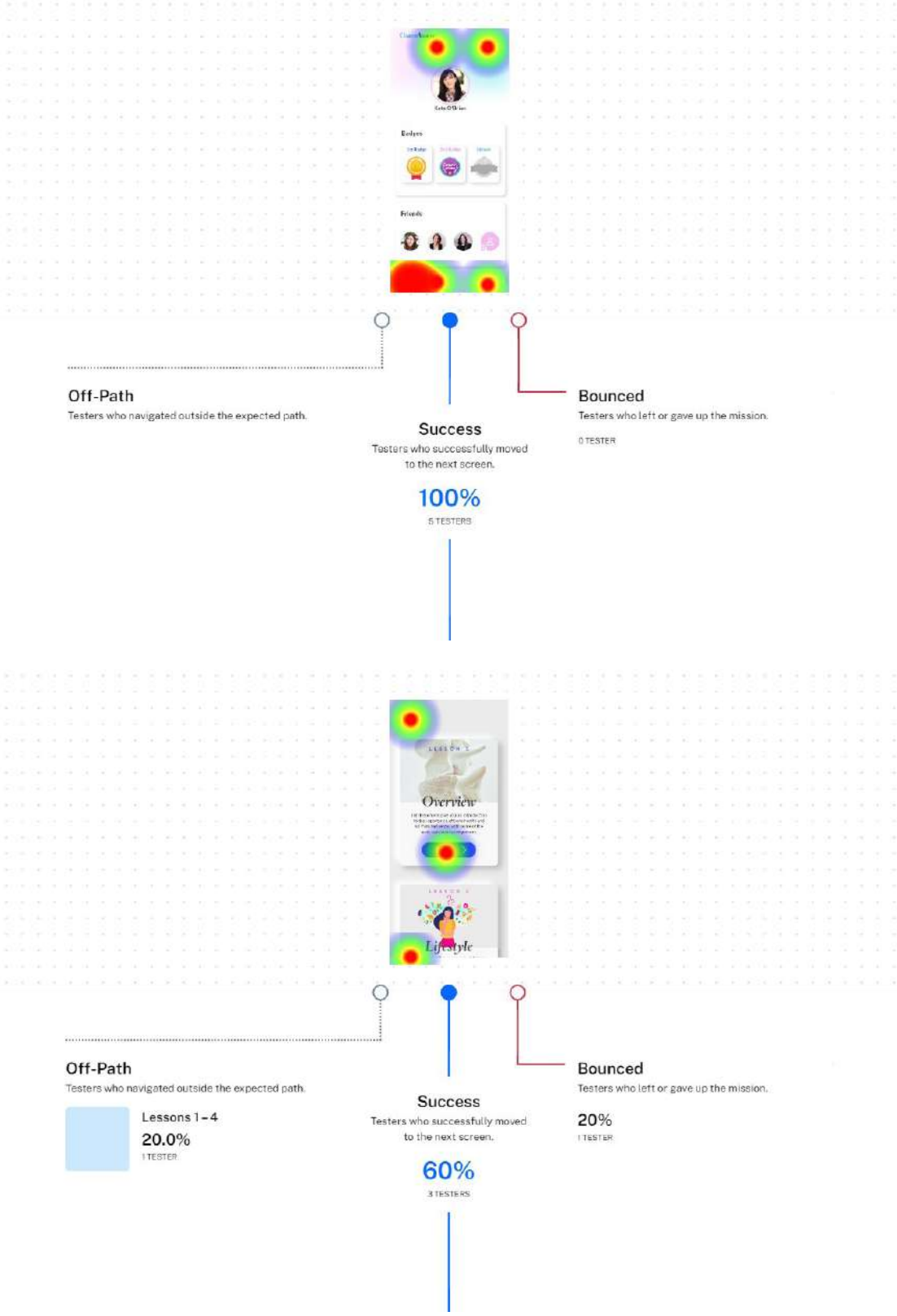
Prototype A - User Testing Results (Mission 1)

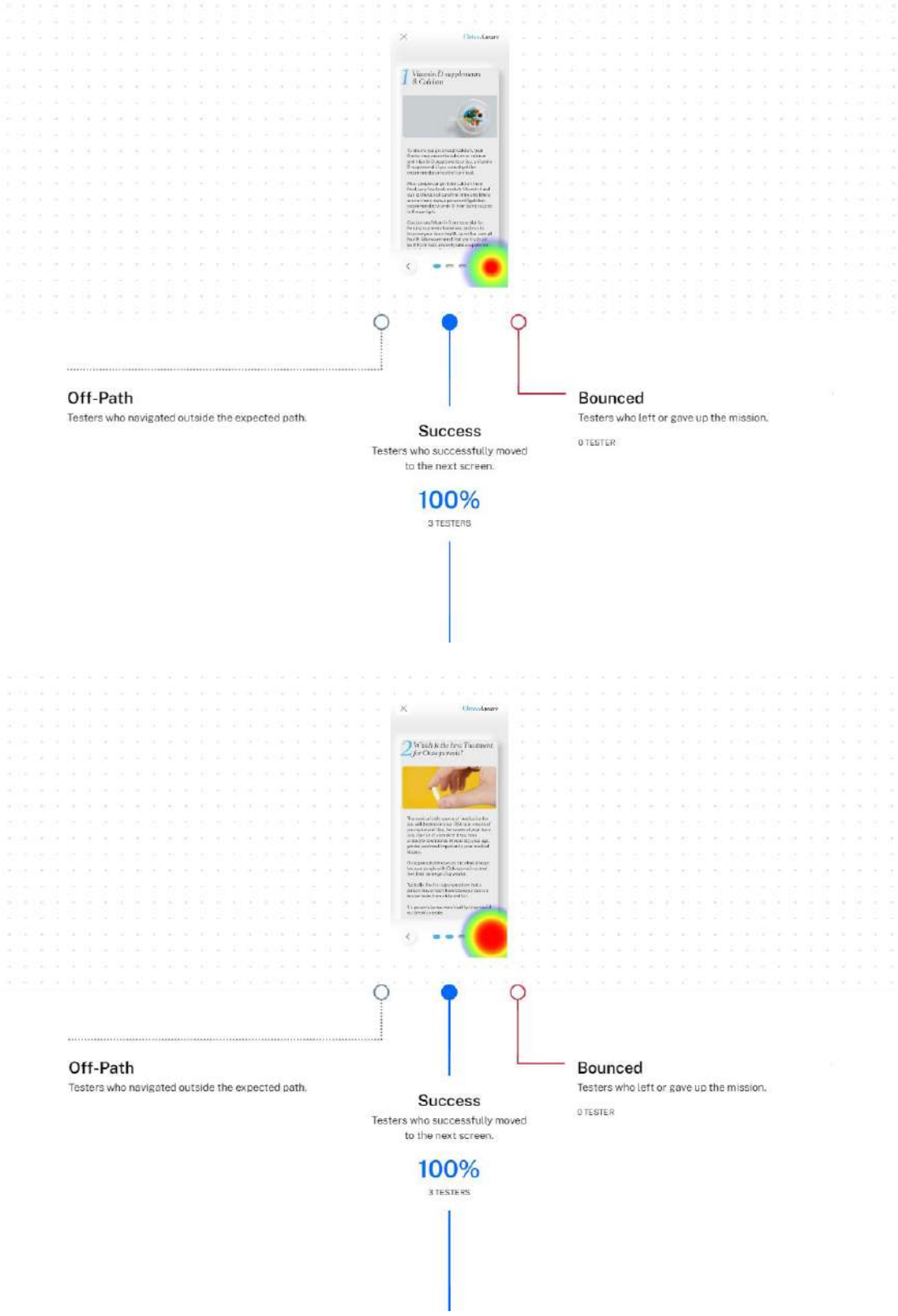


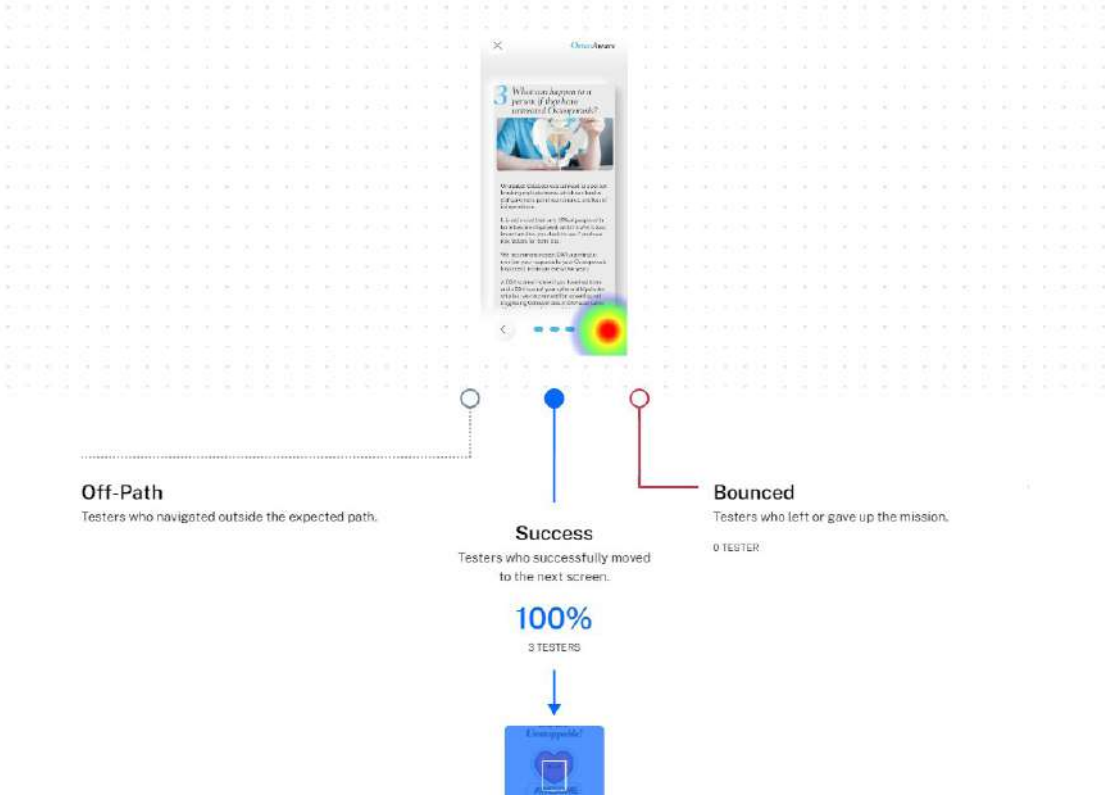


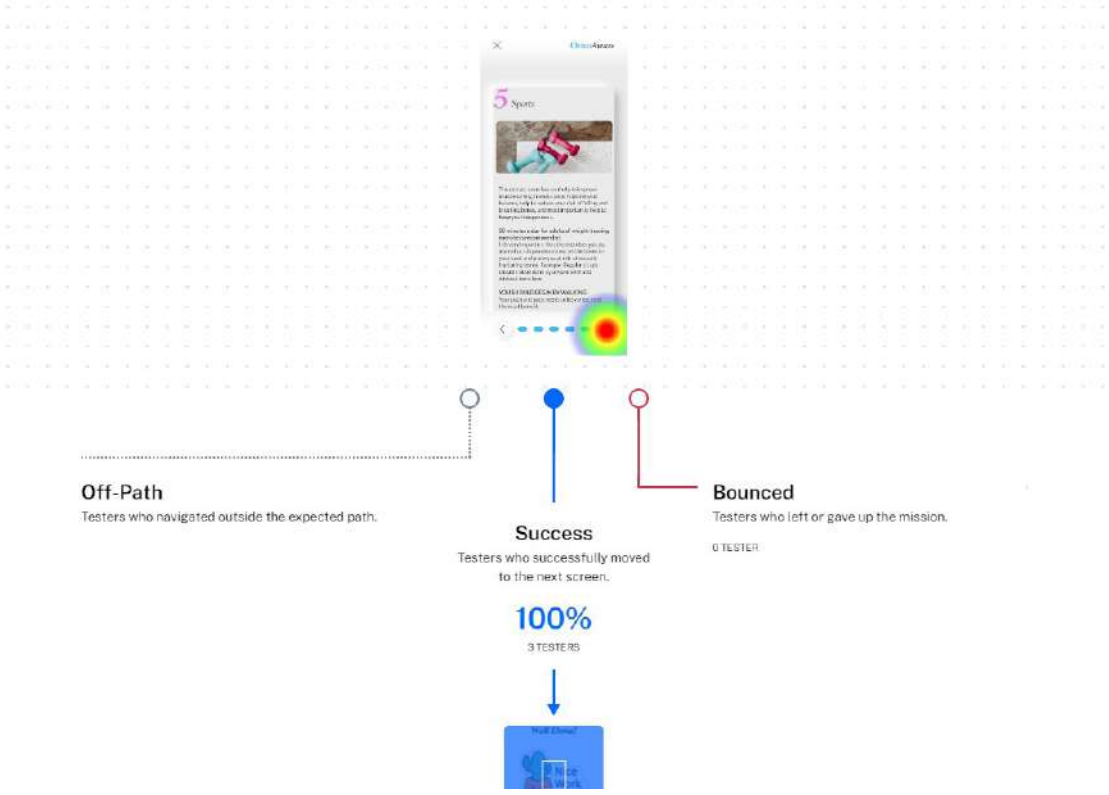

Learn
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
Challenge
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

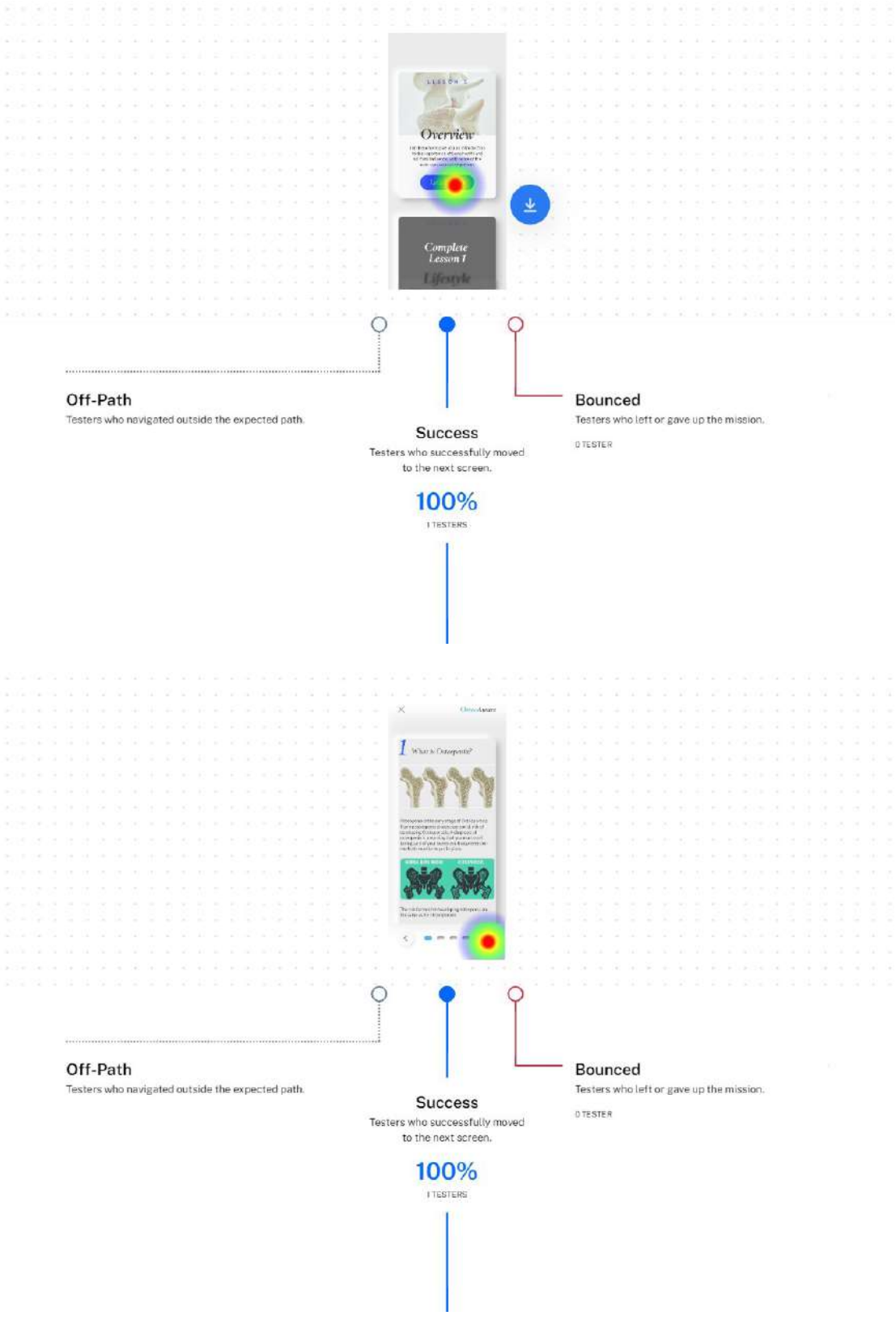
Prototype A - User Testing Results (Mission 2)

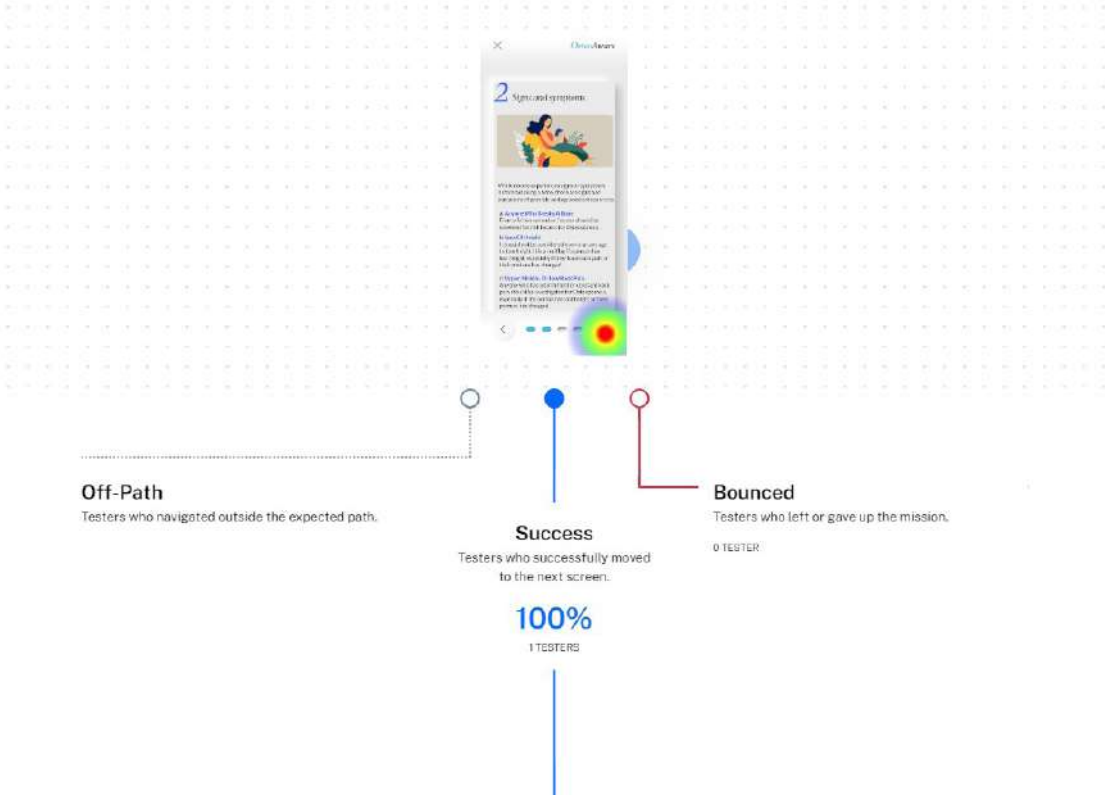


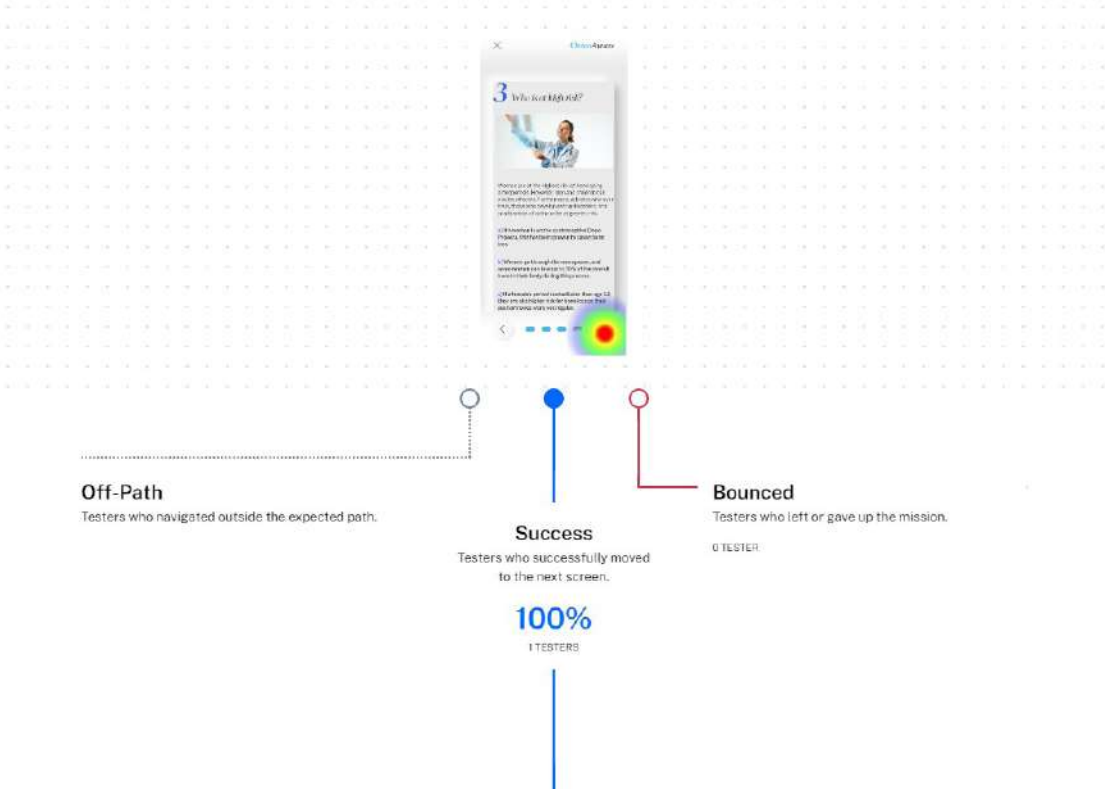

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

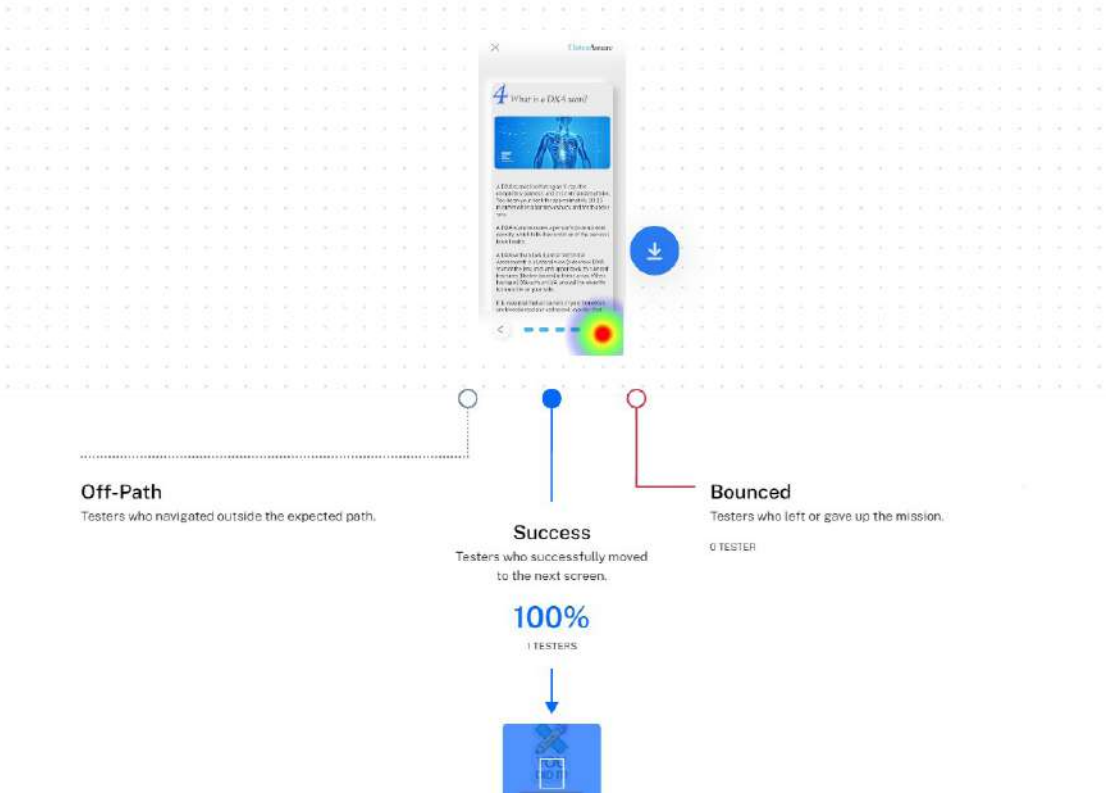

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

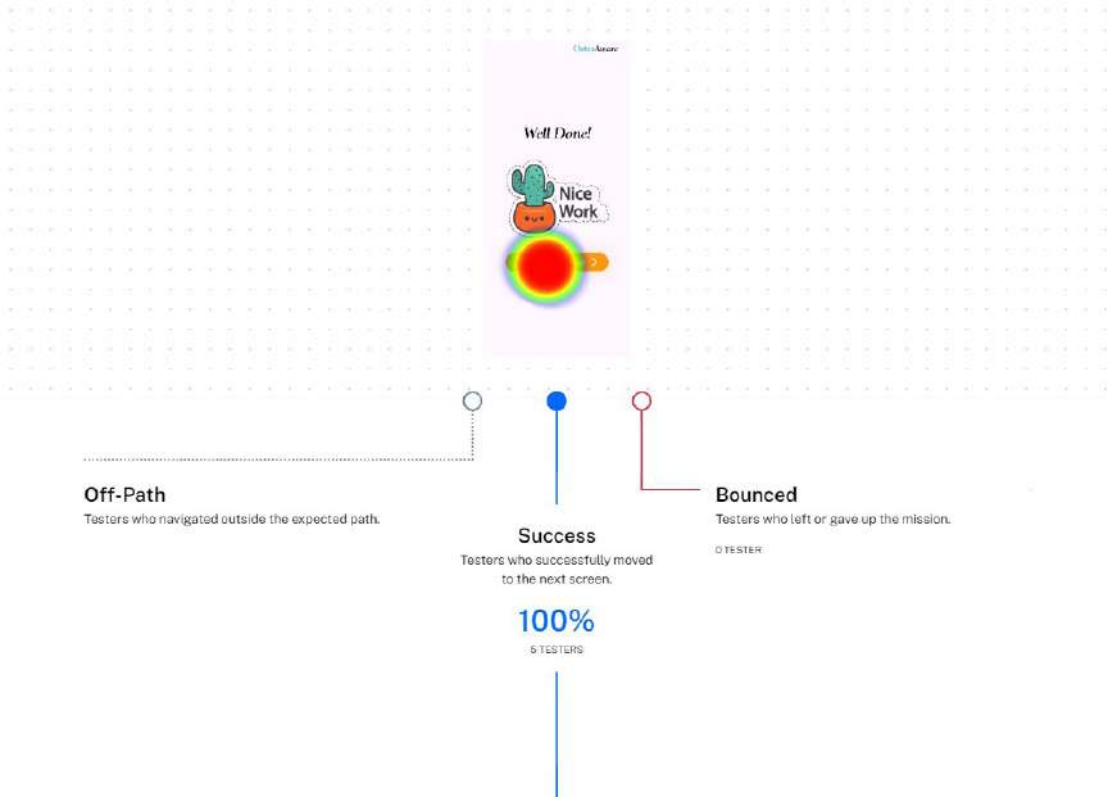

Overview
Complete Lesson 1
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
1 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
1 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

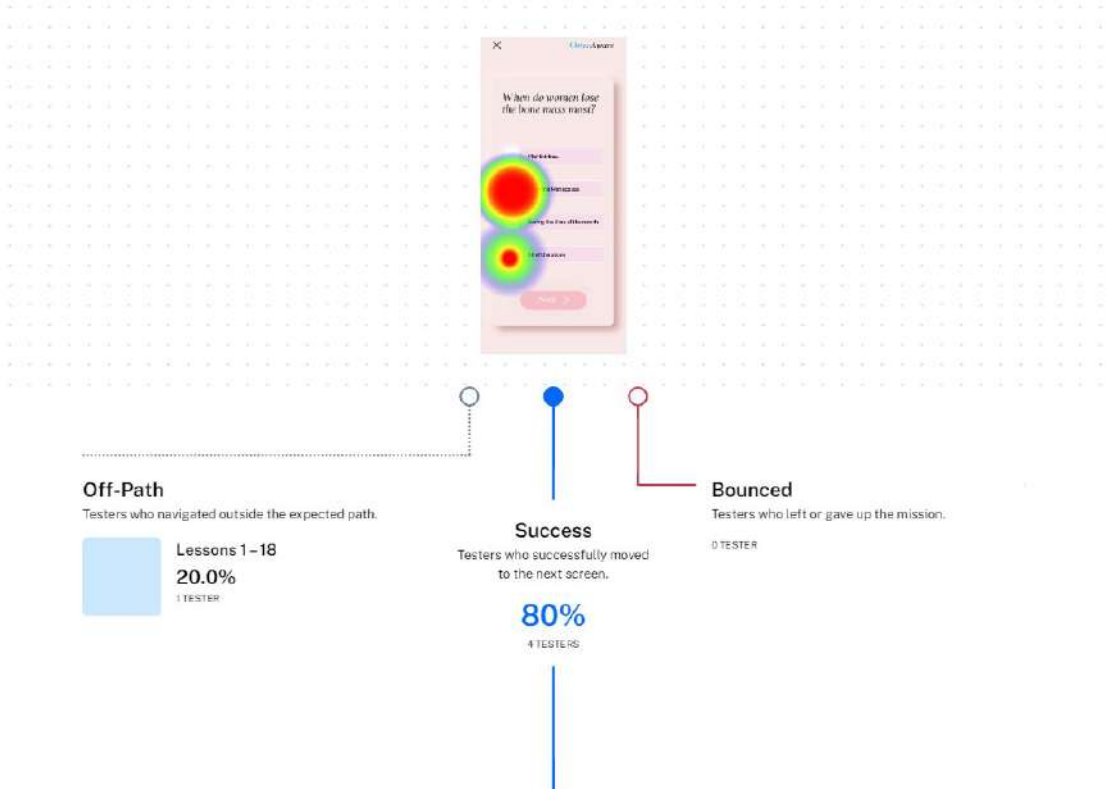

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
1 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

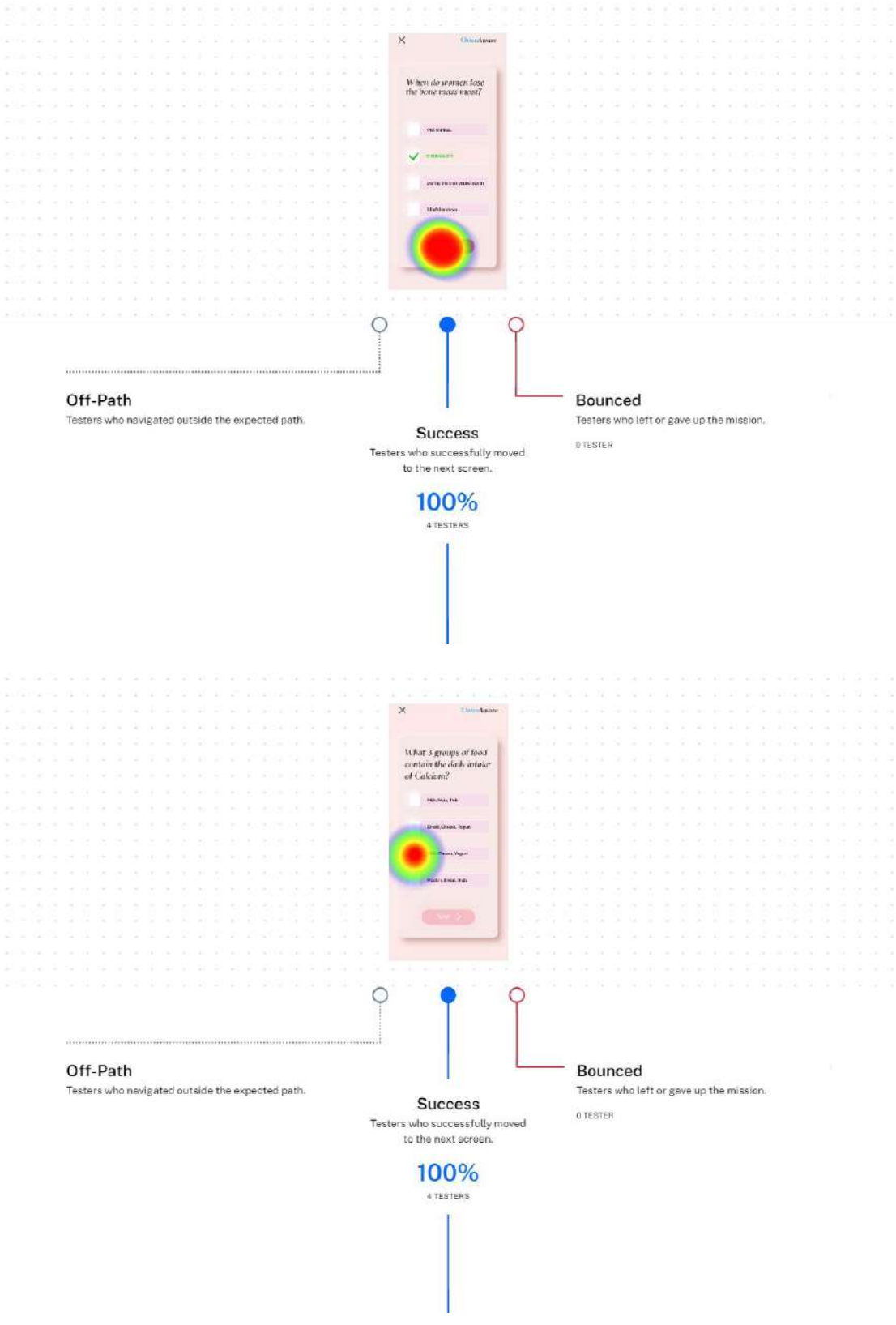

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
1 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

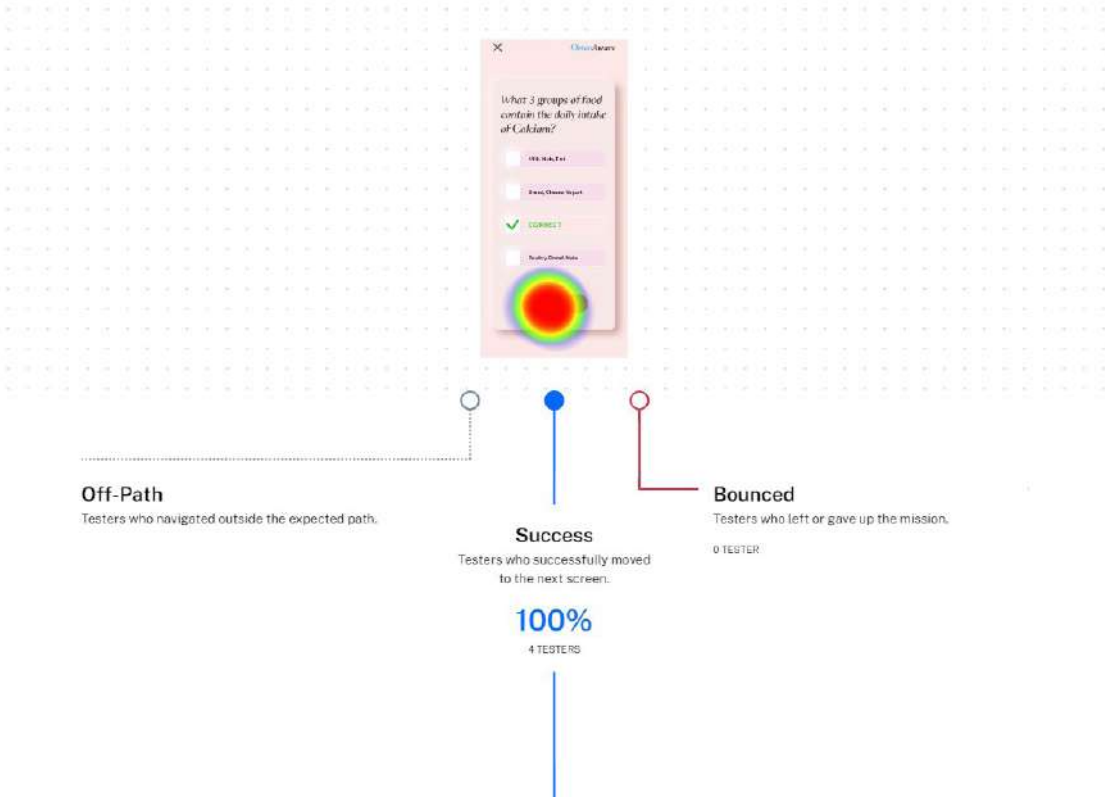

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
1 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

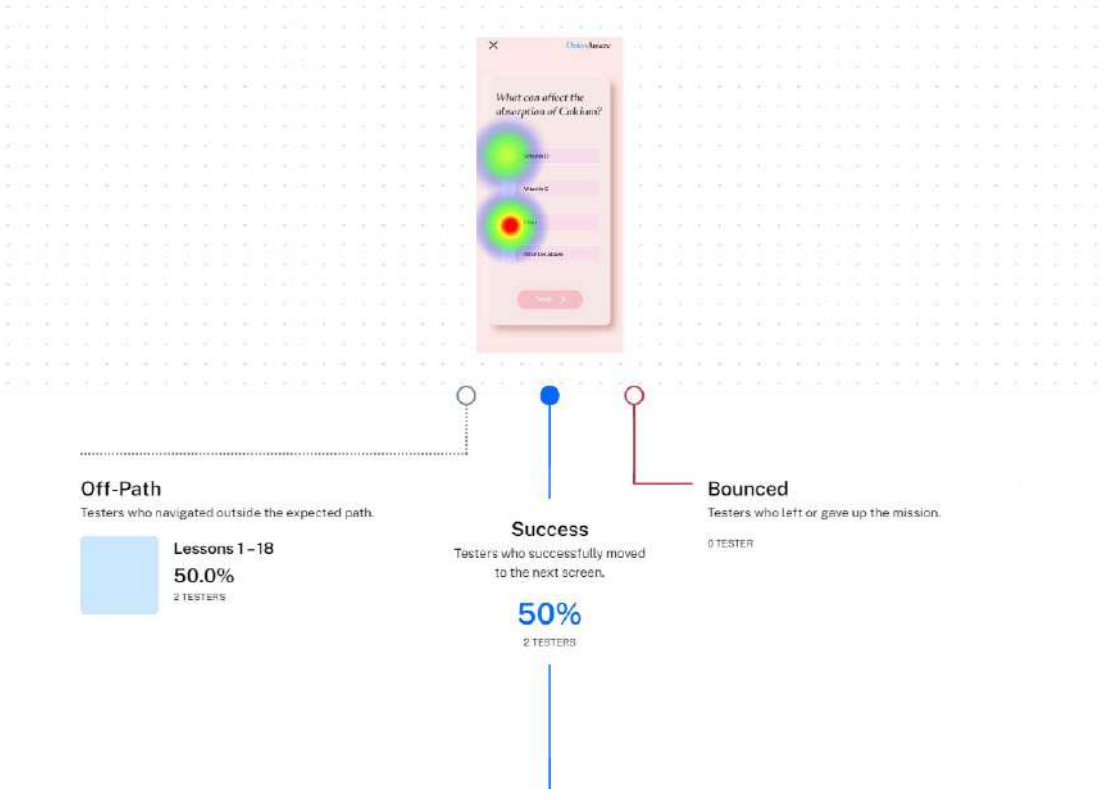
Prototype A - User Testing Results (Mission 3)

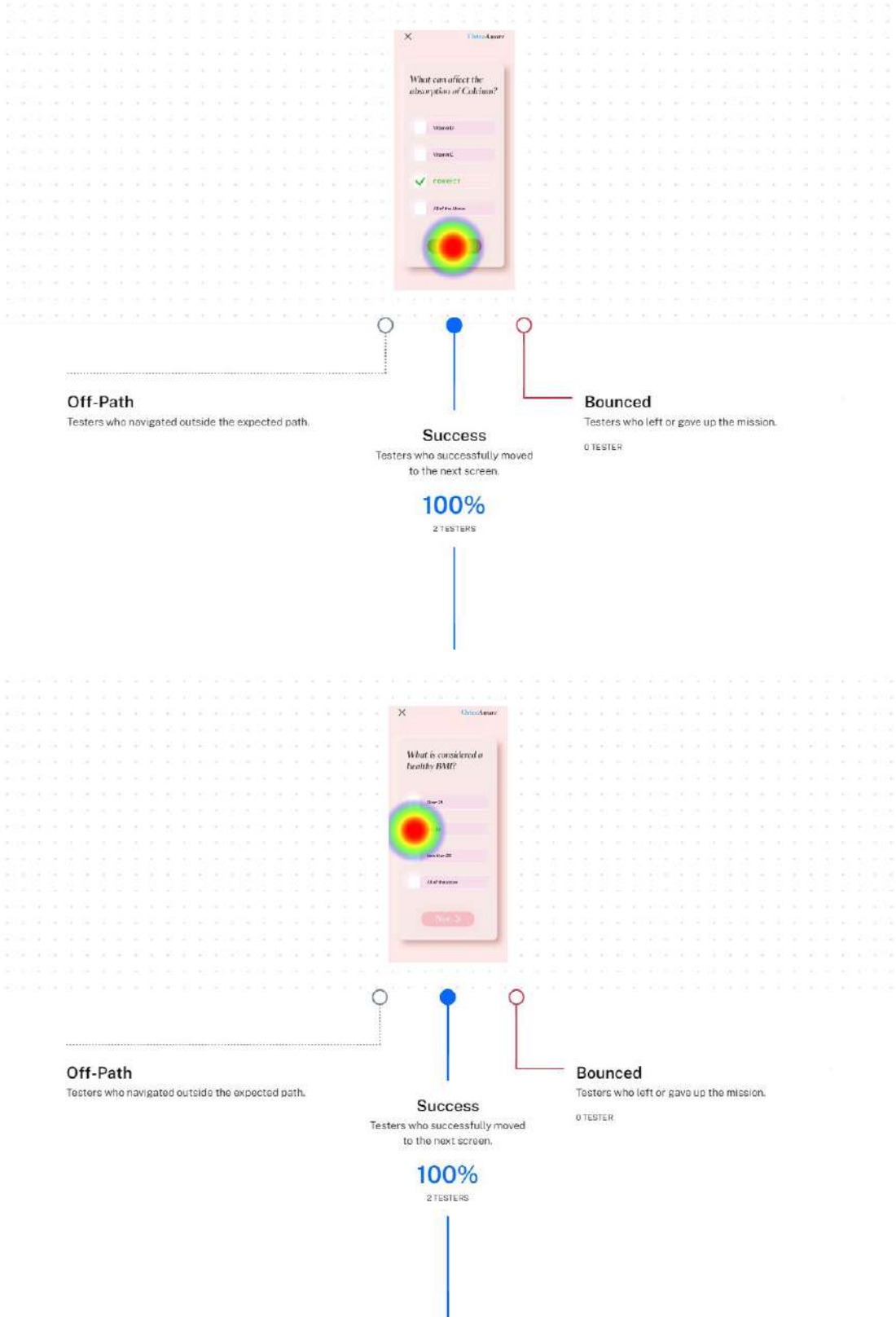


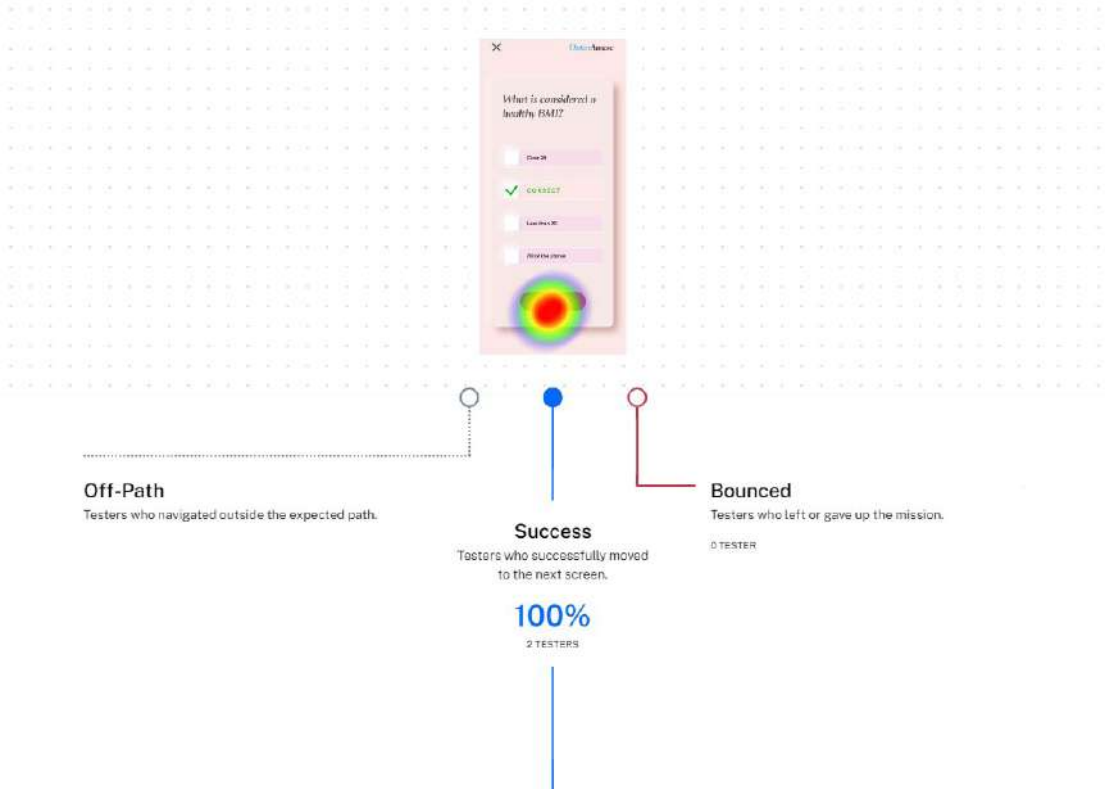



When do women lose the bone mass most?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
What 3 groups of food contain the daily intake of Calcium?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


What 3 groups of food contain the daily intake of Calcium?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

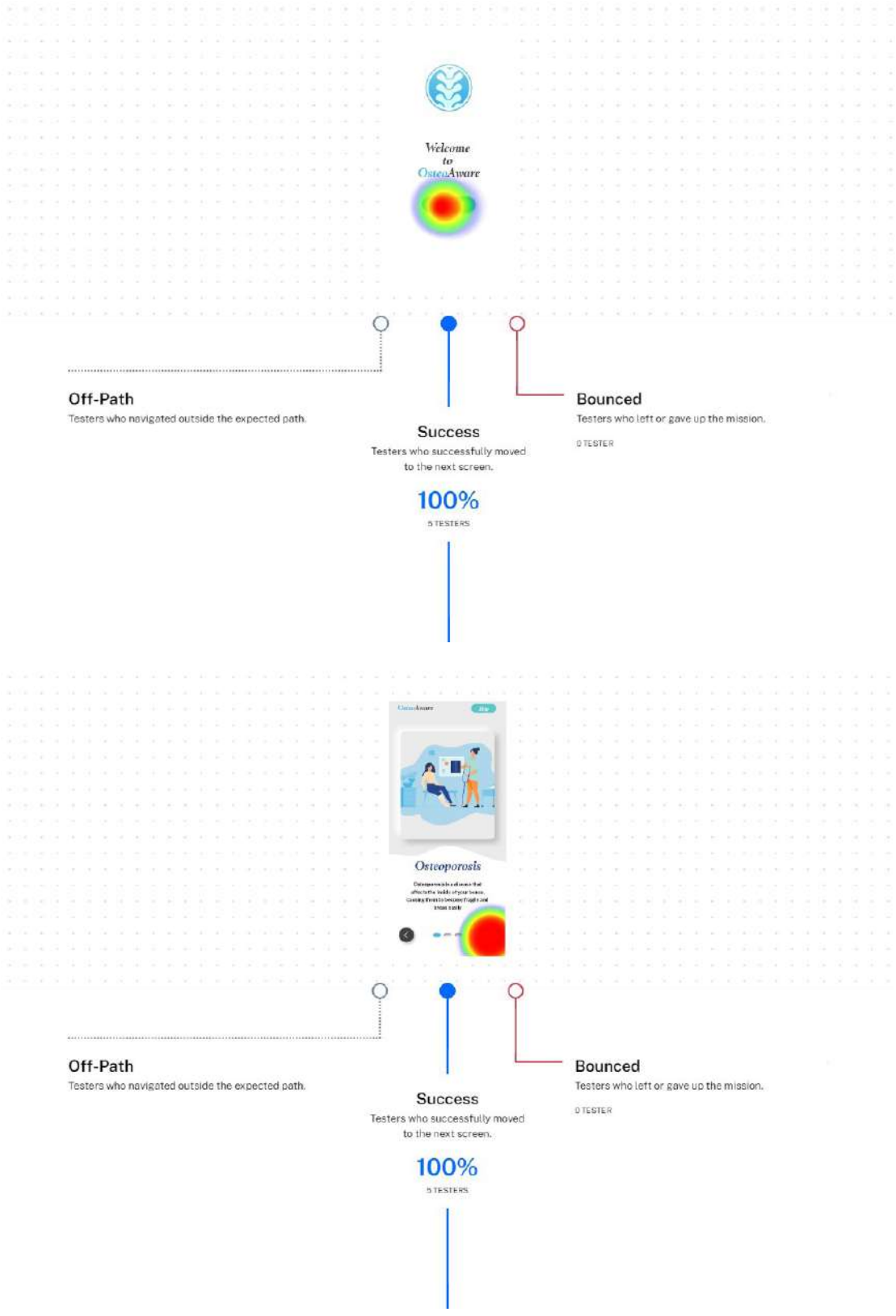

What can affect the absorption of Calcium?
Off-Path
Testers who navigated outside the expected path.
Lessons 1-18
50.0%
2 TESTERS
Success
Testers who successfully moved to the next screen.
50%
2 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

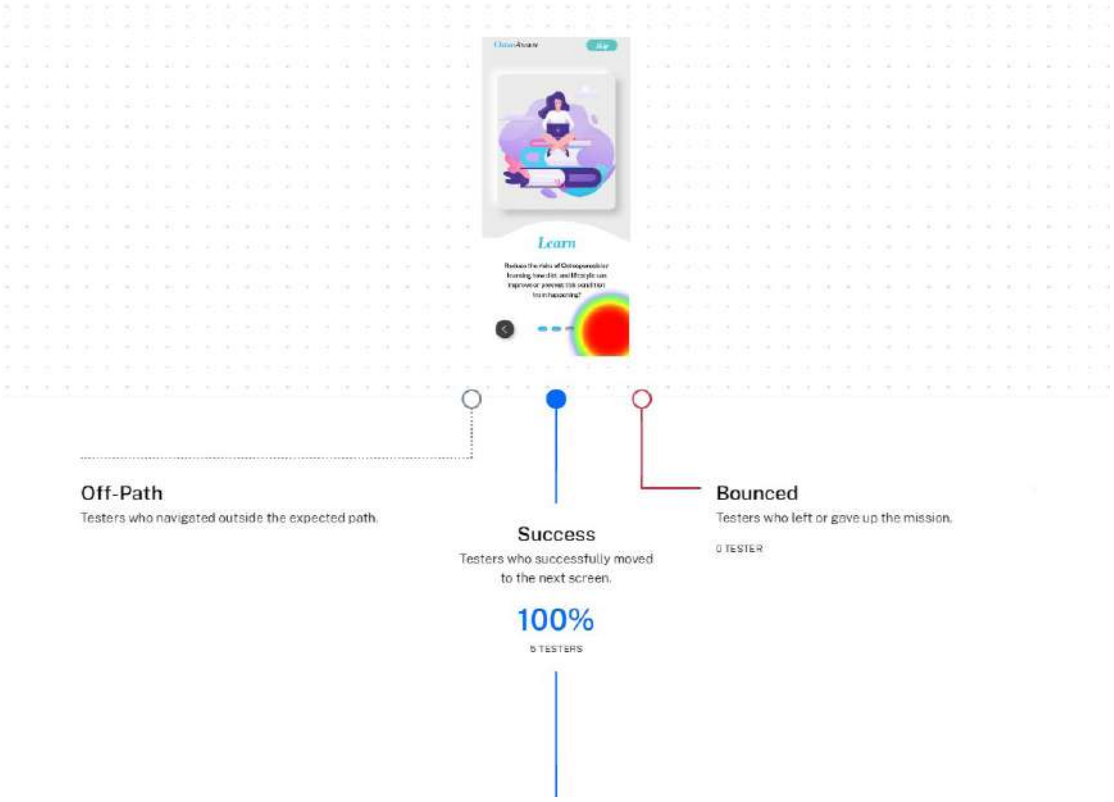

What can affect the absorption of Calcium?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
2 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
What is considered a healthy BMI?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
2 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

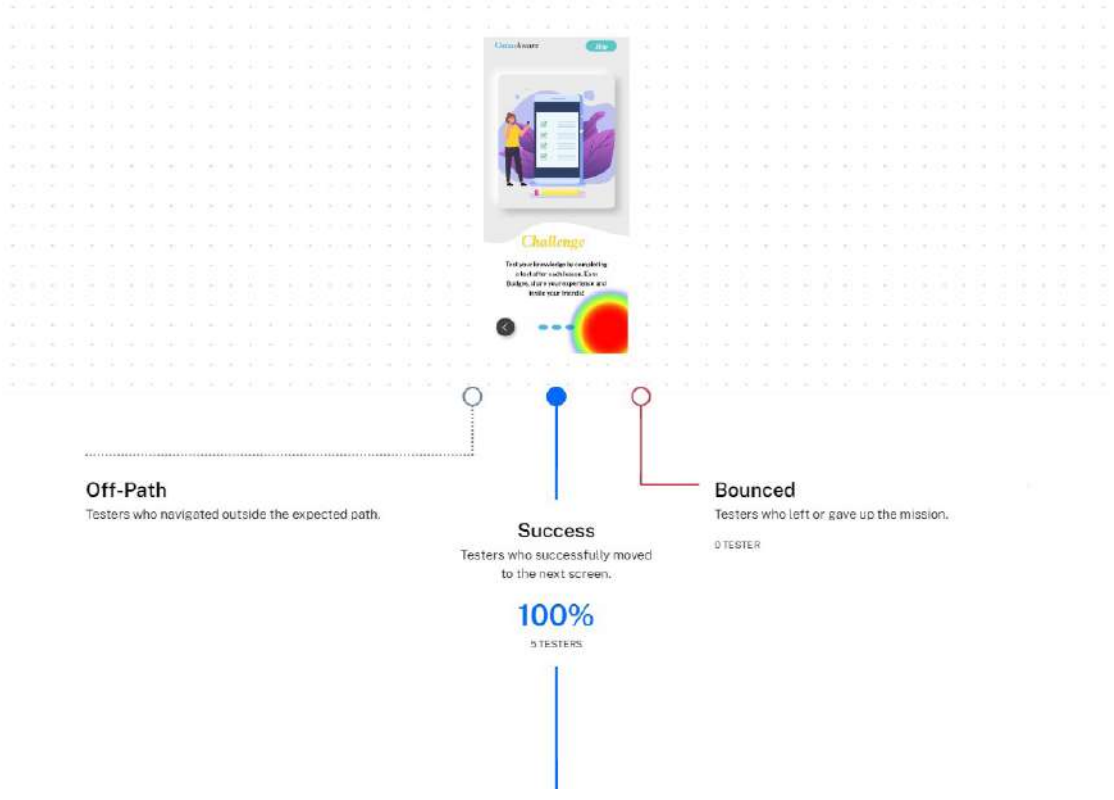

What is considered a healthy BMI?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
2 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

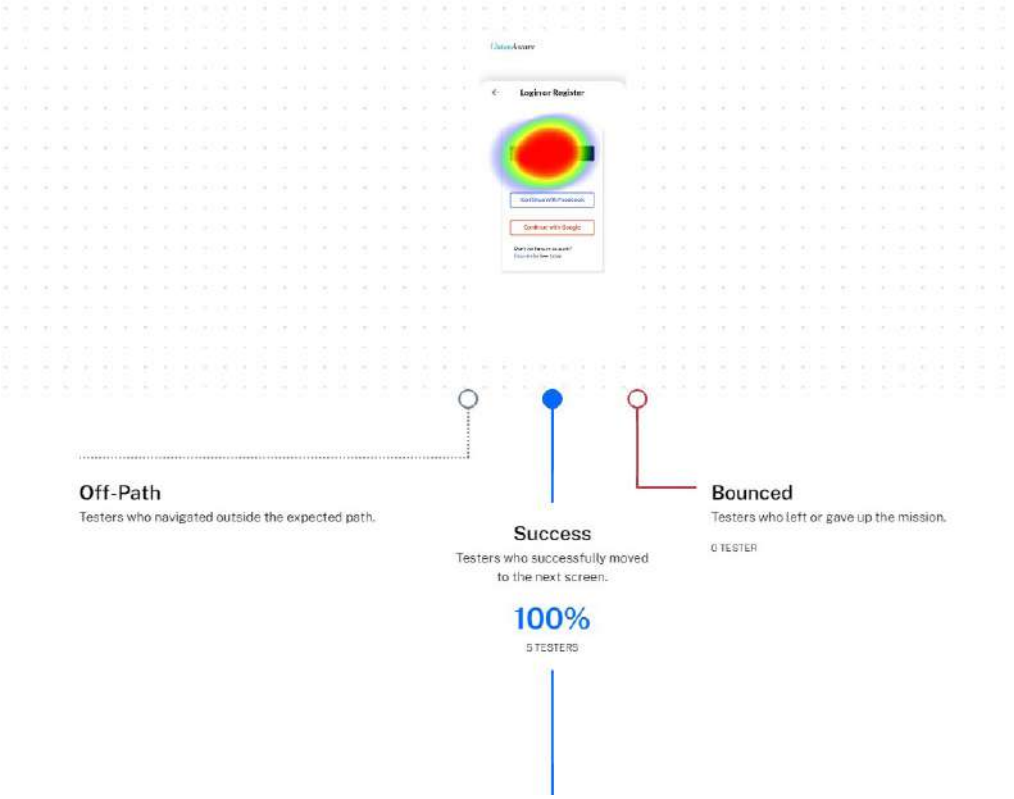
Appendix E

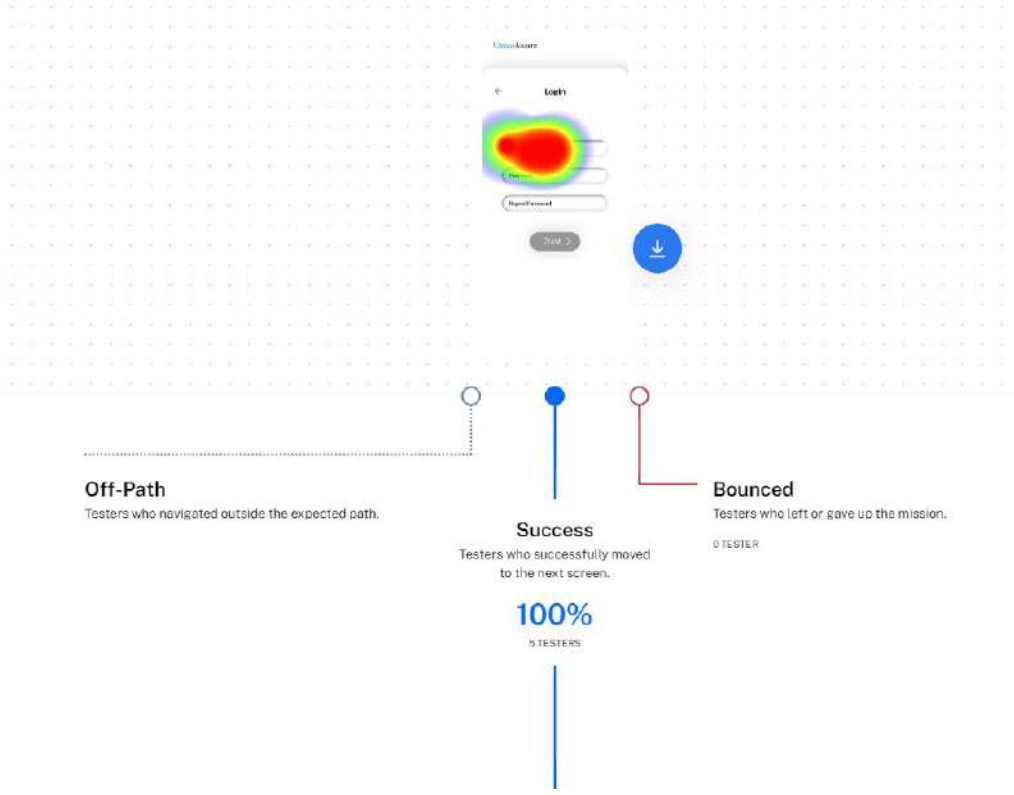
Prototype B - User Testing Results (Mission 1)

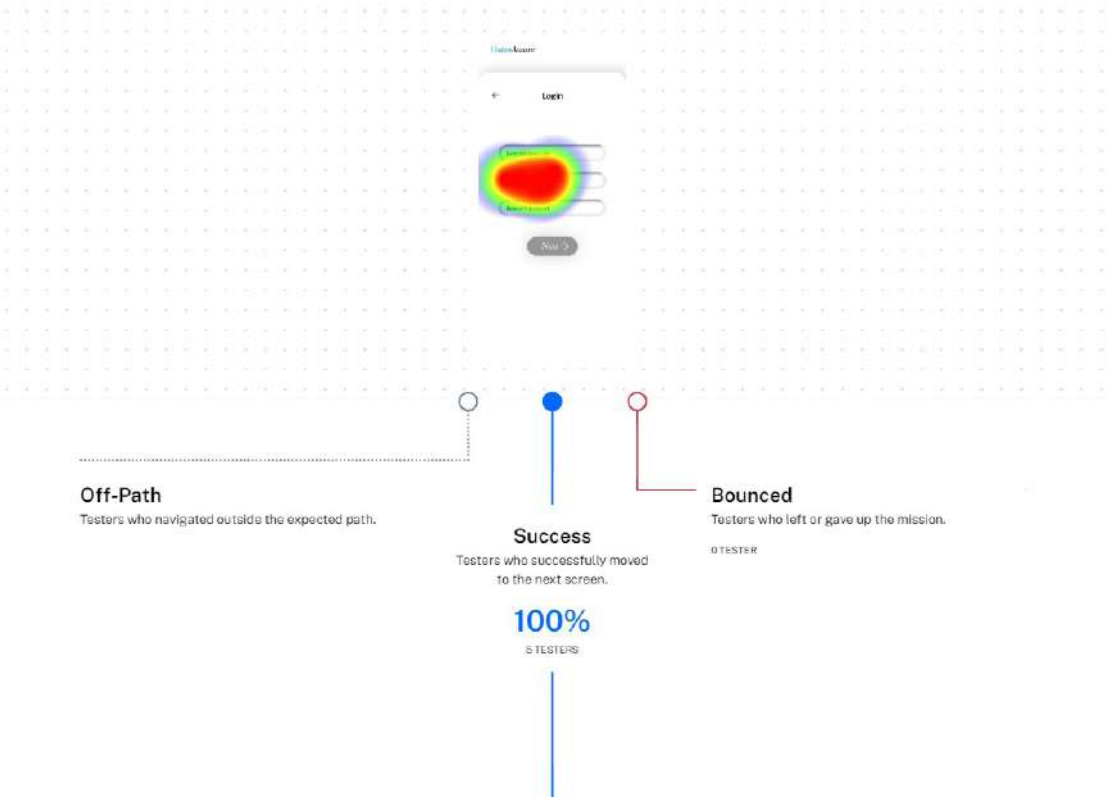



Learn
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

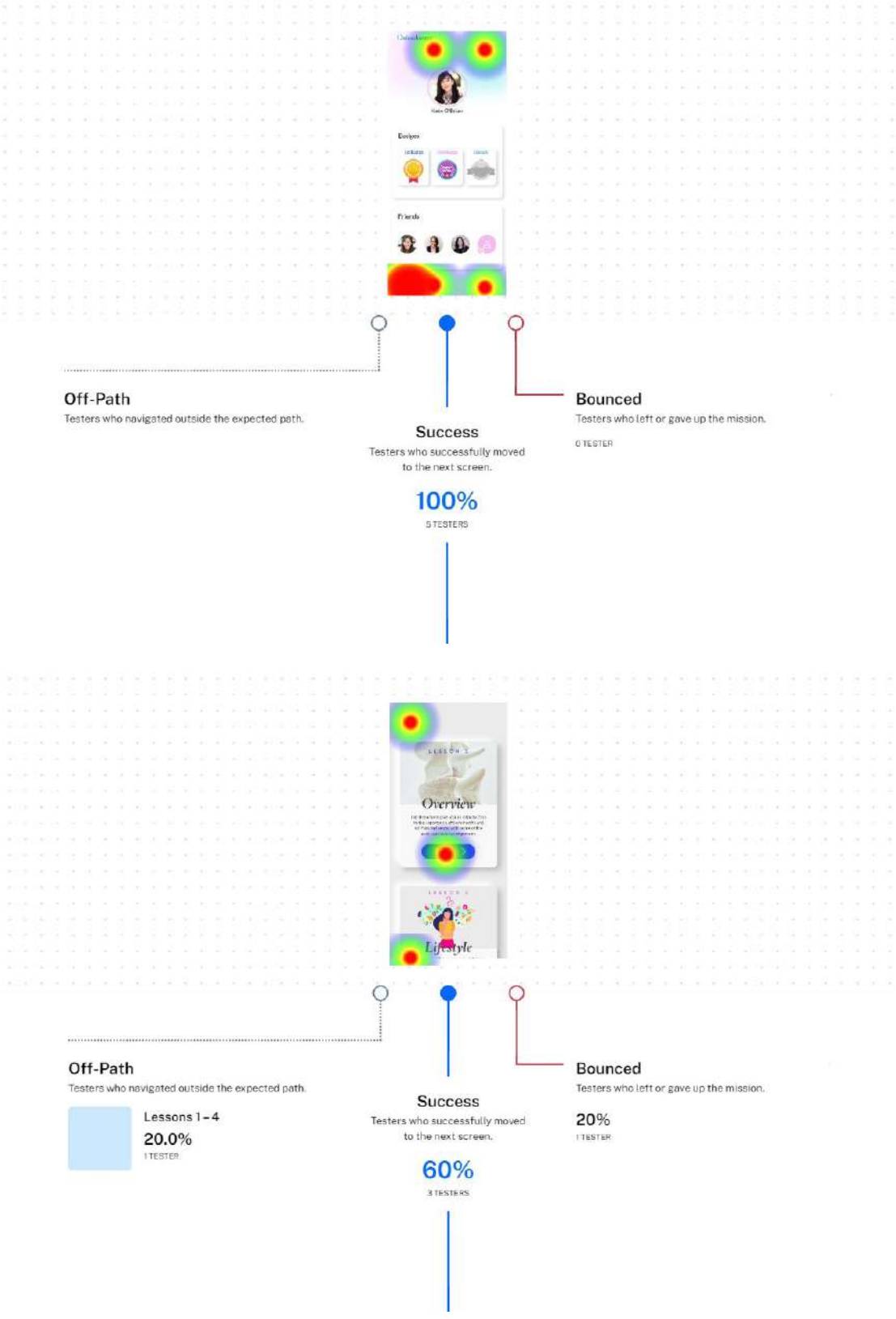

Challenge
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

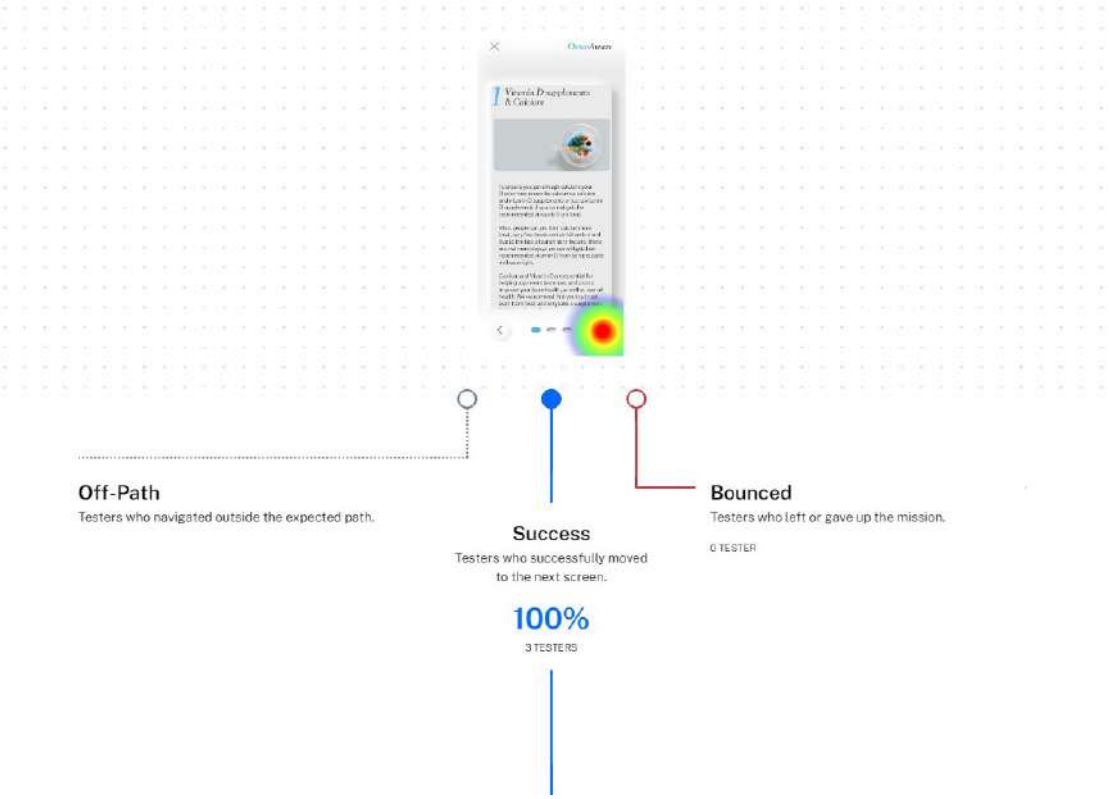

Login or Register
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

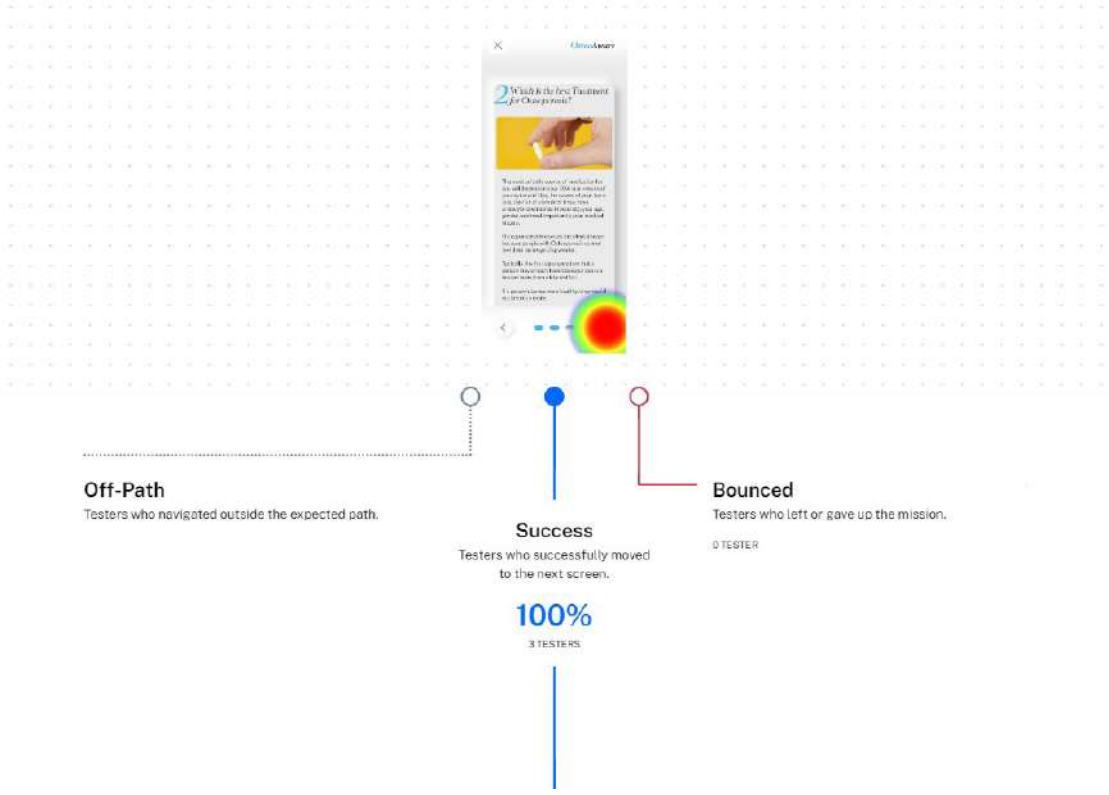

Login
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

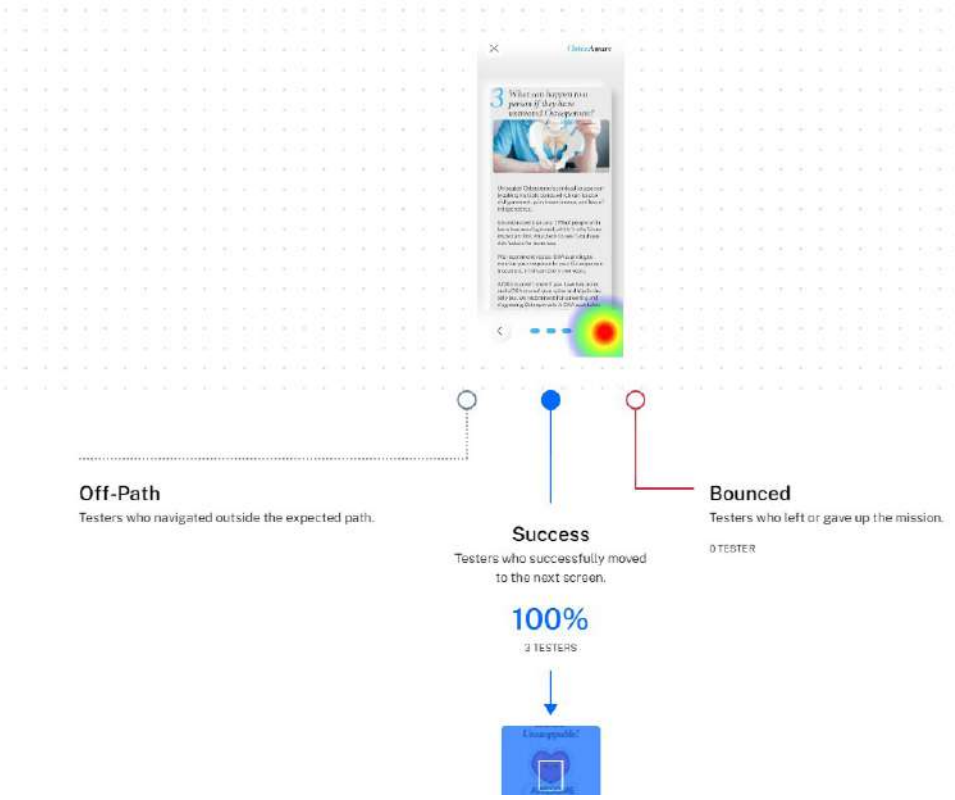

Login
Next >
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

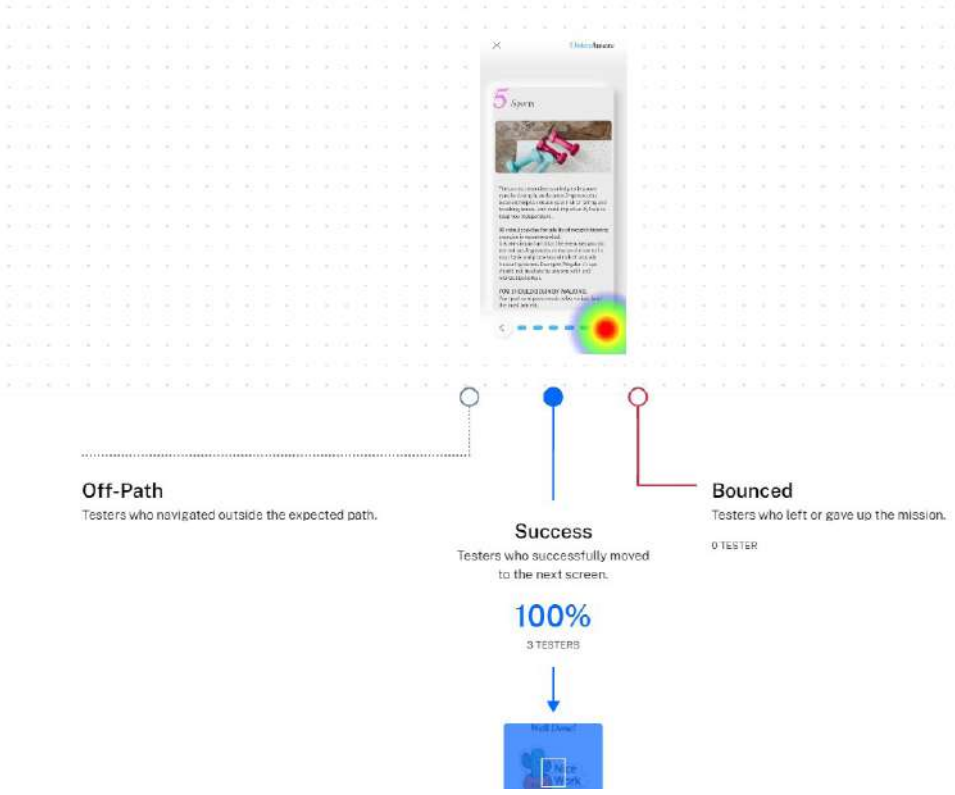
Prototype B - User Testing Results (Mission 2)



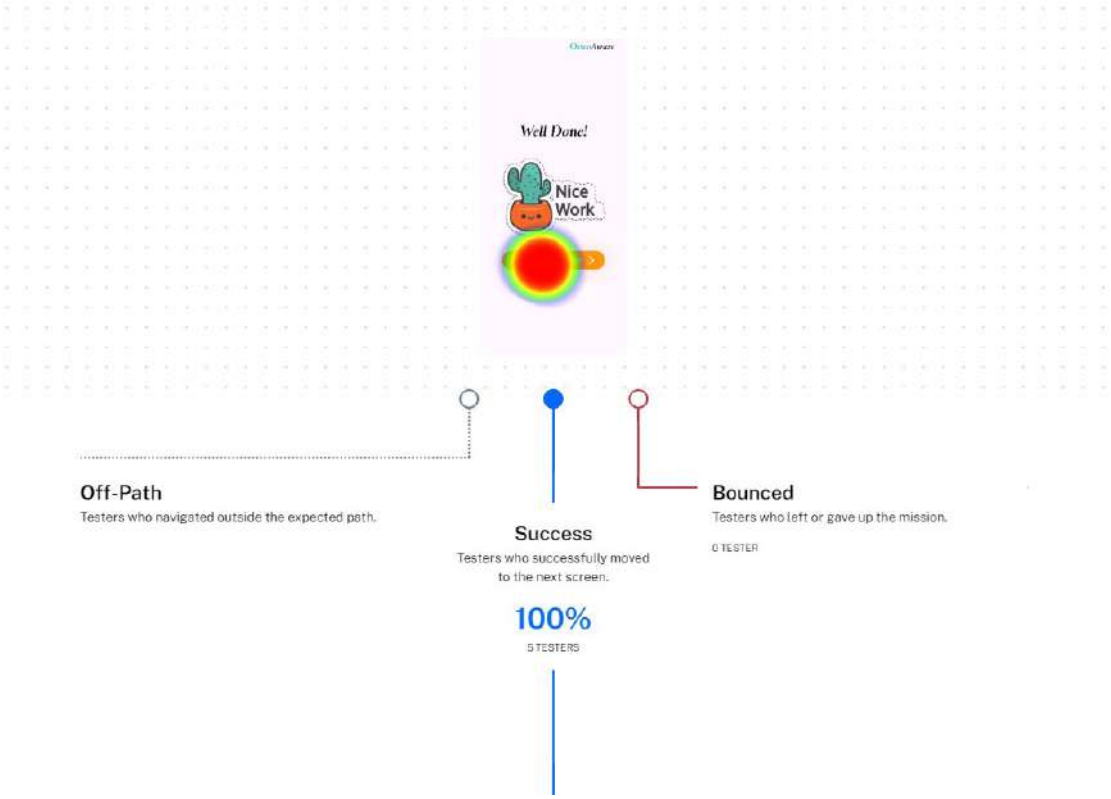

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

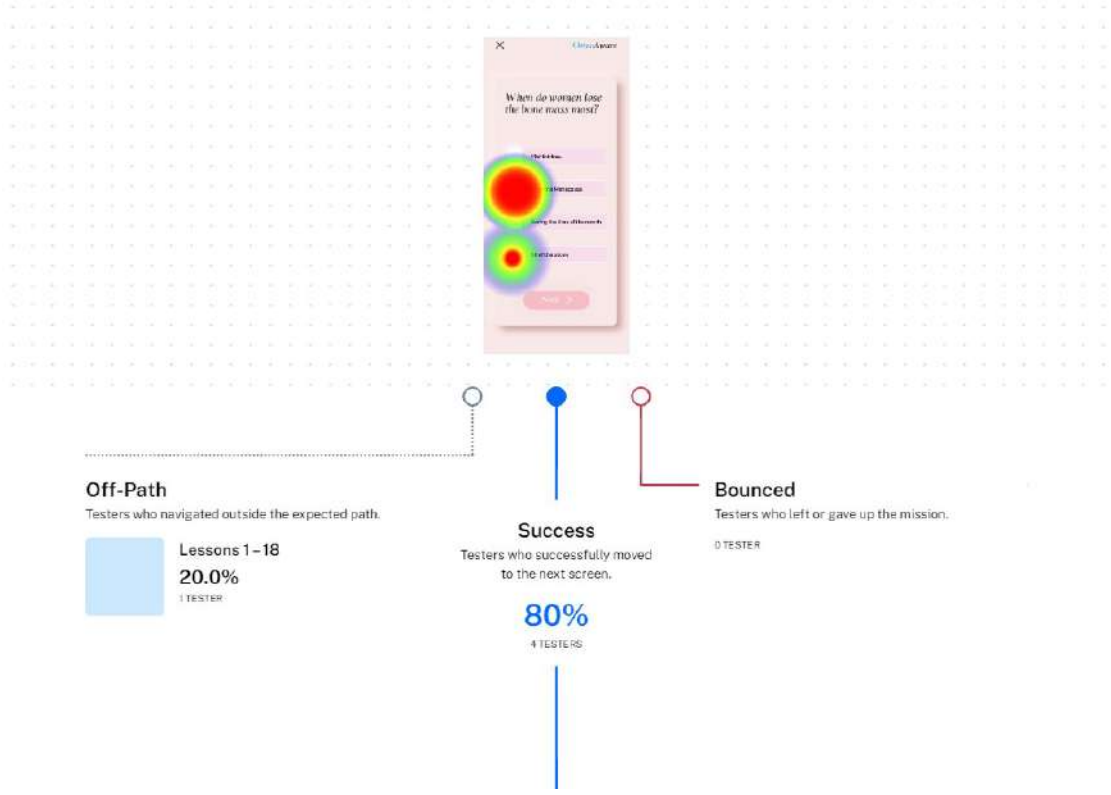

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

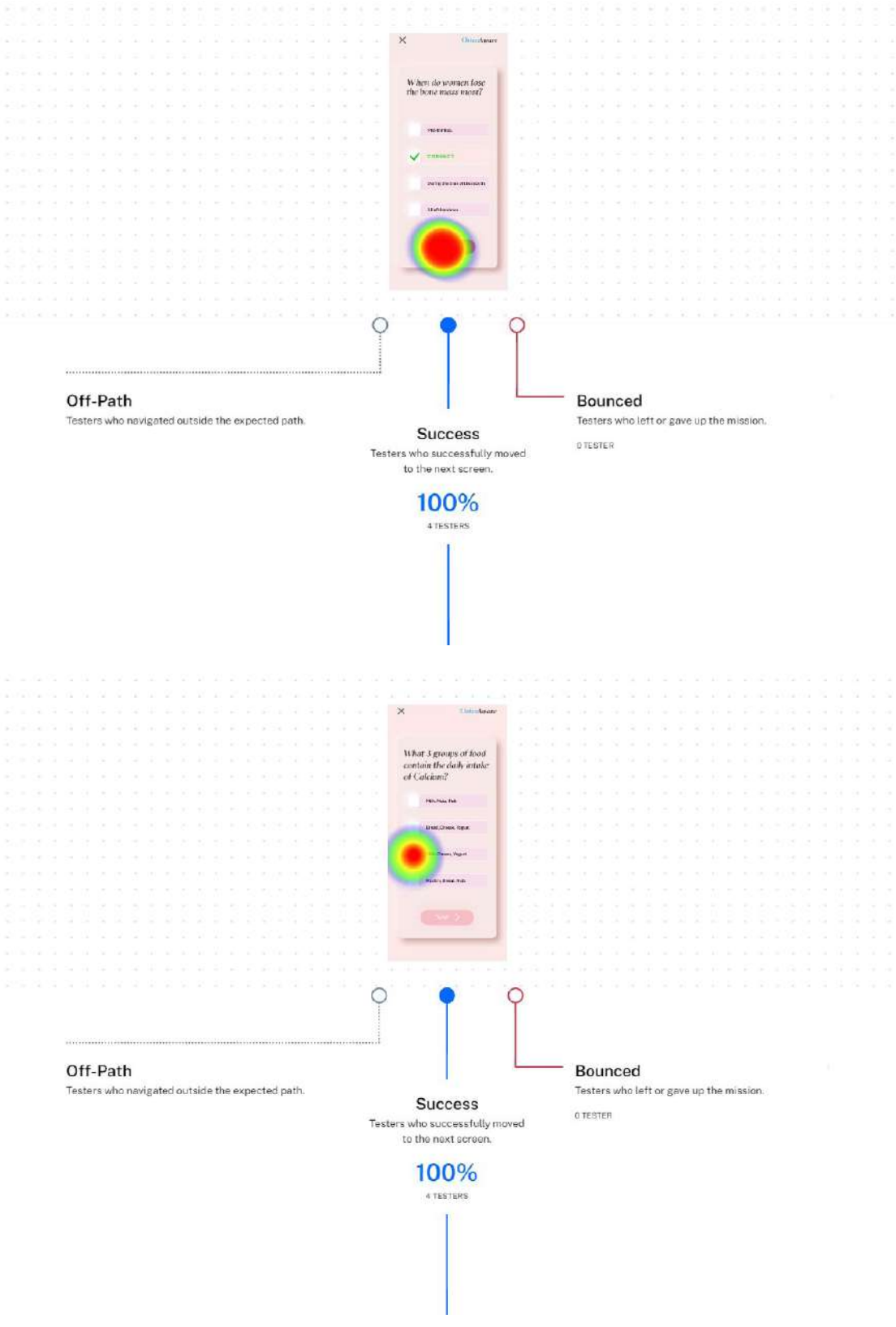

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

Prototype B - User Testing Results (Mission 3)

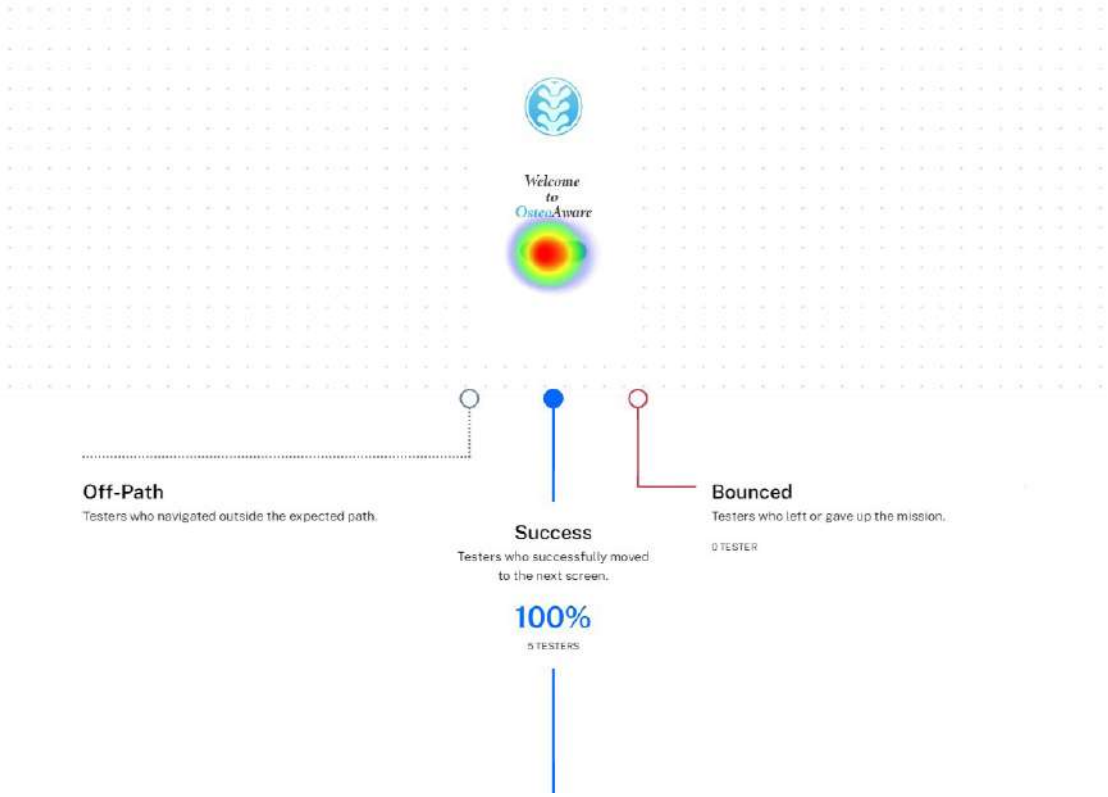


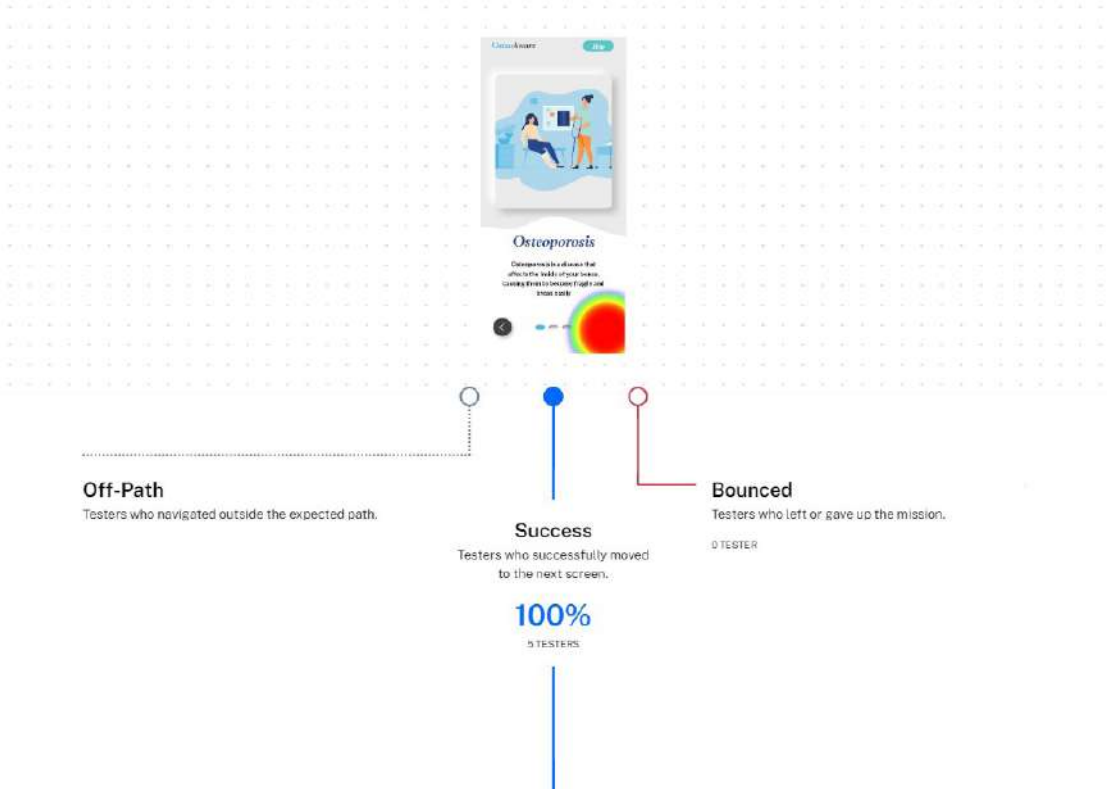


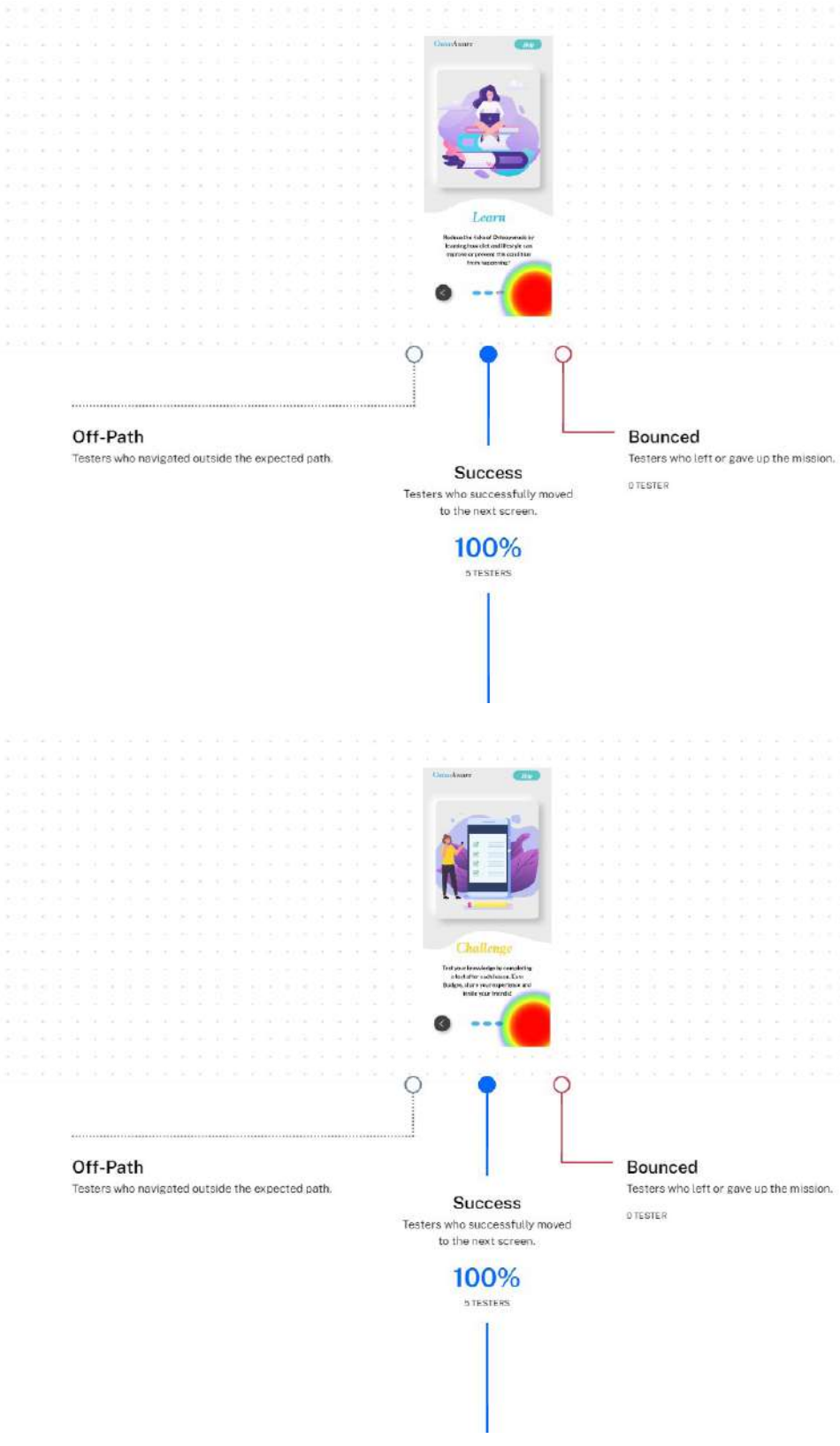

When do women lose the bone mass most?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
What 3 groups of food contain the daily intake of Calcium?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

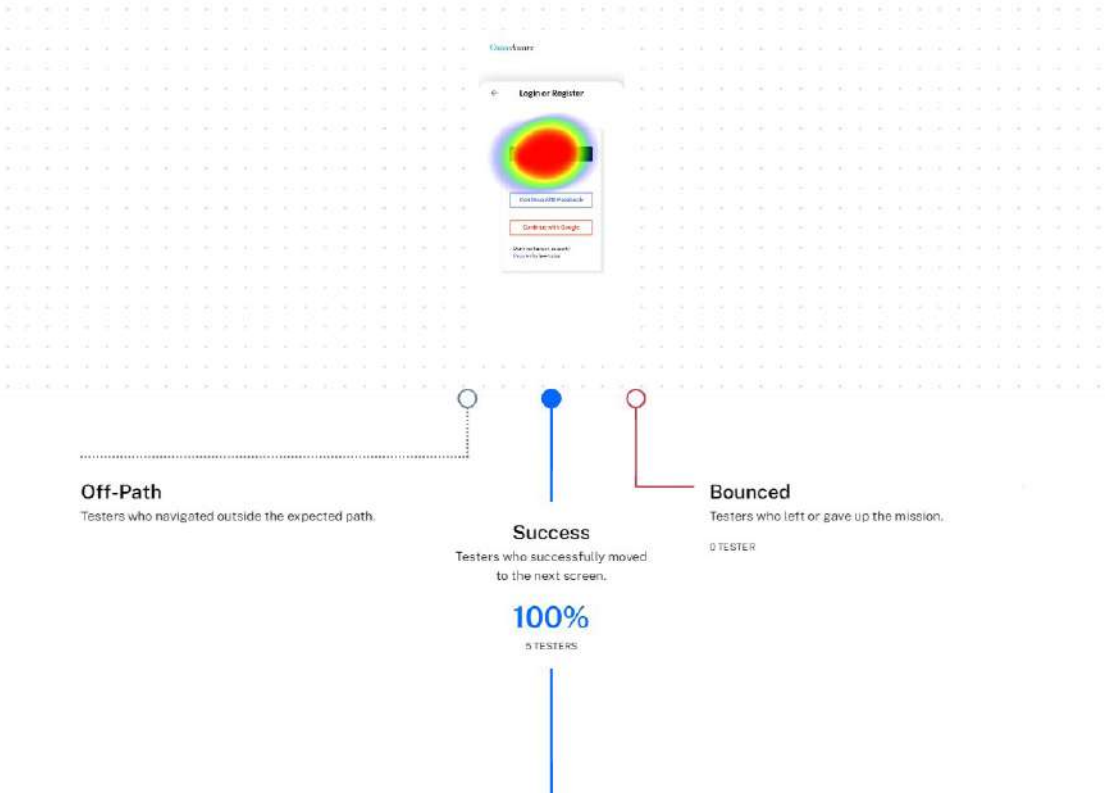
Appendix F

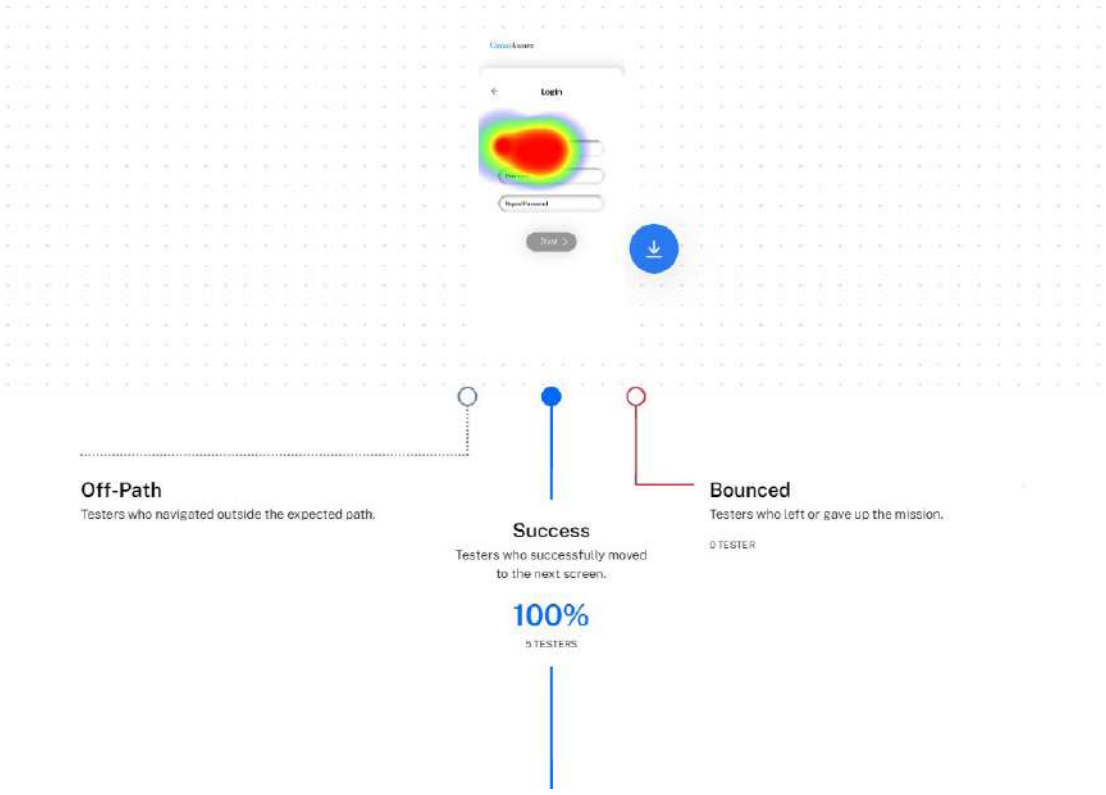
Prototype C - User Testing Results (Mission 1)



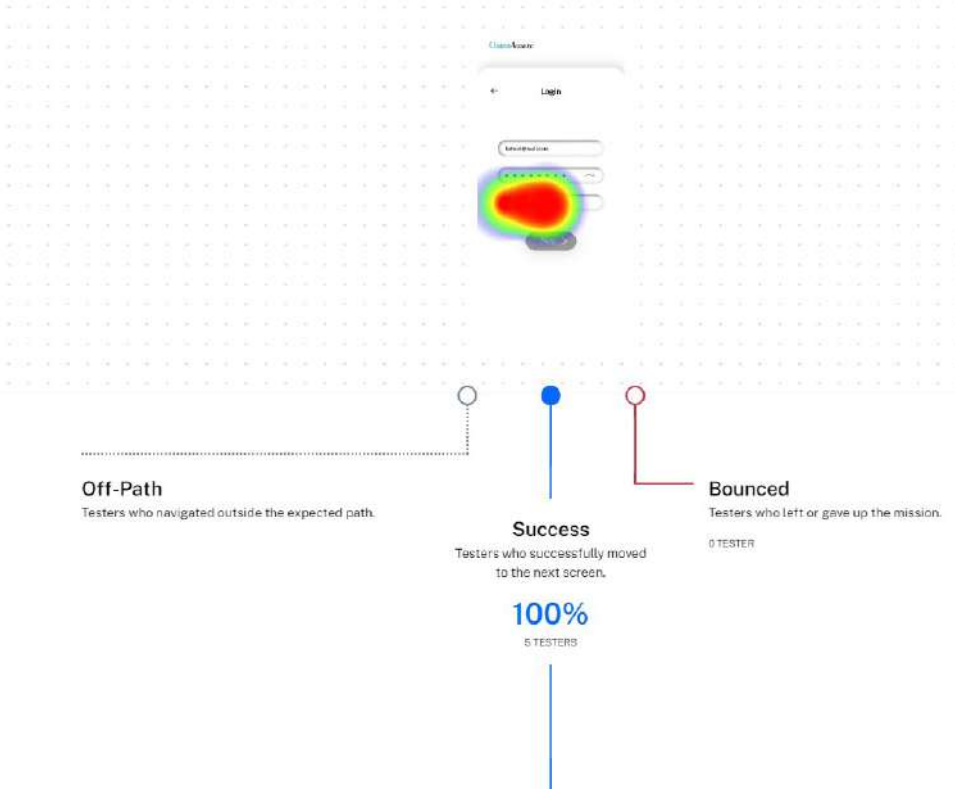


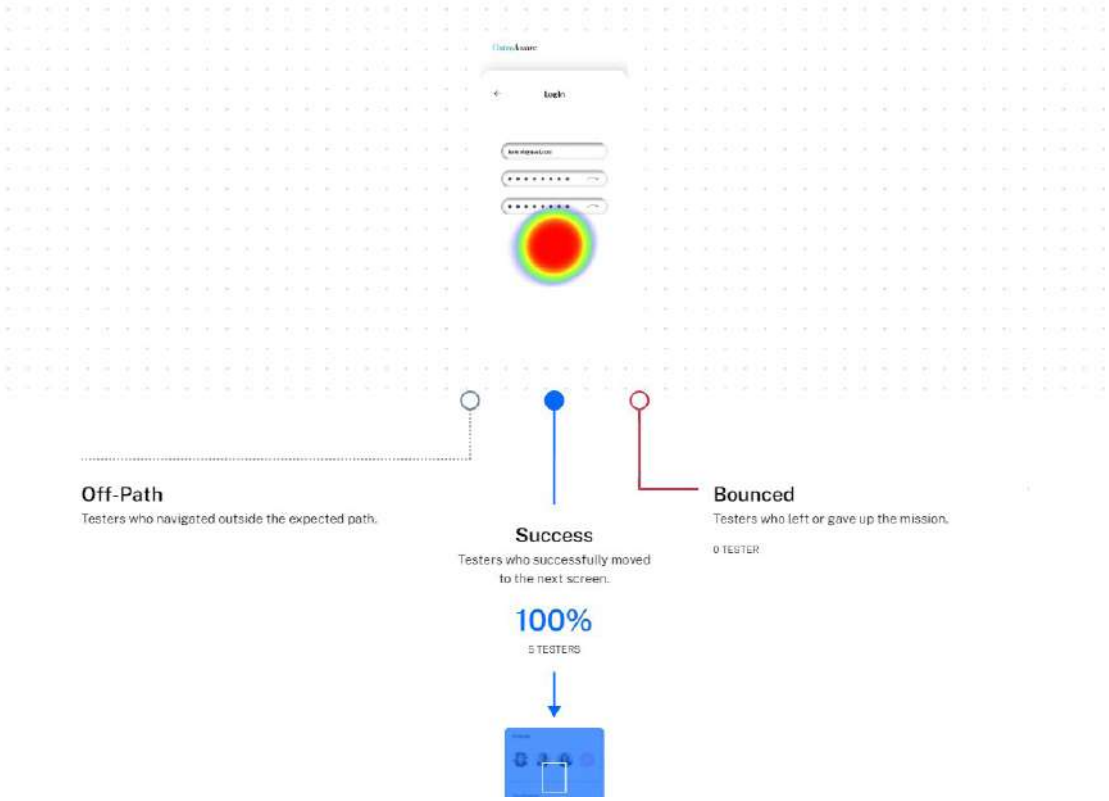

Learn
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
Challenge
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


Login or Register
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

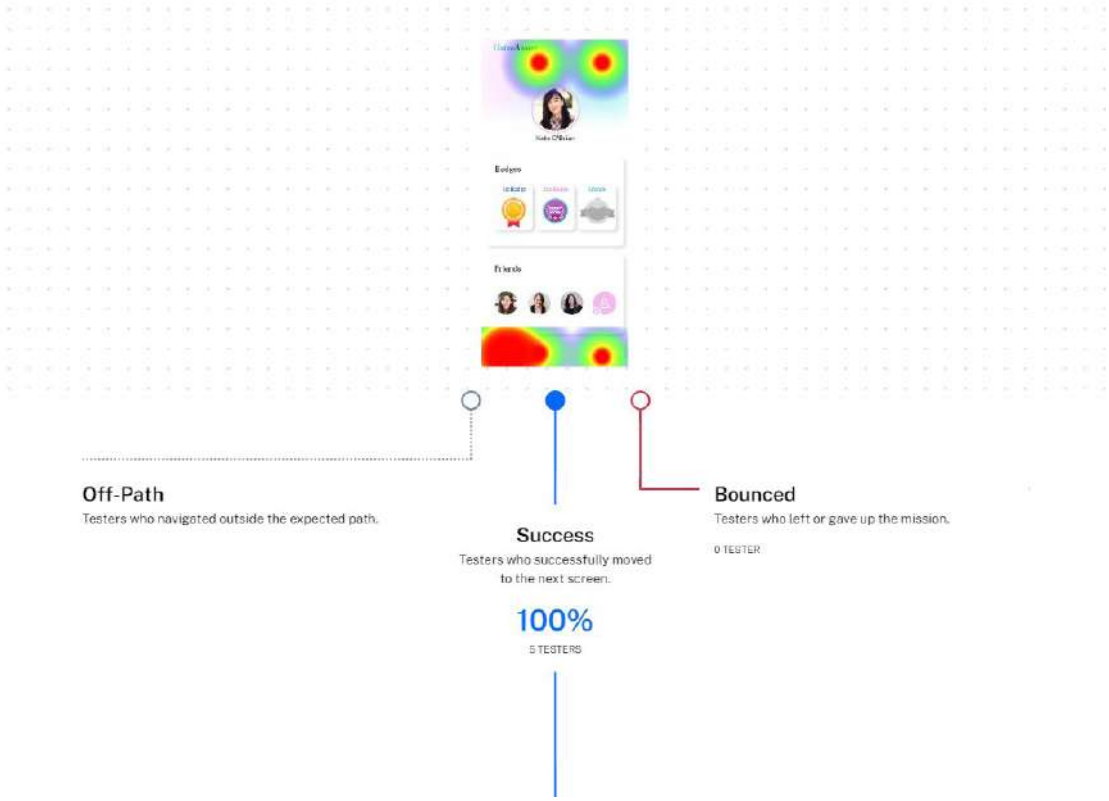

Login
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

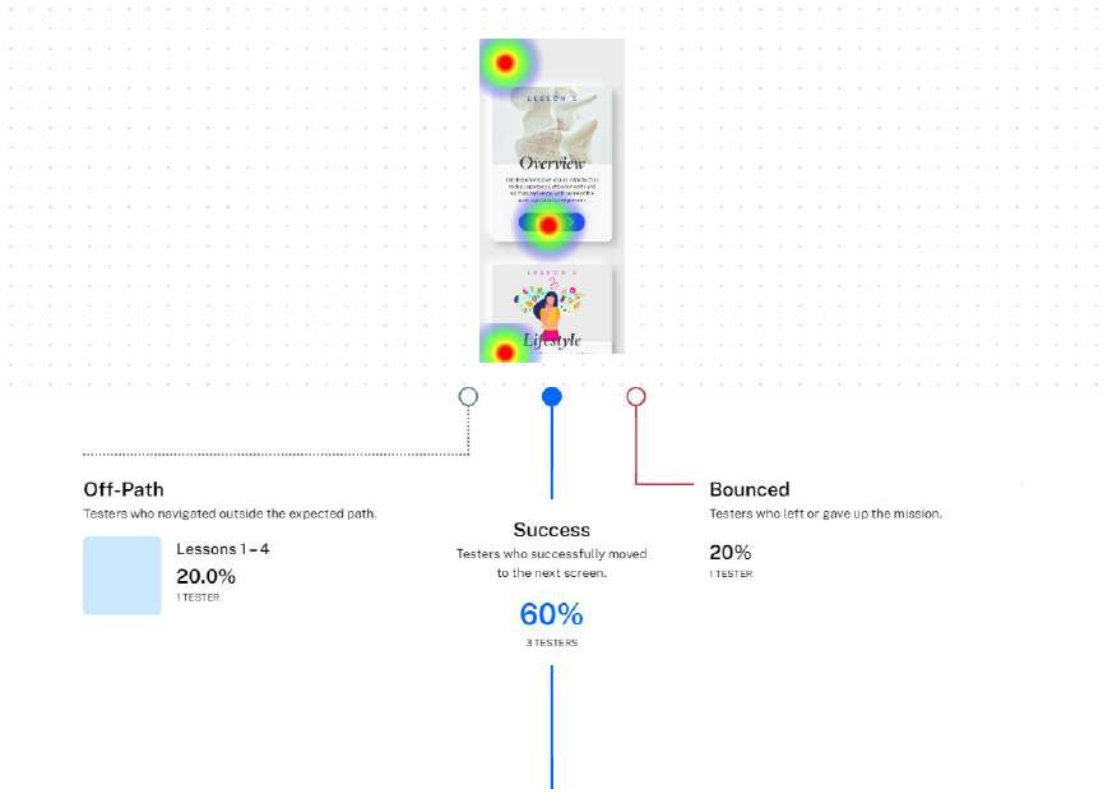

Login
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

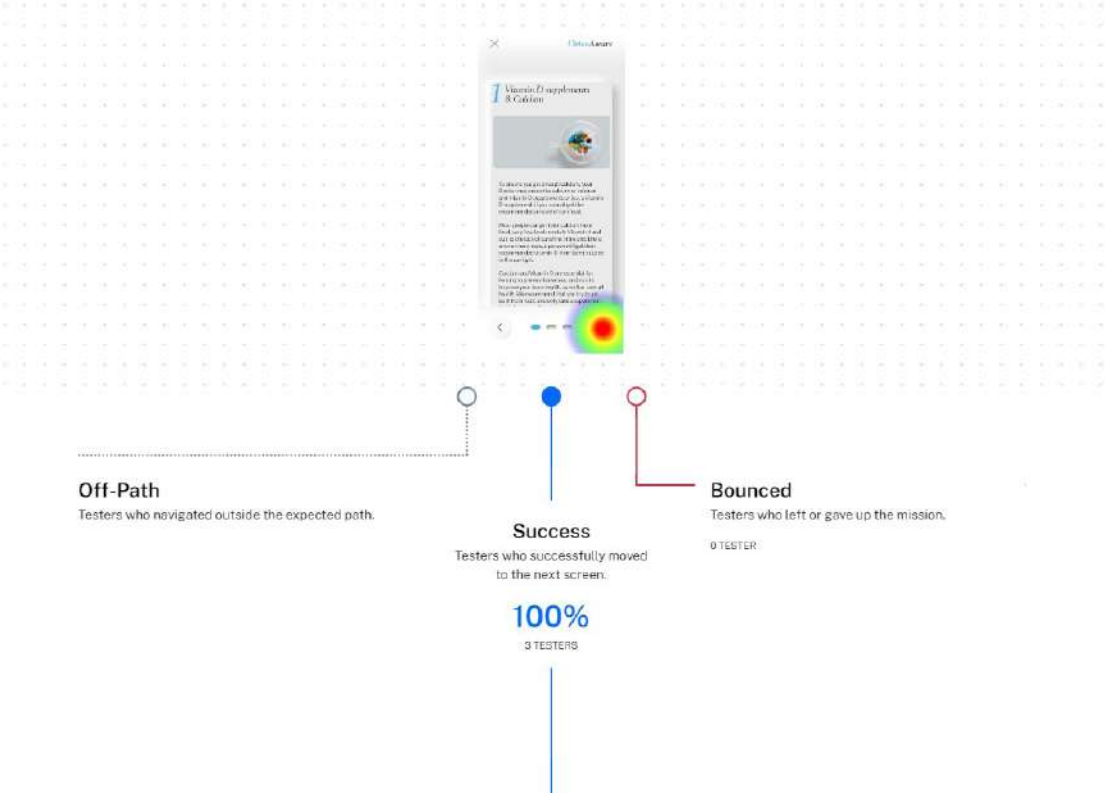

Login
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

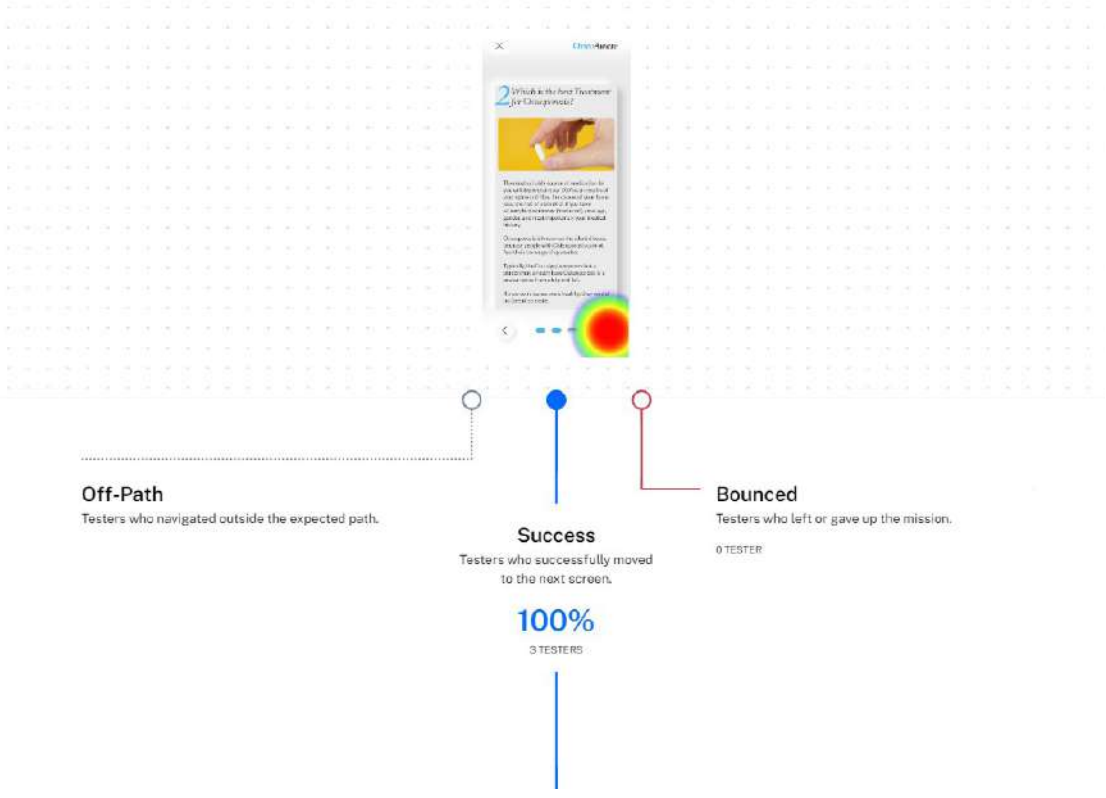

Login
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

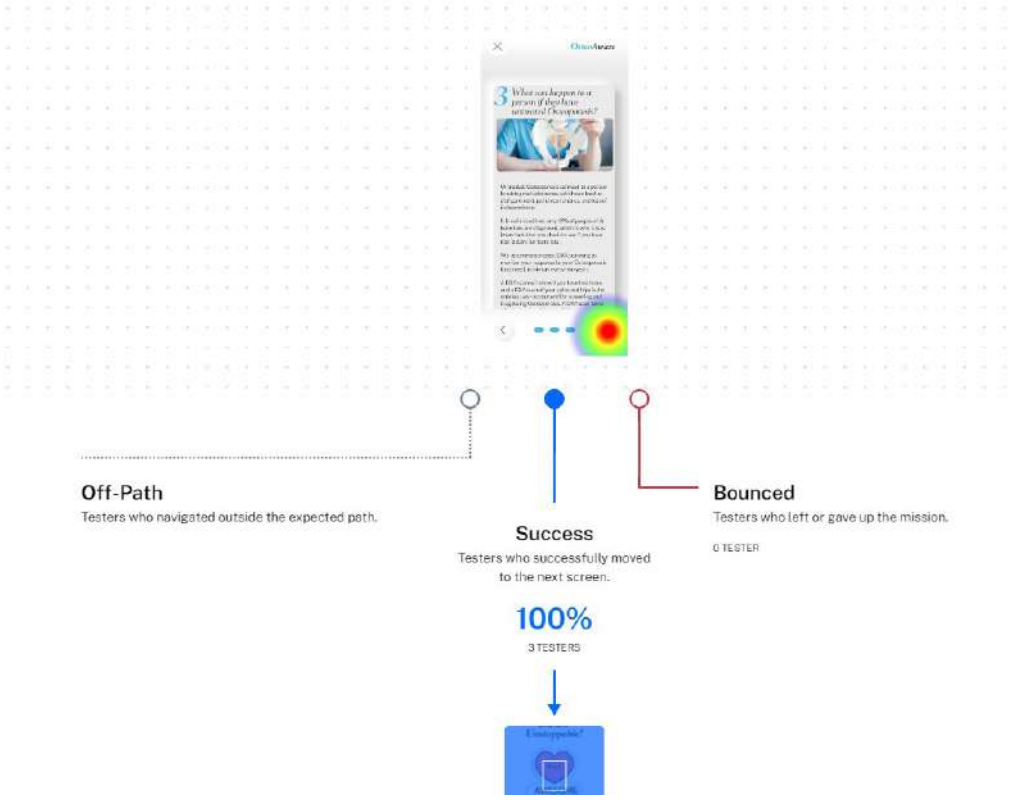
Prototype C - User Testing Results (Mission 2)



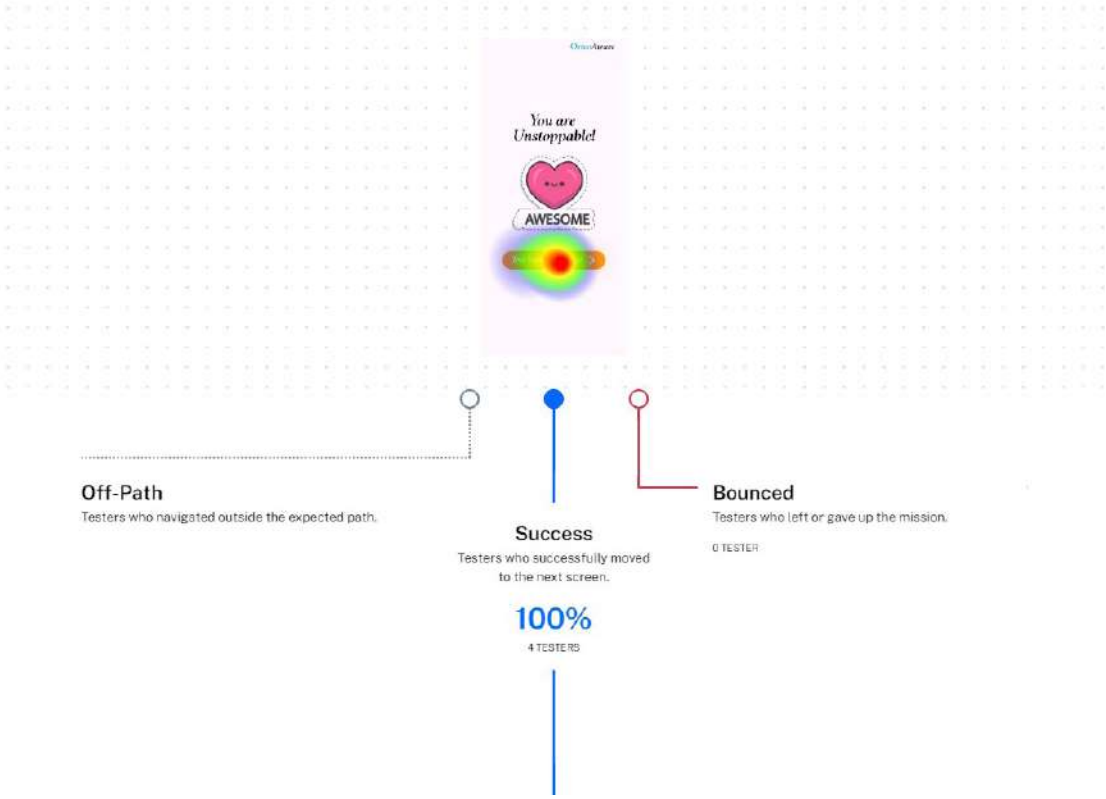


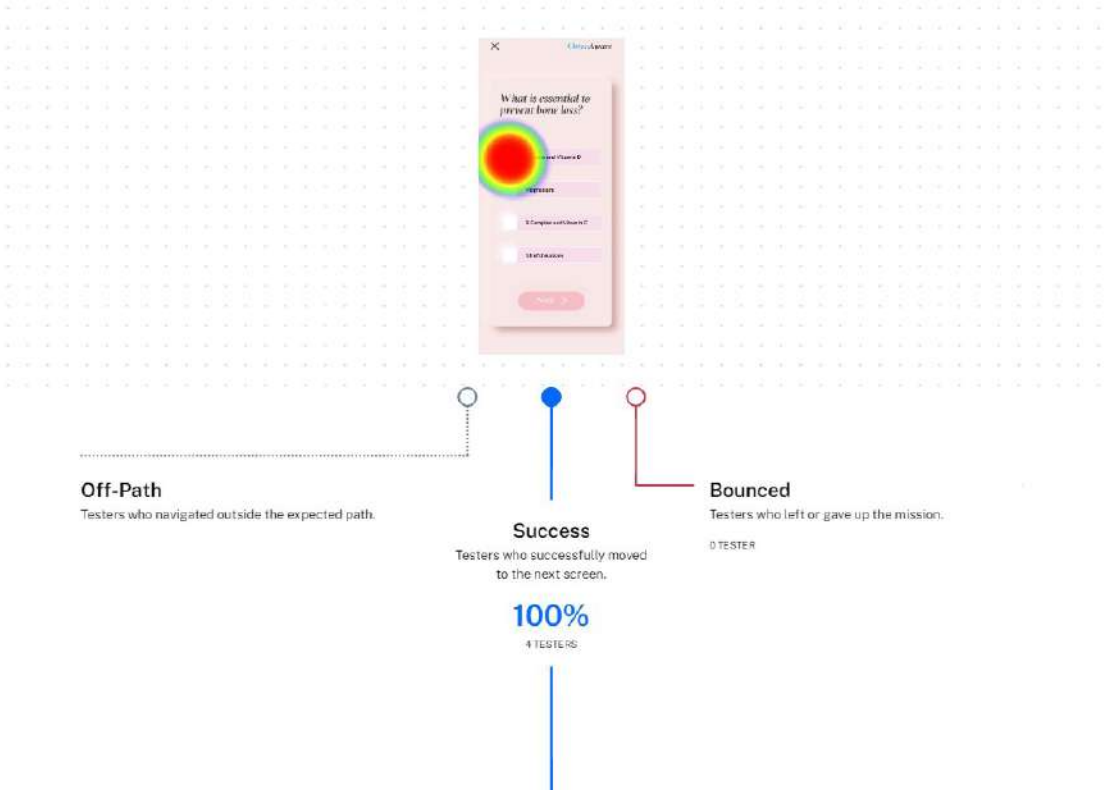

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

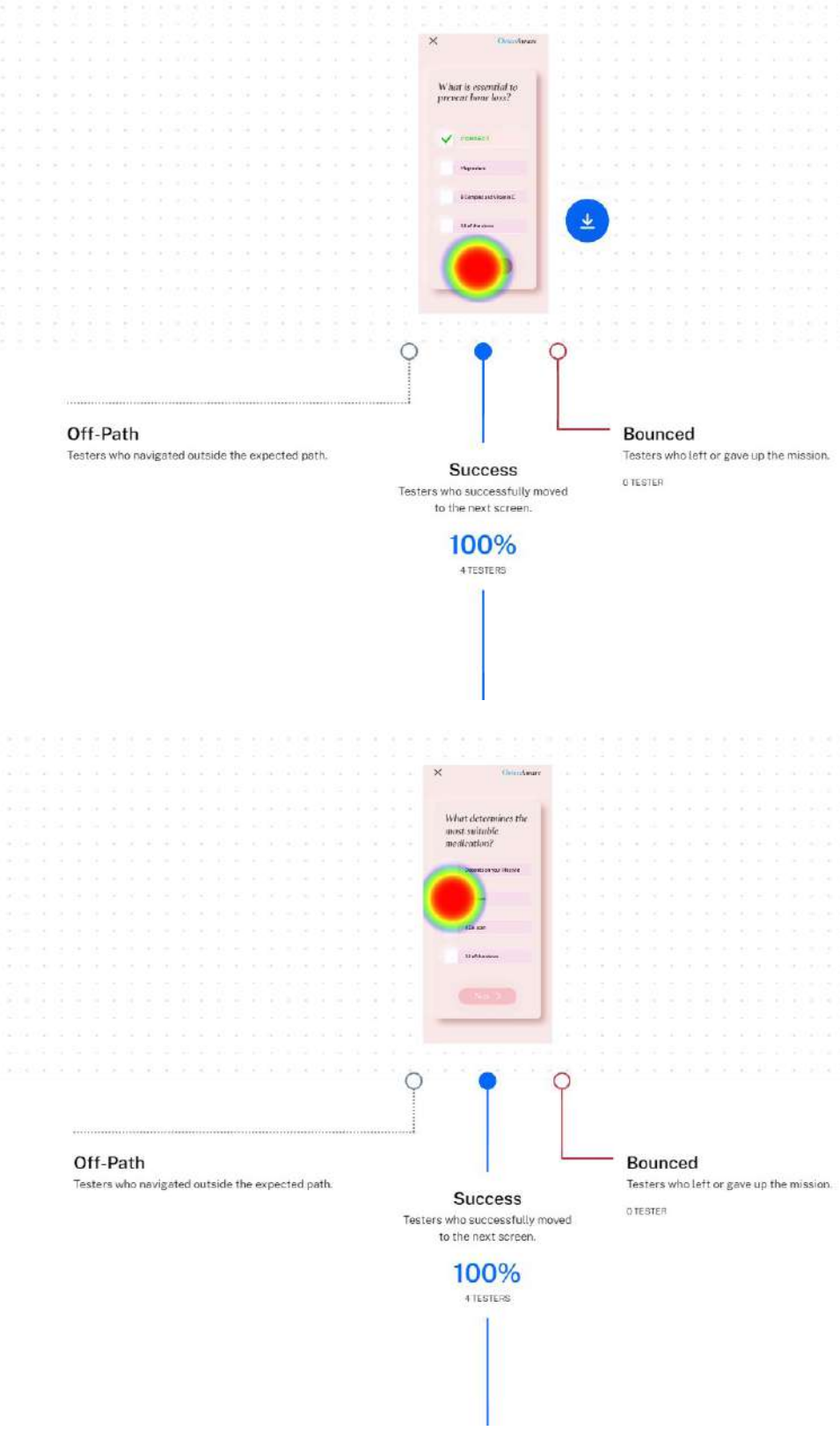

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

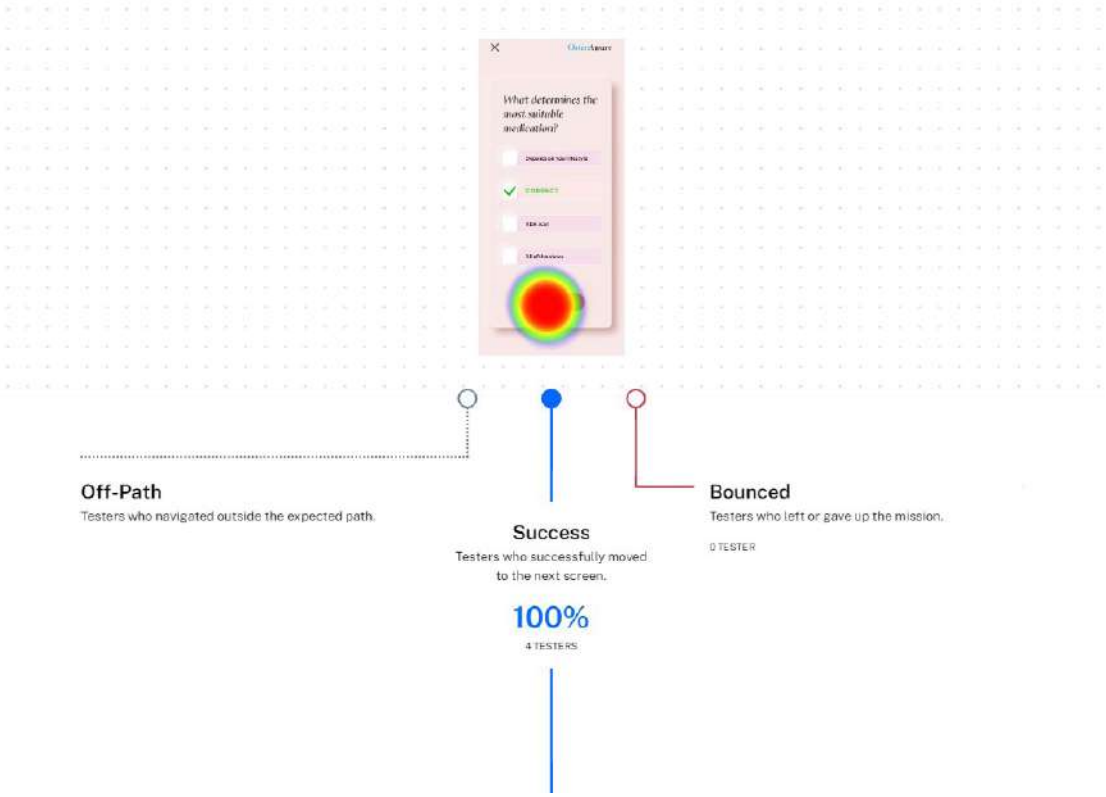

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

Prototype C - User Testing Results (Mission 3)

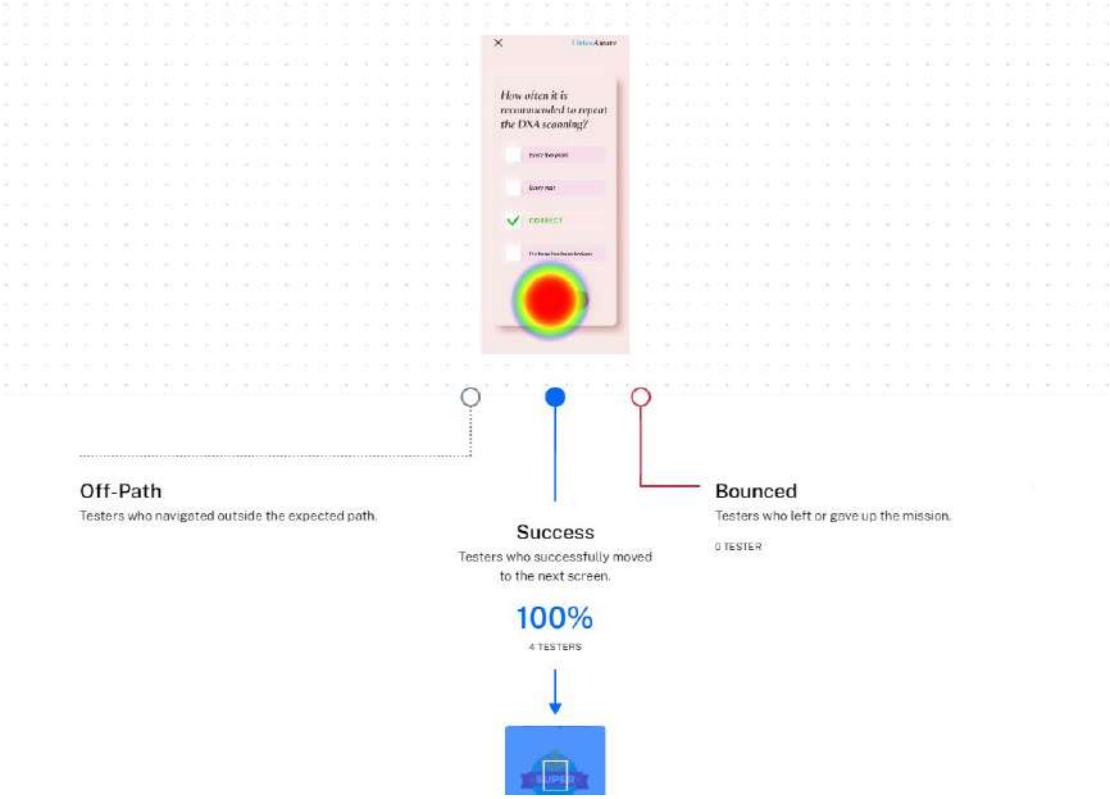





What is essential to prevent bone loss?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
What determines the most suitable medication?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


What determines the most suitable medication?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


How often it is recommended to repeat the DNA scanning?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


How often it is recommended to repeat the DNA scanning?
CORRECT
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

User testing Consent Form 1

UX Usability Test Consent form

Usability Test – Permission to Record

Thank you for participating in our usability test. We will be recording your session to allow UX Design Institute staff members who are unable to be here today to observe your session and benefit from your comments, as well as to thoroughly analyse this session after its end. Please read the statement below and sign where indicated.

I understand that my usability test session will be recorded. I grant Ustina Maximova (a student of TU Dublin, Blanchardstown) permission to use this recording, for the purpose of improving the designs being tested.

Signature: _____

Print your name: _____

Date: _____

Re: Prototype testing (Osteoporosis for Women 40+)

[redacted]

26/07/2021 13:25

To: Yustina

Yes I consent and agree!

he

User testing Consent Form 2

UX Usability Test Consent form

Thank you for participating in our usability test. We will be recording your session to allow UX Design Institute staff members who are unable to be here today to observe your session and benefit from your comments, as well as to thoroughly analyse this session after its end. Please read the statement below and sign where indicated.

I understand that my usability test session will be recorded. I grant Ustina Maximova (a student of TU Dublin, Blanchardstown) permission to use this recording, for the purpose of improving the designs being tested.

Signature: [signature]
Print your name: [redacted]
Date: 26/07/2021

Appendix G

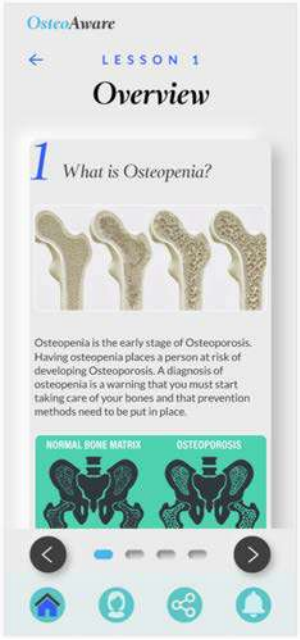
A and B Testing Results

Hi, if you have a minute, to test 2 variations of the prototype that would be great.

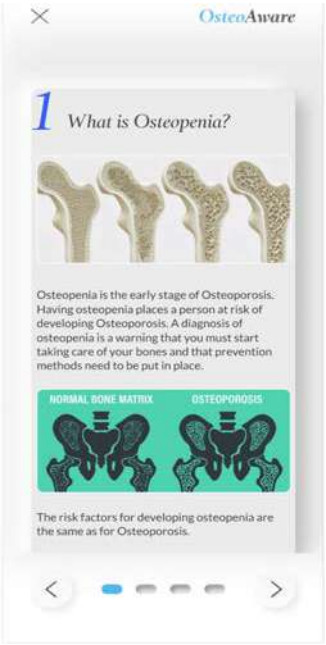
Testing A-B (1) - July 2, 2.04.31 pm (adobe.com)

OR is this section of the prototype better? (Why do you think so?)

Testing A-B (2) - July 2, 2.04.31 pm (adobe.com)



Prototype (1)



Prototype (2)

User 1

the second prototype is better since if you dont want to do a lesson or done this lesson before you can navigate out of it by using close bottom, i like the use of pink as highlight for home button.

User 2

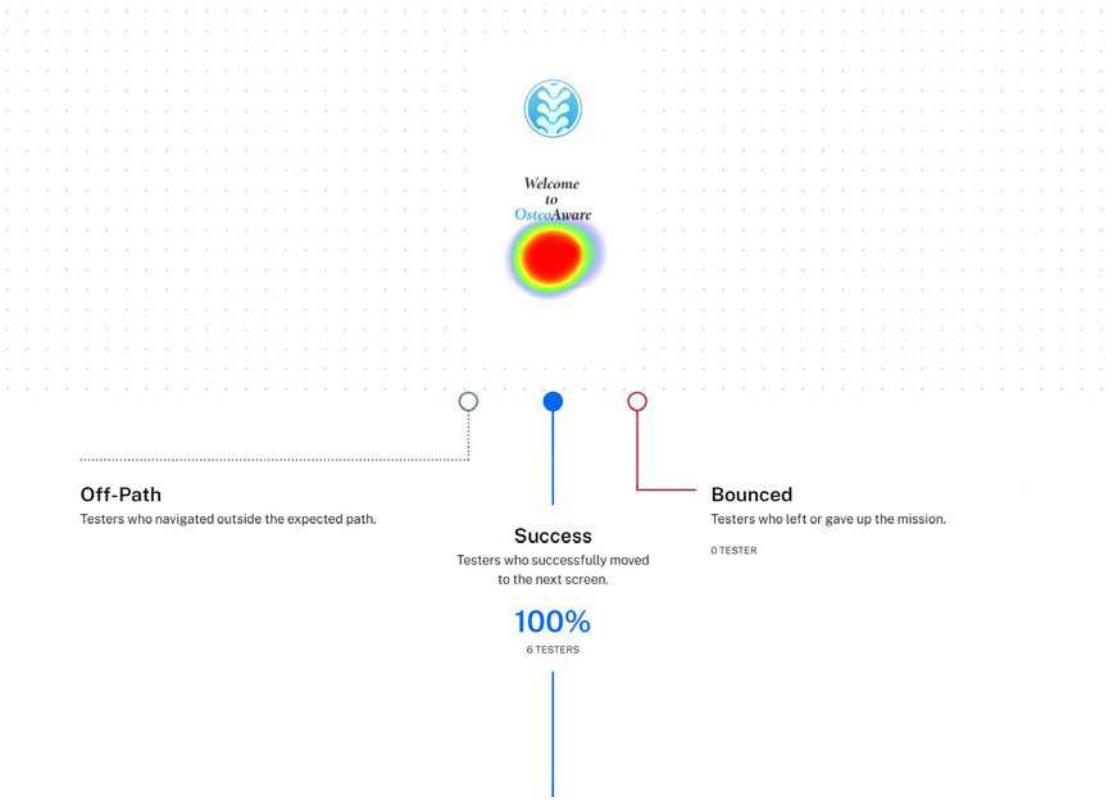
Hello!

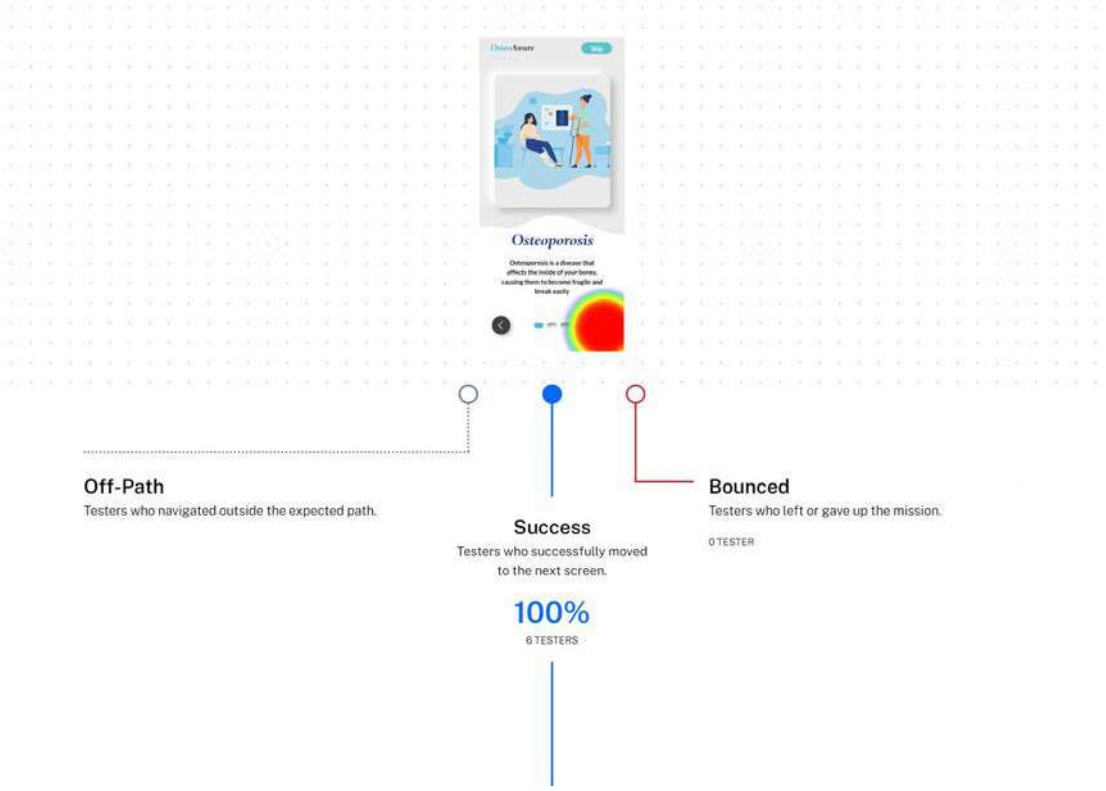
Today, in a more relaxed atmosphere, I looked at the prototypes.

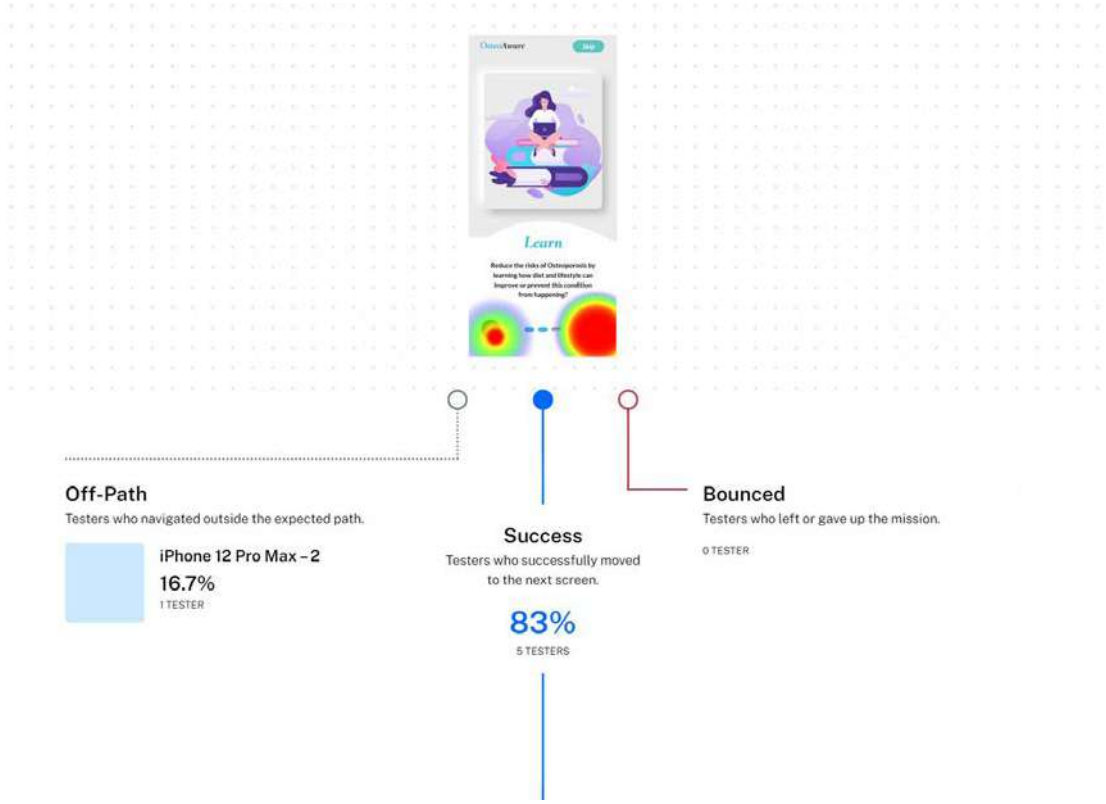
Still, I tend to number 2, it is less loaded and I like the light buttons/arrows more.

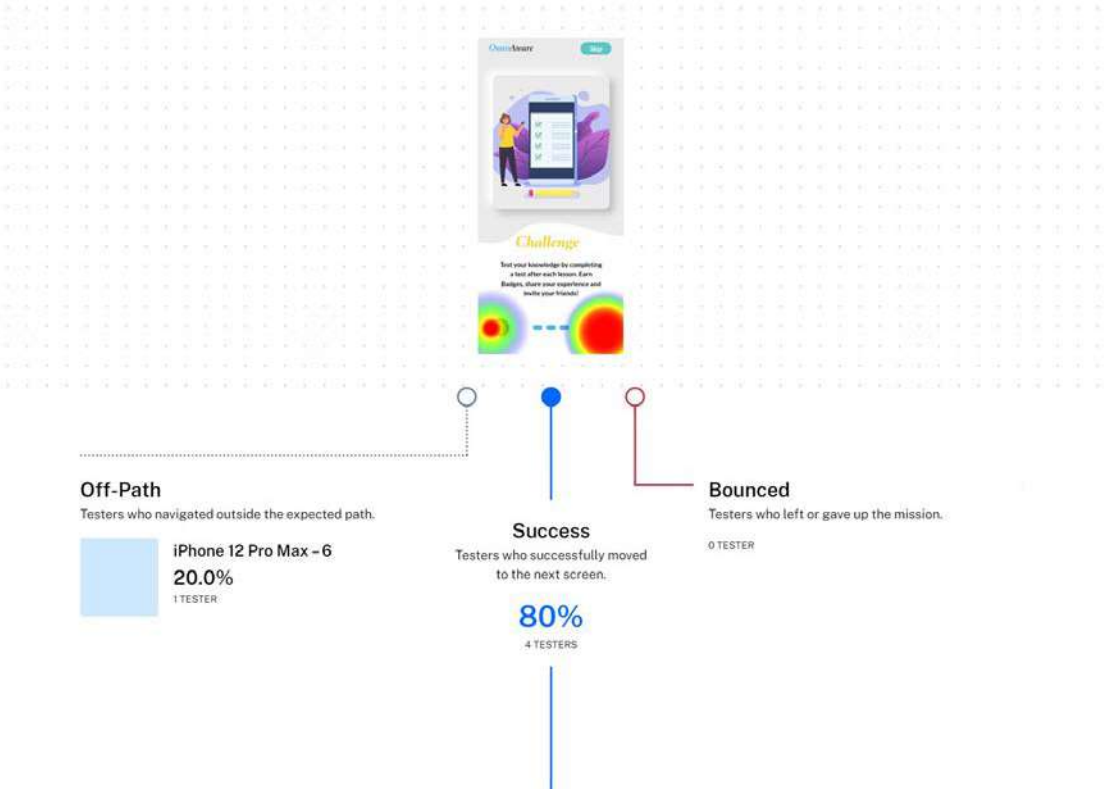
Appendix H

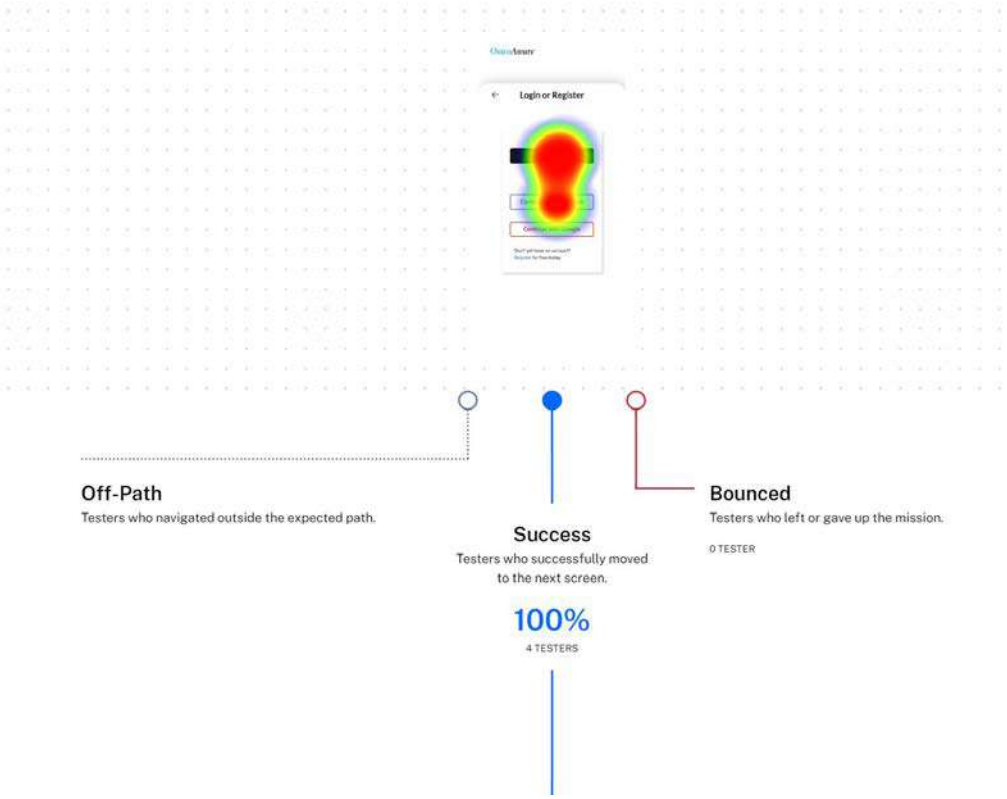
Prototype D - User Testing 2 Results (Mission 1)

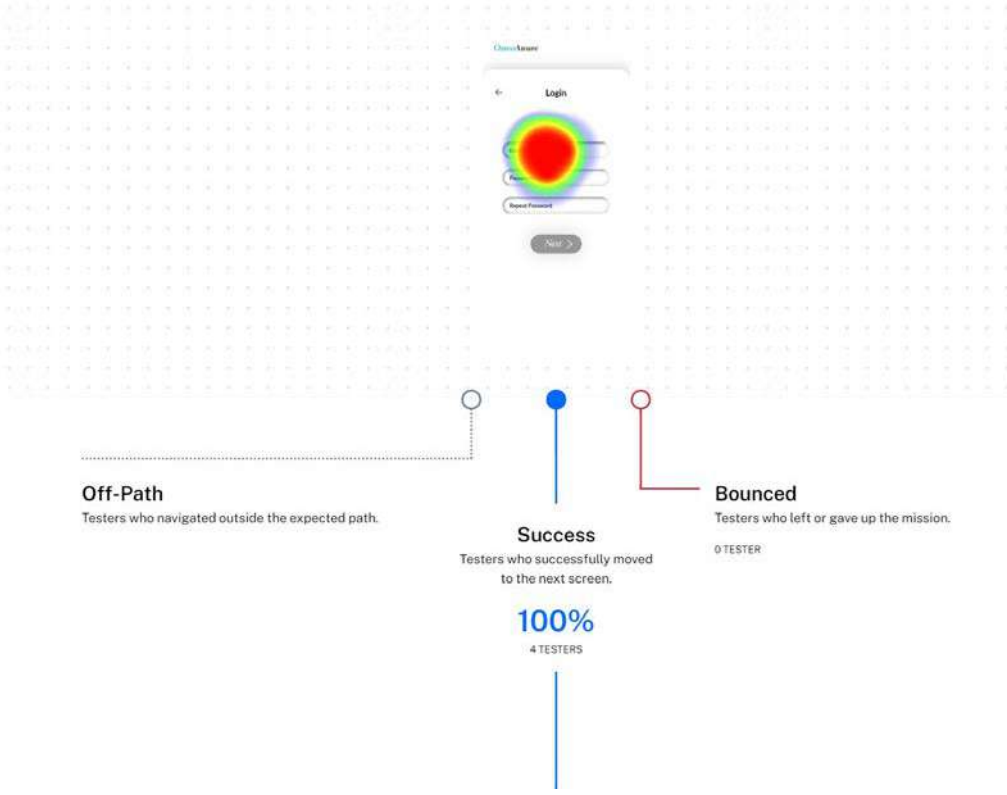


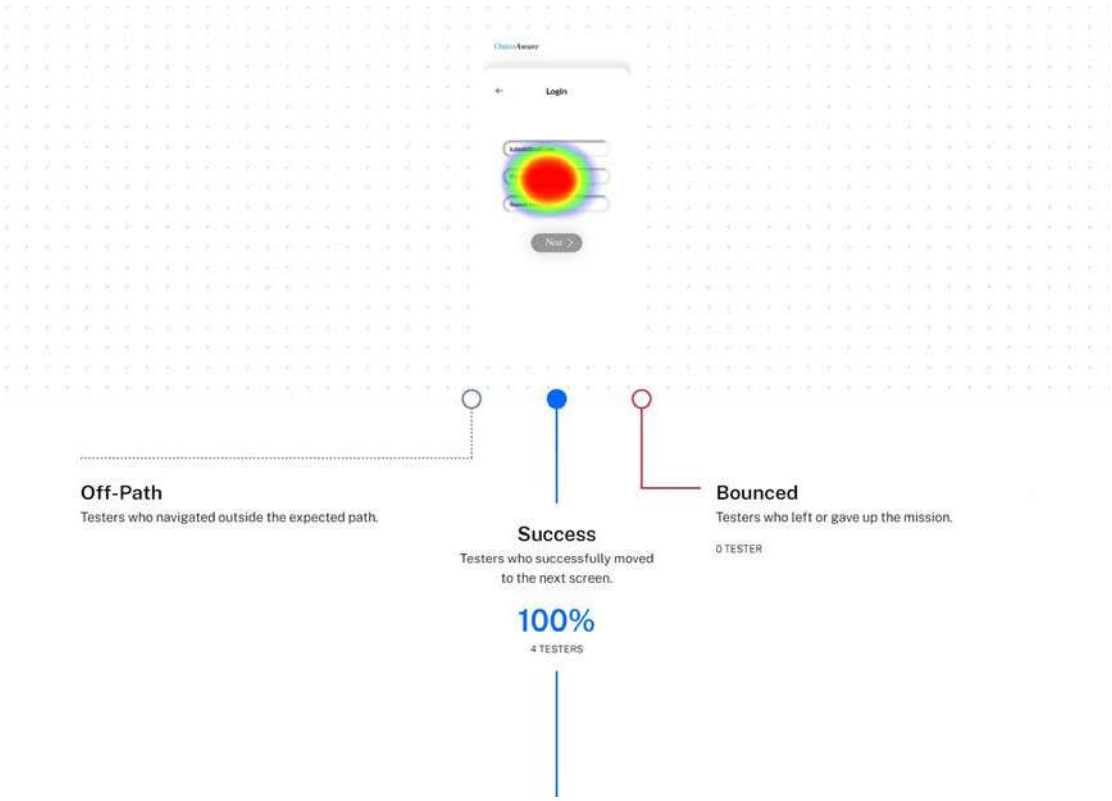


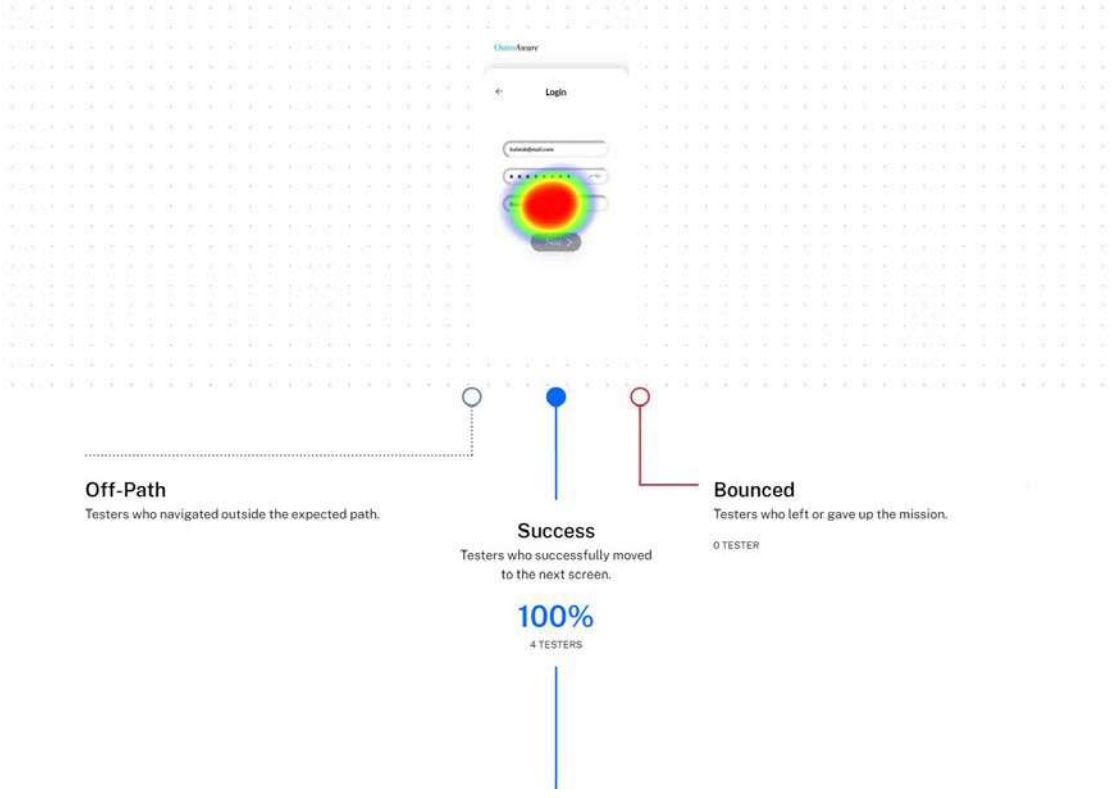

Learn
Off-Path
Testers who navigated outside the expected path.
iPhone 12 Pro Max – 2
16.7%
1 TESTER
Success
Testers who successfully moved to the next screen.
83%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

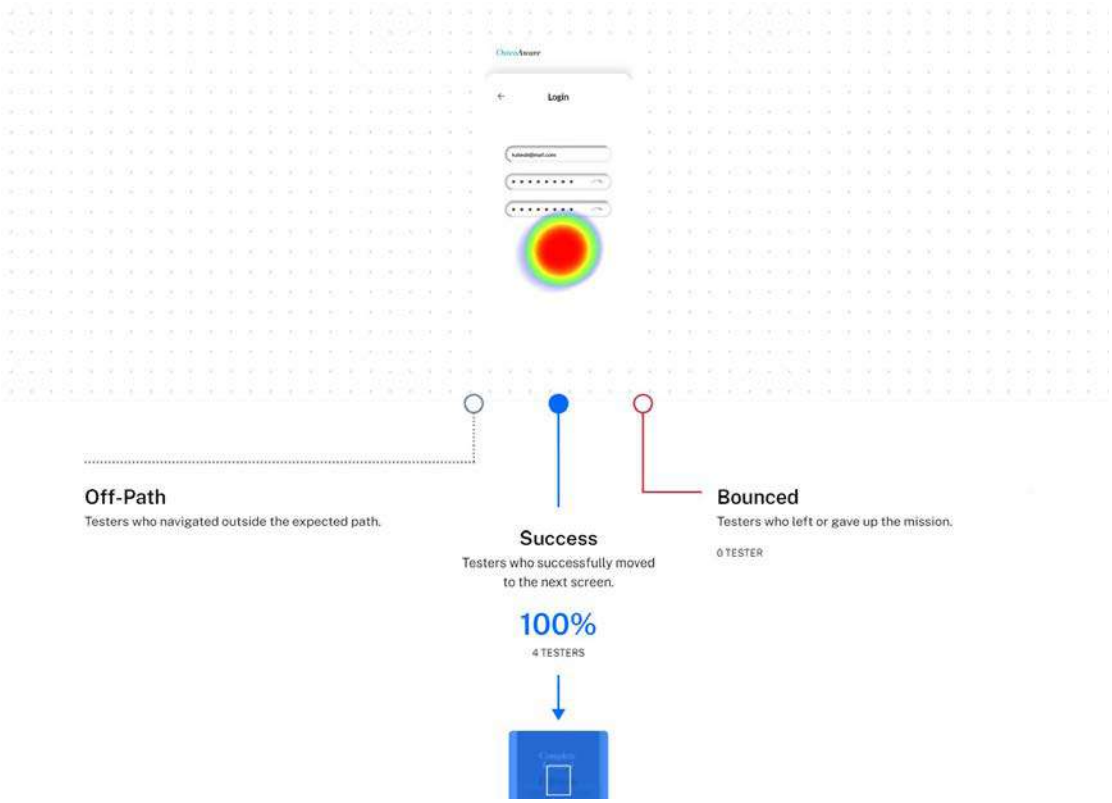

Challenge
Off-Path
Testers who navigated outside the expected path.
iPhone 12 Pro Max – 6
20.0%
1 TESTER
Success
Testers who successfully moved to the next screen.
80%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


Login or Register
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

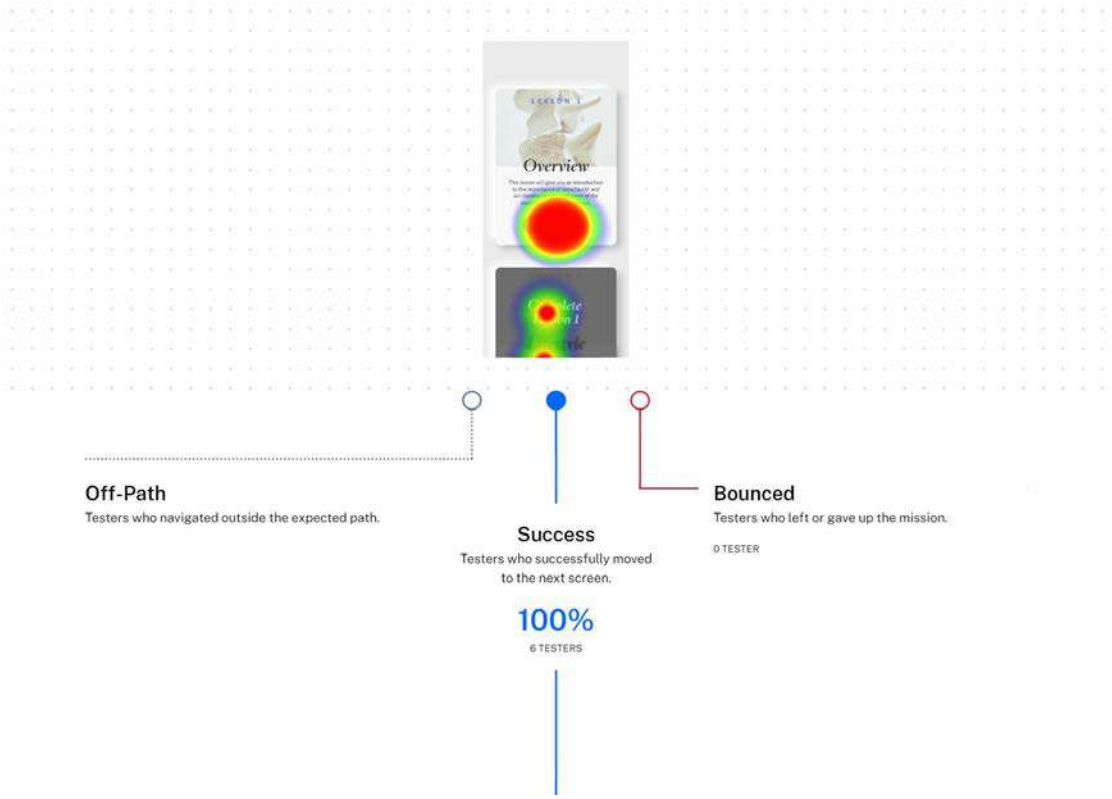

Login
Next >
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

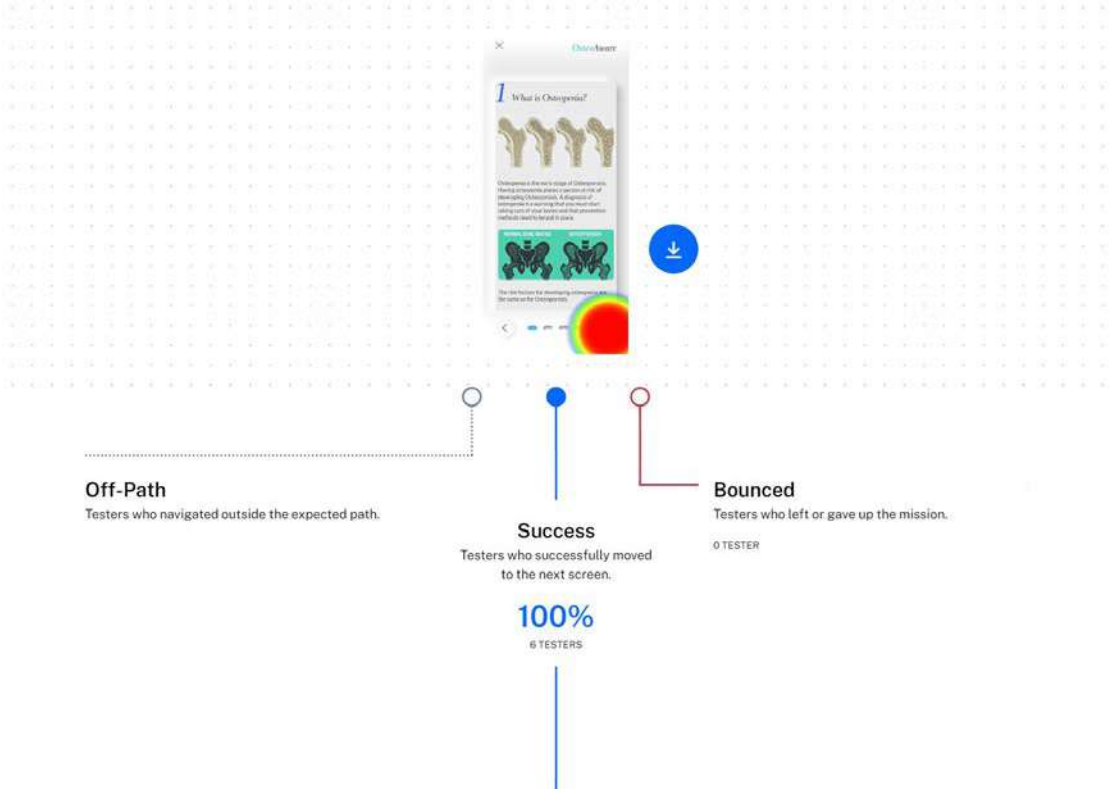

Login
Next >
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

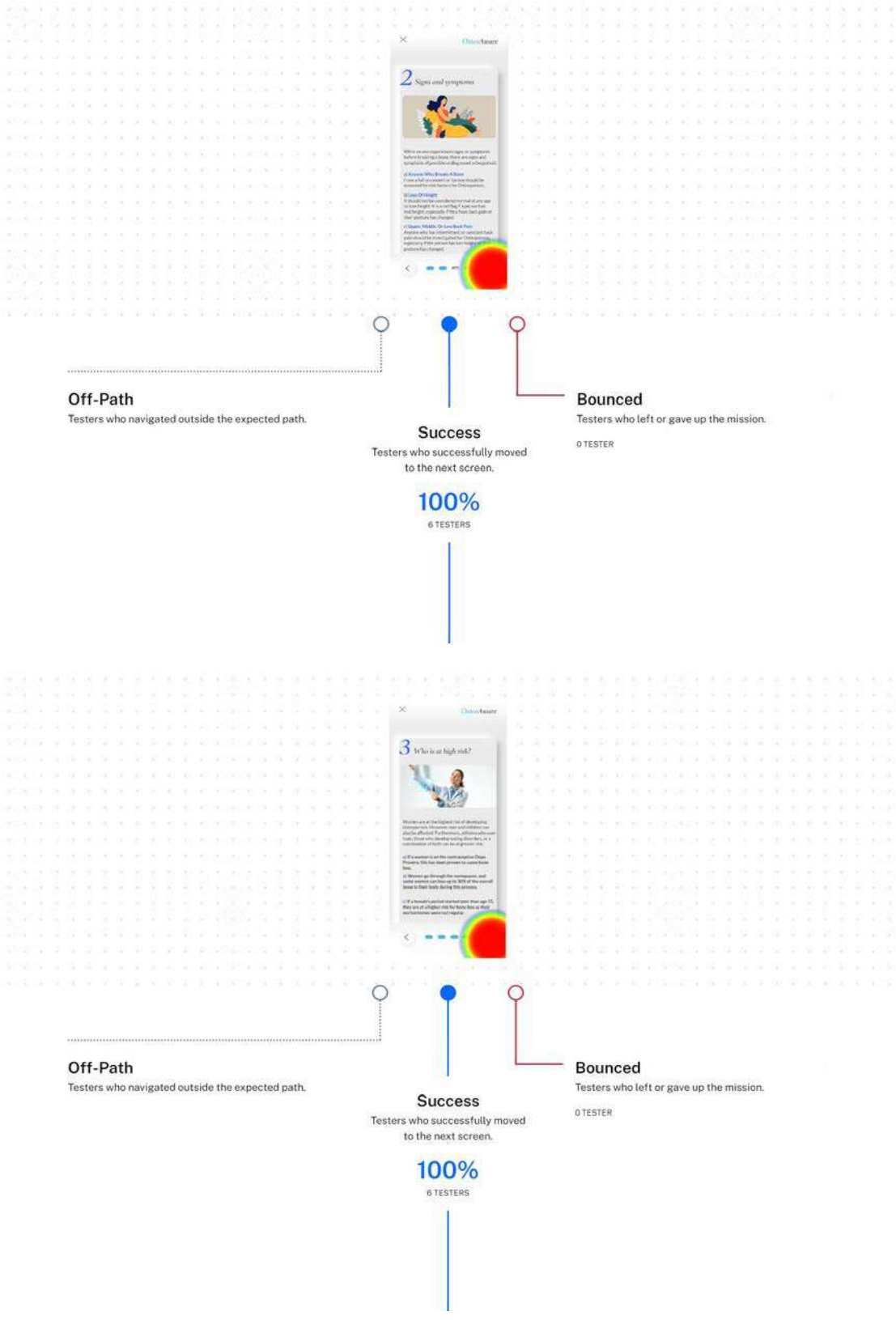

Login
Next >
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

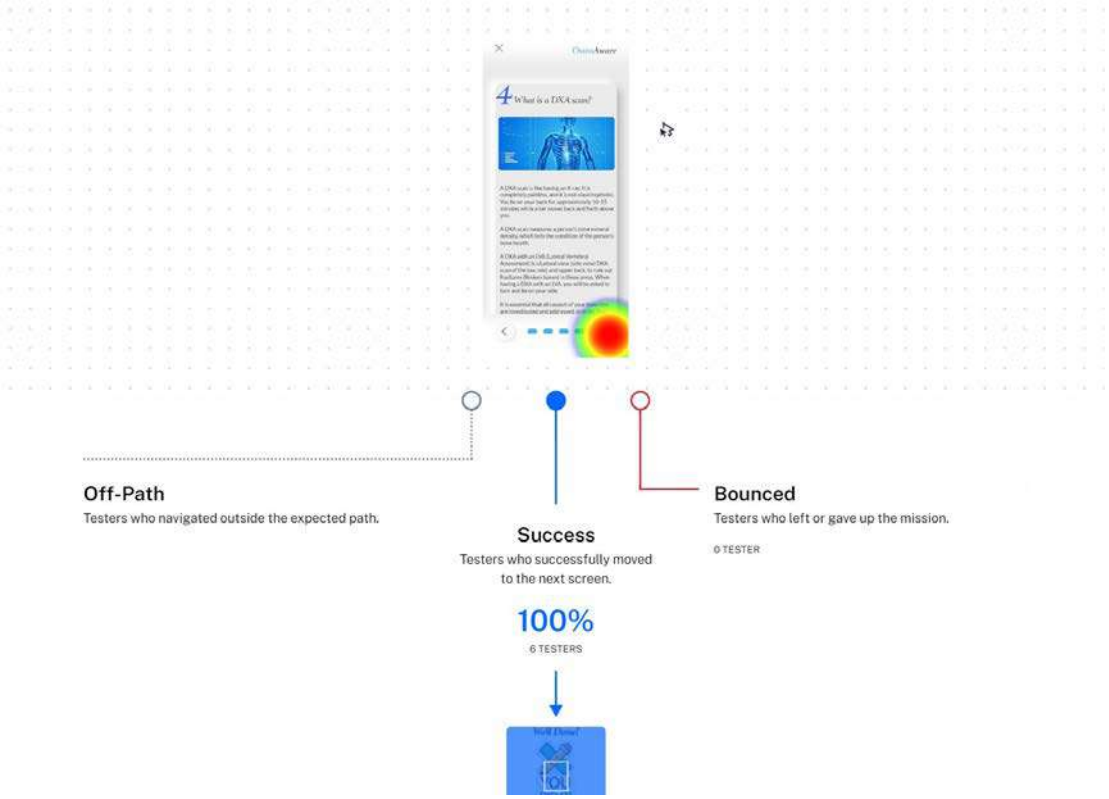

Login
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

Prototype D - User Testing 2 Results (Mission 2)

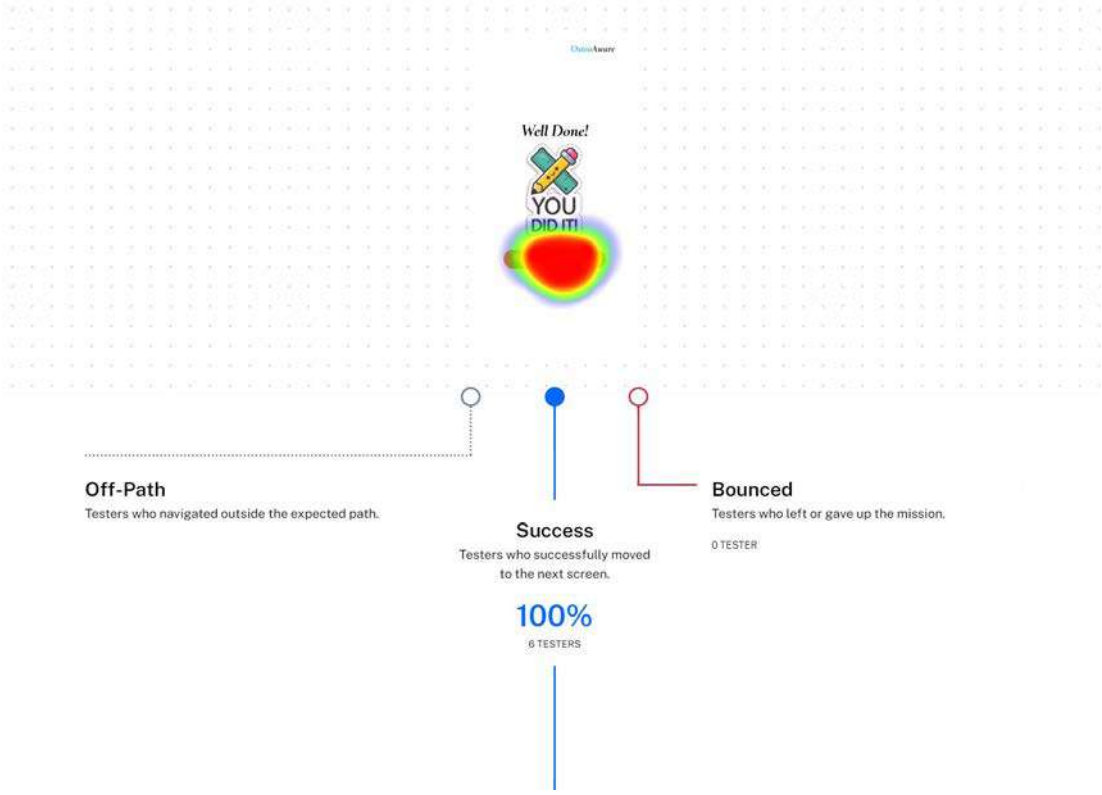


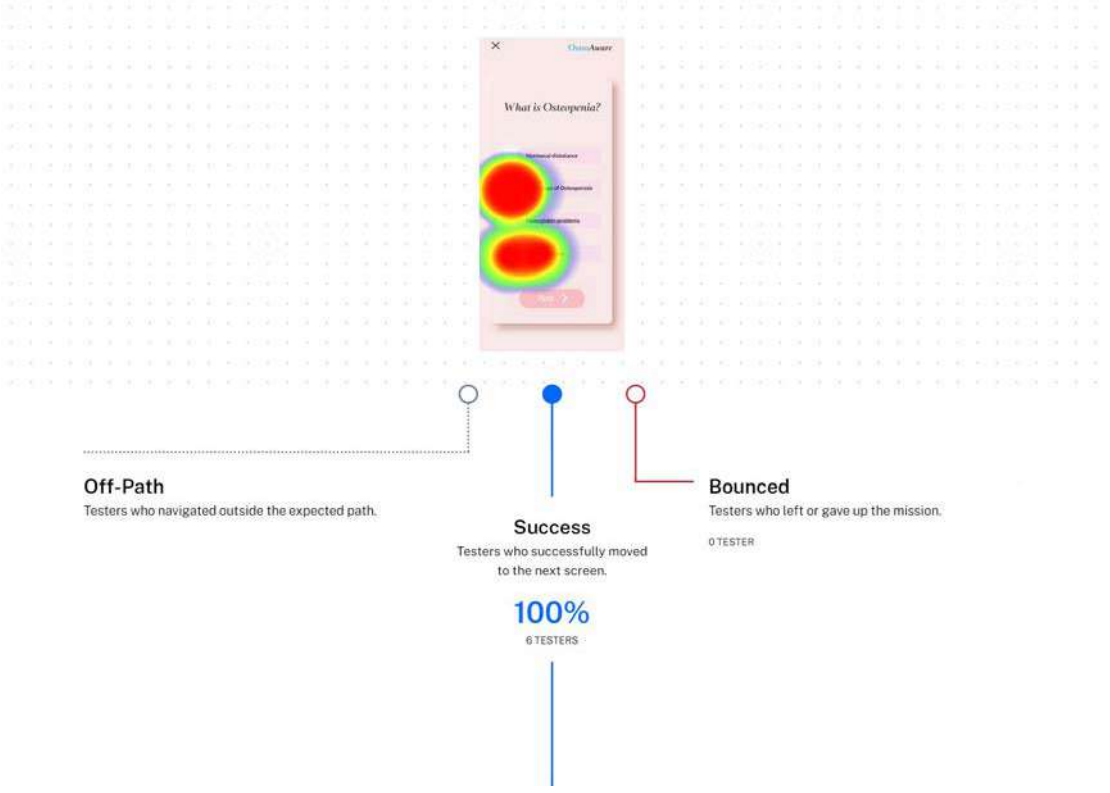


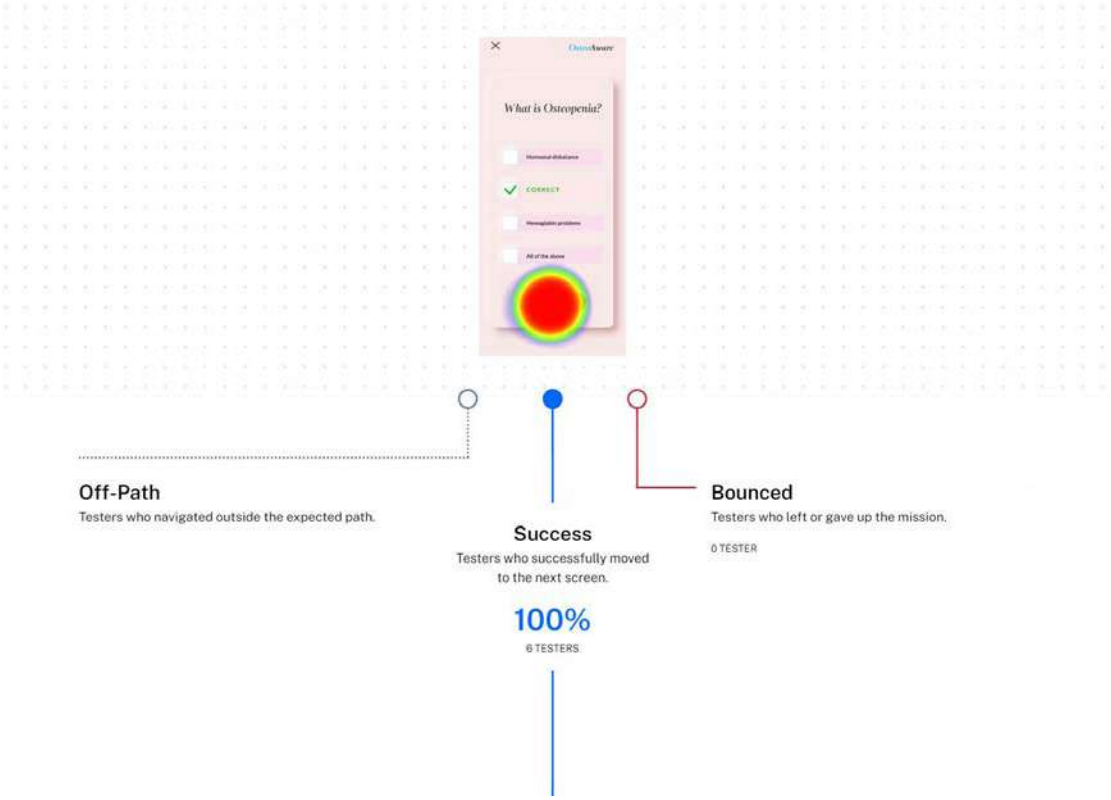

Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

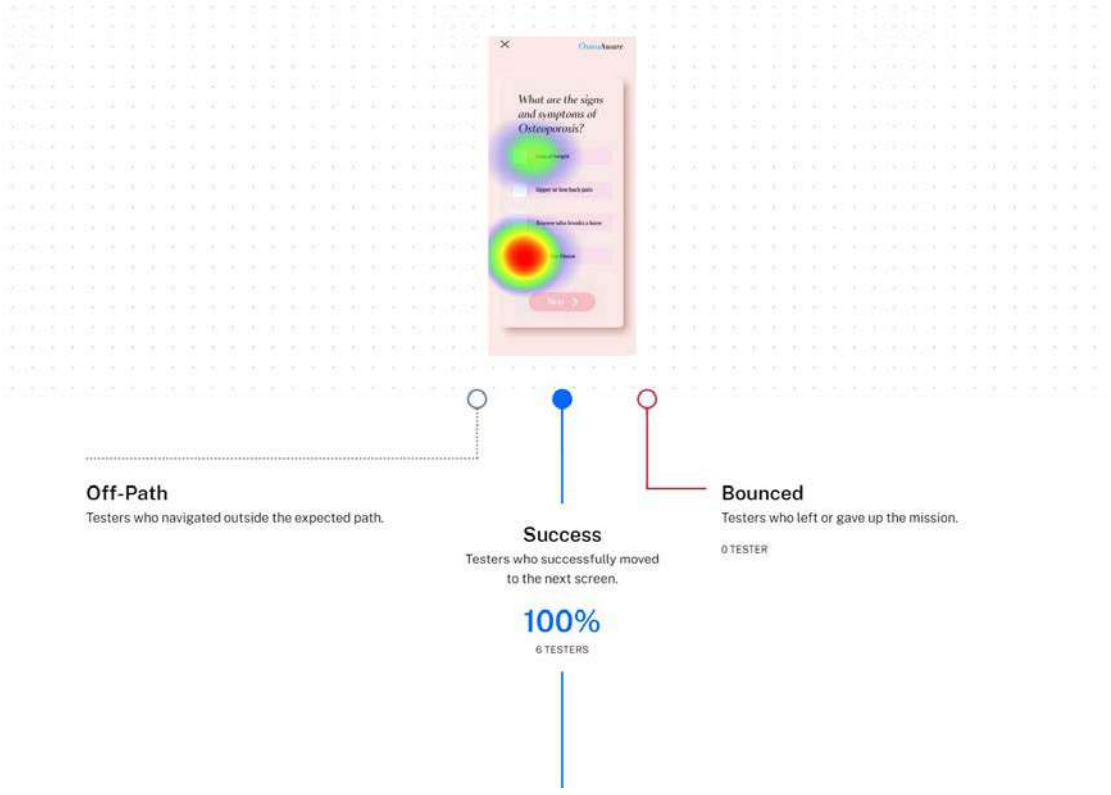

4 What is a DXA scan?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

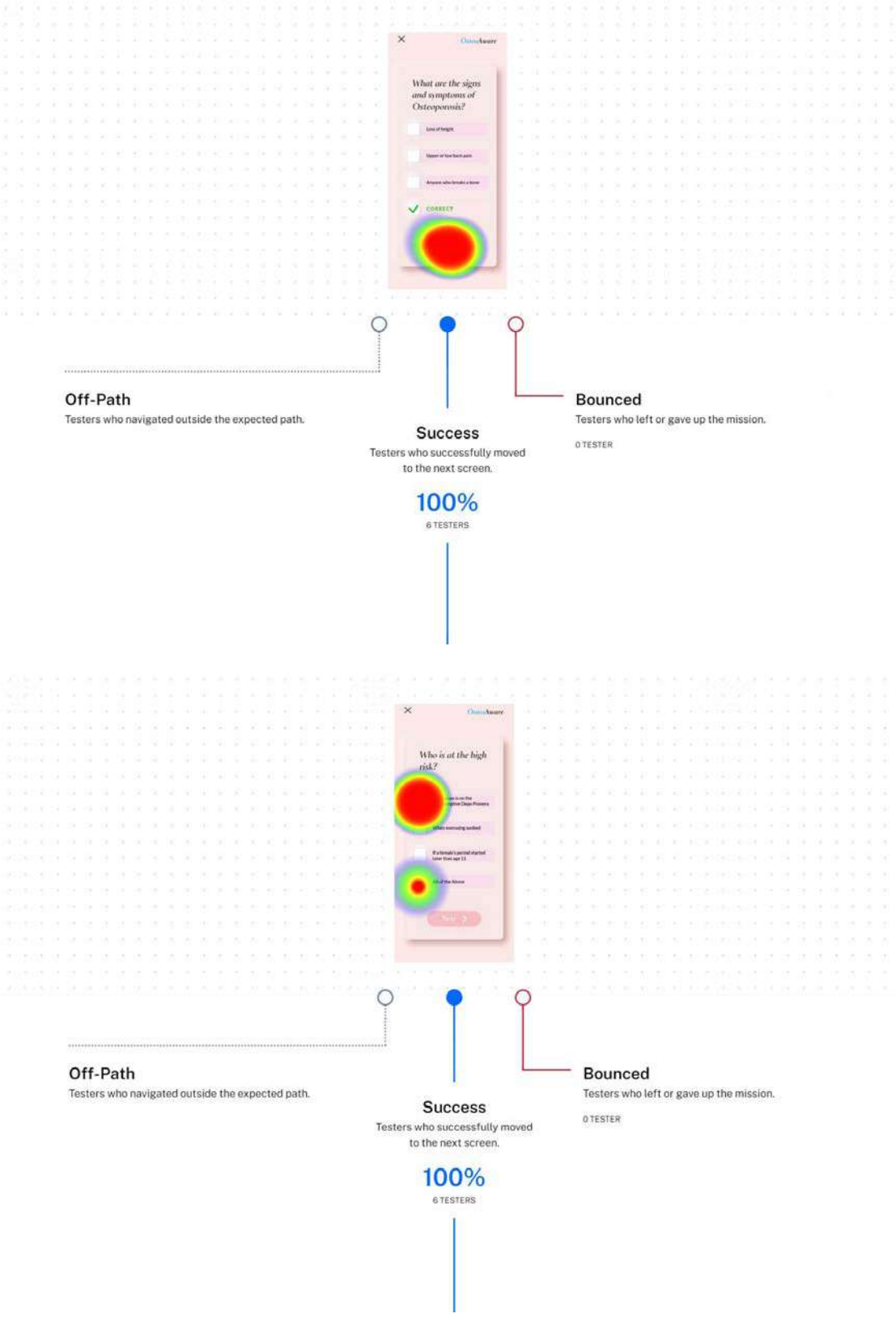
Prototype D - User Testing 2 Results (Mission 3)

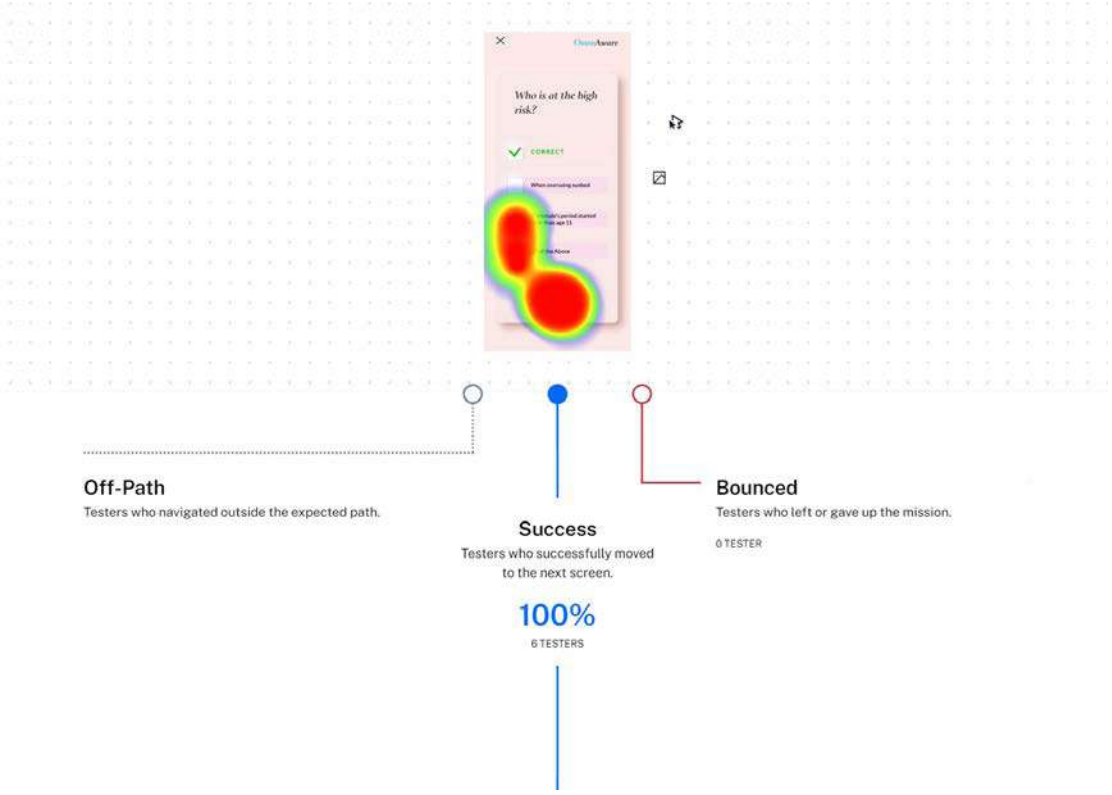


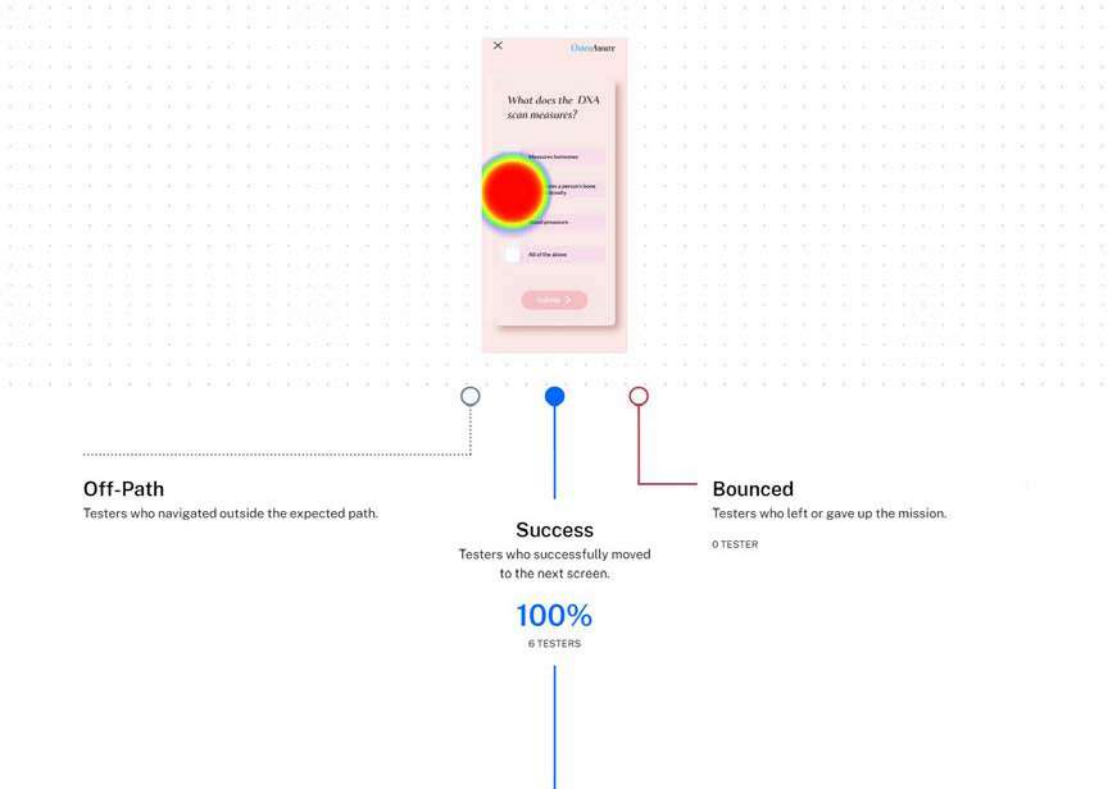


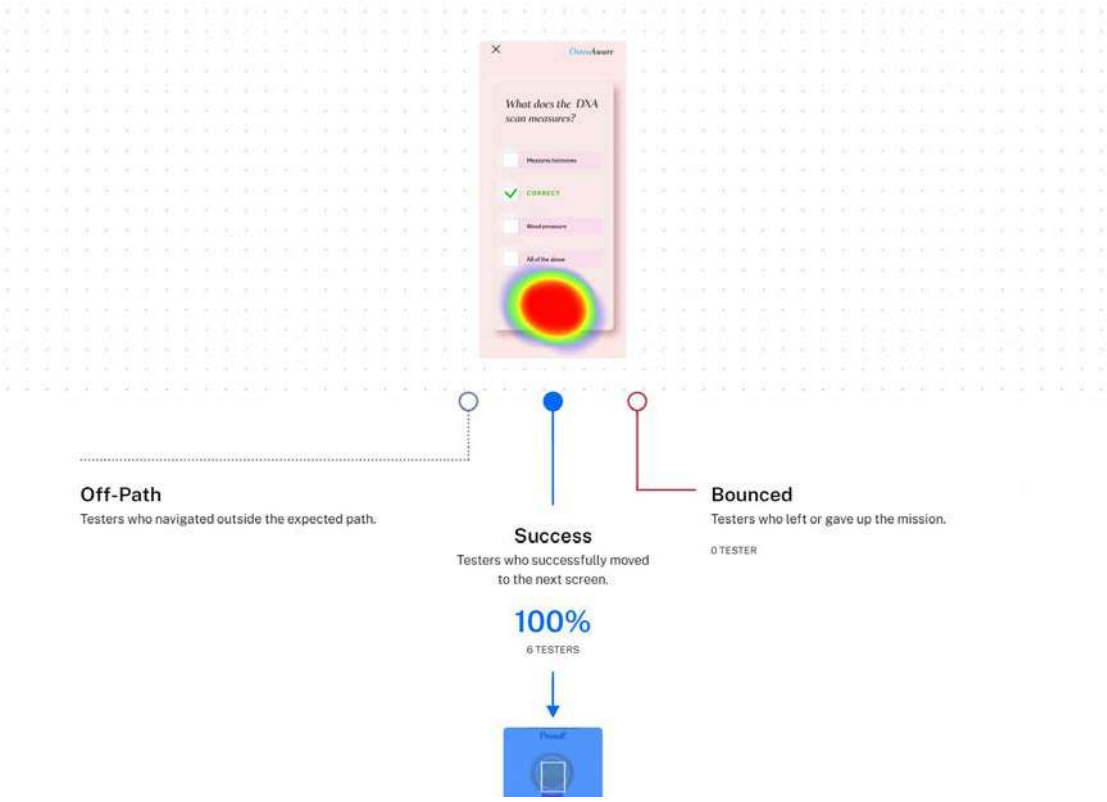

What is Osteopenia?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


What are the signs and symptoms of Osteoporosis?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

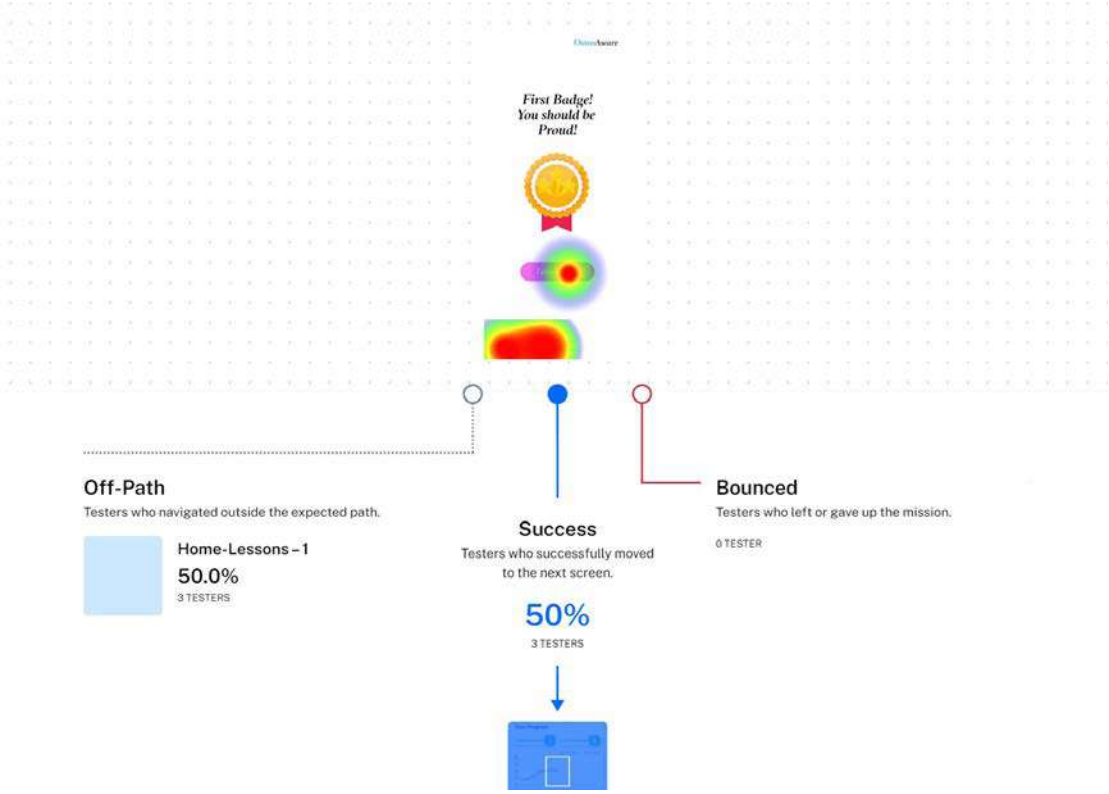

What are the signs and symptoms of Osteoporosis?
CORRECT
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
Who is at the high risk?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


Who is at the high risk?
CORRECT
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

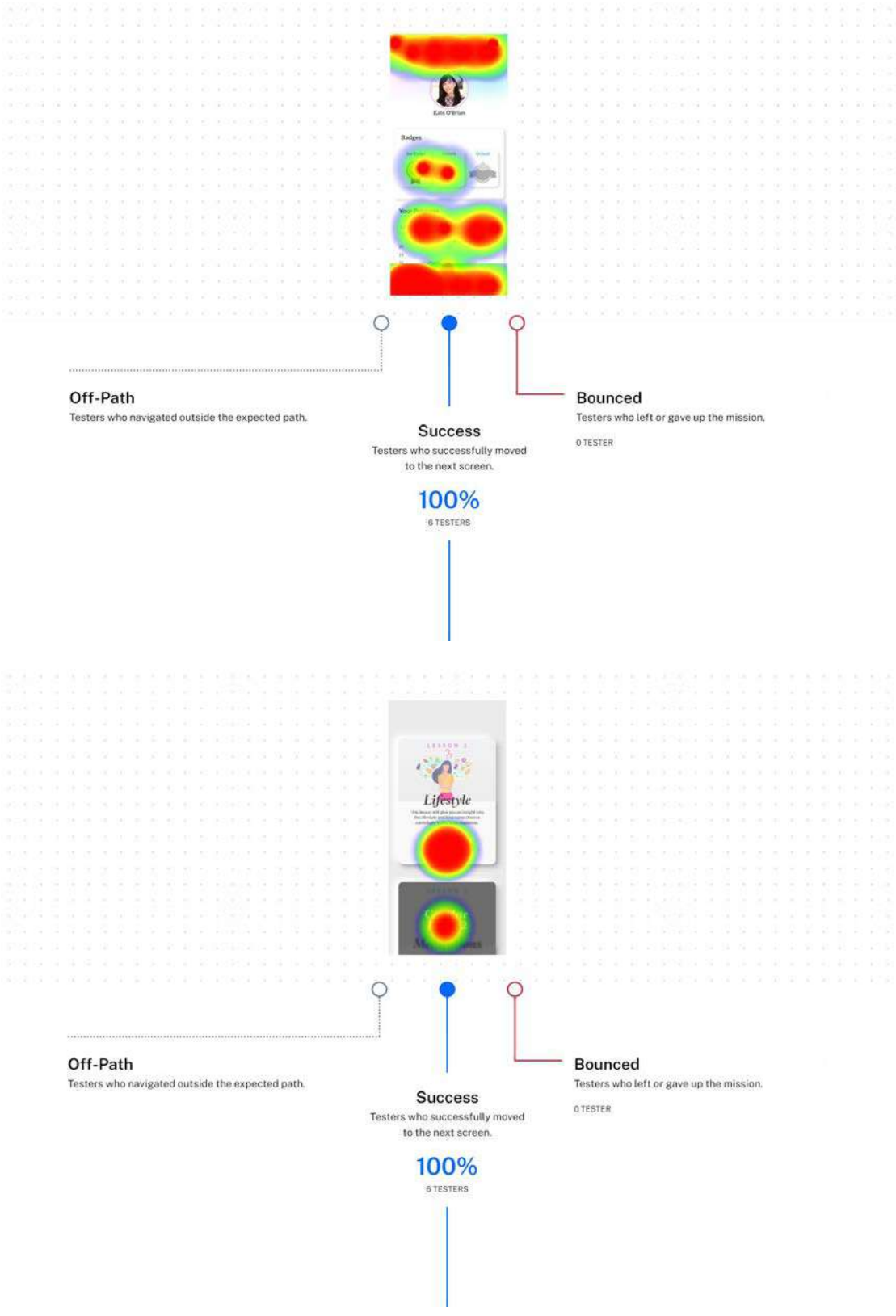

What does the DNA scan measures?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

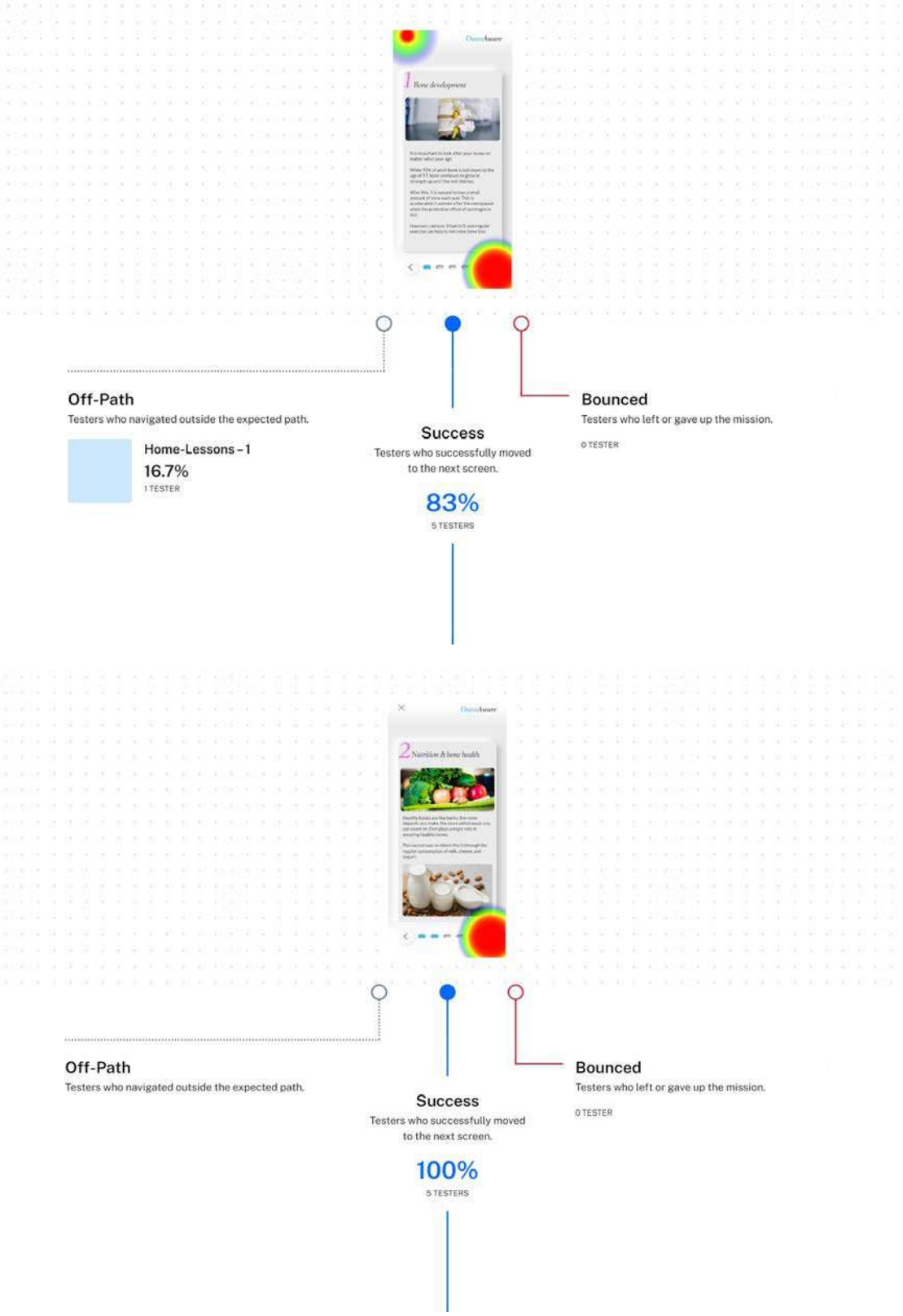

What does the DNA scan measures?
CORRECT
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

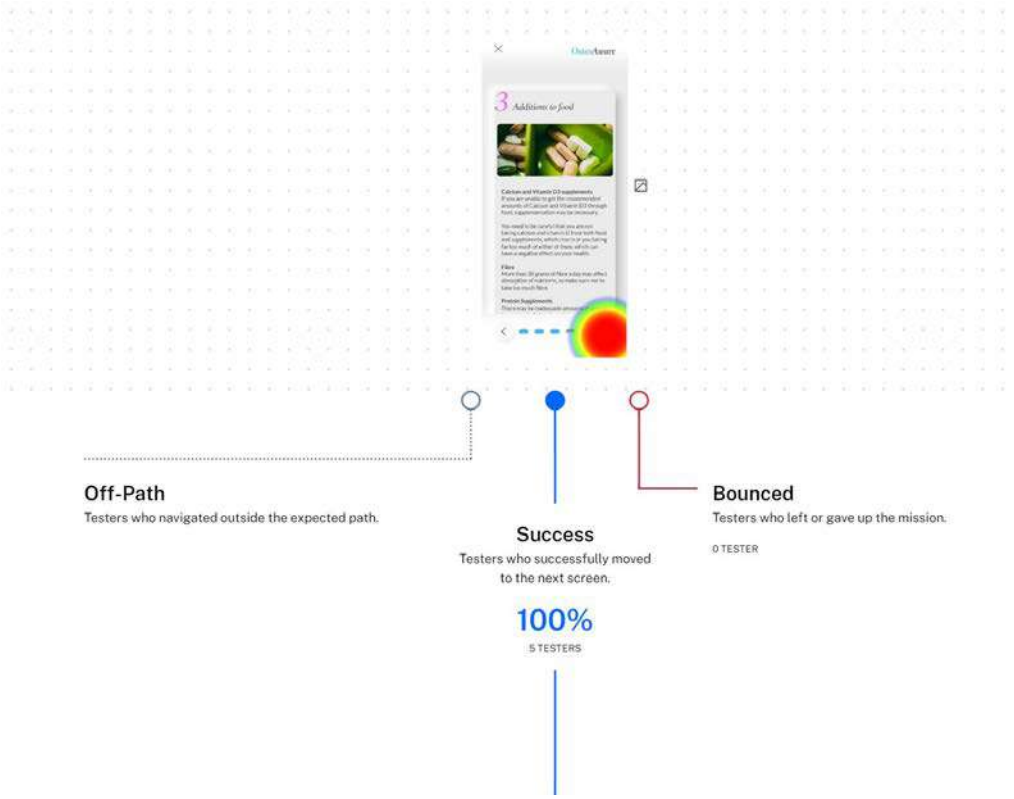
Prototype D - User Testing 2 Results (Mission 4)

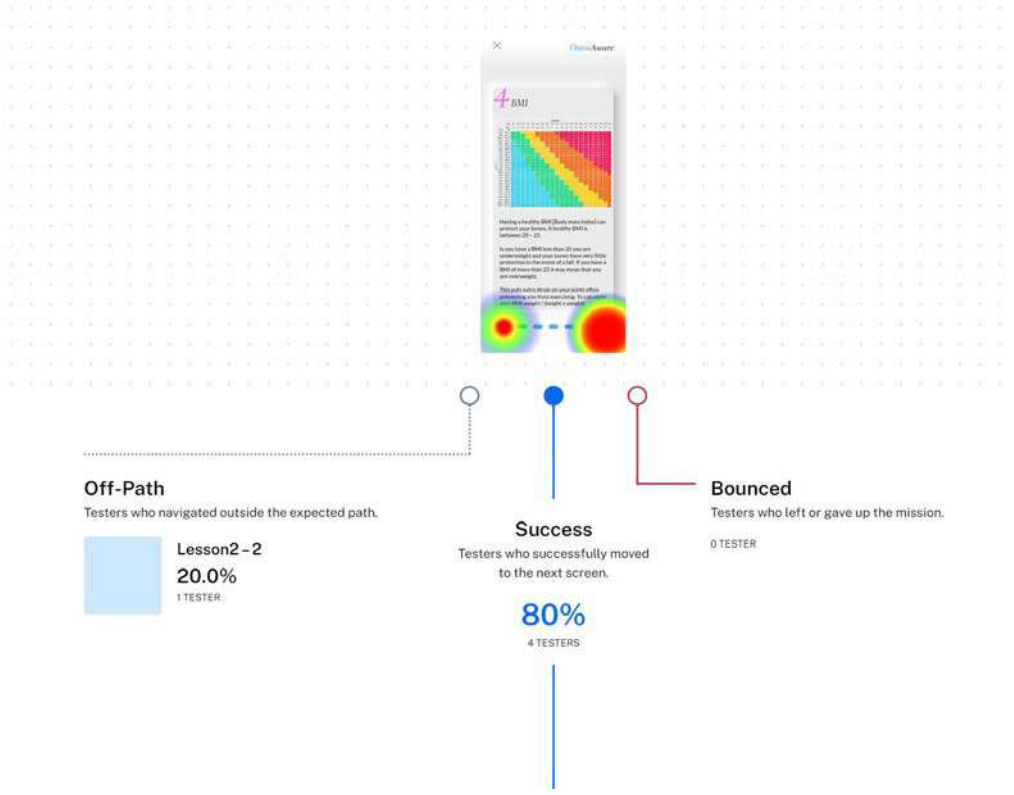


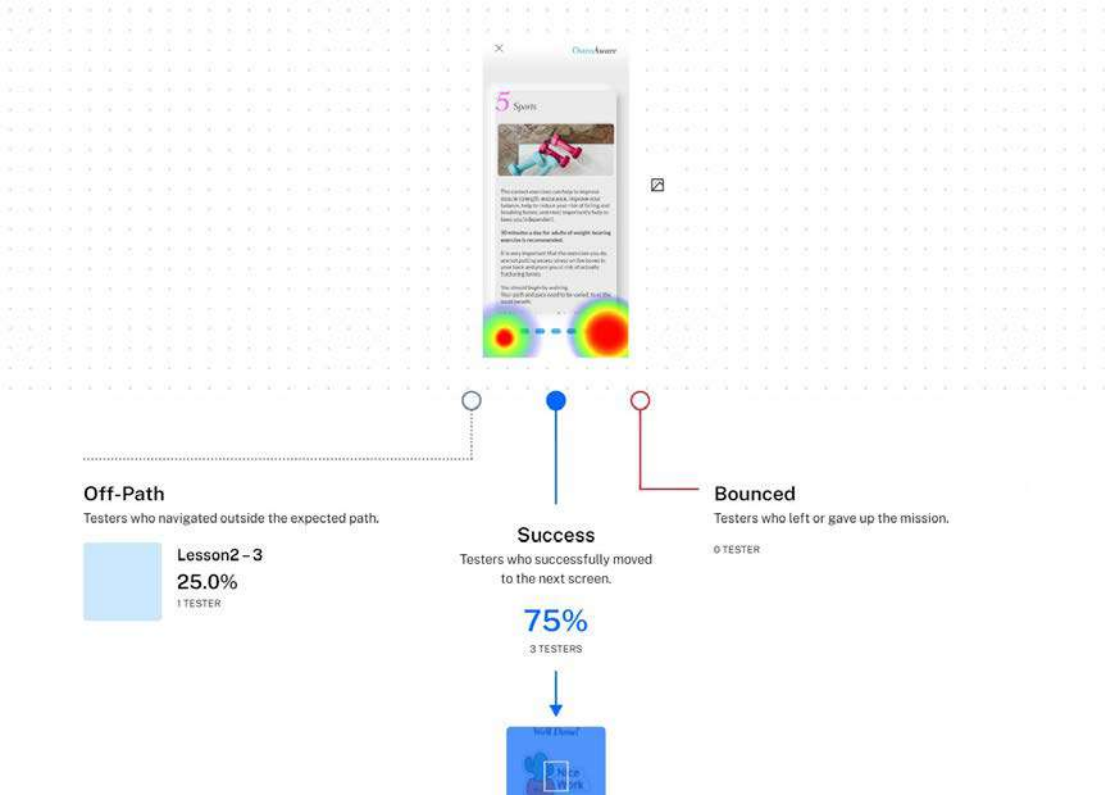
Prototype D - User Testing 2 Results (Mission 5)



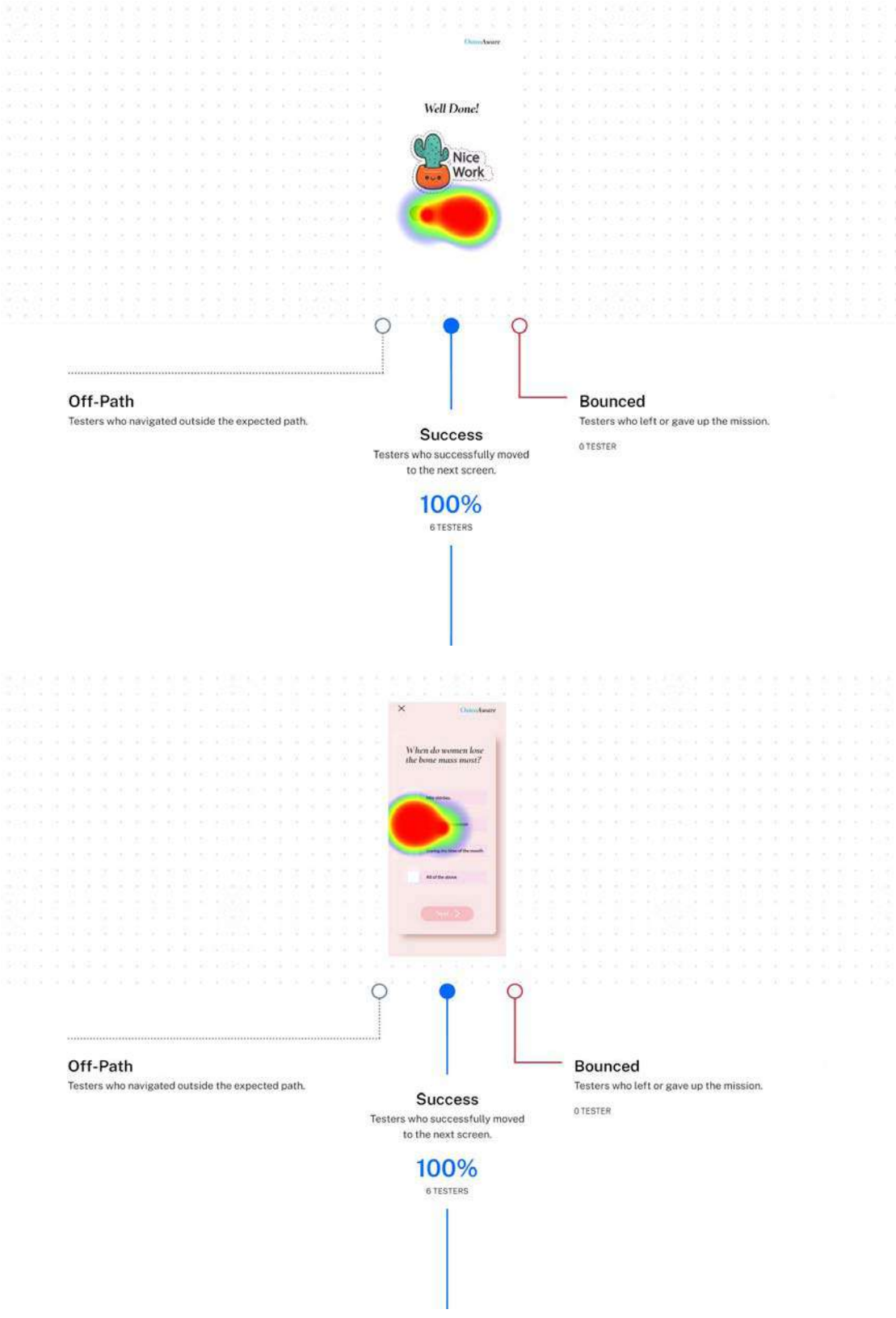

1 Bone development
Off-Path
Testers who navigated outside the expected path.
Home-Lessons – 1
16.7%
1 TESTER
Success
Testers who successfully moved to the next screen.
83%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
2 Nutrition & bone health
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

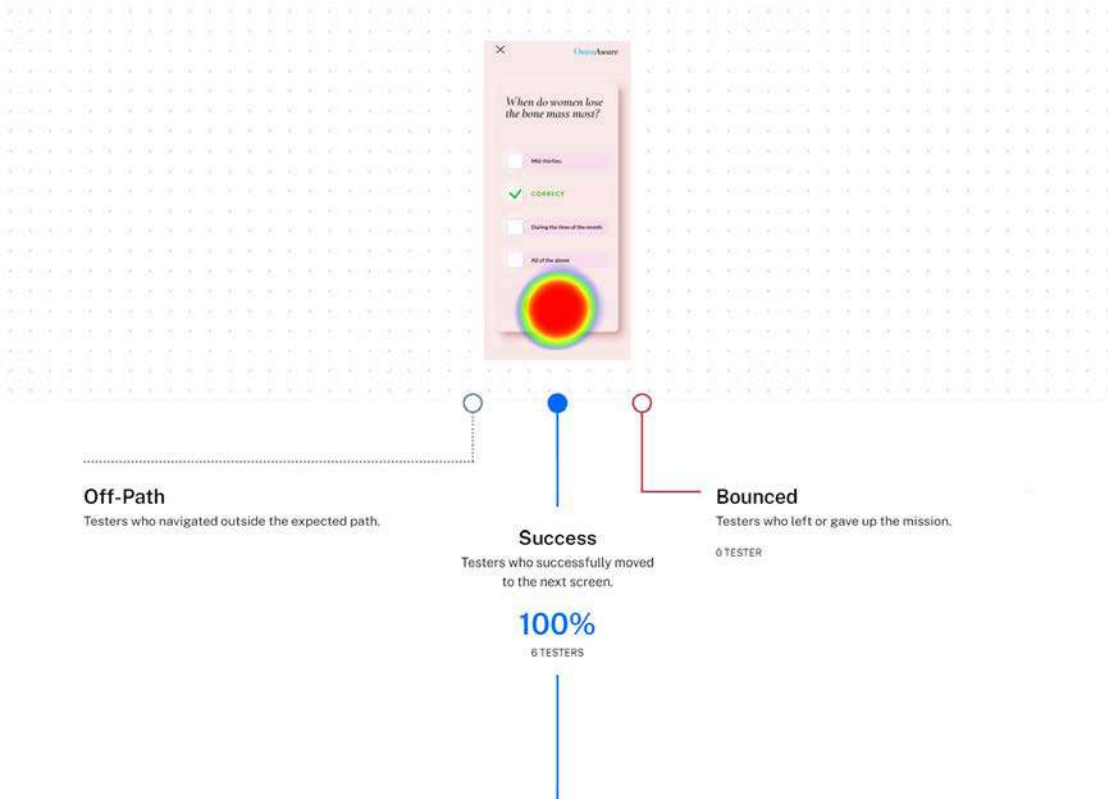

3 Additions to food
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
5 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

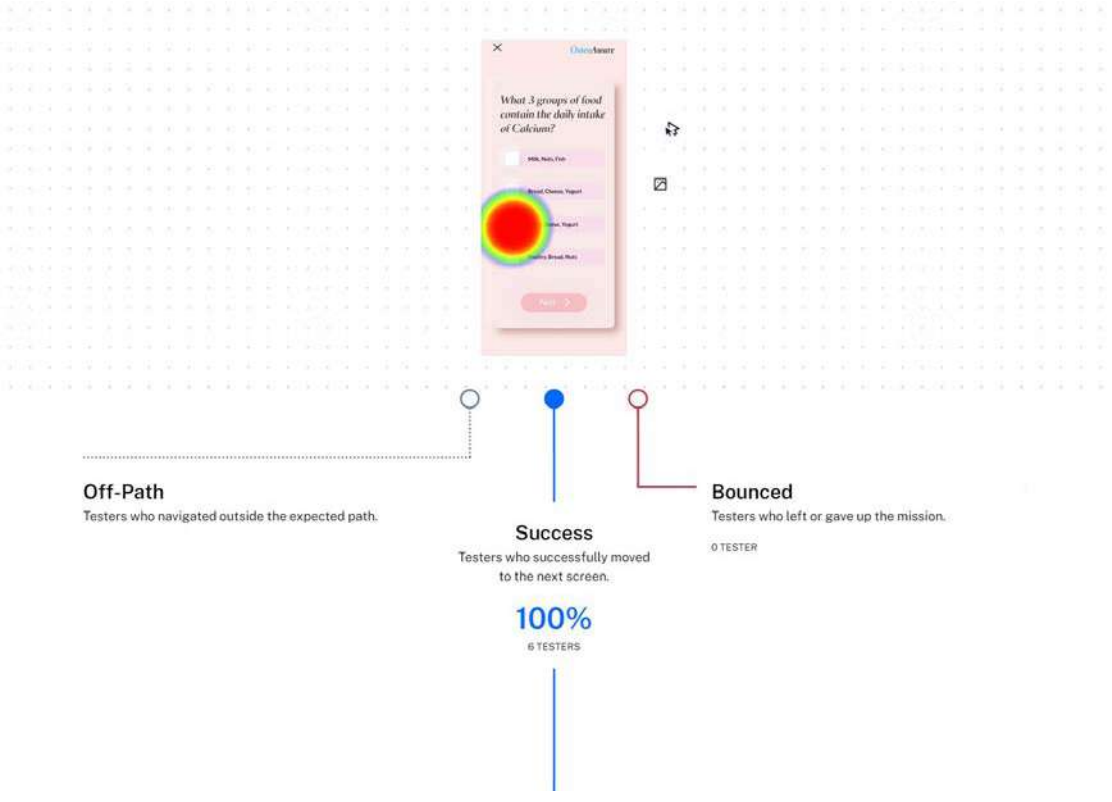

4 BMI
Off-Path
Testers who navigated outside the expected path.
Lesson2 - 2
20.0%
1 TESTER
Success
Testers who successfully moved to the next screen.
80%
4 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

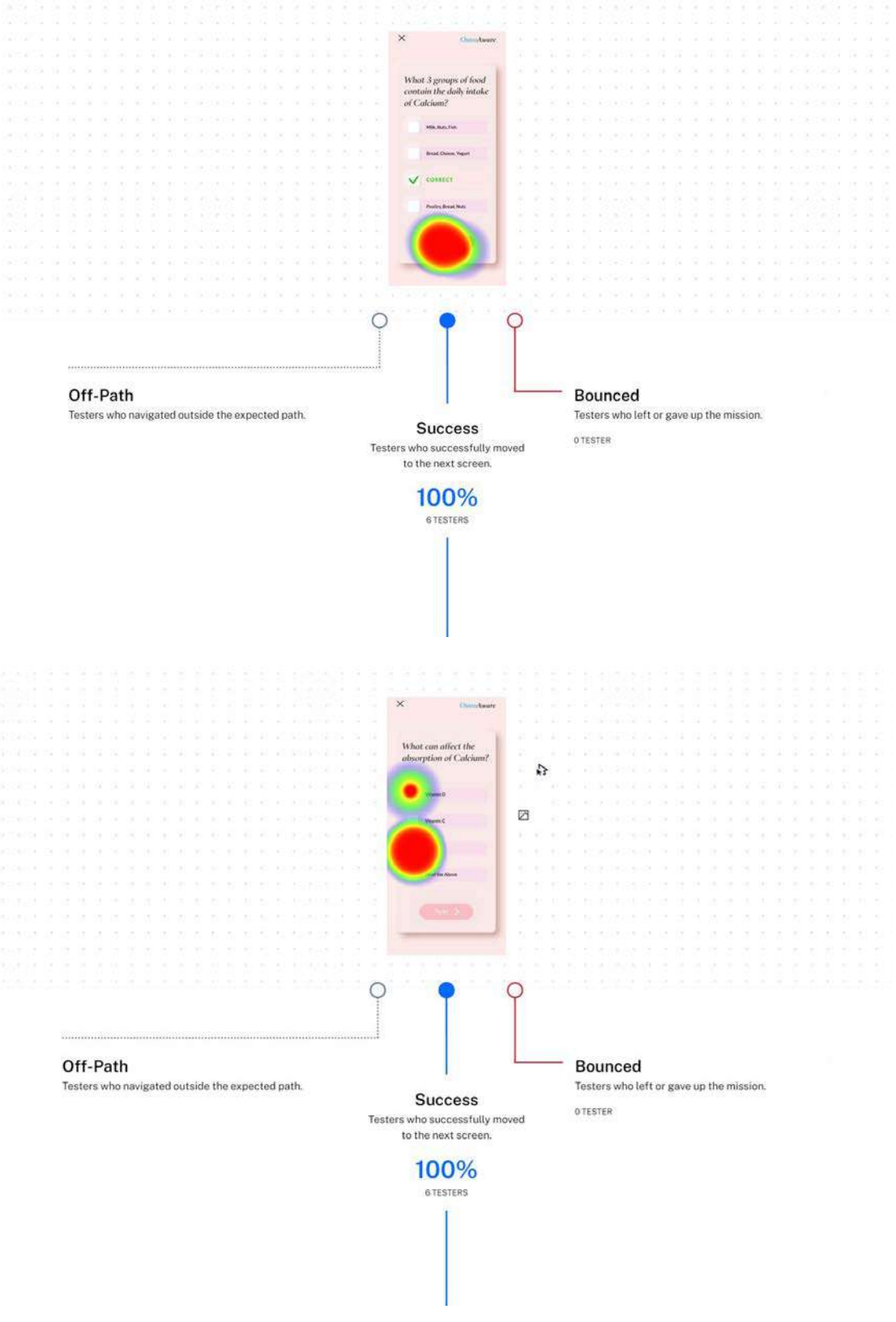

5 Sports
Off-Path
Testers who navigated outside the expected path.
Lesson2 - 3
25.0%
1 TESTER
Success
Testers who successfully moved to the next screen.
75%
3 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

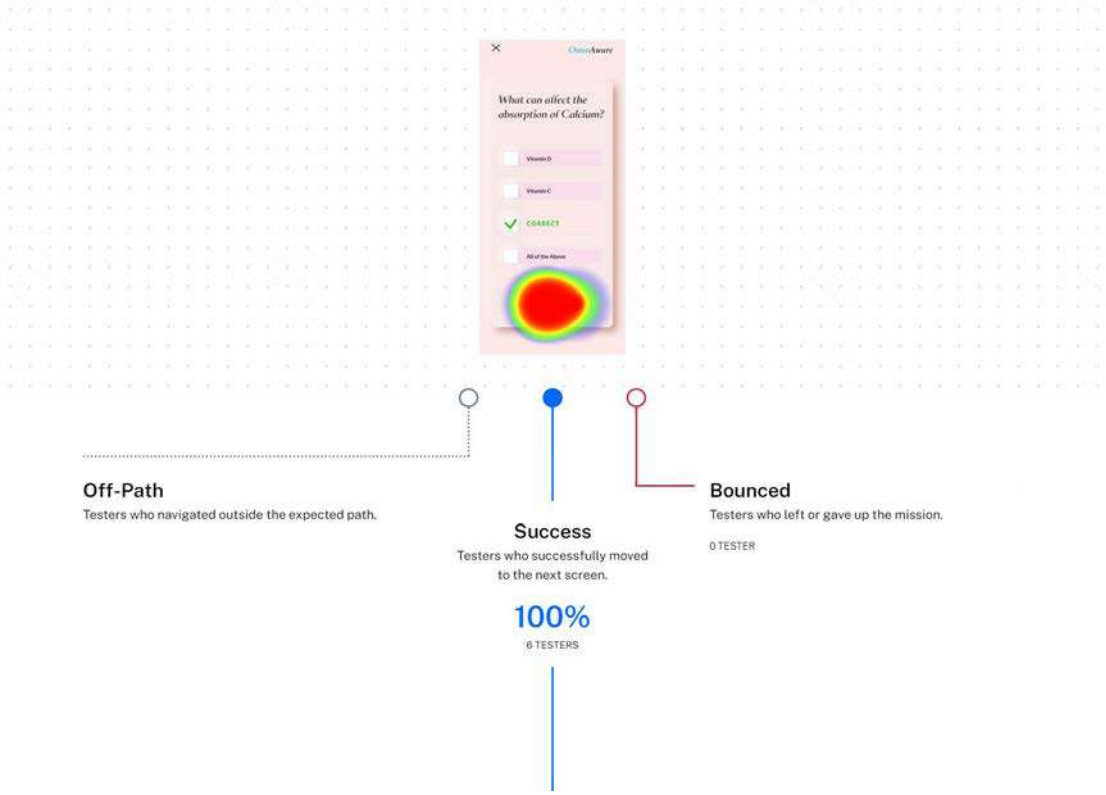
Prototype D - User Testing 2 Results (Mission 6)




When do women lose the bone mass most?
CORRECT
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


What 3 groups of food contain the daily intake of Calcium?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


What 3 groups of food contain the daily intake of Calcium?
CORRECT
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
What can affect the absorption of Calcium?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


What can affect the absorption of Calcium?
CORRECT
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
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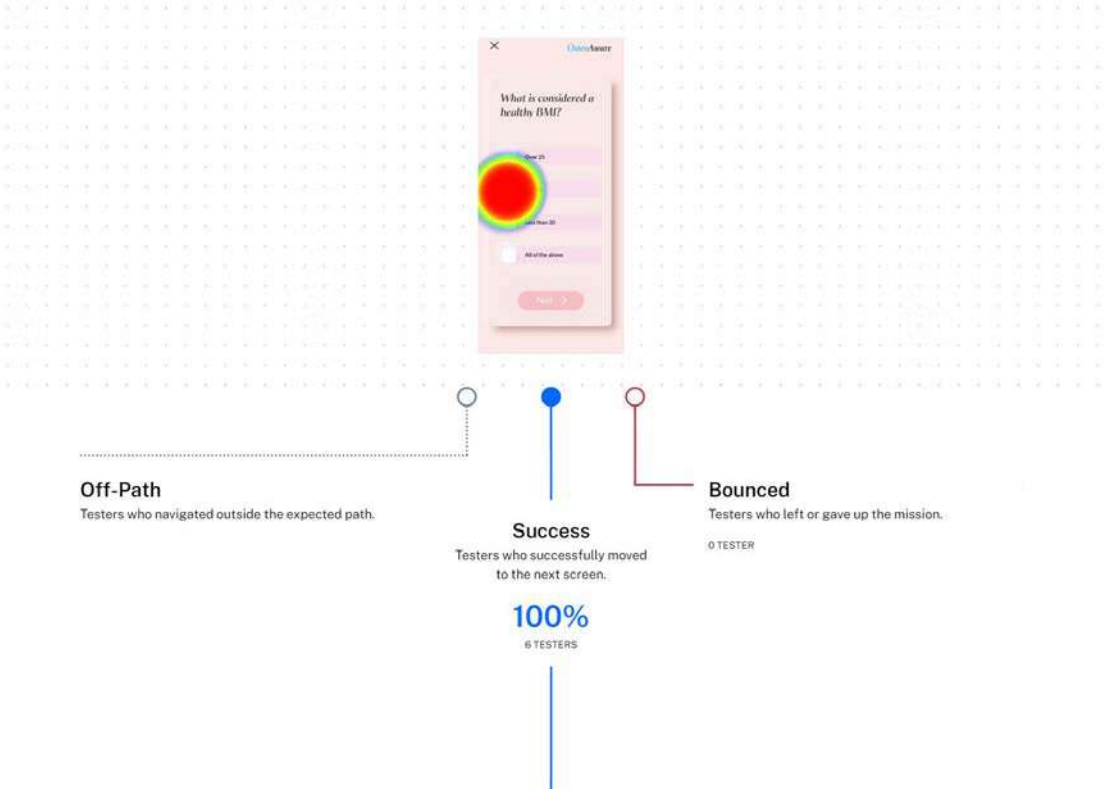
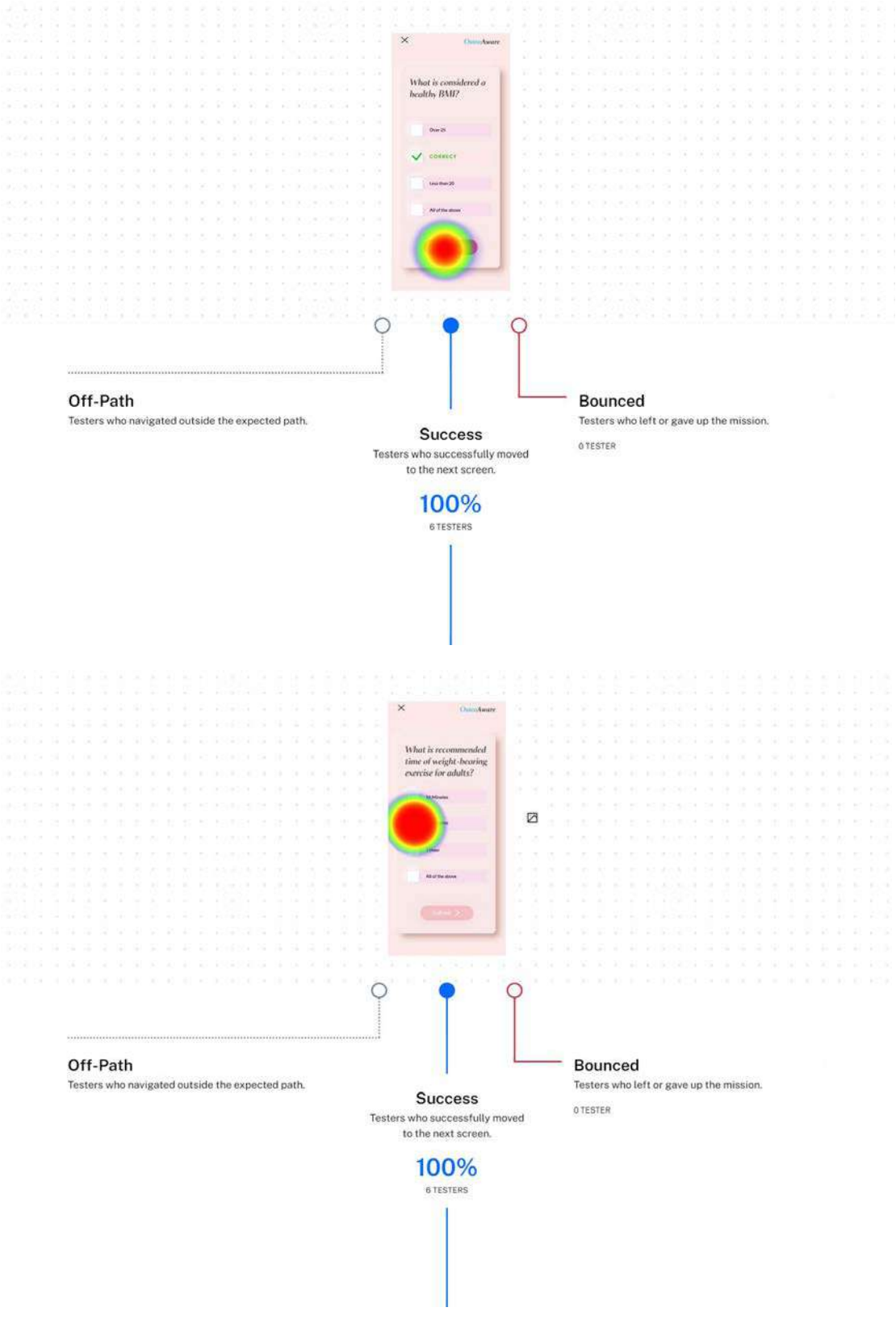
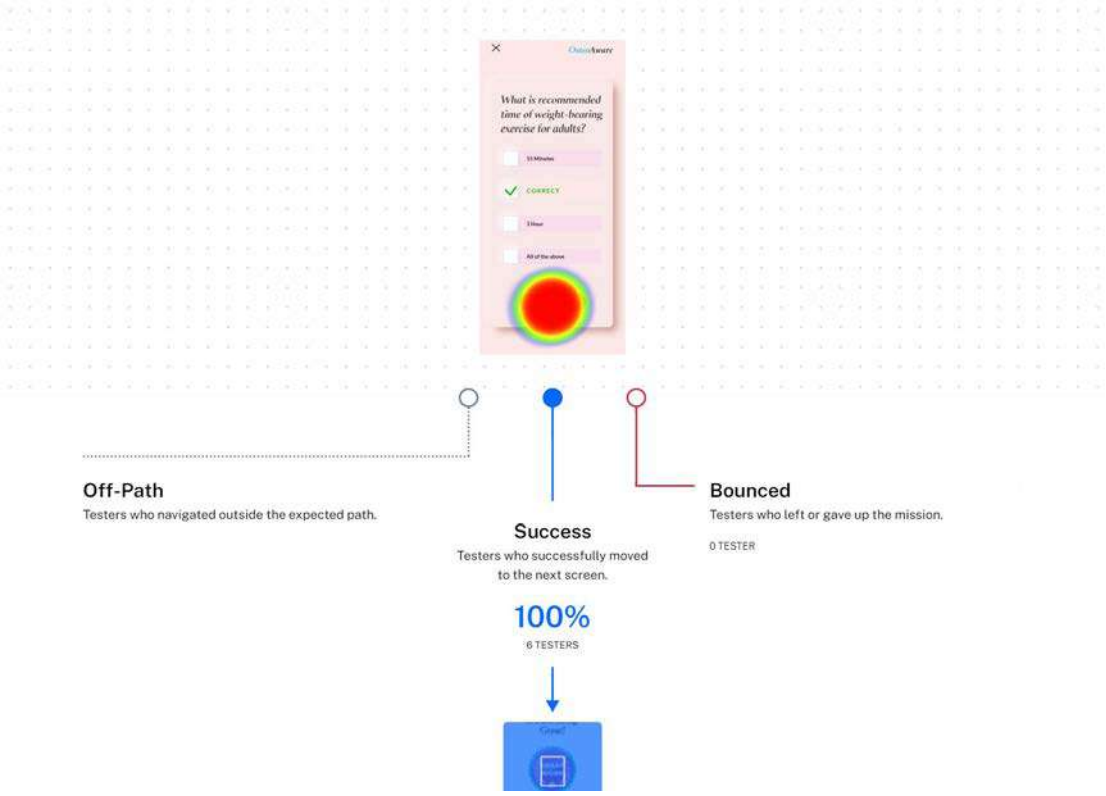
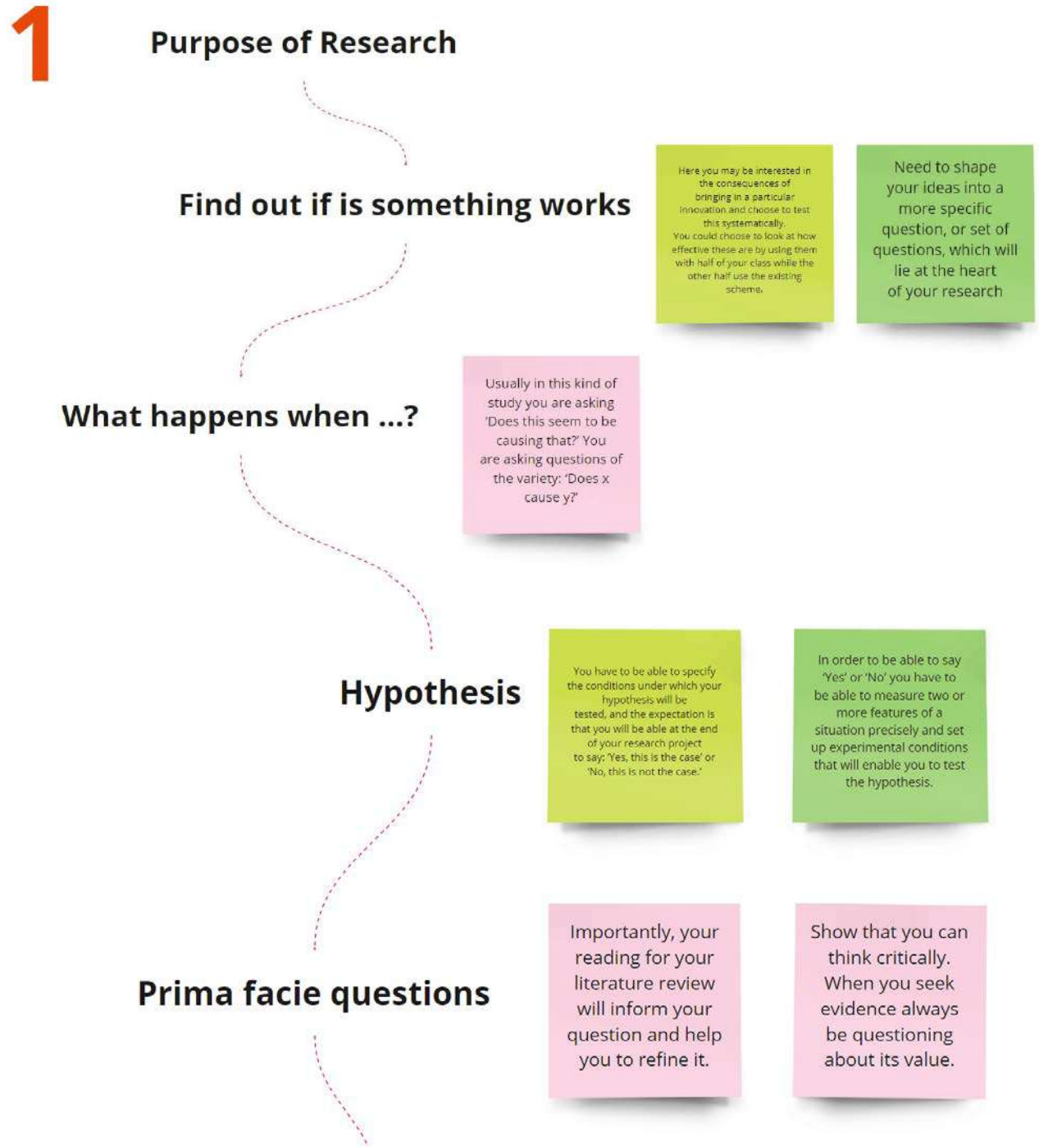

What is considered a healthy BMI?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

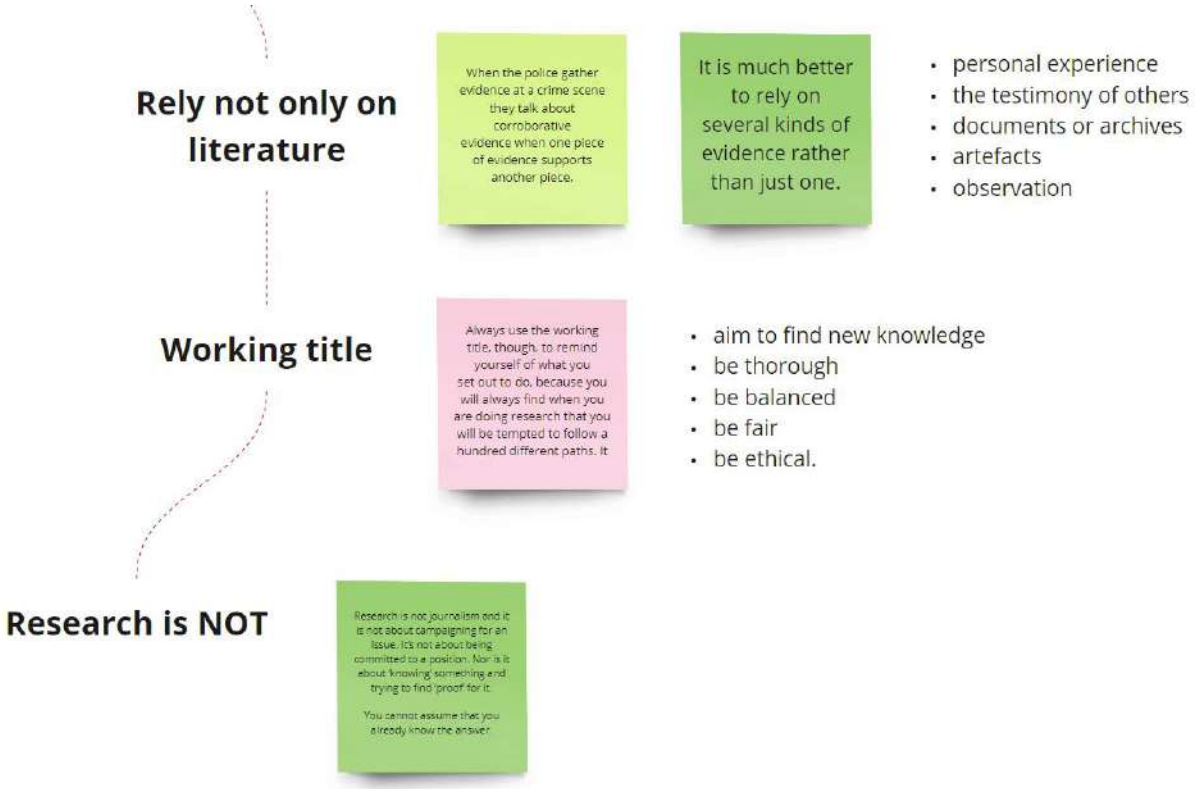

What is considered a healthy BMI?
CORRECT
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER
What is recommended time of weight-bearing exercise for adults?
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER


What is recommended time of weight-bearing exercise for adults?
CORRECT
Off-Path
Testers who navigated outside the expected path.
Success
Testers who successfully moved to the next screen.
100%
6 TESTERS
Bounced
Testers who left or gave up the mission.
0 TESTER

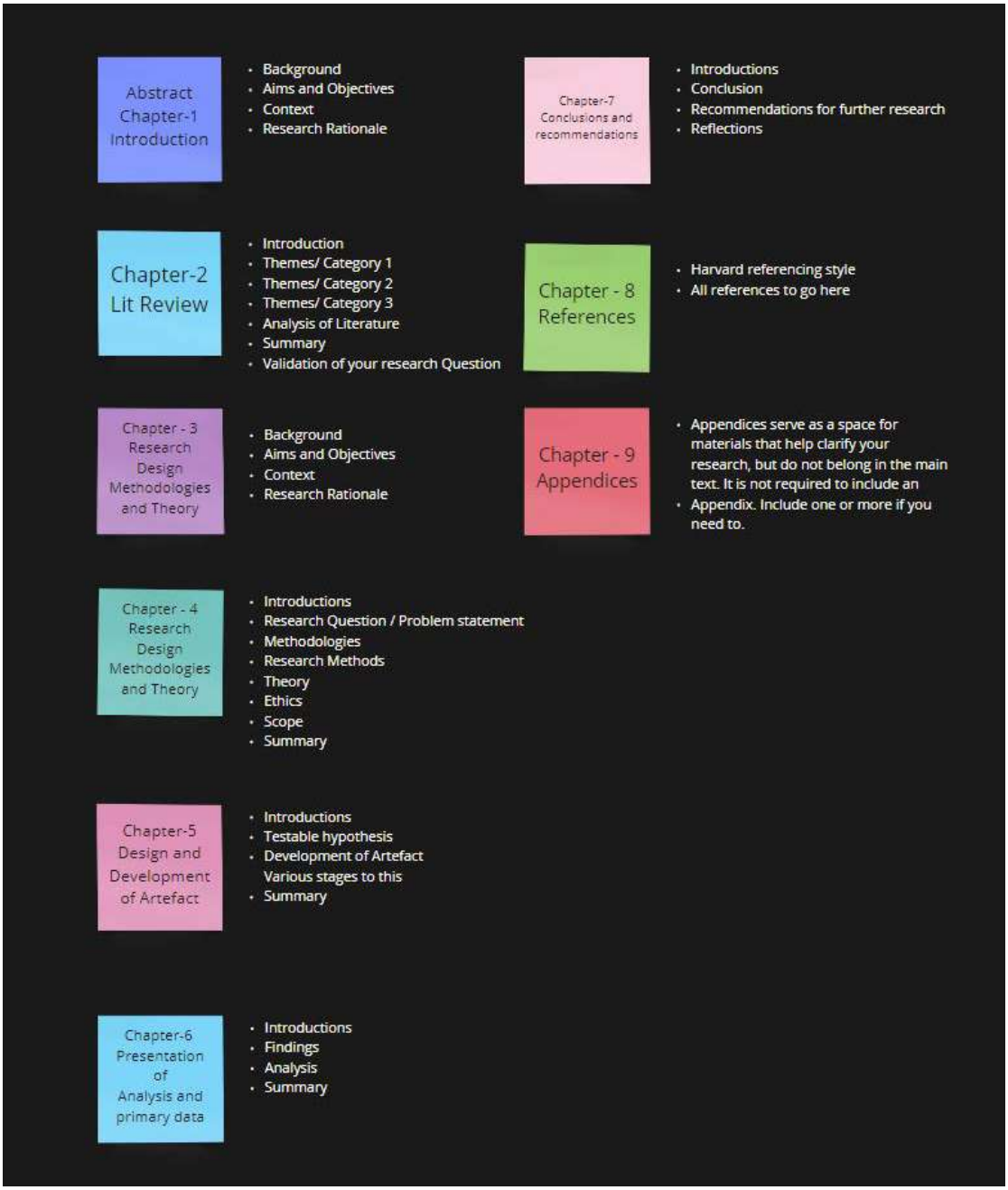
Appendix I

Brainstorming ideas – Miro Boards




Rely not only on literature
When the police gather evidence at a crime scene they talk about corroborative evidence when one piece of evidence supports another piece.
It is much better to rely on several kinds of evidence rather than just one.
personal experience
the testimony of others
documents or archives
artefacts
observation
Working title
Always use the working title, though, to remind yourself of what you set out to do, because you will always find when you are doing research that you will be tempted to follow a hundred different paths. It
aim to find new knowledge
be thorough
be balanced
be fair
be ethical.
Research is NOT
Research is not journalism and it is not about campaigning for an issue. It's not about being committed to a position. Nor is it about 'knowing' something and trying to find 'proof' for it.
You cannot assume that you already know the answer.

Research Structure



Forming the research question

1 Topic / Problem Statement/Research question

Osteoporosis in Women 40+

2 Current Problems

The lack of reliable information available to Irish women over the age of 40.

There are currently many resources available on the Internet, such as blogs and tips on preventing or reducing the risk of developing this disease. However, not all materials are reliable and scientifically proven.

However, not all materials are reliable and scientifically proven. Also, it is known that the environment, geographic location, and socioeconomic status play a part in developing this condition.

3 Research Question

How can medically valid information available in digital format help Irish women 40+ prepare and protect their bodies before Menopause, which most often worsens the situation?

How can food and lifestyle control help to manage or prevent this condition?

4 Hypothesis

"The hypothesis is testable and helps test the assumption made, leading the right direction for the thesis".

Can medically valid information available in digital format help Irish women 40+ prepare and protect their bodies before Menopause, which most often worsens the situation?

5 Methods/Artefacts

Survey questionnaire for the GP who is specialises in women's health across Ireland, and for Irish woman 40+, to identify the general awareness of this condition, and get to know the lifestyle.

User Testing by Surveys (getting to know the user is important in this case) – finding relevant forum and emailing my proposal to participate in this questionnaire and outlining the potential contribution to improving the information available regarding this topic. It is important to bring awareness to the public and highlight that the public should trust reliable source of information (for example, the information provided should be approved by the GP/Doctor).

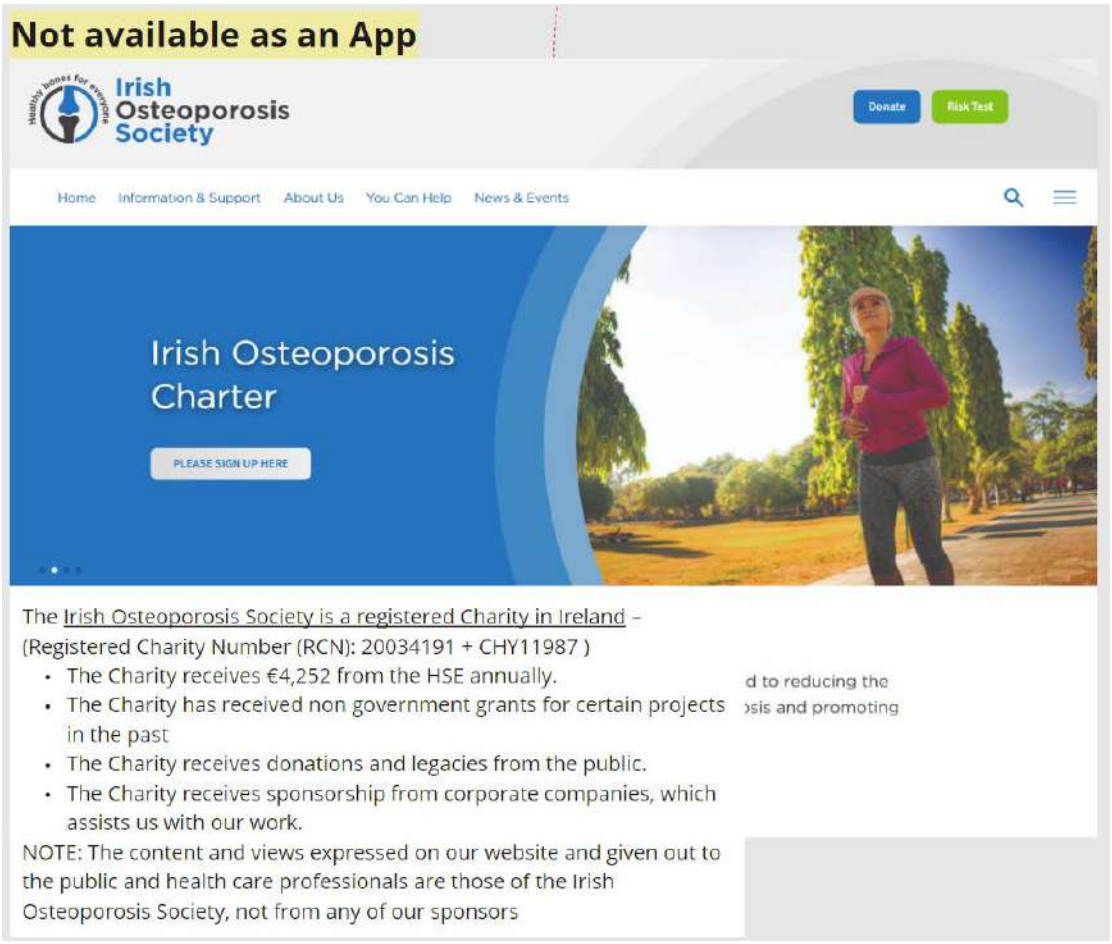
6 Plan of work & time schedule

Gantt Chart

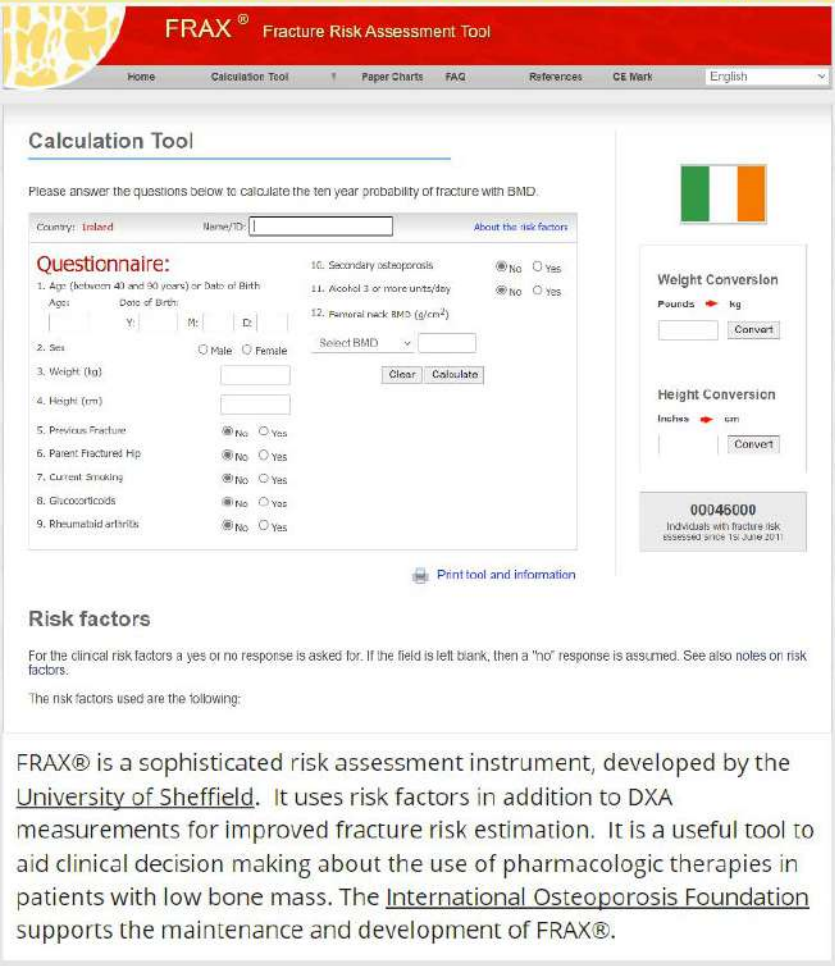
7 Scope and Limitations

- Finding the GPs/Doctors who are specialising in this area.
- Approving the information for preventing this condition.

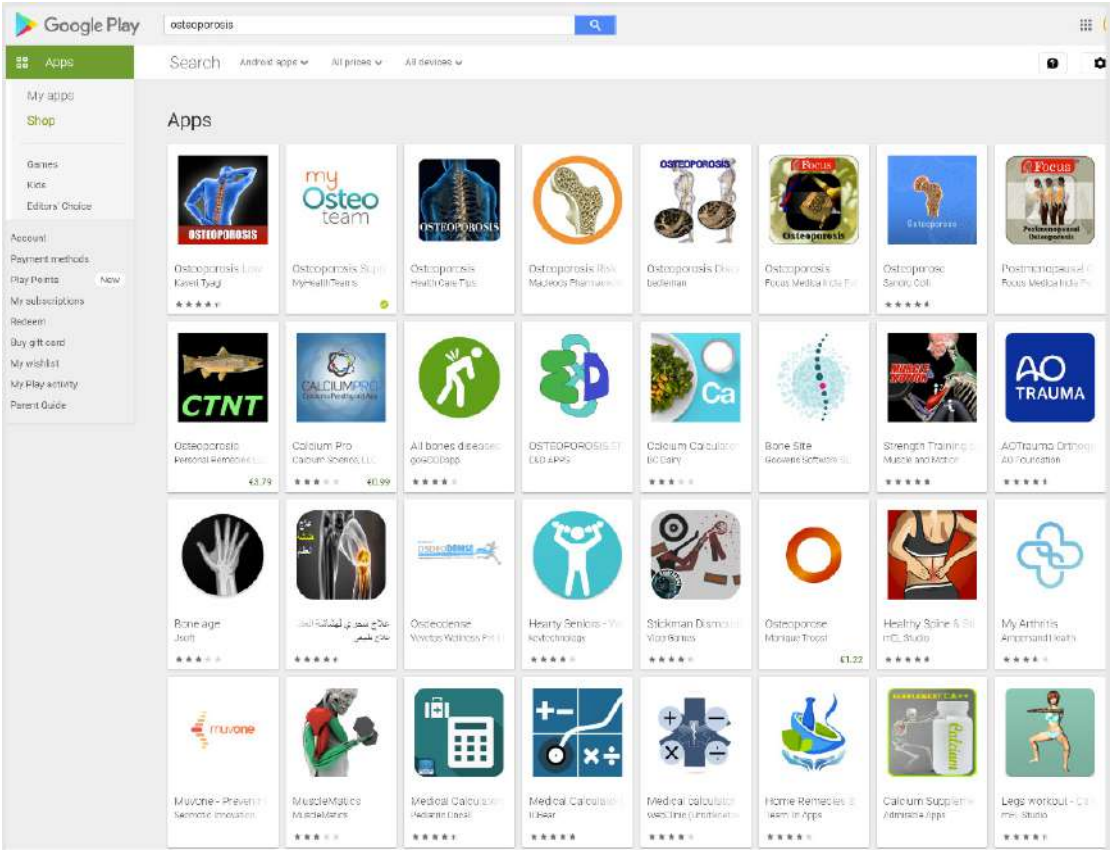
Available information on Osteoporosis



https://www.sheffield.ac.uk/FRAX/tool.aspx?country=48



FRAX® is a sophisticated risk assessment instrument, developed by the University of Sheffield. It uses risk factors in addition to DXA measurements for improved fracture risk estimation. It is a useful tool to aid clinical decision making about the use of pharmacologic therapies in patients with low bone mass. The International Osteoporosis Foundation supports the maintenance and development of FRAX®.


Google Play
osteoporosis
Apps
Search
My apps
Shop
Games
Kids
Editors' Choice
Account
Payment methods
Play Points
My subscriptions
Redeem
Buy gift card
My wishlist
My Play activity
Parent Guide
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CALCIUMPRO
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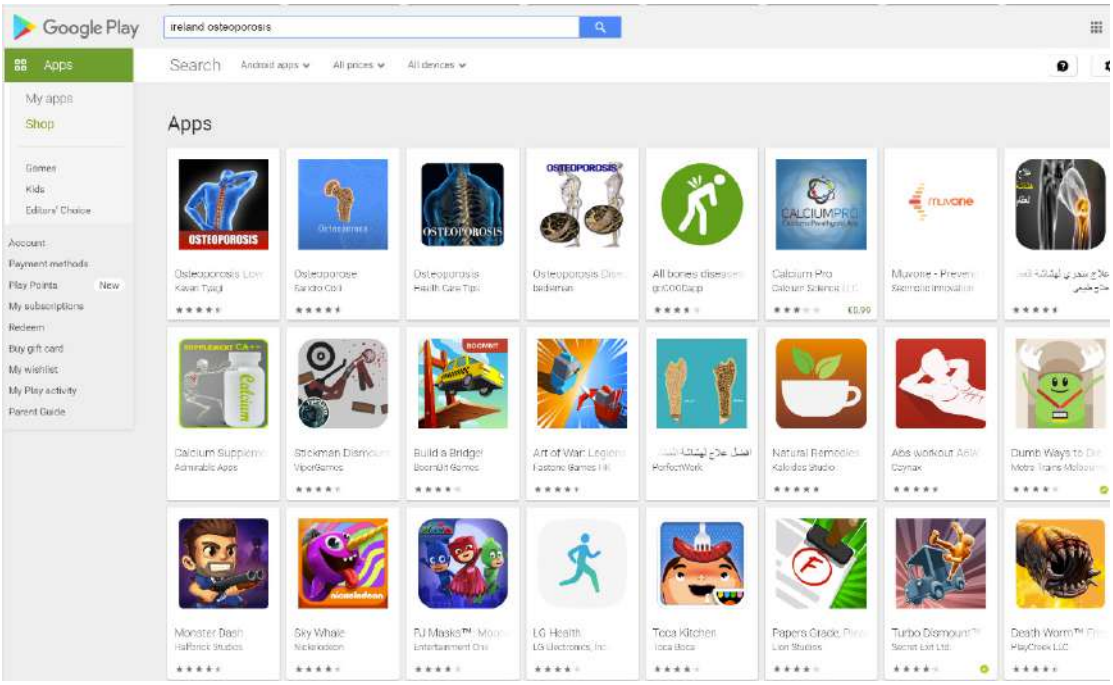
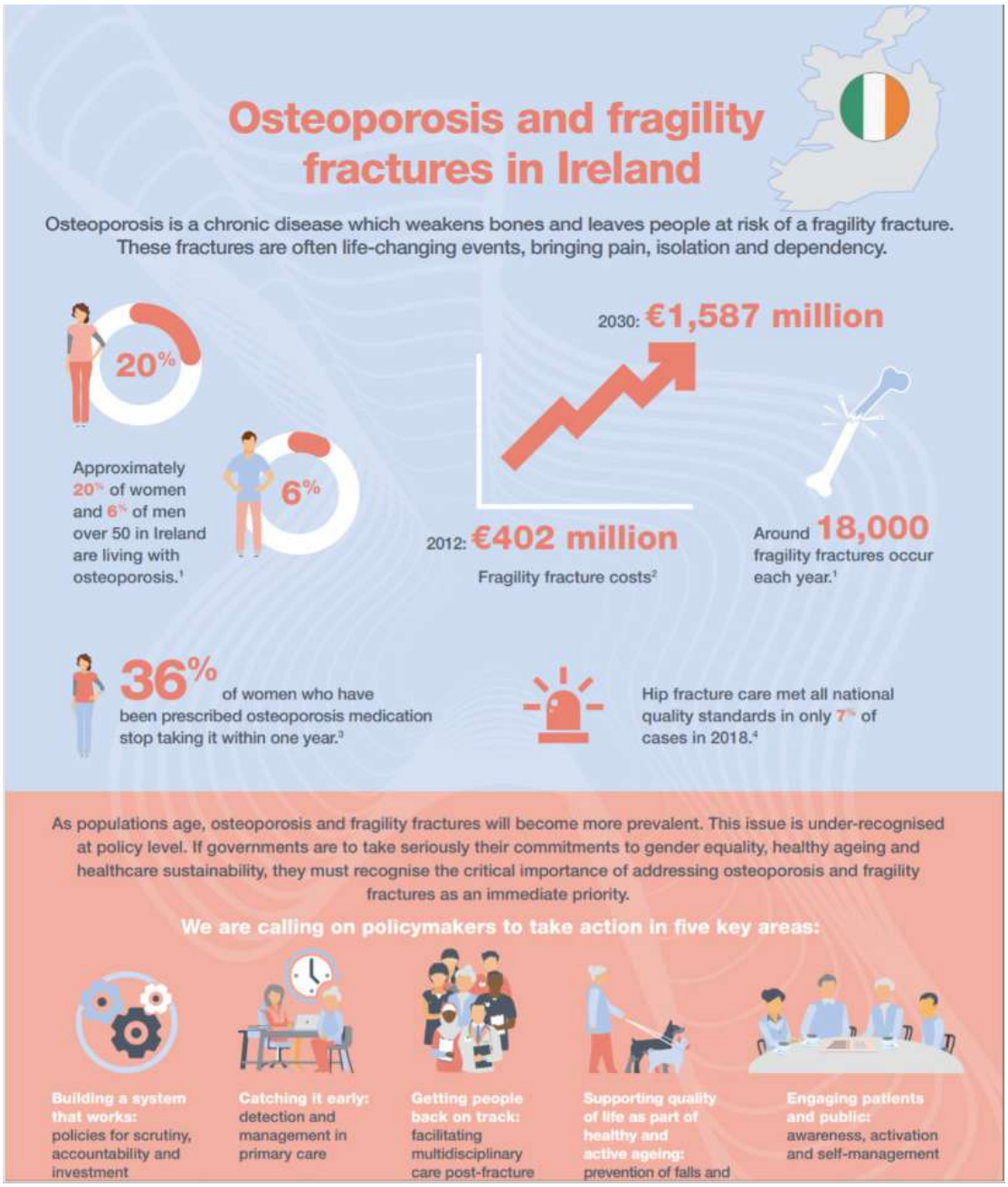
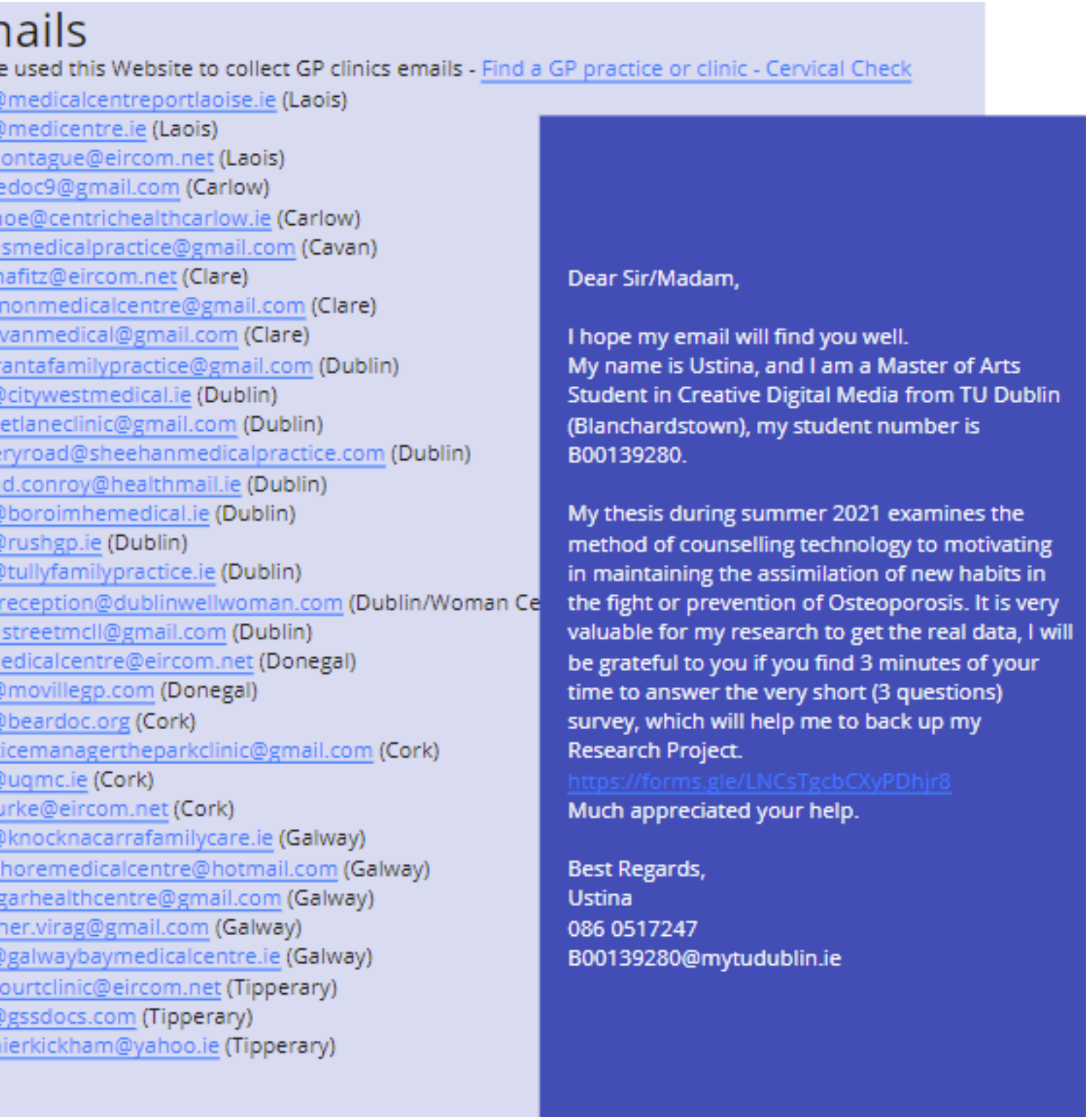
AO TRAUMA
muvone

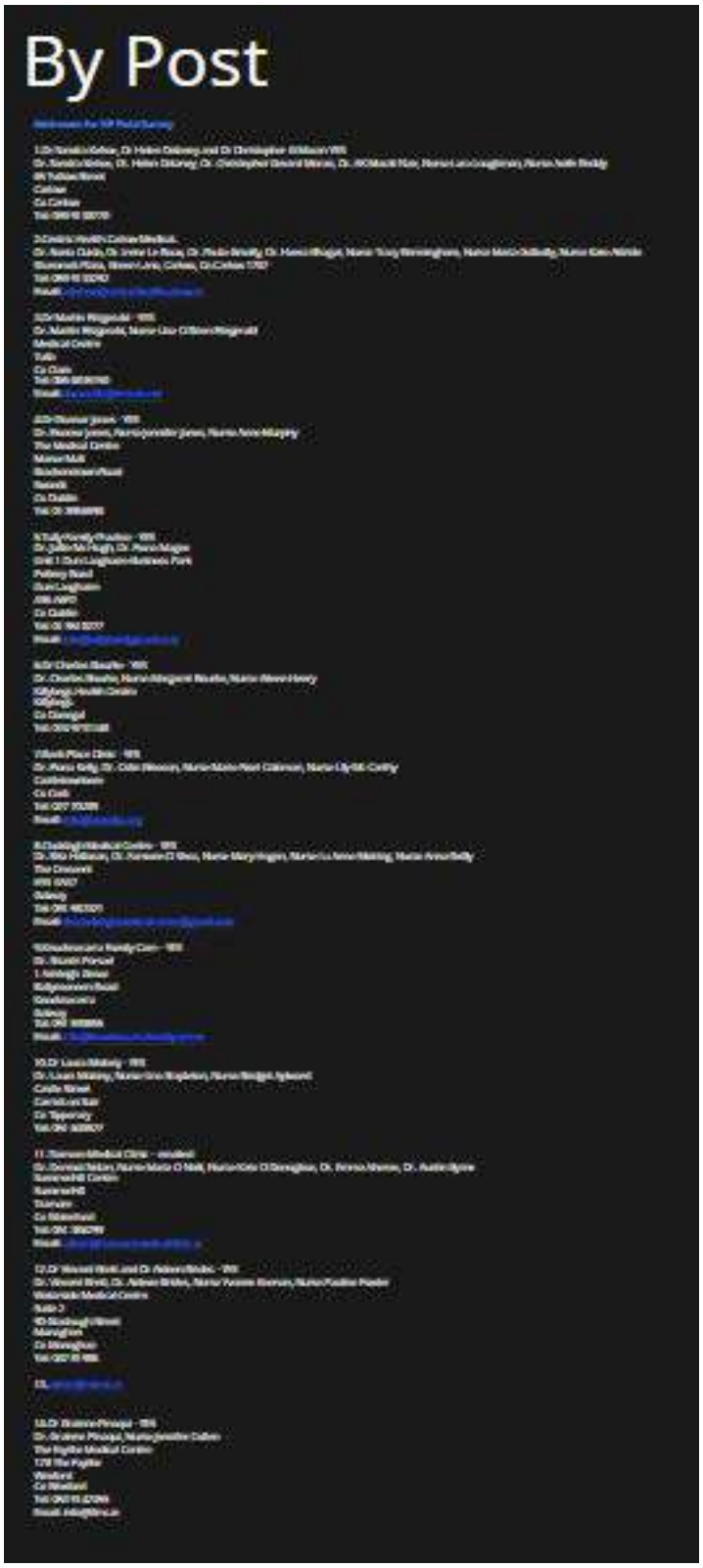

Google Play
ireland osteoporosis
Apps
Search
My apps
Shop
Games
Kids
Editors' Choice
Account
Payment methods
Play Points
My subscriptions
Redeem
Buy gift card
My wishlist
My Play activity
Parent Guide
Apps
OSTEOPOROSIS
CALCIUMPRO
muvone


Osteoporosis and fragility fractures in Ireland
Osteoporosis is a chronic disease which weakens bones and leaves people at risk of a fragility fracture. These fractures are often life-changing events, bringing pain, isolation and dependency.
20%
6%
Approximately 20% of women and 6% of men over 50 in Ireland are living with osteoporosis.[1]
2030: €1,587 million
2012: €402 million
Fragility fracture costs[2]
Around 18,000 fragility fractures occur each year.[1]
36% of women who have been prescribed osteoporosis medication stop taking it within one year.[3]
Hip fracture care met all national quality standards in only 7% of cases in 2018.[4]
As populations age, osteoporosis and fragility fractures will become more prevalent. This issue is under-recognised at policy level. If governments are to take seriously their commitments to gender equality, healthy ageing and healthcare sustainability, they must recognise the critical importance of addressing osteoporosis and fragility fractures as an immediate priority.
We are calling on policymakers to take action in five key areas:
Building a system that works: policies for scrutiny, accountability and investment
Catching it early: detection and management in primary care
Getting people back on track: facilitating multidisciplinary care post-fracture
Supporting quality of life as part of healthy and active ageing: prevention of falls and
Engaging patients and public: awareness, activation and self-management

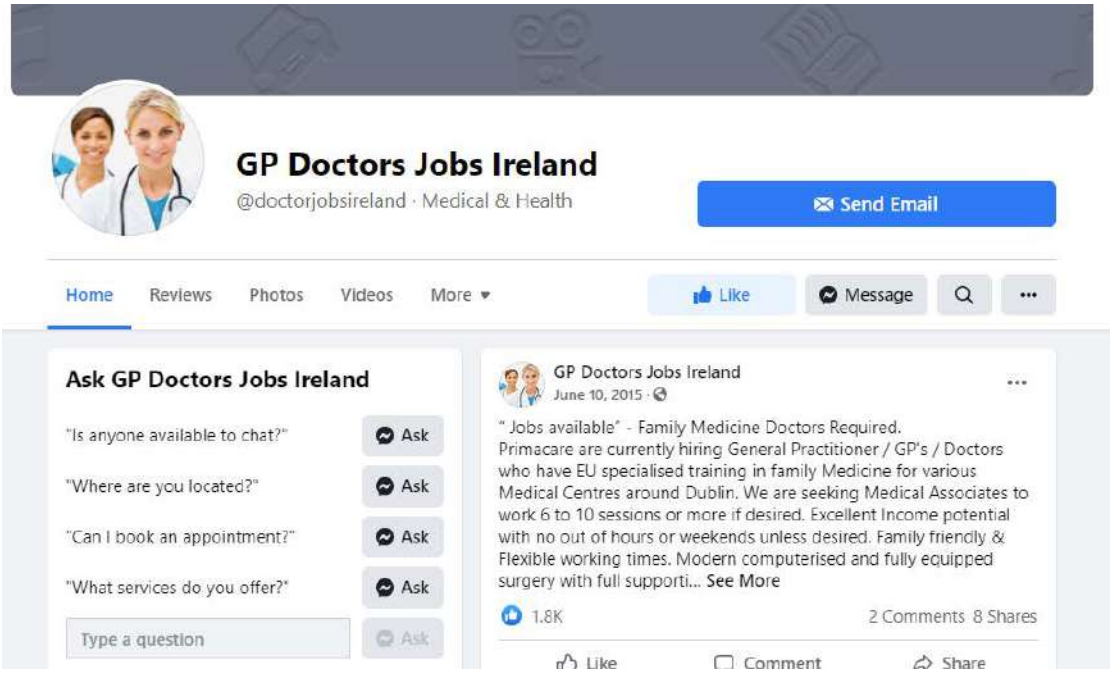
Emails sent out to GP's for Survey 2

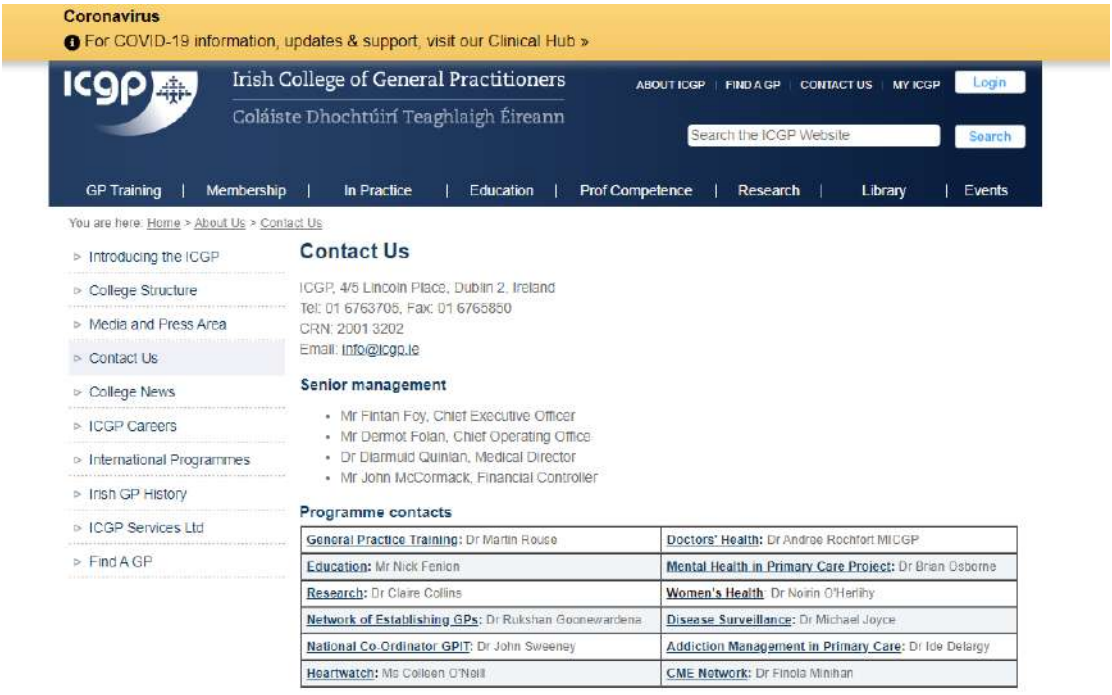


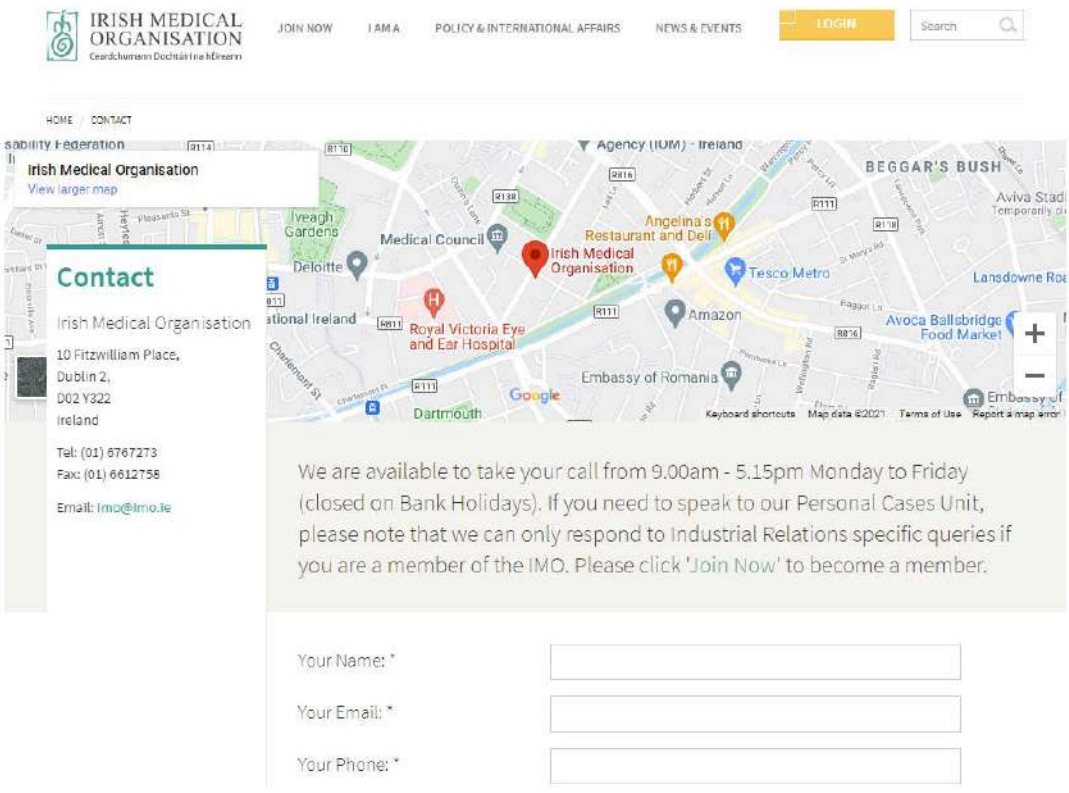
Printed Forms sent out to GP's for Survey 2


By Post

Additional sources for Survey 2






IRISH MEDICAL ORGANISATION
Ceardchumann Dochtúirí na hÉireann
JOIN NOW
I AM A
POLICY & INTERNATIONAL AFFAIRS
NEWS & EVENTS
LOGIN
Search
HOME / CONTACT
Irish Medical Organisation
View larger map
Contact
Irish Medical Organisation
10 Fitzwilliam Place,
Dublin 2,
D02 Y322
Ireland
Tel: (01) 6767273
Fax: (01) 6612758
Email: imo@imo.ie
Iveagh Gardens
Medical Council
Deloitte
Irish Medical Organisation
Angelina's Restaurant and Deli
Tesco Metro
Royal Victoria Eye and Ear Hospital
Amazon
Embassy of Romania
Dartmouth
Google
BEGGAR'S BUSH
We are available to take your call from 9.00am - 5.15pm Monday to Friday (closed on Bank Holidays). If you need to speak to our Personal Cases Unit, please note that we can only respond to Industrial Relations specific queries if you are a member of the IMO. Please click 'Join Now' to become a member.
Your Name: *
Your Email: *
Your Phone: *

Raising Osteoporosis awareness for women 40+ using technology, gamification methods and investigation.

Q1 Can technology increase the Osteoporosis awareness for women 40+ using Gamification?

Prototype A - uses only extrinsic motivation	Prototype B - uses only intrinsic motivation	Prototype C - uses extrinsic and intrinsic motivation

H1 Extrinsic Motivation

We believe that Prototype C is the most effective way to present the information regarding the Osteoporosis condition this way increasing awareness. We will know this is true after testing the three prototypes with the one user group, this way the user can compare the three prototypes. Wilcoxon Signed-Rank Test?..

H2 Intent

We believe that the user is more inclined to look after their bone health after using the application, and considers changing their habits. We will know this is true after conducting a Faraday's own intent test tool.

OTHER IDEAS

H1 What percentage of the information is remembered after the use of presenting the information about Osteoporosis using gamification framework?

H2 How accurate is the information understood by the user, after using gamification methods?

H3 Does the user consider adjusting or change their daily habits in order to improve their bone health in the long run?

1 Information regarding osteoporosis should be taken from reliable source - Information & Support - Irish Osteoporosis Society

2 Easy to remember Brand Name: Osteo40+; OsteoAware; Colours that are associated with the Health Authorities.

3 Pixel perfect Images, use of iconography. Sound when prize (badge) is won. Smooth interactions between switching screens.

4 Accessible at all times Navigation Menu. Customizable profile will add a unique experience. Share and Invite friends available at all times.

CONTEXT (Before)	SCENARIO (During)	OUTCOMES (After)
The internal & external factors that frame a users interaction with a product * History and context * Physicals environment * Motivation and CTA	**The actions and steps that a user takes as they attempt to satisfy their need or goal.** * Where they start * The actions they take * Their pain points along the way	**What a user does or how they feel after they are done interacting with a product or service.** * How they use what they gained * The activities they engage in next * How they feel upon completion
* Confident using technology * Uses her phone around 2 hours per day (8-9am, and 7-8pm) * Wants to be healthy	* Likes to learn about health through blog posts * Because visiting GP is expensive * Not sure if the blogs are trustworthy	* Starts to consider adjusting lifestyle to achieve better bone health in the long term, and considers doing the DXA scan. * Shares the application with her friends * Encouraged and happy

1. Epic Meaning and Calling
• Narrative - it is a Drive in which the player believes that he is doing something more than himself, or he is "chosen" for something. (Yu-kai Chou, 2021)

2. Development and Accomplishment, using following features.
•Progress Bar
• Step-by-step overlay tutorial
• Badges
• High five
The word “challenge” plays an important role, because badges or trophies brin meaning only when they are earned by overcoming a challenge. (Yu-kai Chou, 2021)

3. Empowerment of Creativity and Feedback
• Instant feedback
• Milestone unlocks.
It is important for people to see the results of their efforts, receive feedback, and respond to it. (Yu-kai Chou, 2021)

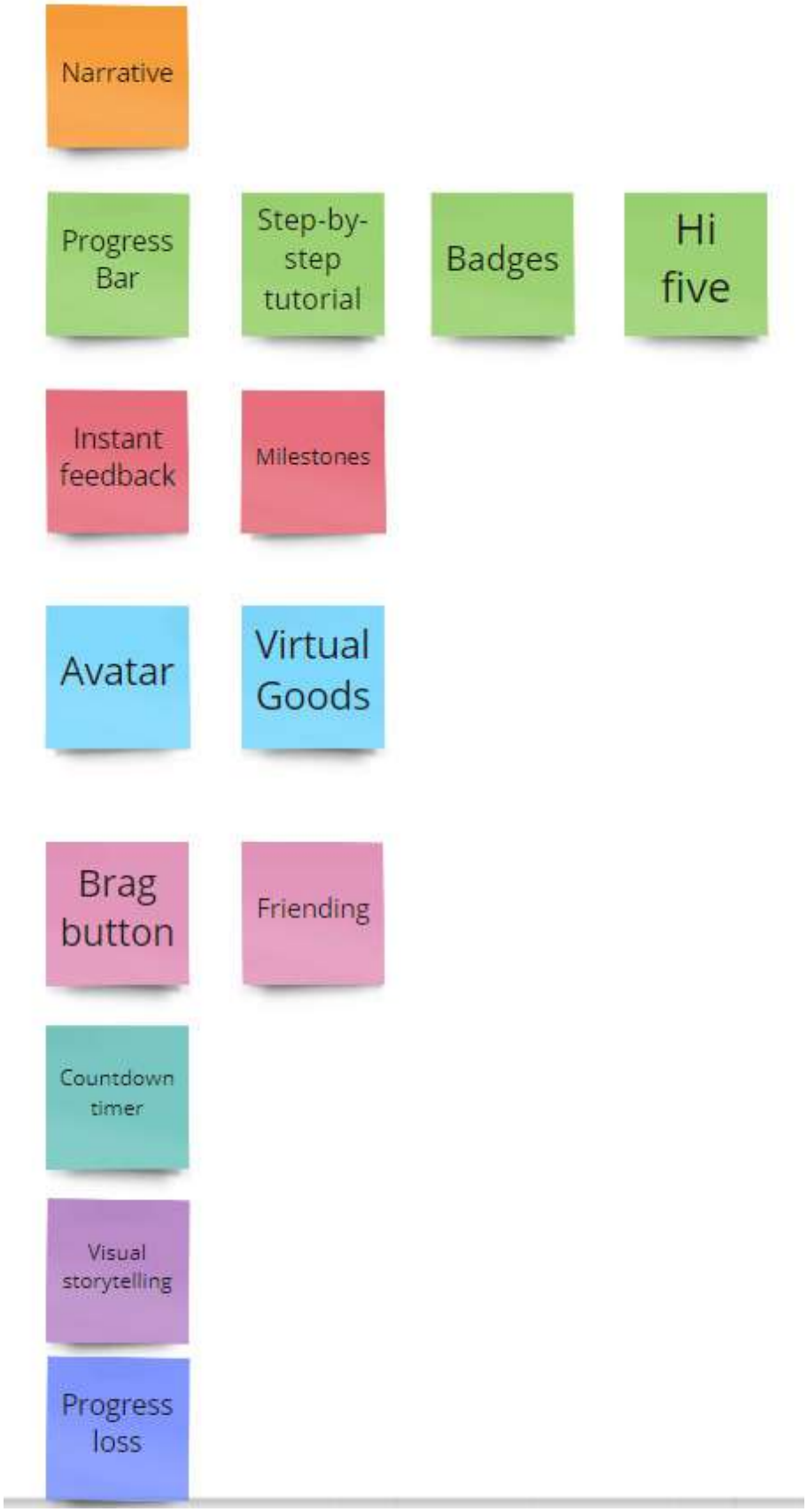
4. Ownership and Possession
• Avatar
• Virtual Goods
“This is the drive where users are motivated because they feel like they awn something” - Yu-kai Chou, 2021. When the user spends an extra time customizing their profile, it is automatically the user feels more ownership towards it. (Yu-kai Chou, 2021)

5. Social Influence and Relatedness
• Brag Button
• Friending
This drive includes all the social elements that drive people, including acceptance, social reactions, friendships, competition, and jealousy. (Yu-kai Chou, 2021)

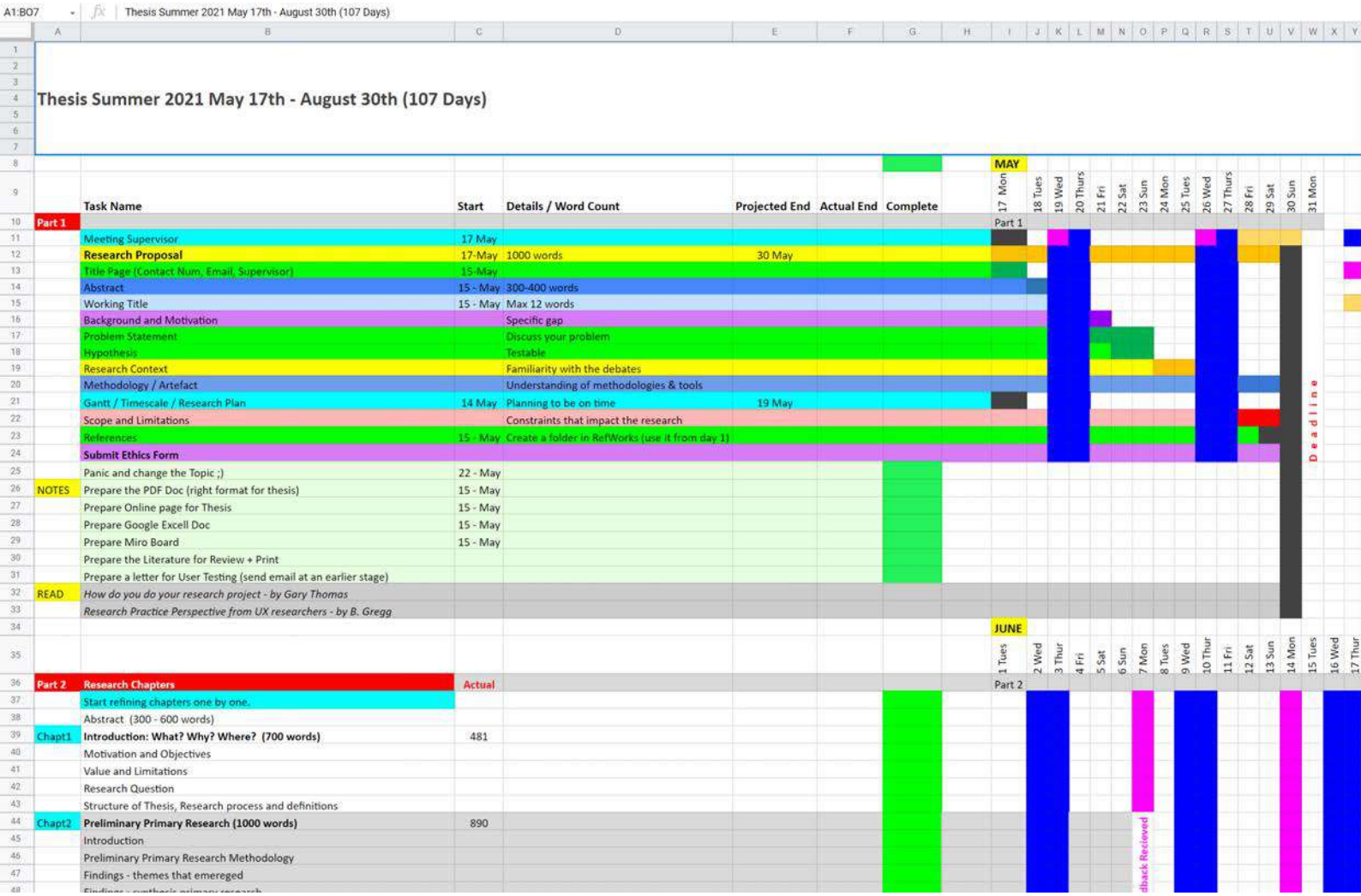
6. Scarcity and Impatience
• Countdown Timer - It is the urge to want something because you cannot have it. The fact that users cannot get something right now motivates them to think about it all day. (Yu-kai Chou, 2021)

7. Unpredictability and Curiosity
• Visual Storytelling - If the user does not know what to expect or what will happen, their brain is busy, and they often think about it. (Yu-kai Chou, 2021)

8. Loss and Avoidance
• Progress Loss - This tendency is based on avoiding something negative. On a small scale, this would be done to avoid losing previous progress. (Yu-kai Chou, 2021)


Narrative
Progress Bar
Step-by-step tutorial
Badges
Hi five
Instant feedback
Milestones
Avatar
Virtual Goods
Brag button
Friending
Countdown timer
Visual storytelling
Progress loss

Detailed Planning - Link



Thesis Summer 2021 May 17th - August 30th (107 Days)

	Task Name	Start	Details / Word Count	Projected End	Actual End	Complete
Part 1						
	Meeting Supervisor	17 May				
	Research Proposal	17-May	1000 words	30 May		
	Title Page (Contact Num, Email, Supervisor)	15-May				
	Abstract	15 - May	300-400 words			
	Working Title	15 - May	Max 12 words			
	Background and Motivation		Specific gap			
	Problem Statement		Discuss your problem			
	Hypothesis		Testable			
	Research Context		Familiarity with the debates			
	Methodology / Artefact		Understanding of methodologies & tools			
	Gantt / Timescale / Research Plan	14 May	Planning to be on time	19 May		
	Scope and Limitations		Constraints that impact the research			
	References	15 - May	Create a folder in RefWorks (use it from day 1)			
	Submit Ethics Form					
	Panic and change the Topic ;)	22 - May				
NOTES	Prepare the PDF Doc (right format for thesis)	15 - May				
	Prepare Online page for Thesis	15 - May				
	Prepare Google Excell Doc	15 - May				
	Prepare Miro Board	15 - May				
	Prepare the Literature for Review + Print					
	Prepare a letter for User Testing (send email at an earlier stage)					
READ	*How do you do your research project - by Gory Thomas*					
	Research Practice Perspective from UX researchers - by B. Gregg					
Part 2	**Research Chapters**	Actual				
	Start refining chapters one by one.					
	Abstract (300 - 600 words)					
Chapt1	**Introduction: What? Why? Where? (700 words)**	481				
	Motivation and Objectives					
	Value and Limitations					
	Research Question					
	Structure of Thesis, Research process and definitions					
Chapt2	**Preliminary Primary Research (1000 words)**	890				
	Introduction					
	Preliminary Primary Research Methodology					
	Findings - themes that emereged					

MAY: 17 Mon, 18 Tues, 19 Wed, 20 Thurs, 21 Fri, 22 Sat, 23 Sun, 24 Mon, 25 Tues, 26 Wed, 27 Thurs, 28 Fri, 29 Sat, 30 Sun, 31 Mon

JUNE: 1 Tues, 2 Wed, 3 Thur, 4 Fri, 5 Sat, 6 Sun, 7 Mon, 8 Tues, 9 Wed, 10 Thur, 11 Fri, 12 Sat, 13 Sun, 14 Mon, 15 Tues, 16 Wed, 17 Thur

Part 1

Part 2

Deadline

dback Recieved