

The Creation, Development and Reception of 'Orb Sort'

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The video game industry has seen an incredible increase in popularity, diversity, and financial income within this century. A survey conducted by the Electronic Software Association shows that 'more than 214 million people in the United States today play video games one hour or more per week' and that approximately 46 million people that play games have disabilities (theesa.com, 2020) Furthermore, the video game market has more than doubled in value over the last 8 years at \$159.3 billion and is predicted to be worth more than \$200 billion by 2023 according to We PC. As someone who often plays video games and has learning disabilities, I decided that making a Unity game integrated with FMOD was the best option for me. Not only does it appeal to me as a music producer and a 'gamer', but it also gives me invaluable experience in producing audio for this industry.

When approaching this project, my first broad concept was to create an interactive experience that can engage the user in a calming and meditative way. Considering the current climate of the world, games that help distract and improve people's mentality and wellbeing are very important. There have been numerous studies regarding mental wellbeing and playing certain video games, including the famous case of *Tetris* helping road traffic accident witnesses with PTSD. Playing games of that nature helped alleviate intrusive thoughts within the test subjects, both in the short term and the long term. In the researcher's interpretation, they clarified that 'the important thing is that task is visually demanding, as opposed to a verbally demanding task such as filling in crosswords or reading.' (nhs.uk, 2017) Whilst I do not aim for my game to help severe, medical mental conditions, the fact that the visual aspect is key to help distract the brain is valuable.

I integrated this into my project by mimicking the bright colours used in the visually demanding games. However, to balance this characteristic with the goal of creating something calming, I decided to use pastel shades of pink, blue, green, and yellow combined with an emission glow. Multiple sources from design websites claim pastel colours as calming and gentle. An Australian study on how a participant's mood is affected by the colour of their walls found that 'pastel colours such as light green, lilac and blue were likely to make the participants feel calm, while brighter colours such as yellow, orange and pink made them feel more upbeat and excitable.' (The Telegraph, 2018) This, alongside the statement that they complement neutral colours, helped design the surrounding area in the game, including the sound orbs, orb boxes and the game floor.

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Another area of research I investigated was sensory toys for children and adults. A running theme, like the visually demanding games, was the use of bright colours. Some examples of this include ball pits, various fidgeting toys, and multi-coloured playing dough. This further backs up my decision to use such colours in my project, again with the caveat of changing them to pastel to help calm the player. Furthermore, a sensory game by Project: EVO was used in a study involving children with ADHD, with its results showing that it has potential to be a significant factor in combating this sensory issue:

“After playing the game for a month, parents of seven of the kids with both sensory issues and ADHD reported enough improvement in their children for kids to no longer meet the clinical definition for ADHD, the study found.” (Reuters, 2017)

This research guided the project into a more sensory route. Whilst certain senses – such as taste and smell – could not be replicated with the resources I had, I attempted to recreate sound, sight, and touch within the game. The ball pit containing the multiple sound orbs was directly inspired by the effect ball pits have in real life. To fit with the ambient score and the overall atmosphere, the sound orbs make a soft sound made by pitching down a celeste VST and exporting the hits individually. I made sure that everything was exported in the key of G so that it harmonises with the score as well as the low volume hum the orbs emit. To add variety, I included notes not in the G major triad, but decreased their probability of triggering so that there is not much dissonance in the overall product.

The area that I first concentrated my effort on was the ball pit, the sound orbs, and the orb dispenser. Creating the sound orbs helped give the overall project a basis on what the final project will sound and look like. I created the hum by first producing an ethereal and seamless loop using a reversed chime sample. By using the blur function found in FL Studio’s Edison, I was able to produce a perfect loop that had a continuous drone sound but also did not have a definable melody. On top of this, I added a scatterer instrument with several synthetic whistles. The aim for this design was to make the sound orb seem friendly and almost sentient, as well as give off the same calming feeling as the pastel shades. Whilst I was happy that the collision and hum events were functional, I thought later in the process that they could use some more personality other than their colour. As such, I changed the sounds in the scatterer instrument for each colour of ball, giving them their own audible personality. This goes in hand with the research I had about synaesthesia. The concept of hearing colour or seeing sound came to me while researching sensory games, which fit the atmosphere that I

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was aiming for early on. I also utilised this because being able to see sound or hear colour is something that can easily be put into this project. To develop these sounds, I concentrated on the original sound used and imagined how each colour would vary on this. For example, I kept the original sound on the sky-blue orb as to me it represented the whistling of wind and birds in flight.

When creating the previously mentioned game objects, I came across a problem that changed the way I took this project. I realised that whilst an enjoyable experience for the player, it would not necessarily engage or distract them for that long. Furthermore, rendering hundreds of different orbs all emitting sound and colliding with each other would have majorly affected the game's performance, as well sounded dissonant and unpleasant. Considering that I wanted this project to be meditative and engaging as well as playable on basic computers and smartphones, I had to create something that engaged the players mind whilst simultaneously using less orbs. The final decision was to make a sorting game, using the colour coding of the orbs as a variable in the sorting process. This mechanic is like the ones found in games like *Candy Crush Saga*, another pioneering game in the industry. Adapting this mechanic into my game will create a meditative but focused atmosphere for the player, like the ones found in games that help treat PTSD in the study above. This also meant I could cut down on the number of orbs in the game, as having too many would drag out the player's experience to the point of boredom. I settled on four per colour, as I thought it was the best balance of effectiveness and the players attentiveness.

Once this decision was made, I went about creating a box for the orbs to be sorted into. After creating the box model in Blender, I positioned the boxes in the four corners of the map to let the player utilise the entire space rather than going back and forth between the same two places. I also made sure that the ball-pit was close to the boxes, which will give players the ability to throw from the edge of the pit. As players often try and find the quickest way to achieve their goal, giving them the option of sorting the orb without leaving the pit satisfies this thought process. During playtesting, I discovered that, while possible, it was very hard to do, which is a perfect balance for this type of tactic as it will entice players into successfully making the shot, which in turn will increase play time.

I decided to base some of the sorting mechanics off another game I personally used to calm down and distract myself, *Robot Roller-Derby Disco Dodgeball*. I used a similar picking up system, with the throwing system being more basic and 'weak' rather than the chargeable, 'strong' method of throwing in *Robot Roller-Derby Disco Dodgeball*. If I were to develop this game more, I would implement a better throwing system, so the player had more choice over the orbs trajectory, relying

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less on the bounciness of the orb and more on their own input. I believe this would give the player a better experience of the overall game. Some aspects of the game had to be tweaked so that all the elements worked together to create a seamless playing experience. This included increasing the box height and reducing the orb's bounciness, so the ball does not bounce out when sorted.

Unsurprisingly, this aspect of the project took the most time, used the most scripts and caused the most bugs. Some ideas on improving the game had to be abandoned due to its inability to work with the current build or were too complex to code. One area I had the most trouble with is having a button to press to trigger the end screen. I attempted it multiple ways, including making the button model interactable with raycasting and using a capsule collider to trigger the scene change when the player stood on it, but I constantly ran into coding problems. My workaround uses a UI button in the world space render mode placed on top of the button model. I made it clear what the button does by adding an image saying 'Finish!' in the game's font. Whilst the code was copied then adapted from the buttons in the main menu, the button did not trigger when clicked. This was due to the cursor being invisible while playing with the FPS Controller. After trying multiple solutions, the only way that was reliable was to use the escape key to unlock and show the cursor to click the button. I then wrote this change into the controls page so the player would know what to do. A similar problem would then occur in the finish screen, where the cursor was visible but locked to the centre of the screen, which was fixed with a custom script that unlocked the cursor then the scene starts.

Another area that I encountered problems with was the trigger inside the different boxes. As the code used for keeping score originally only applied to one object, putting four instances of the trigger caused issues, like triggering the game music multiple times. In the end I rectified this by making the sky box the only one that triggers the music, and as it is the box closest to the ball-pit's entrance, the chances of it being the first one the player uses are much higher. I then created a colour coded score counter for each box so the player would know which counter represented which box.

For creating the music in the main menu, I decided to take inspiration from games like *Animal Crossing* and *Stardew Valley*. I chose these games in particular because of their ability to connect, calm, and suitably distract their player. During last year, I continuously played these games during my spare time to distract from the negative surroundings the first lockdown brought. While the gameplay was the main factor that made us enjoy these games, the way the soundtracks were utilised enhanced the gaming experience. The instrumentation in both soundtracks is natural and

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appropriately compliment the game, rather than taking all the attention with intrusive melodies and mixing. Real instruments such as guitars, strings and drum kits are used throughout the games, with the occasional use of synthetic and electronic sounds where they fit the scene's atmosphere. As the main menu is a simple two-page system with elegant text and a marble background, I decided the least synths used the better. The instruments I ended up using were flutes, a string trio, celeste, various chord instruments, 3 different drum loops and a copious amount of rhythm loops, consisting of guitar riffs and soft percussion. Once I finished creating the animation when the main menu boots up, I created a simple jingle at 120BPM so that the notes would sync up to the text fading in. Later on in the process I did the same for the finish screen, but only with a one-shot instrument. Then, to connect the jingle and the loops together, I only used the first percussion fill so that the first part remains consistent no matter how many times you boot up. Finally, I kept the mastering and processing to a minimum so that the music was not too loud or distressing for the player. It was also done to help keep the overall sound below -24LUFS as is the standard for Sony. All of this was done to keep the general atmosphere of calm and friendliness while also engaging the player into the game from the first note.

When creating the looped soundtrack in FMOD, one of the main issues I noticed was the lack of connection between the end of bar 4 and the start of bar 1. The way I arranged it initially made the loop stand out in the game, especially after letting it play for a substantial amount of time. I decided to rectify this by adding percussion fills and flourishes at the end of bar 4. This kept the massive amount of variation that the loops have while making the whole track sound more seamless. I then added several rim and cymbal hits to the Flourish channel to link up the percussion fills to the beginning. For something that is so brief in the players gaming process, I believe that this event successfully sets the overall mood of the game while not being too repetitive or disconnected.

I decided to take a different, more calm approach toward the in-game music. First, I tracked the tempo of the players walking speed (approximately 120BPM) and set the tempo of my in-game music to 60BPM to create a calming atmosphere and to contrast the faster menu music. For my inspiration, I looked at how music is utilised in *Minecraft* by its composer *C418*. Once again, the game has a calming and understated soundtrack, with an innate ability to trigger memories of playing the game. This effect is something I attempted to utilise in my sound design, but the scope of both these games are incomparable, therefore I settled on getting as close as I can. As it is a sandbox game that is continuously played and not broken up into separate levels, I thought it would be a perfect match for my project. Another aspect I wanted to incorporate was the way a track subtly

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fades in and out of the game rather than have the same looping piece of music with different variations like the game menu level. To put my own input into the design, I decided to keep a quiet ambient drone on during the entire game, subtly fading in and out as the loop continues. Then, I composed a few melodic pieces and put them into a scatterer instrument, allowing them to play at any time. While on paper it looks like a loop like the menu music, it sounds and behaves in a completely different way, therefore evoking a different reaction from the player.

Easter eggs have been a part of the gaming industry since the beginning, with the first known easter egg being found in the 1979 game *Adventure* on the Atari 2600. Originally made in secret, the idea of hiding references, jokes and messages in games grew as the gaming industry blossomed. Nowadays, almost every AAA game has numerous easter eggs hidden around the levels. The Youtuber *FunWithGuru* outlines the majority of easter eggs found in games, demonstrating the lengths one must go through to find them. These range from simple interaction with an object, to getting your character to manoeuvre into secret hiding spaces, to multi-step processes against the clock. When considering easter eggs for my project, I decided to take inspiration from two game franchises that influenced my perception of games: *Portal* and *Call of Duty*. The easter egg is a simple 'passive' secret used by changing the play percentages in an FMOD multi-instrument. When holding a sky-coloured sound orb, you can hear the ambient hum it emits, alongside an occasional whistle controlled by a scatterer instrument. However, there is a 2% chance that the sound orb will emit a 'hello' in the same tone and melody as the whistles. This easter egg is partially inspired from the sound design of the Companion Cube and the radios in the *Portal* franchise. When near and holding these objects, they emit a sound appropriate for their purpose, such as the radio version of the song *Still Alive*. However, when taken to the right places or destroyed via the material emancipation grill, they emit secret messages about the truth behind Aperture Science. This idea of sentient objects is something I wanted to create from the concept, but in a less ominous way.

Another easter egg I considered putting in would be considered 'active' as it involves the player specifically interacting with a game object for the secret to occur. The idea involved the player finding a model of a bird hidden within the level, then placing it into the sky box. This is like the easter eggs that can be found in the *Call of Duty* zombie maps, except with less steps and complexity so that it could be reasonably found within a typical playthrough. When the bird is put into the sky box, the trigger would add more birdsong to the ambience soundscape while changing the footsteps to simulate bird feet on marble and metal. It would also trigger an ability to double jump, with the controller emitting a bird tweet on each jump. Whilst this idea did not make the final build due to

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time constraints and the debatable negative that it would detract from the meditative atmosphere, there are still game objects that hint at its existence. For instance, the hiding spot for the model would have been underneath the slope in the ball-pit, with a spotlight dimly lighting the bird. The spotlight is still there, but now lights the dark area just in case any orbs get lost underneath.

In the early stages of conceptualising my project, I researched into a game mechanic that I find personal interest in: microphone integration. Instead of it just being used to communicate to other players in the game, using your microphone to interact and successfully play the game is a rarely used technique in triple A games. Games like *Phasmophobia*, which uses your microphone to talk to the dead, are considered revolutionary. However, a quick look at the website *itch.io* shows hundreds of independent games that use voice control. The original plan in the purely meditative version of the project was to have a gigantic room where you can shout into the void, which would play back what you said with reverb, with the void occasionally speaking back reassuring phrases. However, after doing research into how you can implement that into FMOD and Unity, it would involve going deep into the API of the software, which I had no knowledge of coming into this project.

Nevertheless, if I were to continue this project again, microphone integration would be the first area I would implement and perfect.

When beta testing the game, I gave a functioning version of the project to my friends that knew enough about gaming to understand the mechanics. When asked about navigating the game, they said it was as clear and as simple as it can be, with the writing being legible but appropriate for the game. This bias towards regular game players in the beta test both benefitted and hindered the results that came back. Like the WEIRD (White, Educated, Industrialised, Rich, and Democratic) participant bias that plagues psychology research, having a beta test for a game that only has avid game players does not cover the full extent of what the game can offer. For instance, while the beta testers claimed that the font and text were legible, this may only be in comparison to games with more complex and detailed menu screens. As such, I made sure that the text was clear enough so that it is legible on even the smallest smartphone screen and made sure the font was legible even from an exaggerated distance.

One area that I did not fully consider when creating the game is accessibility issues. One of the game testers was colour-blind, which meant playing the game was much more difficult as some of the orbs looked similar or identical to each other. One way to solve this, like many games with

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numerous accessibility options, for instance, *The Last of Us: Part 2*, would be to have an options menu with an option to change the colours to ones detectable to people with different versions of colour blindness. Whilst this was the most obvious option, I decided to go a different path due to time and coding constraints. The way I rectified it was to attach the colour identifying sound of each of the orbs to their corresponding boxes. Then, so that identifying them would be easier, I put a box in each corner of the level, so the player does not hear multiple different sounds coming from different boxes. I then remixed the sound of the orbs and boxes so the personality sounds are more distinct and trigger more frequently, so it is easier to distinguish the orbs apart on sound alone.

Another visual issue that game up in play testing was the fact that the orbs and the boxes were the exact same colour. While in theory this is not a problem, in the game the orbs can be easily disguised by the boxes, meaning the player can lose sight of the orb as it camouflages next or close to the box. This became a big issue when lining up shots as the player had no easy frame of reference. There were several ways I attempted to solve this, such as adding an outline to the ball or just using the personality sound to identify the boxes. In the end I decided to change the emission hue of the boxes slightly so that the orb is clearer to see in front of the box while keeping its original colour.

Not all feedback was negative, however. Most of the people I gave the game to commented on the orb sound effects, enjoying the fact that they emit their own sounds depending on the colour. They only noticed the passive easter egg I implemented after I told them, however considering how little they played the game I do not think that this was an issue. Overall, I am happy with how the beta testing went, and it was a valuable experience having different people play my game for the first time.

Taking into consideration that I started with no knowledge in Unity and FMOD, I believe that my game turned out better than originally imagined. I stuck to my goal of creating a game that calms and distracts the mind, while taking alternative paths as to how the game plays and presents itself. Introducing a game mechanic with FMOD integration was a good decision in hindsight, as it gave the project an extra layer of interest for the player and complexity with the sound. If developed further, I would like to have expanded the map and the game mechanic to add extra rules or levels to increase its ability to distract and immerse the player, as well as being more likely to be replayed in the future. Another area that I would aim to improve on is adding options to make the game more accessible to all players. While it is accessible to people on basic computers and smartphones, it is not fully accessible to people with certain disabilities that impair the normal gaming experience.

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While most accessibility problems could not be solved by one inexperienced person with no budget, if the marketing went ahead as planned then the public interest, resources and financial incentive would help *Orb Sort* truly be a game for all.

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