LightMind

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Introduction and project goal

Computer games often have been seen as having negative influences especially on young people. The variety of games which are based around violent and aggressive activities is also not decreasing anytime soon.

However, the gaming market has recently seen a growing popularity of games focusing on creating a link between gameplay and positive well-being. This new genre has recently emerged on the market and according to research, which states that those who engage in moderate game play have been shown to have lower psychological symptoms than individuals who play video games excessively or not at all (Durkin & Barber, 2002), they could counter the negative impression people have about the effect of gaming by making a positive impact on people's mindset.

For this project, the opportunity came to work on a design which would promote positive mental health and wellbeing. This gave the opportunity to broaden our horizons and create something that was not specifically focused on people with mental health problems, but also could benefit ones who are having a difficult time in general.

With the goal of this project being, helping people overcome struggles like these, but still trying to do it in a playful environment, lead to us creating LightMind. A playful and accessible game experience, in the form of an open world mobile game, that is inspired by Cognitive Behavioral Therapy (CBT). By doing so, we want to create more knowledge and awareness on these CBT exercises and motivate people to work on them through fun game experiences. This is done with minigames resembling these Cognitive Behavioral Therapy exercises to let the user get familiar with CBT in a playful and engaging way.

The game takes place in the subconscious of the mind, visualized as a little village in the woods. However, this village is cursed with evil spirits, and as the player it is your job to show the villagers of Lightmind the light again. By talking to villagers and playing CBT inspired minigames, you proceed through the storyline while learning about Cognitive Behavioral Therapy, ultimately defeating the evil that roams the village.

In this report the design process that led to LightMind will be explained. During the design process multiple design iterations were finished, with all of them leading to new insights as well as new design challenges.
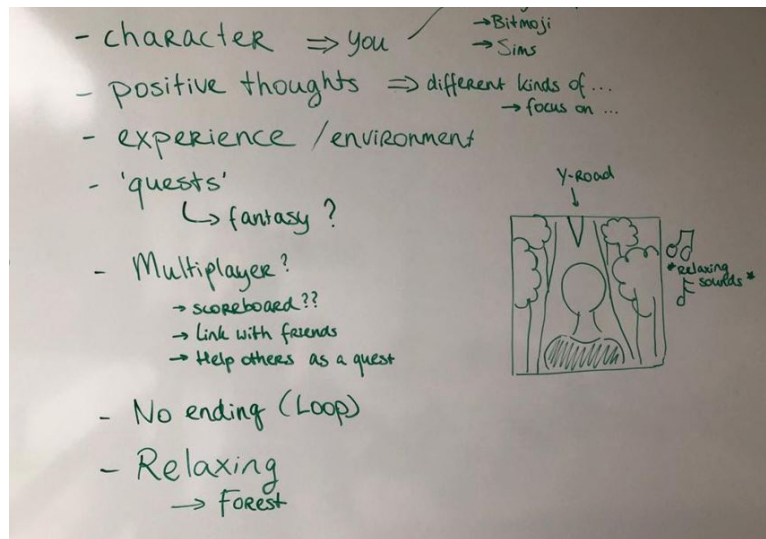
Design Process

First glance

As a starting point for the project, different games that were already out there that fit within the topic of positive mental health and wellbeing were analyzed. Games were studied as a concept and divided into specific aspects as Aesthetics, Mechanics and Dynamics. Games as Sparx and SuperBetter (Fleming, 2017), which tend to help young people who feel a bit down, were our main inspiration, but it was clear that there were a bunch of different ways to achieve the project goal.

After a bit of introductory research, an overview of the different sub-topics within the topic of positive mental health and wellbeing was put together to understand in what direction we wanted to take this project. By doing these activities, the conclusion was drawn that the majority of topics that spoke to us, as well as the games that were already created, fell into one or more of the following categories: optimism, empowerment and calming (Figure 1).

Figure 1: The brainstorm to explore subtopics within the topic of mental health and wellbeing

After an overview of all our individual goals was made, it was clear that the focus would lay on improving mindset and positivity. That is also how a target group was appointed and the first ideas were generated about how the project should fit within the "Games and Play" squad. The first pressure cooker concept consisted of a game that would focus on positive thoughts. The focus would lay on creating a relaxing experience, where the player could play a bunch of different quests (Figure 2 and 3). There was also the suggestion to make the game as a multiplayer, to allow for people to help each other with certain quests and have some social interaction. However, part of the relaxing and calming experience could disappear when other players would be directly involved, especially when it would become competitive through some kind of scoreboard or ranking. That is why the decision was made to keep it on a singleplayer game for the moment.

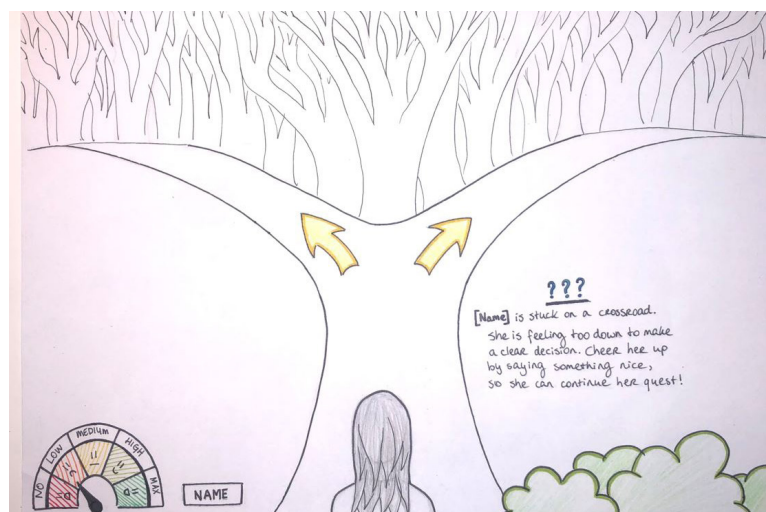Figure 2: The pressure cooker concept in development

Figure 3: Design sketch of the pressure cooker concept

Taking a deeper dive

The following step was to take a deeper dive into literature. Papers related to using positive thinking and research show that positive affirmations can help with positive thinking (Peden, Rayens, Hall, & Beebe, 2001). The hooked model (Eyal & Hoover, 2014) gave a better understanding of how to make players come back to playing our game. Applied gaming can offer immersive experiences where a state of "flow" can be achieved, provide rich sensory environments to support learning, allow behavioral modeling and social learning, allow users to try new skills in a safe yet reactive environment, and facilitate repeated rehearsal of new behavior (King et al., 2009). This gave us the insight that video game playing behaviour is influenced by a variety of factors including the structural characteristics of video games and those factors all can impact the players.

By making the mistake of seeing many topics to be important instead of only deciding on a few, led to us the concept and project goal being too broad and to us losing time on trying to implement it all. For that reason the process floundered for a bit, yet this was resolved by creating a complete overview of every last topic (Figure 4). This way everybody had a good picture of the current situation and this made it way easier to select the priorities and sort things out.
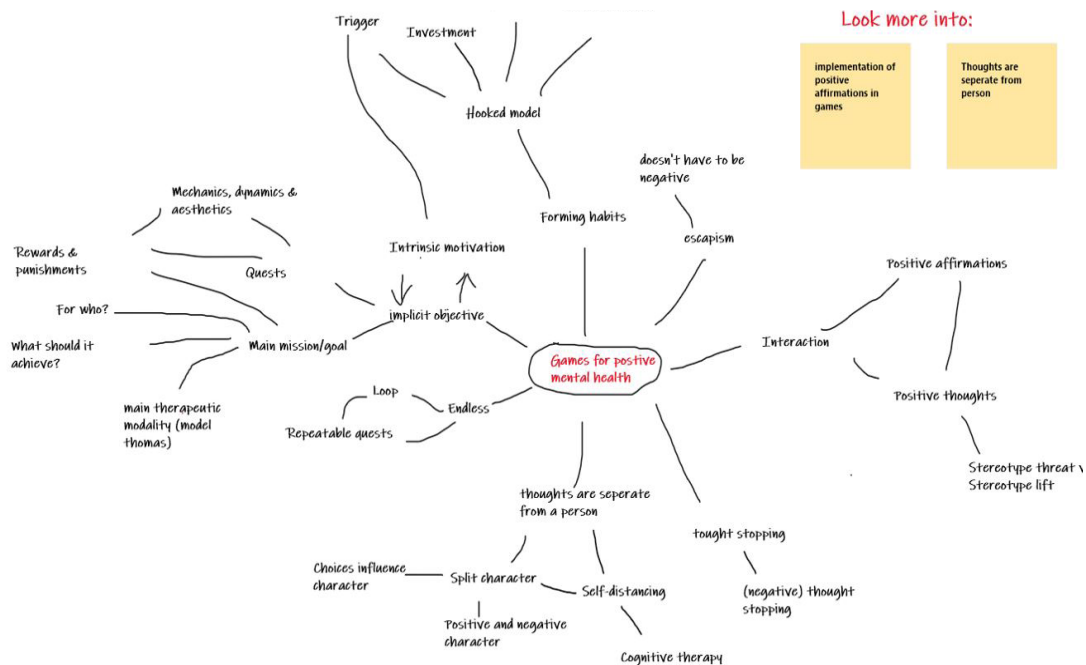
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Figure 4: Overview of all the topics literature was found

Another take we took on the project goal was introducing a split character. This way we could promote self-distancing yourself from certain thoughts. With this split character, the player had to play the game with themselves as the hero as well as the opponent, playing a sad and a happy character at the same time (Figures 5 and 6). Self-distancing is a method in which a person looks at an emotion or situation from the perspective of a by-stander. It is used as an important mechanism in therapy, such as Cognitive Behavioral Therapy and mindfulness Cognitive Behavioral Therapy (Adyuk & Kross, 2010). At the end the decision was made not to implement this, since self distancing also has negative effects, as well as it being too difficult to properly combine with other aspects in the game.
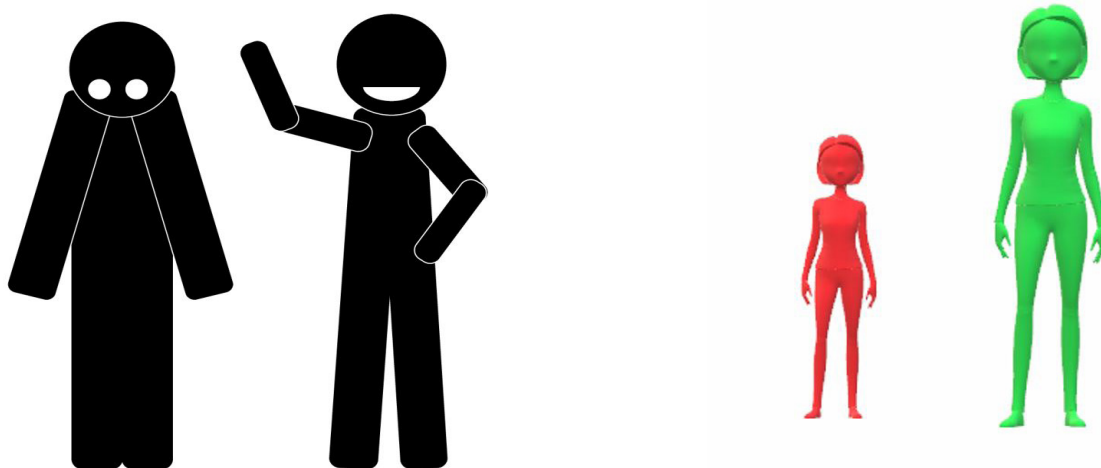

Figure 5 & 6: izualizations of the split character idea

Cognitive Behaviour Therapy
After this, our main goal was to elaborate more on what these quests should look like. As explained earlier, Sparx has been an inspirational source. Sparx uses a type of 'talking therapy' called Cognitive Behavioral Therapy, or CBT for short. Cognitive Behavioral Therapy teaches skills regarding how to cope with negative thoughts and feelings by helping people to think in a more balanced and helpful way, as well as getting them to do things they enjoy or that give them a sense of achievement. Research shows that Cognitive Behavioral Therapy helps with anxiety and depression (The science behind SPARX | SPARX, n.d.). This was a perfect fit for our concept.

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As inspiration for the minigames, different Cognitive Behaviour therapy exercise sheets (Appendix 2) were analyzed and studied. One of the exercises with potential was an exercise in which the participant has to focus on the positive words and avoid the negative words(Section 3: Minigame 1). To properly implement this into a minigame, inspiration was derived from the classic failing apples game (figure 8). Instead of having to catch apples we chose to catch positive words, and instead of bombs, negative words should be dodged (figure 7).

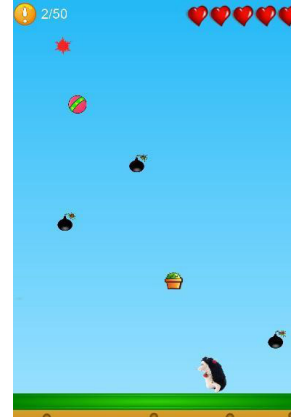Figure 7: Draft version of the falling words game made in Unity

Figure 8: Falling apples game

The other minigame is based on mindfulness & breath exercises (Section 3: Minigame 2). By doing a breath exercise and drawing how the participant feels while doing the exercise, awareness gets raised about the effect of a breathing exercise in a playful way (figures 9, 10& 11). There were also multiple options on what to do with the drawings, yet the decision was made to store them in a gallery and if it would be doable to add some form of challenge to do with the drawing.
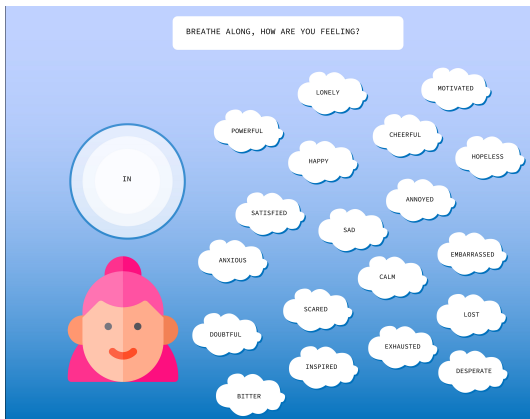
Figures 9 10 & 11: First visualization of the mindfulness game

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Connecting

At this point the concept started to come together. All that was still missing was a way to connect the minigames, which was the next step in the design process. By creating a world map and a storyline, everything could be brought together to create a full game instead of a collection of minigames.

The world map should have a similar style as the minigames, therefore we took inspiration from Evoland, CubeWorld and the classic Pokémon games, meaning pixelated with a fake 3D perspective. Right from the start everybody agreed for the scene to be a calming and relaxing environment (Section 3: World map). A small village, with a bit of a mystical vibe, called "Lightmind" next to a stream in the middle of a forest became the final scene for the game(Figure 12). Lightmind, the name of the village, was also the source of the name created for the game: "LightMind".

Figure 12: First draft map(Left) & Final map(Right)

The final part of the conceptualization phase consisted of writing of the storyline. The storyline had to match the vibe of the village, as well as properly connect all the minigames and implement them in the map. Since Cognitive Behavioral Therapy is all about helping people and thinking in a balanced and helpful way, the idea came up to continue this vision into the storyline(Section x: Storyline).

Battling with Unity (prototyping)

A prototype was needed to validate our concept by doing an exploration test, and actually making it would also give some valuable insights about what would be possible to implement and feasible in the amount of time. There were multiple options of software to use for the development phase, varying from basic to advanced professional(K., 2020). The decision to use Unity was based on the possibilities Unity offers in combination with its shallow learning curve(Unity. (n.d.)). While making the prototype, it became clear that this was something all of us heavily underestimated. Since nobody had real Unity experience, it mostly came down to learning it on the spot. The actual creation of the prototype was mostly a process of trial and error while following tutorials. The tasks were divided based on experience and also a bit so that everybody could work on their own ideas. This process of programming, developing, testing and starting over carried on for some time, until at a certain point everything was ready to be combined together and integrated as one game in Unity.

Besides some small bugs that still required fixing, the minigames were perfectly integrated in the already working world map. To make the game easily accessible at any time and location, the conclusion was drawn that it was necessary to make LightMind into a mobile game. This required some adjustments to the prototype as the mechanics on a mobile game work differently than those of a Pc game. Luckily one of Unity's options also allowed for exporting to an .apk file, so it was only a matter of adjusting slight parts of the code.

At this stage the Demoday was approaching quickly, and a first round of usertesting (consisting of 6 participants) was set up to determine people's first opinion on LightMind as well as an overview of important aspects to work on. This qualitative research survey consisted of a returning PANAS section and an actual playtest and at the end a PXI section(Section 3: Validation - First user testing round).

After Demo Day
With the feedback from Demoday (Section x: Demoday) and the insights gathered from the first round of user testing, everybody went straight back to the drawing table to figure out how to get the most out of all the data. Some issues, such as the lack of a scene explaining the controls, were pre-known and easily fixed. The minigames weren't fully finished at that point, so those also needed an upgrade. To achieve some of those bug fixes, a bit of external help was required. After all the feedback was analyzed and the last bugs were fixed, only the storyline remained a problem. The interactions were being detected and the scenes were switching, yet the dialogue system just wouldn't work properly. After a lot of experimenting and setbacks, the decision was made to use a tool from the asset store. With the use of this dialogue tool, the issue was quickly resolved and the first fully functional prototype of LightMind was finally a fact (Appendix 1: LightMind. apk).

A new fully functional prototype required a second round of user testing(Section 3: Validation - Second user testing round). This time on a larger scale (28 participants) and focussing on the impact LightMind can make on the player's mood. The game aspects and playability were also mentioned to keep gaining the insights. Those insights will determine the future steps.

Overall Results

In the end, a mobile game was created, that is fun to play and can be made accessible to all age groups, but in particular, our target group (students aged 18-25). LightMind is an accessible and playful environment in which the user gets familiar with CBT techniques in a motivating way. The game consists of an open play map with minigames. In the introduction the player finds out that the town is cursed, haunted by evil energies. In order to help the village of Lightmind, the player can talk to the villagers and help them solve their problems through a variety of minigames. When a minigame is successfully completed, the villager cheers up and the entire town glows up a bit. After all the quests are fulfilled and the storyline is finished, the game is over. Although not completely, because the world remains open and playable, allowing the player to replay their favourite minigame or break that one record they couldn't break.

The storyline
The story is set in the subconscious of the human mind.
The target user of our game often struggles with a lot of negativity. When spawning into the game, everything in the world around you is therefore dark and achromatic. The characters in human form represent the neurons of the brain. They have lost their connections to each other and their surroundings.

You came here to restore the connections between the people and their surroundings. Your goal is to help the people of Lightmind. Some people might only require a conversation and some advice, some might even require fulfilling an entire quest. Every time you help someone, the world will become a little brighter.

The first quest you encounter is when you talk to an elderly man, his parrot is stolen. He is completely panicking and feeling down, since the parrot was a big part of her life. He tells you that he saw the thief running towards the well, but that he couldn't go after him/her. When talking to the man, your quest to save the parrot begins. The parrot has been locked in a cage and the only way to get him out of there is to find it and to break the bars of the cage by playing the game. In the game you need to catch positive words and dodge negative ones. After having caught 10 positive words, the parrot is free and you have completed the quest.

At the other villager you encounter the second quest, which is focused on mindfulness. It starts off by having to do breathing exercises. Besides this you are required to pick certain feelings you are feeling at that moment. After you have completed this you have to draw these feelings to see them as different parts of yourself. These drawings end up in a gallery in the next screen on which you can look back to.

World map

The world map, consisting of the village of Lightmind and all its inhabitants, is the main scene where the player can explore, talk to the villagers and pursue quests. The world map sets the tone for the entire game and for that reason it was important to create the right vibe. The project goal was to create an accessible and playful environment in which the user gets familiar with CBT techniques in a motivating way. To achieve this, it requires a calming and relaxing environment. A forest, a mountain range with a valley, a beach and an island were all possible options, with one thing in common. The environment has to be somewhere in nature. The two common aspects of those locations are trees and water. When combined they give a village somewhere in the middle of a forest with a babbling brook.

In the beginning, the world looks dark and achromatic (Figure 13). The player just arrived in the village and everybody is still sad. After the player successfully completes a minigame, things brighten up and a bit of color returns to the village of Lightmind (Figure 14). This process continues all the way till the storyline has been completed and the village has been freed of the evil spirit.

Figure 13: the dark times in Light Mind

Figure 14: Things are brightening up

The village itself has been designed in a way that all places are easily reachable, there are plenty of interactions possible and still spots to hide stuff. The babbling brook cuts straight through the town and the dense woods give a true feeling like this village is somewhere deep in the forest in the middle of nowhere. As if there is nothing else except the player, the village and raw nature. Of course not to forget the strange statues that suddenly seemed to appear along with the evil spirit. This evil spirit also has had a go at some parts of the village, for example the Holy Tree, which seems to be pulsating a strange form of energy.

The development of the draft version of the map was done with the use of RPG Maker MZ. RPG Maker softwares are ideal for making the classic Pokemon style maps with the fake 3D perspective. The only downside is that it doesn't allow for the implementation of projects developed in other applications as Unity or Unreal Engine. For that reason RPG Maker MZ was used to design the primary map layout and a mock-up demonstrator for the midterm presentation. After the midterm it was all the way back to the drawing board and implementing the insights gained during the midterm. Only difference, this time in Unity. From the base floorplan to creating layers with objects to get some depth. From the collisions between the player and the border to the detecting of interactive npc's. Redesigning the final version of the map in Unity took quite some time, yet allowed for much more possibilities with respect to interactions and minigames. Starting a minigame for example, it is only a matter of targeting the NPC and triggering a switch of scenes.

Minigame 1: locked up birdy

When delving into the world of Cognitive Behavioral Therapy exercises, you soon notice there is a whole variety of different exercises that can be done. Since each minigame implemented into this game will represent its own CBT exercise, a few interested ones had to be picked.

When opening the game LightMind, one of the first quests you encounter in the game is the Locked up Birdy minigame. The storyline behind this game is that you come across a local villager crying out for help. Her little birdy was kidnapped and put inside a cage. She asks you for help to save her little birdy.

In this minigame you have to collect the positive words and dodge the negative ones. Each positive word you catch gives you 1 point. If you catch a negative word by accident you have to start all over again. If you manage to get a score of 10 by catching all the positive words, the bird is released and you've won the game (Figure 15).

This minigame is inspired by CBT exercises exploring personal values. Identifying values provides a basis for reconnecting with identity, for focusing on the areas of our life that are important to us and for reestablishing a sense of personal integrity in the choices we make (Hickey, 2020).

Because the game makes you focus on the certain words dropping down and assessing if they are positive or negative, you are able to help them identify and focus on positive values again. Since focusing on positive values is not a one time thing, the game can be repeated many times.

Figure 15: Free the parrot by catching positive words

Minigame 2: Mindfulness

When discovering different types of therapy and different types of Cognitive Behavioral Therapy in particular, one that stood out was mindfulness Cognitive Behavioral Therapy (M-CBT) due to the popularity of mindfulness. This minigame is based on an exercise from positive psychology.com, a website created by and for psychologists as well as patients. In this exercise, you are asked to focus on your breath and how you feel for 3 minutes (Figure 16):

"The three-minute breathing space is a quick exercise that is undertaken in three steps:
• The first minute is spent on answering the question, "how am I doing right now?" while focusing on the feelings, thoughts, and sensations that arise and trying to assign these words and phrases.
• The second minute is spent on keeping awareness on the breath.
• The last minute is used for an expansion of attention from solely focusing on the breath, to feeling physical sensations and how they affect the rest of the body."
(Ackerman, 2020).

To make it more playful, there is a section added where the player can express their feelings (Figure 17). This allows for the game to save their drawings in a gallery-like place, where the player can come back to and ultimately see the different drawings they made (Figure 18). This is also created to make this minigame into something that can be played over a longer period of time.
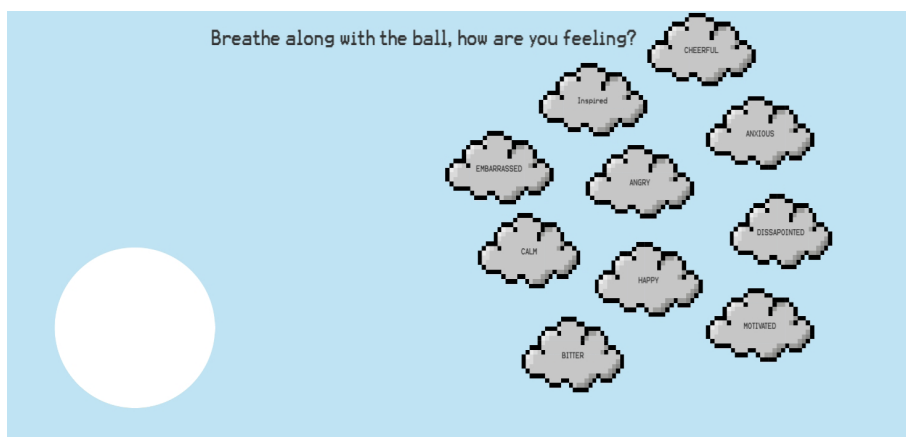
Figure 16: Breath exercise
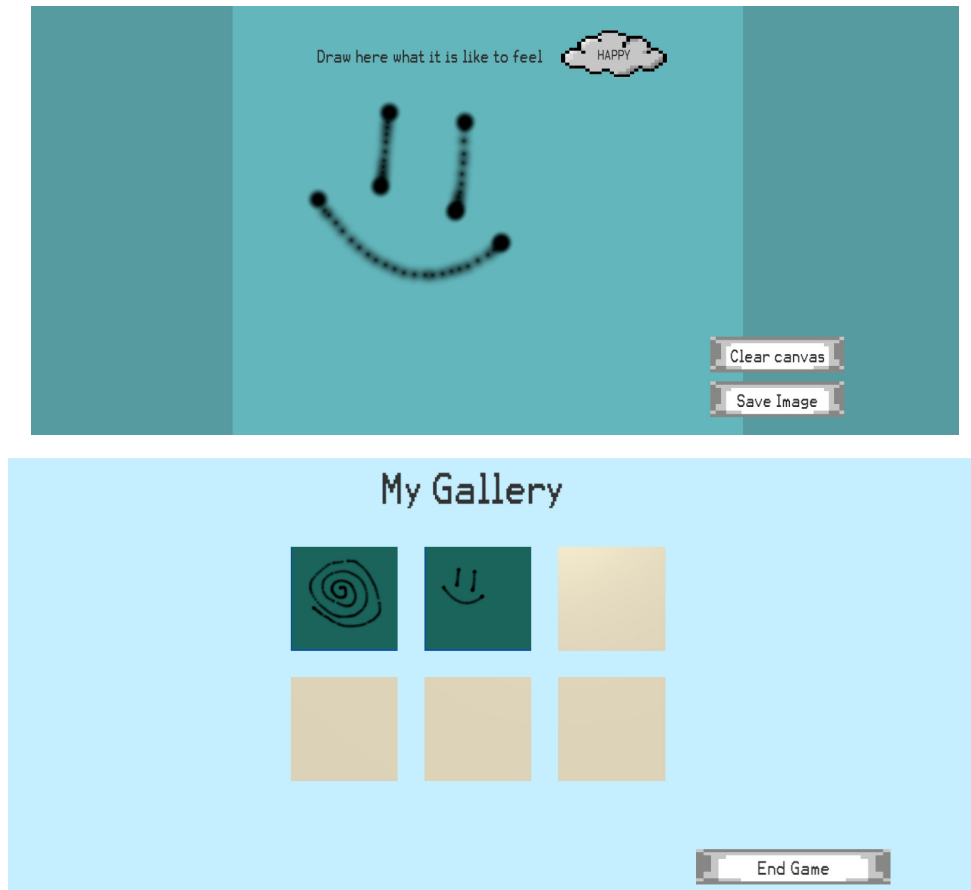
Figure 17 & 18: Draw how the player feels and save in the gallery

Validation

First usertesting round
Two measurements needed to be done in our first user test. How the user was feeling in general and how our game was performing overall. Due to Covid restrictions and the need of having enough responses in a short period of time, a questionnaire seemed to be the best method of gathering data and feedback.

Firstly, research had to be done to see if there were any questionnaires that combined our testing criteria into one. Some interesting examples in a paper on questionnaires were found (Imran Nordin & Denisova, 2014, p. 1). Especially the Immersive Experience Questionnaire (IEQ), which focuses on Emotional involvement, Cognitive involvement, Real world dissociation and Challenge and Control. Besides IEQ, another useful questionnaire was Social Presence in Gaming Questionnaire (SPGQ), which focuses on Psychological involvement (empathy), Psychological involvement (negative feelings) and Behavioural engagement.

The only problem with both questionnaires was that they both had some interesting aspects, so the initial thought was to combine them. This wasn't possible, since the validity of the questionnaire would be thrown away or the questionnaire would be too long. At this moment the decision was made that there was a need for two different questionnaires to

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achieve all the research goals. One to focus on the player's mood, the second to determine how the game itself performed. After some discussion with our project coach, the conclusion was reached that it is not helpful from a research perspective to mix multiple questionnaires and existing instruments as each one is a validated measure and mixing to create a new version, which will not be a validated tool and it can't be claimed what exactly it measures. For this reason, the decision was made to use two separate questionnaires, yet without actually merging them.

Especially when it comes to the decision which questionnaire to use to determine general game performance , there were a lot of options to choose from. However, a number of existing options are not directly suited for our goal. For instance, some surveys are designed to measure a very specific aspect of game experience while others look at gameplay over a long time. Both of those were not usable since this first round of user testing was focussing on the general functioning and feel of the game. The suggestion was made to use PXI (Player Experience Inventory), which was suitable for capturing broader game experience and could be used even after a short gameplay session.

For the questionnaire regarding the player's mood, there was no longer the need to include a game aspect. This made the choice for PANAS a pretty easy one (Positive and Negative Affect Schedule). PANAS allowed for a detailed analysis of the players mood in a timeframe. By questioning a first PANAS before the play test, and a second evaluation version after the play test, an analysis could be made of the impact LightMind has had on the participant. The full questionnaire including the outcomes can be found in the appendix (Appendix 4: First User testing round)

Second usertesting round
In the second testing round, a better look had to be taken into the different scales that measure how the user is feeling prior to playing and after playing this game. In the first user testing round PANAS was used, however this proved to not be suitable for the evaluation. It made the questionnaire too long and it was made to measure positive and negative effects over a week's period of time instead of capturing the moment itself. Research showed that a distinction between mood and emotion had to be made(Desmet et al., 2016), which turned out to be an important factor in our own user evaluation. The goal of this project was to make people feel better, which is directly associated with mood, rather than emotion. As mentioned before, the questionnaire should also not be too extensive. Feedback we received during the Demoday was that our questionnaire should not exceed the playtime of our game too much, otherwise the user is spending more time on filling in the survey than on actually playing the game.

The requirements for using a different scale resulted in measuring mood instead of emotion, answering questions should not take too much time (therefore, shorter mood questionnaires were preferred), answers to the scale have to be specific enough and the scale had to be about a short period of time (matter of minutes).

Because of the latest requirements, we found that while pictorial self reporting scales were extremely quick (Desmet, Vastenburg & Romero, 2016), they did not give us the nuance within our usertest we were looking for.

In the paper of Desmet, Vastenburg & Romero (2016), they outline a variety of different user evaluation methods that make use of mood and emotion. When considering these different evaluation methods, the one that met our requirements the best was the BRUMS scale. This is a 24-item feelings scale that measures mood over a short period of time. Research shows that this scale can also be used as a way to measure mental health (Brandt et al., 2016).

Results usertests
Table 1 shows the most important results of the first usertest. The results are based on a scale of 7 and are the average of all the participants. From this questionnaire we learned that the progress in the game and the goals and rules of the game were not completely clear, and so we decided to focus our work on these challenges after that first user test. Furthermore, we decided that the PANAS questionnaire is not valid at this moment, since we only had six participants.

In table 1 you can see that during the second user test the game improved in all the areas of the questionnaire. Especially the results of progress feedback and goals and rules have grown a lot, which means that some good improvements were made in these areas. In table 2 you can see the results from the BRUMS, which are part of the second usertest. These numbers are based on a scale from 0-4 and are also the average of all the participants. You want to have most of these results low, since they have a negative meaning, except for vigor which you want to have as high as possible since it is positive. As you can see in the table all of the results show a positive substantial improvement, which means that the game can make a short-term impact on the mood of the users.

	First usertest	Second usertest
Progress Feedback	1.83	3.30
Goals and Rules	3.17	4.96
Challenge	3.44	4.29
Meaning	3.56	4.27
Immersion	3.89	4.63
Mastery	4.17	4.52
Autonomy	4.22	4.82
Overall Appreciation	4.67	5.58
Audiovisual Appeal	5.17	5.87
Curiosity	5.33	5.48
Ease of control	5.39	5.51

Table 1: results of the PXI

	Before the game	After the game
Anger	0.62	0.33
Confusion	0.70	0.63
Depression	0.88	0.41
Fatigue	2.02	1.50
Tension	1.13	0.69
Vigor	1.76	1.91

Table 2: results of the BRUMS questionnaire

Demoday

Midterm Demoday
For the midterm Demoday a presentation consisting of the following parts was prepared:
- A functional muck-up version of the world map
- A draft version of the "Locked up Birdy" minigame
- Visuals of the minigame concepts

The feedback that was given on the presentation provided us with useful insights in what aspects of the concept needed improvement or additional research:

Feedback points:
One of the main concerns was the question for whom this game was meant to be played. Only by people with mental health issues, for example through referral of a therapist, or for people going through a rough time in general. How would they access the game? How would they be impelled to play this game?

How we implemented feedback:
While the focus of this project was not necessarily the marketing aspect, it is important to note that this game should be downloadable in the app store and Google play store, so that everyone with a smartphone is able to download it. Furthermore, through creating a following on social media platforms as well as word-of-mouth and perhaps in the future even therapist referrals, this game should be accessible for all of those who want to play it.

Feedback points:
Another concern during the midterm demo day was whether LightMind would be able to keep the player engaged over a longer period of time, and if so, how? What happens when you 'finish' the storyline but you still want to play the minigames?

How we implemented feedback:
As this was something considerably important, every minigame was analyzed separately and a brainstorm was done about how to make it more playable. For the bird in the cage, the words should drop faster as the game progresses, as well as an option for the user to add their own words. For the mindfulness minigame, a function was implemented that the user allows to save their drawn images in a gallery that allows for viewing, so that over time they end up having a gallery with all their different feelings and visuals to look back on.

Final Demoday
For the final Demoday a digital gallery was created to show "LightMind" https://demoday.id.tue.nl/projects/A8OXAgoyQn. A lot of useful feedback has been received, especially from the presentation. The main take-away was related to the user testing. While LightMind could be played for about 15 minutes, the first round of user testing included a PANAS section asking about the participants mood over the last week. A game like LightMind can make an impact on the player's short term mood. A week, on the other hand, is way too long to notify a change. This insight has proven very useful in the second round of user testing (Section 5: Second user testing round).

Marketing and business

To get an overview as to how to get the app to the end user, a business model canvas was created (***figure 14***). One important thing to note though, is that not all of the aspects within this model are doable for the game as it is now. For our long-term goal, we wanted to create a game that has been proven to be helpful with individuals that struggle with their mental health. This is not yet possible with the app as it is now, as it needs more research and further iterations.

⚘ Key partners	☆ Key activities	⚑ Value proposition	♡ Customer relationship	☺ Customer segment
App developers (improve app and fix bugs) **LM Studio's** (creaters of design) **Therapists** (Help make the app more relevant) **Students** (Have a fun game, help improving the app) **Marketing team** (Gain attention and players of this app)	Add more minigames and other features Test for long-term mental health improvement Develop further with therapists. **〰 Resources** App developers to further improve the app programming Marketing team to get this app the right exposure	Make a fun environment for Cognitive Behaviour Therapy inspired games Make Cognitive Behaviour Therapy exercises more accessible Increase postive mental health and well-being through a game	Get a good working app with minigames that are worth playing Get new updates and introductions within the app Have a fun addition to therapy sessions **⊙ Channels** App stores (Google Play and IOS App Store)	People that are struggling with their mental health People that want to be introduced to CBT

⊞ Cost structure		€ Revenue streams	
App developping and bug fixing Marketing team		Freemium model In-app advertisements at app start-up	

Figure 19: Business model canvas for Light Mind

As is visible in the canvas business model, the revenue models that were chosen for this app are the freemium model (meaning, you can access part of the app for free but have to pay for premium features) as well as in-app advertisement at the start of the app. This is so that users that might need the app in the future can get the full experience of this app, while users that might want to try this app at first can do so without paying for it.
In order to succeed with this freemium model, the game would need constant updating and a proper balance between the free and paid version (Holm & Günzel-Jensen, 2017). This would work for our app, as discoveries and innovations in both the psychology field as well as in the field of game design would mean app-updates.
Since this app would be rather data-sensitive, this app will not be using or sharing any user data. The in-app advertisements will mostly be used to promote similar games, but these ads will not be personalized any further.

Conclusions

Evaluation

The main focus of this project was to explore the possibilities regarding helping people overcome mental struggles in a playful way. There are various ways to achieve this, yet during this project the decision was made to focus on offering CBT exercises in a playful way. This meant that during the project, our goal was creating a CBT inspired game that was fun to play.

To allow the CBT exercises to fully manifest, the other aspects of the game also need a relaxing and peaceful vibe. The decision to use a pixelated style village in the middle of a forest as a world map turned out to be a great choice. The results of the first round of user testing, with the unfinished prototype, showed that about 90% of the participants like the style and appreciated the aesthetics. The goal to make CBT exercises enjoyable was also a success, since over 90% of the participants had a good time playing the game.

While the feedback we got consisted mostly of positive comments, it also put forward some things that still needed improvement. For example, a lot of users were wondering why the storyline did not change after completing minigames and they indicated that they would like more feedback when playing the game. Overall, we can conclude that this game, especially when small feedback aspects are integrated, is a fun way to experience CBT inspired exercises.

Future work

With the insights gained from the demo day and the second round of user testing, the next steps can be determined. The development of the prototype should be continued, as well as the creation of additional CBT-based minigames to increase play time. To create those minigames, more in-depth research into Cognitive Behavioral Therapy, as well as other types of existing therapy games, is required. An expert conversation with a professional therapist would be a beneficial addition to this research. This could potentially, yet not necessary, include a third round of user testing with actual CBT users.

LightMind should be released on the Play Store and the development of an IOS version is also a necessity. Currently LightMind is only available on Android, since the development policy of IOS is way stricter than Android's policy.

Acknowledgements

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Appendix

Appendix 1: Link to Game
The app that was created for this project can still be installed on phones that run on Android. To install it, click the following link:

https://drive.google.com/file/d/1IEVJu4QKA6FCYiswhgMKVdkmM-s8RuLf/view

Appendix 2: CBT worksheets

Think CBT
Cognitive Behavioural Therapy

Exercise 5 – Personal Values

The next part of the initial assessment phase in the CBT process involves exploring and specifying your personal values. Clients often say that they have lost contact with their values or their sense of identity in attempts to cope with their problems. We often get so caught up in attempting to prevent, avoid or stop what we don't want, that we lose sight of who we are and what we do want.

Identifying values provides a basis for reconnecting with identity, for focusing on the areas of our life that are important to us and for re-establishing a sense of personal integrity in the choices we make. If our goals are the "What", our values provide the "Why".

The statements in the following exercise are not a definitive list of all human values, however they may provide a prompt to help identify the things that are important to you now and the values that will be instrumental in supporting how you want to be in the future.

Value Description	Highly Important	Moderately Important	Less Important
Accepting: Open to and willing to experience thoughts and feelings without resistance or judgement.			
Affectionate: Displaying and expressing love or strong feelings for others.			
Aspiring: Actively seeking opportunities and striving for success.			
Assertive: Respectfully standing up for my rights and balancing my needs with the needs of others.			
Authentic: Being genuine, honest and true to myself.			
Caring: Helpful and considerate to myself and others.			
Challenging: Willing to examine and challenge unhelpful or unworkable patterns of behaviour.			
Compassionate: Recognising and acting to alleviate suffering for myself and others.			
Conforming: Respectful and obedient of helpful rules and obligations.			
Cooperating: Working collaboratively and harmoniously with others.			
Courageous: Brave and persistent in the face of fear, threat or difficulty.			

Value Description	Highly Important	Moderately Important	Less Important
Creative: Imaginative, resourceful and innovative.			
Curious: Open-minded, exploratory and interested in new and alternative approaches.			
Emotionally aware: Receptive to my own feelings and the feelings of others.			
Encouraging: Promoting and rewarding behaviour that I value in myself and others.			
Equality: Treating others fairly, consistently and equally.			
Fairness: Just, rational and reasonable.			
Fitness: Maintaining or improving my physical, psychological and emotional wellbeing.			
Flexible: Adjusting and adapting readily to changing circumstances.			
Forgiving: Coming to terms with or letting go of negative feelings towards myself and others.			
Friendliness: Friendly and companionable towards others.			
Generosity: Sharing and offering time, attention and resources to myself and others.			
Gratitude: Appreciative and valuing of the things that I have in my life.			
Honesty: Truthful and sincere with myself and others.			
Humility: Modest about my contributions whilst allowing my achievements to speak for themselves.			
Humour: Seeking out and engaging in the humorous side of life; not taking myself too seriously.			
Independent: Self-directive, contained and able to support myself.			
Industrious: Hard-working and productive with my time and resources.			
Open-minded: Approaching issues from an objective position, listening and considering other views.			

Value Description	Highly Important	Moderately Important	Less Important
Orderly: Planning, prioritising and being organized in my life.			
Patient: Waiting calmly and in line for what I want or need.			
Respectful: Polite, considerate and showing positive regard to others.			
Safe: Acting in a secure, protective and stable manner.			
Self-aware: Aware of my own thoughts, feelings and actions, considering how I come across to others.			
Self-disciplined: Acting according to my values and commitments, over my mood or vulnerabilities.			
Tenacious: Persisting despite problems and difficulties and without giving up.			
Tolerant: Coming to terms with, acknowledging and respecting things that clash with my own opinions.			
Trusted: Discrete, loyal, faithful, sincere and reliable.			
Other:			
Other:			

Priority	Which of the above values will be instrumental in the achievement of my personal goals?
1.	
2.	
3.	
4.	
5.	
6.	

Negative Core Beliefs

Negative core beliefs are fundamental, absolutist and generalised beliefs that we hold about ourselves, other people, the world and the future. Negative core beliefs develop in response to early life experiences and can be divided into three categories covering helplessness, lovability and worthlessness. Examples include:

Helplessness Beliefs
- I am vulnerable, weak, needy, a victim, likely to be hurt.
- I am stupid, ineffectual, incompetent, can't cope.
- I am inferior, a failure, a loser, defective, not good enough.

Unlovability Beliefs:
- I am unlikable, unwanted, will be rejected or abandoned, always be alone.

- I am undesirable, unattractive, boring, have nothing to offer.
- I am different, flawed, weird, not normal.

Worthlessness Beliefs:
- I am worthless, unacceptable, crazy, broken, nothing.
- I am dangerous, toxic, bad, evil,
- I deserve punishment, pain, suffering.

Although negative core beliefs are often difficult to identify, use this box to record any core beliefs that may have influenced your wider thinking patterns:

Negative Core Beliefs -

Exercise 15 - The Self Perception Continuum – How do you value yourself?

Totally Worthless	Totally Worthwhile
0%	100%
Insulting	Respectful
Selfish	Kind
Lazy	Productive
Spiteful	Gracious
Cold	Warm
Taking	Giving
Biased	Fair
Cruel	Compassionate
Abusive	Supportive
Avoidant	Willing
Callous	Sensitive
Indifferent	Caring
Deceitful	Honest
Neglectful	Attentive
Hostile	Receptive

Three-Minute Breathing Space

The three-minute breathing space is a quick exercise that is undertaken in three steps:

- The first minute is spent on answering the question, "how am I doing right now?" while focusing on the feelings, thoughts, and sensations that arise and trying to assign these words and phrases.
- The second minute is spent on keeping awareness on the breath.
- The last minute is used for an expansion of attention from solely focusing on the breath, to feeling physical sensations and how they affect the rest of the body.

For a guided version of the three-minute breathing space, watch **this video**.

Other recommended MBCT techniques are discussed below.

Appendix 3: Consent Form

Subject information for participation in scientific research

Serious Games to Promote Positive Mental Health and Wellbeing

Introduction

Dear Sir/Madam,

You are asked to take part in a scientific study.
Participation is voluntary. Participation requires your written consent. Before you decide whether you want to participate in this study, you will be given an explanation about what the study involves. Please read this information carefully and ask the investigator for an explanation if you have any questions. You may also discuss it with your partner, friends or family.

General information

A strength-focused view of mental health is becoming popular, which proactively focuses on positive
mental health factors e.g. positive emotions, individual strengths, relationships, etc. Digital games offer
immense potential with immersive and expressive elements (mechanics/dynamics/ aesthetics) to promote
positive mental health. We are working on 'Designing serious games/play experiences to stimulate
positive thinking and attitude among players'. In simple words, we would try to answer how games can
bring more joy and wellbeing for people, by diving into challenges like how to conceptualize positive
character traits such as gratitude, optimism, etc. in game design.

For this study 15-20 participants in the age category of 18-25 are required.

Purpose of the study
The purpose of this study is to find out if the game we created is motivating to play. We would like your opinion on how you experienced playing this game. This is so that we can improve the game and make it more engaging and fun to play.

What participation involves
During the study, the following will happen:
- Data will be collected through a questionnaire and/or interview about your experience of the game.
However, the study might involve participants to be self-aware of their feelings.
Participation in gameplay and the followup survey is completely voluntary and participants can stop at any time if they are not comfortable.

What is expected of you
In order to carry out the study properly it is important that you give your opinion without any restriction.

It is important that you contact the investigator:
if you no longer want to participate in the study.
if your contact details change.

If you do not want to participate or you want to stop participating in the study
It is up to you to decide whether or not to participate in the study. Participation is voluntary. If you do participate in the study, you can always change your mind and decide to stop, at any time during the study. You do not have to say why you are stopping, but you do need to tell the investigator immediately.
The data collected until that time will be discarded at that time.

If there is any new information about the study that is important for you, the investigator will let you know. You will then be asked whether you still want to continue your participation.

End of the study
Your participation in the study stops when
you choose to stop
the end of the entire study has been reached (at latest 29-01-2021)
the investigator considers it best for you to stop
Eindhoven University of Technology, the government or Ethical Review Board, decides to stop the study.

The study is concluded once all the participants have completed the study.

Usage and storage of your data
Your personal data will be collected, used and stored for this study. This concerns data such as your age. The collection, use and storage of your data is required to answer the questions asked in this study and to publish the results. We ask your permission for the use of your data

Confidentiality of your data
To protect your privacy, your data will be given a code. Your name and other information that can directly identify you, will be omitted. Data can only be traced back to you with the encryption key. The encryption key remains safely stored in the local research institute. The data that is sent to any assessors will only contain the code, not your name or other data with which you can be identified. The data cannot be traced back to you in reports and publications about the study.

Access to your data for verification
Some people can access all your data at the research location. Including the data without a code. This is necessary to check whether the study is being conducted in a good and reliable manner. Persons who have access to your data for review are Mart Jonkman, Lara Potma, Thomas Wezel, Jula Sanders and Aakash Johry: the committee that monitors the safety of the study, a controller / monitor working for the TU/e. They will keep your data confidential. We ask you to consent to this access.

Retention period of your data
Your data must be kept for 5 years at the research location.

Withdrawing consent
You can withdraw your consent to the use of your personal data at any time. This applies to this study. The study data collected until the moment you withdraw your consent will still be used in the study.

More information about your rights when processing data
For general information about your rights when processing your personal data, you can consult the website of the Dutch Data Protection Authority.

If you have questions about your rights, please contact the person responsible for the processing of your personal data. For this study, that is:

 TU/e project group Serious Games to Promote Positive Mental Health and Wellbeing: See Appendix A for contact details.

If you have questions or complaints about the processing of your personal data, we advise you to first contact the research location. You can also contact the Data Protection Officer of the institution at Eindhoven University of Technology (Appendix A) or the Dutch Data Protection Authority.

Any questions?
If you have any questions, please contact Mart Jonkman, Lara Potma, Thomas Wezel or Jula Sanders.
If you have any complaints about the study, you can discuss this with the investigator. If you prefer not to do this, you may contact the Project Coach: Aakash Johry. All the relevant details can be found in Appendix A: Contact details.

Signing the consent form
When you have had sufficient time for reflection, you will be asked to decide on participation in this study. If you give permission, we will ask you to confirm this in writing on the appended consent form. By your written permission you indicate that you have understood the information and consent to participation in the study. The signature sheet is kept by the investigator. Both the Investigator and yourself receive a signed version of this consent form.

Thank you for your attention.

Appendices to this information

A.   Contact details

B.   Informed Consent Form

Appendix A: contact details for Project Group games for mental health and Wellbeing

Mart Jonkman: m.jonkman@student.tue.nl
                                 -
Lara Potma: l.a.potma@student.tue.nl
              +31627223624

Jula Sanders: j.r.sanders@student.tue.nl
              +31619637818

Thomas Wezel: t.s.wezel@student.tue.nl
              +31625475135

Project Coach of the institution (TU/e):

Mr. A (Aakash) Johry: a.johry@tue.nl

Data Protection Officer of the institution (TU/e):

Ms. A.H.J. (Annuska) van den Eijnden: 040-2476079 dataprotectionofficer@tue.nl

For more information, questions or complaints about your rights: privacy@tue.nl

Appendix B: Consent Form
Serious Games to Promote Positive Mental Health and Wellbeing

I have read the subject information form. I was also able to ask questions. My questions have been answered to my satisfaction. I had enough time to decide whether to participate.
I know that participation is voluntary. I know that I may decide at any time not to participate after all or to withdraw from the study. I do not need to give a reason for this.
I give permission for the collection and use of my data to answer the research question in this study and for the registration of the study product.
I know that some people may have access to all my data to verify the study. These people are listed in this information sheet. I consent to the inspection by them.

I
__ do   __do not
consent to keep my data, after the research is finished

I want to participate in this study.

Name of study subject:
Signature:
                                Date: __ / __ / __

I hereby declare that I have fully informed this study subject about this study.

If information comes to light during the course of the study that could affect the study subject's consent, I will inform him/her of this in a timely fashion.

Name of investigator (or his/her representative):
Signature:
                                Date:__ / __ / __

Appendix 4: User test 1

Game review questionnaire

Hello, thank you for taking part in our user test. We made this usertest for our game, which is based on cognitive behavioral techniques to see if it can impove the mood of users. This user test will consist of five parts. The First part will be The Positive and Negative Affect Schedule (PANAS). This is a self-report questionnaire that consists of two 10-item scales to measure both positive and negative affect. In the second part you will be asked to play the game that we developed for 20 minutes. In the third part we ask you to fill in the PANAS questionnnaire again to see the difference of positive and negative affect before and after playing our game. The fourth part is a Player Experience Inventory (PXI), which will help us in further developing our game. In the fifth and last part we ask for any feedback on our game.

Volgende

Game review questionnaire

*Vereist

Characteristics

What is your birth year? *

Jouw antwoord

What is your gender? *

○ Female

○ Male

○ Anders:

Vorige   Volgende

PANAS part 1

In the questions below indicate the extent you have felt this way over the past week.

Interested

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Distressed

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Excited

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Upset

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Strong

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Guilty

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Scared

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Hostile

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Enthusiastic

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Proud

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Irritable

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Alert

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Ashamed

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Game review questionnaire

PXI questionnaire

The questions of the questionnaire are from the Player Experience Inventory (PXI). These questions will be able to asess how our game performs and make design decisions based on this questionnaire.

Playing the game was meaningful to me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game felt relevant to me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

Playing this game was valuable to me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I wanted to explore how the game evolved. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I wanted to find out how the game progressed. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt eager to discover how the game continued. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

Inspired

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Nervous

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Determined

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Attentive

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Jittery

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Active

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Afraid

	1	2	3	4	5	
Very slightly or not at all	○	○	○	○	○	Extremely

Vorige   Volgende

Game review questionnaire

Game play

In this part you are going to play the game for 20 minutes. After you are finished playing the game continue to the next part.

Vorige   Volgende

I felt I was good at playing the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt capable while playing the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt a sense of mastery playing this game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt free to play the game in my own way. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt like I had choices regarding how I wanted to play this game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt a sense of freedom about how I wanted to play this game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I was no longer aware of my surroundings while I was playing. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I was immersed in the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I was fully focused on the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game informed me of my progress in the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I could easily assess how i was performing in the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game gave clear feedback on my progress towards the goals. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I enjoyed the way the game was styled. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I liked the look and feel of the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I appreciated the aesthetics of the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game was not too easy and not too hard to play. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game was challenging but not too challenging. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The challenges in the game were at the right level of difficulty for me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

It was easy to know how to perform actions in the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The actions to control the game were clear to me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I thought the game was easy to control. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I grasped the overall goal of the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The goals of the game were clear to me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I understood the objectives of the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I liked playing the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game was entertaining. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I had a good time playing this game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

Vorige Volgende

Game review questionnaire

Feedback

Do you have any feedback on our game?

Jouw antwoord

Vorige Volgende

Thank you!

Thank you for participating in our usertest. You can now send the usertest and close this window.

Vorige Verzenden

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Appendix 5: User test 2

Game review questionnaire

Hello, thank you for taking part in our user test. We made this user-test for our game, which is based on cognitive behavioural techniques to see if it can improve the mood of users.

We are working on 'Designing serious games/play experiences to stimulate positive thinking and attitude among players'. In simple words, we would try to answer how games can bring more joy and wellbeing for people, by diving into challenges like how to conceptualize positive character traits such as gratitude, optimism, etc. in game design.

This user test will consist of five parts. The first part will be The Brunel Mood Scale (BRUMS). It is a 24-item questionnaire of simple mood descriptors, which we would like to fill in how you are feeling at the moment. In the second part, you will be asked to play the game for 10-15 minutes. In the third part, we ask you to fill in The Brunel Mood Scale again to see the difference when having played our game. The fourth part is a Player Experience Inventory (PXI), which will help us in further developing our game. In the fifth and last part, we ask for any feedback on our game.

During the study, the following will happen:
Anonymous data will be collected through a questionnaire about your experience of the game.
The study might involve participants to be self-aware of their feelings. Participation in gameplay and the followup survey is completely voluntary and participants can stop at any time if they are not comfortable.

It is up to you to decide whether or not to participate in the study. Participation is voluntary. If you do participate in the study, you can always change your mind and decide to stop, at any time during the study. The data collected until that time will be discarded at that time.

If there are any questions or uncertainties, please do not hesitate to contact one of the following:
Mart Jonkman: m.jonkman@student.tue.nl
Lara Potma: l.a.potma@student.tue.nl
Jula Sanders: j.r.sanders@student.tue.nl
Thomas Wezel: t.s.wezel@student.tue.nl

* Required

I give my informed consent to participation in this study *

○ Yes
○ No

Next

Game review questionnaire

*Vereist

Characteristics

What is your birth year? *

Jouw antwoord

What is your gender? *

○ Female
○ Male
○ Anders:

Vorige   Volgende

Brunel Mood Scale part 1

Below is a list of words that describe feelings people have. Please read each one carefully and then select the answer that best describes HOW YOU FEEL RIGHT NOW. Make sure you respond to every word.

Annoyed (geërgerd)

| | 0 | 1 | 2 | 3 | 4 | |
| Not at all | ○ | ○ | ○ | ○ | ○ | Extremely |

Confused (verward)

| | 0 | 1 | 2 | 3 | 4 | |
| Not at all | ○ | ○ | ○ | ○ | ○ | Extremely |

Depressed (teneergeslagen)

| | 0 | 1 | 2 | 3 | 4 | |
| Not at all | ○ | ○ | ○ | ○ | ○ | Extremely |

Worn out (vermoeid)

| | 0 | 1 | 2 | 3 | 4 | |
| Not at all | ○ | ○ | ○ | ○ | ○ | Extremely |

Panicky (paniekerig)

| | 0 | 1 | 2 | 3 | 4 | |
| Not at all | ○ | ○ | ○ | ○ | ○ | Extremely |

Lively (levendig)

| | 0 | 1 | 2 | 3 | 4 | |
| Not at all | ○ | ○ | ○ | ○ | ○ | Extremely |

Energetic (energiek)

| | 0 | 1 | 2 | 3 | 4 | |
| Not at all | ○ | ○ | ○ | ○ | ○ | Extremely |

Exhausted (uitgeput)

| | 0 | 1 | 2 | 3 | 4 | |
| Not at all | ○ | ○ | ○ | ○ | ○ | Extremely |

Muddled (verward)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Bitter (verbitterd)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Angry (boos)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Downhearted (in de put)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Unhappy (ongelukkig)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Anxious (ongerust)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Worried (bezorgd)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Mixed-up (in de war)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Sleepy (slaperig)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Active (actief)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Bad-tempered (slecht gehemeurd)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Uncertain (onzeker)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Miserable (ellendig)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Tired (moe)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Nervous (nerveus)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Alert (opgewekt)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Back   Next

Game play

In this part you are going to play the game for 10-15 minutes. After you are finished playing the game continue to the next part.

Here is a download link to the game in case you need to download it:
https://drive.google.com/file/d/1IEVJu4QKA6FCYiswhgMKVdkmM-s8RuLf/view

Back   Next

Brunel Mood Scale part 2

Below is a list of words that describe feelings people have. Please read each one carefully and then select the answer that best describes HOW YOU FEEL RIGHT NOW. Make sure you respond to every word.

Annoyed (geërgerd)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Confused (verward)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Depressed (teneergeslagen)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Worn out (vermoeid)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Panicky (paniekerig)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Lively (levendig)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Energetic (energiek)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Exhausted (uitgeput)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Muddled (verward)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Bitter (verbitterd)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Angry (boos)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Downhearted (in de put)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Unhappy (ongelukkig)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Anxious (ongerust)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Worried (bezorgd)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Mixed-up (in de war)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Sleepy (slaperig)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Active (actief)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Bad-tempered (slecht gehemeurd)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Uncertain (onzeker)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Miserable (ellendig)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Tired (moe)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Nervous (nerveus)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Alert (opgewekt)

	0	1	2	3	4	
Not at all	○	○	○	○	○	Extremely

Back   Next

PXI questionnaire

The questions of the questionnaire are from the Player Experience Inventory (PXI). These questions will be able to asess how our game performs and make design decisions based on this questionnaire.

Playing the game was meaningful to me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game felt relevant to me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

Playing this game was valuable to me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I wanted to explore how the game evolved. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I wanted to find out how the game progressed. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt eager to discover how the game continued. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt I was good at playing the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt capable while playing the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt a sense of mastery playing this game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt free to play the game in my own way. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt like I had choices regarding how I wanted to play this game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I felt a sense of freedom about how I wanted to play this game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I was no longer aware of my surroundings while I was playing. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I was immersed in the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I was fully focused on the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game informed me of my progress in the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I could easily assess how i was performing in the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game gave clear feedback on my progress towards the goals. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I enjoyed the way the game was styled. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I liked the look and feel of the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I appreciated the aesthetics of the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game was not too easy and not too hard to play. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game was challenging but not too challenging. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The challenges in the game were at the right level of difficulty for me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

It was easy to know how to perform actions in the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The actions to control the game were clear to me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I thought the game was easy to control. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I grasped the overall goal of the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The goals of the game were clear to me. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I understood the objectives of the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I liked playing the game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

The game was entertaining. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

I had a good time playing this game. *

	1	2	3	4	5	6	7	
strongly disagree	○	○	○	○	○	○	○	stronly agree

Vorige   Volgende

Game review questionnaire

Feedback

Do you have any feedback on our game?

Jouw antwoord

Vorige   Volgende

Thank you!

Thank you for participating in our usertest. You can now send the usertest and close this window.

Vorige   Verzenden

Appendix 5: Working in Unity
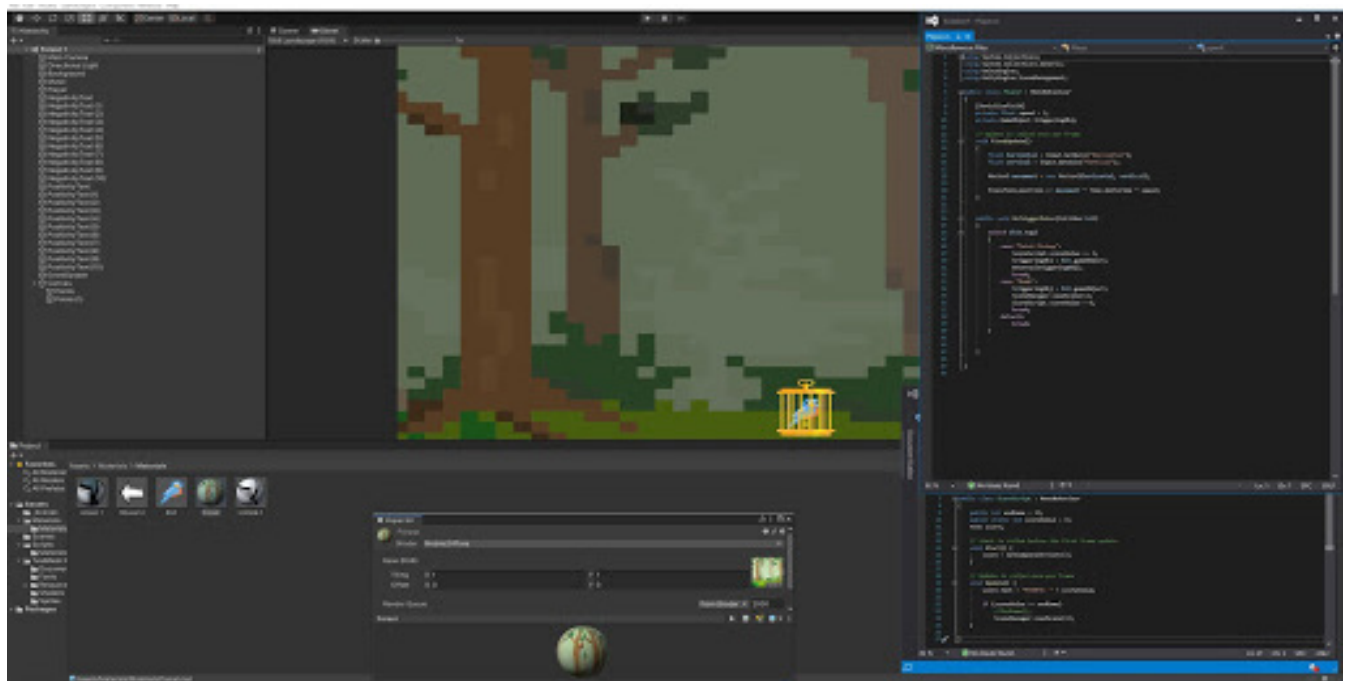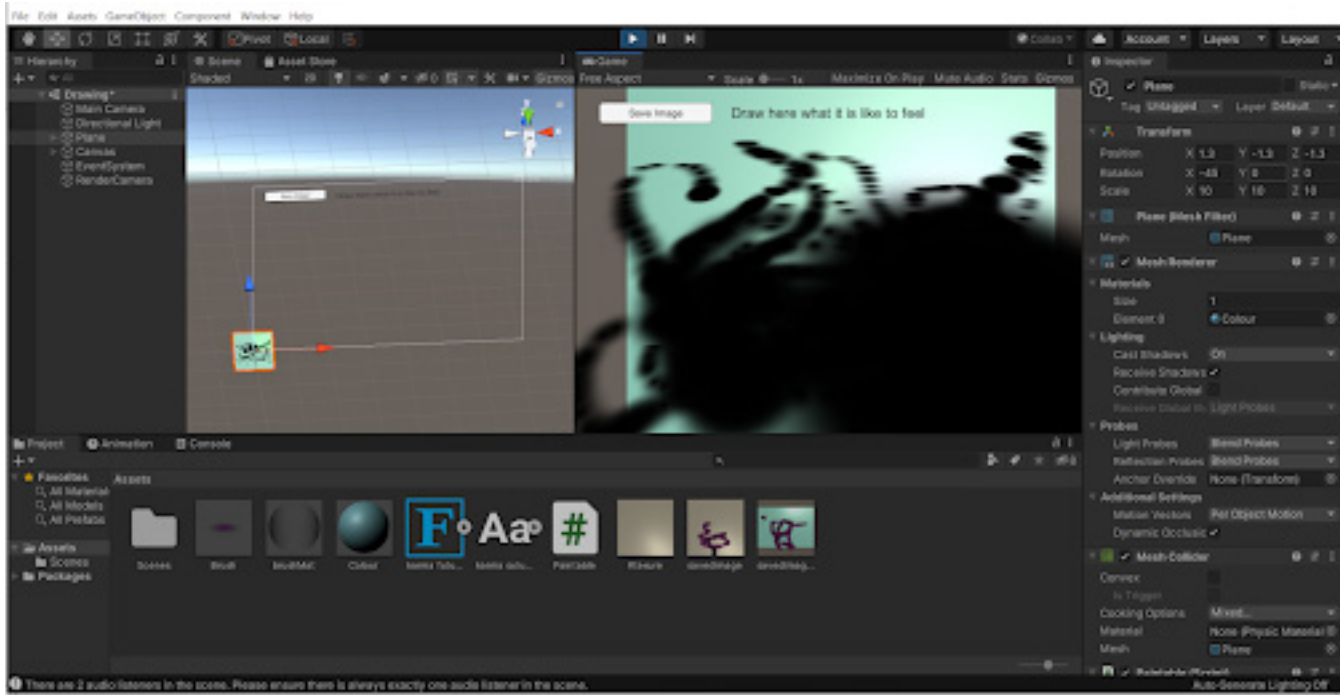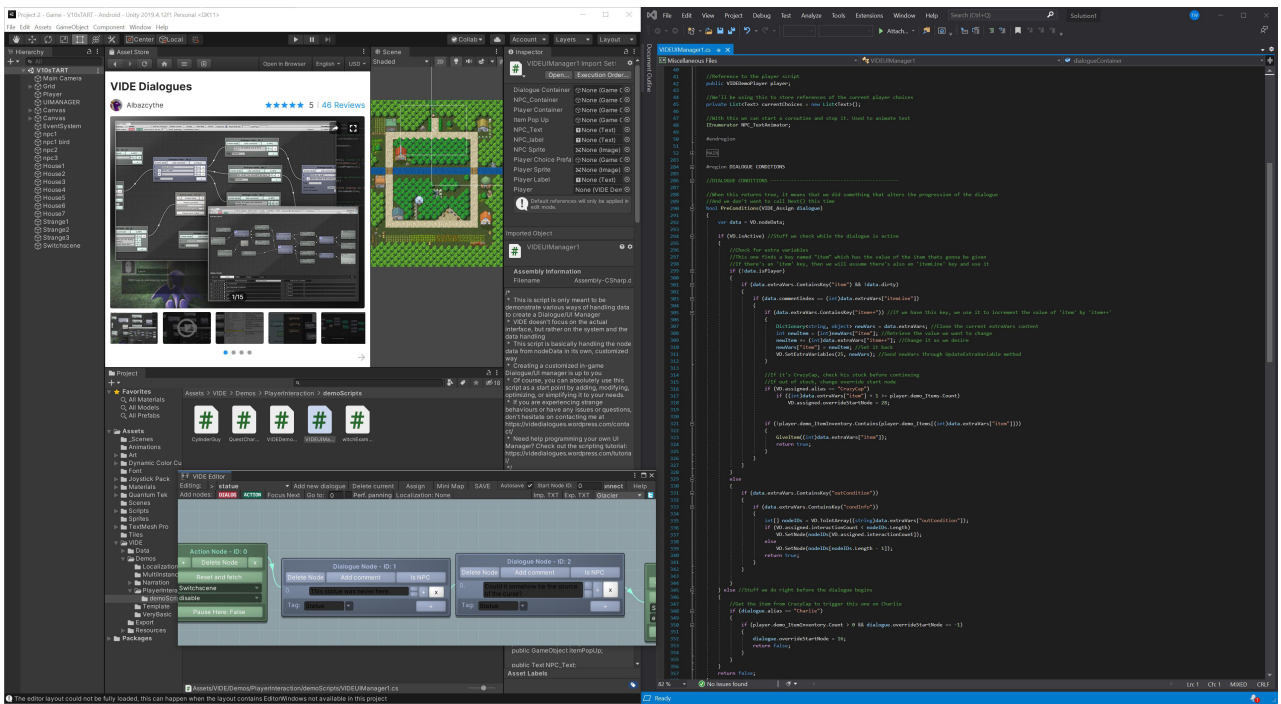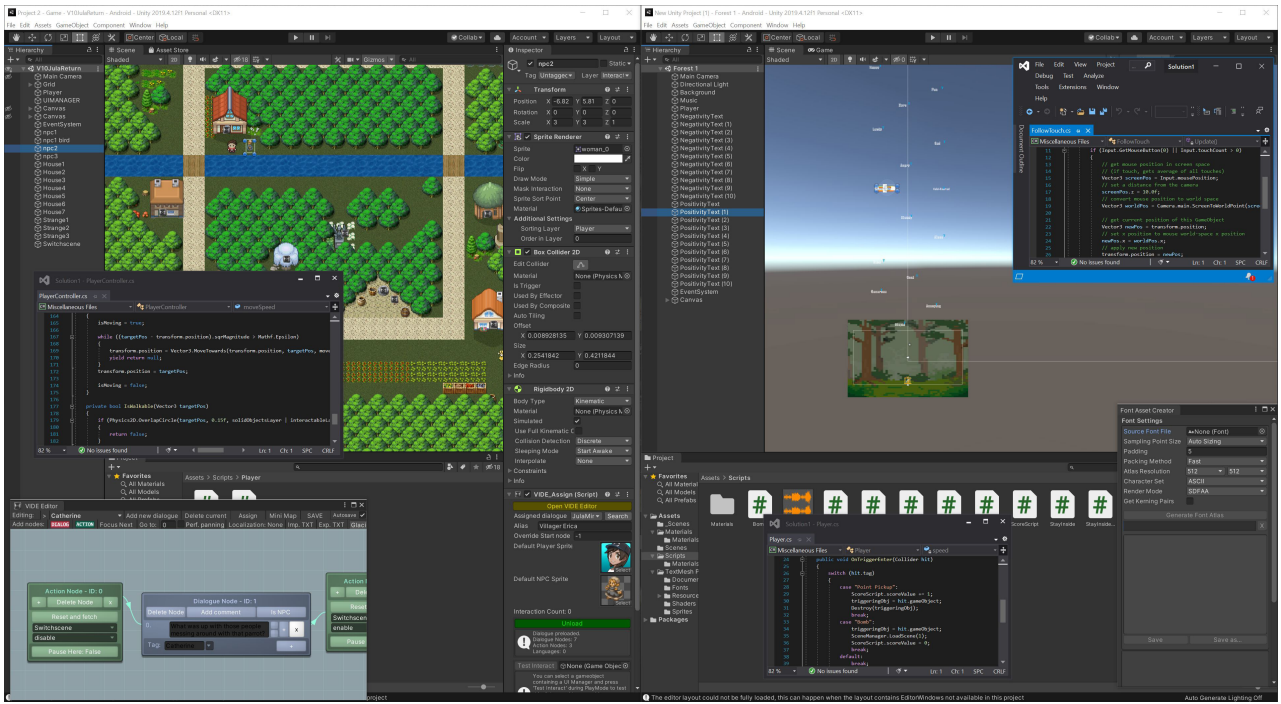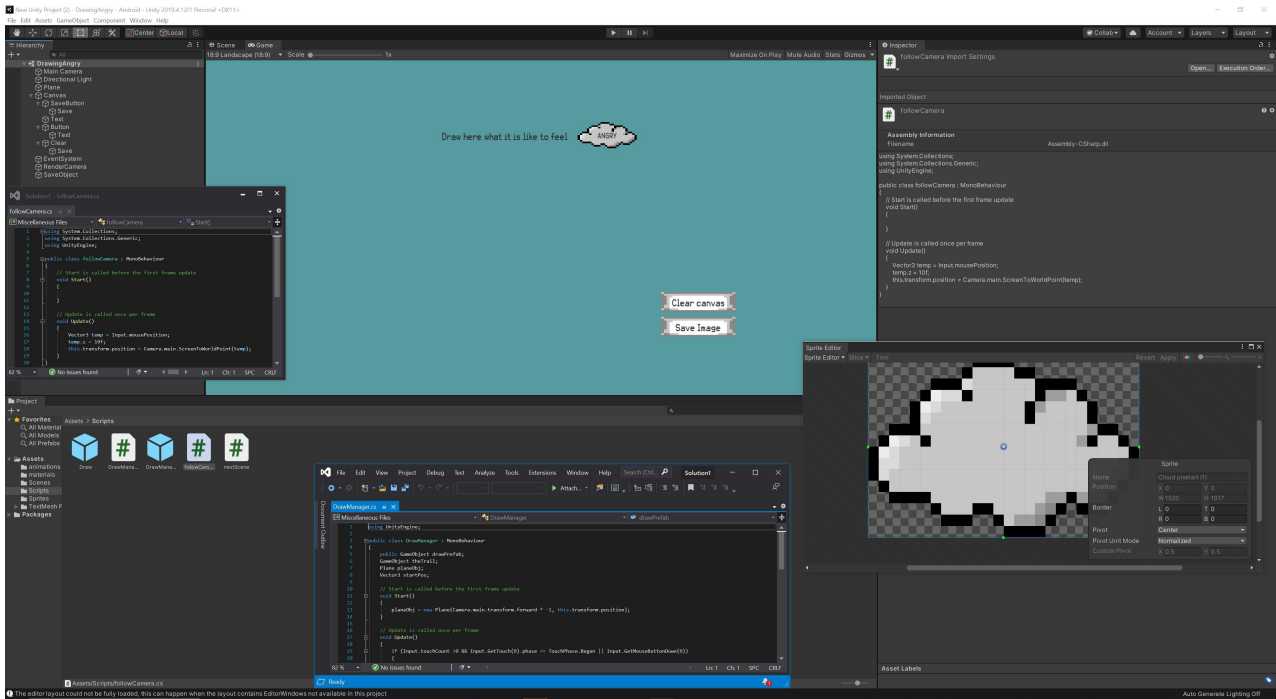
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V3.apk	09/11/2020 18:12	APK File	22.330 KB
V4.apk	11/11/2020 13:48	APK File	22.330 KB
V5.apk	11/11/2020 14:44	APK File	22.330 KB
V6.apk	11/11/2020 15:06	APK File	22.330 KB
V7.5.apk	11/11/2020 16:27	APK File	22.330 KB
V7.apk	11/11/2020 16:21	APK File	22.330 KB
V8.apk	11/11/2020 17:27	APK File	20.902 KB
V9.apk	11/11/2020 19:51	APK File	23.272 KB
V10.apk	12/11/2020 21:18	APK File	29.236 KB
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V11.apk	24/11/2020 13:05	APK File	31.463 KB
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V12.7.apk	09/12/2020 12:37	APK File	32.344 KB
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V13.3.apk	13/12/2020 21:50	APK File	22.827 KB
V13.4.apk	13/12/2020 22:10	APK File	22.827 KB
V13.5.apk	13/12/2020 22:19	APK File	22.827 KB
V13.6.apk	13/12/2020 22:24	APK File	22.827 KB
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V13.apk	09/12/2020 13:36	APK File	32.344 KB
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V16.5.apk	15/12/2020 22:25	APK File	31.996 KB
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V16.9.apk	15/12/2020 22:58	APK File	31.996 KB
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V17.1.apk	15/12/2020 23:21	APK File	31.996 KB
V17.apk	15/12/2020 23:09	APK File	31.996 KB
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V18.2.apk	16/12/2020 16:14	APK File	32.091 KB
V18.3.apk	16/12/2020 16:23	APK File	32.090 KB
V18.apk	16/12/2020 15:15	APK File	32.090 KB
V19.1.apk	16/12/2020 20:24	APK File	32.091 KB

List of versions of our game