



# SensEscape

An immersive escape room where  
**losing a sense** unlocks empathy

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## Abstract

Although modern technology has been significantly advanced over the past years and has helped us in many ways, it has also created a social rift amongst the interactions of people. Our phones have become an extension of ourselves, which many times blocks us from being able to interact or sit down and have a normal conversation without it. One thing, however, that is still the very essence of humanity is curiosity. We love to be curious and participate in things which seem to be interesting or intriguing, which is why creating a conversation about disabilities/sensory loss and how these people might interact with the world in their specific way would be a great way to bring all kinds of people together in a united experience. When we hear the word *disability*, many of us only think of those whose disabilities can be seen, such as those in a wheelchair, with a hearing aid, crutches, etc., but disabilities vary in a great range, both visually and otherwise.

This is summed up nicely in the blog article written by the blogger kitwan, [...] everyone's experience of disability is unique. The experience depends not only from disability conditions and associated secondary conditions. It is also influenced by one's attitude, the living environment and support received <sup>1</sup>. (Kitwan, blog, 2022)

## Why

This project will be from our own perspective of how we imagine someone with certain disabilities to perceive the world, and it will in no way be based on actual facts or information provided by those with disabilities. This project is however perfectly adapted for many of those who live with disabilities. In order to make this experience possible, and to be inclusive for any and all, an Escape Room called *SensEscape* will be created which has three different challenges to beat within a time limit. The main senses that will be explored in this project is vision, hearing, and speech, where other senses such as the tactile sense naturally are used. We feel it's extremely important to raise awareness of the struggles that those with disabilities may face in life, not necessarily from their actual disability, but rather from the social isolation and difficulty with integration in society that many times occur due to assumptions and misinterpretations from those who do not have disabilities. This experience is created for others to have a chance to step into the shoes of those with disabilities, but it is also perfectly adapted for those who actually do have disabilities to enjoy the experience, too.

## How

Three people will work together to solve the challenges, however, one must act blind by using a blindfold, one must act deaf by wearing noise cancelling headphones, and one must act mute and is not allowed to talk. After each challenge, whether it was successfully solved or not, a short video of about 10-20 seconds plays on a small screen, featuring an interview or video (not created by us) of a person who has a disability in real life, and they talk about certain areas such as the difficulties they face with society for having a disability, and the misconception around it. This will help promote empathy from the users, and also educate them in how not to act towards or speak to someone with a disability.

As the users experience the challenges, whether successfully within the time limit or not, a questionnaire will be available after which we ask them how the experience was, and if they have any ideas of how to make life easier for those with disabilities, or if they feel more comfortable on how to approach them. We will ensure that once the experience is done, there will be educational and helpful information provided to the users such as pamphlets with ways to help prevent getting a disability later in life, app recommendations, general information about different disabilities. Etc., and of course a reward for having done the experiment (something small such as a candy or stickers).

## The Challenges

### 1: *Shape Up!*

- 1.1: The deaf person finds the visual order of the shapes (star, cube, hexagon, pyramid, etc)
- 1.2: The mute person communicates the correct order to the blind person by using tapping or other sounds to indicate the correct position (*could be 4 pedestals*) for the shape
- 1.3: The blind person places the shape on the correct position with the help from the mute person

### 2: *Cipher Me This!*

- 2.1: The blind person goes to one section and finds numbers on objects by using tactile senses.
- 2.2: The deaf person goes to another section and finds visual numbers
- 2.3: The mute person collects the numbers from both and need to figure out the combination with the use of a cipher (need to check what shape had which number, ex a cylinder had a 1, a ball had a 5, etc.)

### 3: Now that's called Teamwork!

- 3.1: The blind person can put on headphones to hear a sequence of different sounds (it can be animal sounds or just tones)
- 3.2: The deaf person has a board with 6 buttons, each one has a color and makes a specific sound.
- 3.3: The blind person needs to listen to the tones played by the deaf person and verbally announce which one is correct.
- 3.4: The mute person will look at the correct button color and with the use of sign language in front of a pattern recognition camera do the correct sign in order to show the deaf person which color order is correct.
- 3.5: Once the correct order is made on the board, the group wins the game

We feel that the escape room experience promotes the embodied knowledge, especially the sensory integration, as the user has time to adapt and perform actions with limited senses, forcing their other senses to be more used, and also to think in a different way than they are used to. The *implicit knowledge*<sup>4</sup> would come to be used in this scenario as the user would adapt to a life without one of their senses, and in so learn how to deal with the situation in the best way possible without their current missing sense, without even realizing it. This would in turn evolve into a *procedural knowledge*<sup>5</sup> once the user feels more comfortable in their role, and can look at the next challenges in a new, prepared state-of-mind.

### Technology - Affective Computing

While much of this work can be done without technology, we decided to implement a pattern recognition program for the third and final challenge of the escape room. We will create a system that with the use of a camera can read certain signs and movements created with the user's hands, where the idea is that the user can make signs for colors (red, blue, green, yellow, etc.). The idea is that once the user knows which color to sign, they attempt to sign it based on instructions next to the camera. When they successfully sign it, the deaf person will see a color on a screen in front of them, knowing which button to touch in what order.

It also would be interesting to have a heart rate monitor connected to a screen, showing the stress level of each team member at the end of the challenge. Before the challenge, their heart rate could be taken, and once the challenge is over, the participants can hold onto something that reads their heart rate while they, for example, watch the informative video, to compare their current state to their beginning state.

# Research about the Senses

## Vision

### Leading causes of vision impairment and blindness

- Refractive errors
- Cataract
- Diabetic retinopathy
- Glaucoma
- Age-related macular degeneration.

### General information

One big problem with visual impairment, especially with children, is that it may in many cases cause social isolation and anxiety, but not only the children struggle. Assumptions with adults with visual impairments suffer just the same, in the way that others assume that they can't possibly have a job or a career, or they can't have a family or children, etc. This causes a social rift for those with visual impairments, it makes it difficult for them to integrate normally in society. This can easily be avoided and social interaction can instead be encouraged by asking them simple questions such as *What will make this experience accessible?* Use the power of connection to make a positive difference. (*Many suggestions based on [Amy's story](#)*)

- Different levels of visual impairment - Being blind does not necessarily mean that they can't see anything at all.
- Vision impairment can cause social isolation, depression and anxiety due to the limitations of the everyday lifestyle caused by the vision impairment.
- Many times, visual impairment can be avoided such as those caused by infection, trauma, nutrition related disease, incorrect treatment, avoided check-ups, etc.(source: [WHO](#))

### Color blindness

- Most with color blindness can see colors, just not the same way those without it can. Many times they have red-green color blindness, which makes it difficult to distinguish between the two colors. <sup>2</sup> Blue-cone monochromacy is a rare type which doesn't allow for any colors to be seen at all.

How to prevent vision impairments or facilitate life for those who has it

- Raise awareness, world sight day, MyopiaEd mobile health toolkit, WHOeyes app (information [here](#)), 20-20-20 rule ([here](#))
- Provide glasses
- Teach children in school about disabilities and impairments
- Adapt text on printed paper and screen environments to accommodate those with visual impairment, an example can be seen [here](#)



Image taken from World Health Organization, [WHO](#)

#### How to prevent social isolation and anxiety

- Ask them questions, How can I make this work for you? What support do you need? What will make this experience accessible?
- Avoid any negative assumption, such as assuming a person with visual impairment doesn't have a job, doesn't have a family,
- Create educational online safe-spaces

#### Ideas for creating the experience

- Create glasses which only allows for a small portion to be seen
- Have a blindfold and create a sonar and sensory experience (ex wind, touch, etc.) for those without vision
- Use tactile sense

# Hearing

## The Importance of Hearing

Hearing is one of the senses fundamental to communication and is essential for interpersonal relationships and learning. The human ear is the organ responsible for processing sounds, noises, and vibrations from the environment, playing a crucial role in connecting individuals to their surroundings.

## Identifying hearing health issues

The main symptom of hearing problems is a reduced ability to hear, often accompanied by ear pain and balance difficulties. These symptoms can be temporary or permanent, depending on the underlying cause.

## Causes of hearing loss

Hearing loss may result from various factors, including heredity, recurrent ear infections, meningitis, trauma, prolonged exposure to loud noises, aging and eardrum perforation

## Dizziness and balance

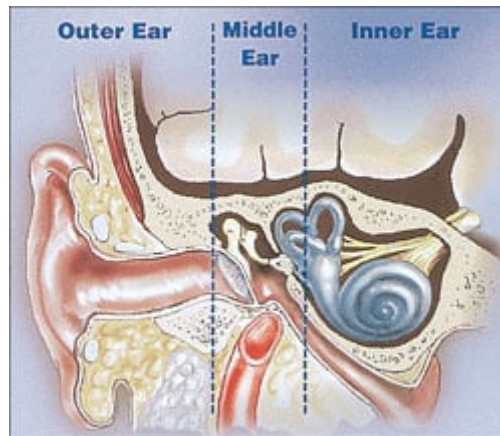
The balance system helps individuals stand, walk, and move through their environment without falling. Balance disorders can cause unpleasant symptoms, such as dizziness, and increase the risk of falls. Dizziness can encompass sensations like lightheadedness or vertigo, where one feels as though they or their surroundings are spinning.

Audiologists are healthcare professionals who specialize in the prevention, diagnosis, and treatment of hearing, balance, and related disorders for individuals of all ages. These specialists are trained to provide evidence-based care tailored to each patient's needs.

## Understanding the ear

The ear is divided into three sections, each playing a distinct role in hearing and balance:

- Outer Ear: Includes the pinna (the visible part) and the ear canal, aiding in identifying the direction of sounds.
- Middle Ear: Starts at the eardrum and contains three small bones (ossicles). These structures transmit sound waves to the brain by causing vibrations in response to sound.
- Inner Ear: Houses the cochlea and components of the vestibular system, which are responsible for detecting balance, motion, and the position of the head and body in space.



What is the role of the inner ear in balance and equilibrium?

The inner ear plays a vital role in maintaining balance and equilibrium through its vestibular apparatus, which includes the semicircular canals, utricle, and saccule. These specialized structures detect changes in head movement and position, sending signals to the brain to activate compensatory mechanisms that help maintain balance.

- Semicircular Canals: These structures detect rotational movements of the head, such as turning or tilting.
- Utricle and Saccule: These organs detect changes related to gravity and linear acceleration, such as forward or upward motion.

The vestibular nerve transmits information from these structures to the brain, where it is integrated with visual input and proprioceptive signals (sensory information from muscles and joints) to maintain balance and spatial orientation.

However, age-related changes in the inner ear, such as the loss of hair cells or degeneration of otoliths (small calcium carbonate crystals in the utricle and saccule), can impair balance and equilibrium, increasing the risk of falls and dizziness in older adults.



# Taste and Smell

## Important definitions

- Anosmia: Complete loss of smell. People can taste salty, sweet, sour, and bitter but cannot distinguish specific flavours, since it relies on smell, not on the taste receptors on the tongue.
- Hyposmia: Partial loss of smell.
- Parosmia: Sense of smell is distorted. For example, instead of smelling a cherry pie, the brain says that the person is smelling spoiled milk (*we could show the food in front of the user but the smell is completely different from the expected*)
- Ageusia: Complete inability to taste food or drink
- Hypogeusia: Partial loss of taste
- Dysgeusia: Distorted sense of taste
- Cacogeusia: Metallic or unpleasant taste - *could be used*

## Connection between taste and smell

Without the sense of smell, the taste is limited to sweet, salty, sour and bitter. All other flavours experienced come from smell. A person can have anosmia without having ageusia, but can also have both conditions, given that taste and smell are chemical senses that work together. Not being able to smell foods and drinks affects how they taste. A study showed that when volunteers wore nose plugs, their sense of taste was less accurate and less intense than when they tasted food without the nose plugs.

## Signs of anosmia and ageusia

- Difficulty distinguishing between different odours
- Decreased enjoyment of food
- Change in appetite (loss or increased consumption of spicy or sweet foods)
- Difficulty detecting dangerous odours - people with this conditions need to have smoke detector since they can't smell the smoke
- Can be related to health conditions, such as infections, head injury or neurological disorders

## Touch

Major touch disabilities:

- Hypoesthesia
  - Description: Reduced sensitivity to touch, also referred to as numbness.
  - Causes: Stroke, trauma, multiple sclerosis, or compression of nerves.
  - Impact: Individuals may not feel pressure, temperature changes, or pain properly, which can lead to injuries or accidents.
- Hyperesthesia
  - Description: Increased sensitivity to stimuli, causing pain or discomfort from normally non-painful sensations.
  - Causes: Nerve damage, infections like shingles, or conditions such as fibromyalgia.
  - Impact: Difficulty wearing certain fabrics, challenges with touch in social interactions, and heightened responses to tactile stimuli.
- Allodynia
  - Description: A condition where normally non-painful stimuli, such as light touch or brushing against the skin, are perceived as painful.
  - Causes: Nerve damage, migraines, or chronic pain conditions.
  - Impact: Discomfort during daily activities, difficulty wearing clothing, or aversion to being touched.
- Paresthesia
  - Description: Abnormal sensations such as tingling, "pins and needles," or burning, often occurring without an obvious physical stimulus.
  - Causes: Temporary nerve compression, diabetes, multiple sclerosis, or vitamin deficiencies.
  - Impact: Disruption of fine motor tasks and overall discomfort.
- Anhidrosis
  - Description: Inability to sweat, which can affect the skin's ability to sense temperature changes.
  - Causes: Genetic conditions, nerve damage, or side effects of certain medications.
  - Impact: Difficulty managing body temperature and sensing thermal extremes.
- Astereognosis

- Description: The inability to recognize objects by touch, despite normal tactile sensation.
- Causes: Brain damage, particularly in the parietal lobe, from stroke, trauma, or neurological disorders.
- Impact: Challenges in identifying objects without visual cues, affecting daily activities.
- Congenital Insensitivity to Pain with Anhidrosis (CIPA)
  - Description: A rare genetic disorder where individuals cannot feel pain or temperature and do not sweat.
  - Causes: Mutations in specific genes affecting nerve development.
  - Impact: High risk of injuries, burns, and overheating, often requiring constant supervision.

## Inspiration, Brainstorming, and Process

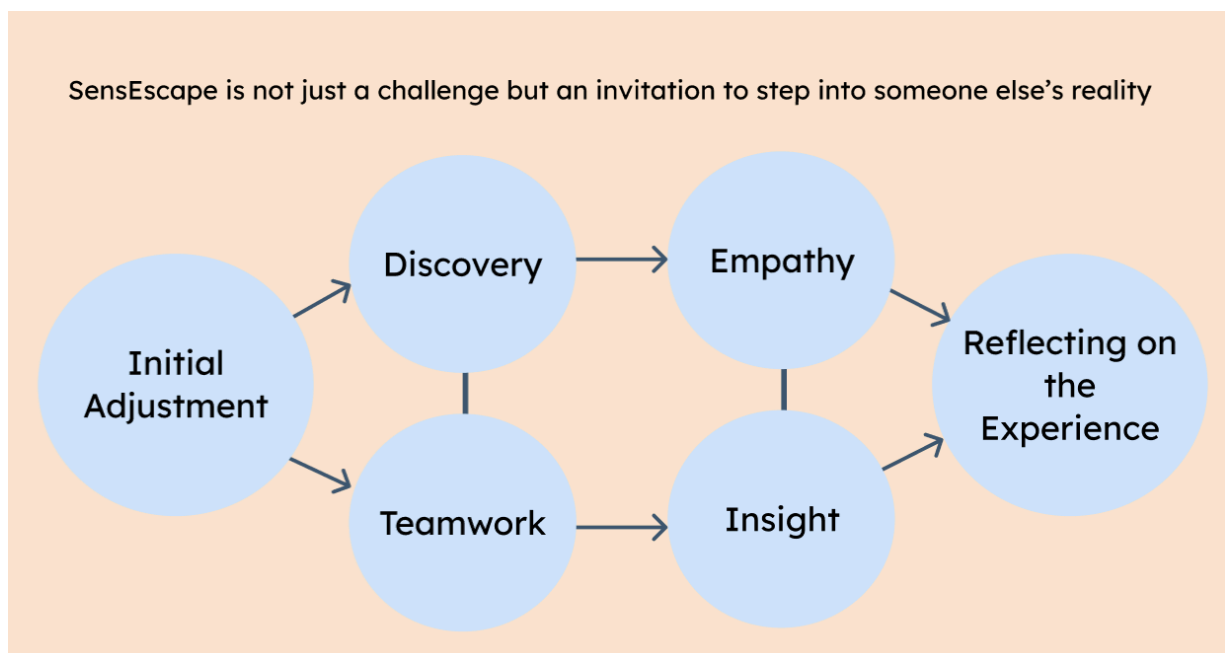
In the beginning we started conversations about what subject we wanted to delve deeper into, and the subject of disabilities and anxiety was brought up. After a lot of initial brainstorming, the main subject centered on starting conversations and raising awareness for those with disabilities such as blindness, being deaf, or mute, etc. We first decided on going for an installation with one specialized and adapted “station” for each sense. At each station, the user could try out and feel how it might be to not have all senses. However, while tactile, vision, and hearing were quite easy to work with, taste and smell felt almost impossible in the setting we had, but also the fact that this would make it a one-person experience, which removed the social interaction and discussion we wanted to implement. This is where we were inspired by the viral challenge going around called “Blind, deaf, and mute challenge” <sup>3</sup>. Seeing as how we wanted to explore the senses and create conversation and understanding about those who live with disabilities, especially sensory ones, this felt like a good direction. While this viral challenge reference’s goal is to bake a cake, we felt like our project needed to be more of an extensive experience in order to evoke the feeling of empathy in the user, and so we decided on creating an escape room with three challenges and a time limit, which would be beneficial as it could provoke stress, which in turn could make the user feel limited due to their lack of a sense. More about our brainstorming and previous ideas is available in the appendix section.

## Journey Experience

At first, users might feel disoriented or frustrated as they adapt to relying on unfamiliar senses, reflecting the daily challenges faced by those with sensory disabilities. As the tasks evolve, we want participants to experience moments of connection and reliance on each other, discovering the power of collaboration and trust as well as problem-solving.

By stepping outside their comfort zones, users begin to grasp how different sensory perceptions shape our interactions with the world, and how some of our other senses can become heightened once another is missing.

When the final challenge is complete, participants leave with more than just the satisfaction of solving puzzles, they gain a renewed empathy and respect for those who go through life with disabilities.



Journey experience mapping made by Linda Rodrigues

## Artificial Intelligence

Since we struggled a lot in our work to get a good concept that corresponded to our desires for the project, we resorted to using the artificial intelligence ChatGPT. During our second brainstorming session, when we had put our first idea of a project behind us, we gave ChatGPT prompts to guide us in how we could build our project based on our ideas. While many of the ideas it provided simply made no sense or would not work in a smaller area or without really extensive work, some of them, including the idea of creating an escape room, significantly helped us on our way. The conversations generated by ChatGPT are provided in the appendix section of this paper.

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All images in the Google Slides presentation were retrieved from *Pinterest*.

## Appendix

## **Artificial Intelligence:**

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*\*Enhanced Escape Room Concept: "The Trio Challenge"\**

### *\*Roles and Strengths\**

1. *\*Blind Participant:\** Relies on touch, hearing, and verbal communication to navigate the environment and interpret tactile clues.
2. *\*Deaf Participant:\** Relies on sight and non-verbal communication (gestures, written notes) to interpret visual information and solve challenges.
3. *\*Mute Participant:\** Relies on sight and hearing, but must use alternative communication methods such as gestures, pointing, or written notes.

### *\*How They Would Work Together\**

1. *\*Challenge: Finding a Key Hidden in a Multi-Sensory Room\**
  - The *\*blind participant\** feels around the room to describe objects by texture and sound.
  - The *\*deaf participant\** interprets visual clues, such as symbols or written instructions.
  - The *\*mute participant\** acts as a bridge, using gestures or writing to communicate between the blind and deaf participants.

#### *\*Example:\**

- The blind participant describes a tactile object, like a rough cylinder.
- The mute participant uses gestures or writes down what the blind participant describes.
- The deaf participant matches this information to a visual clue, such as a picture of a rough object.

### *\*Challenge: Activating a Device with Specific Instructions\**

- The instructions are written on a screen.
- The *\*deaf participant\** reads the instructions and gestures them to the *\*mute participant\**.
- The *\*mute participant\** relays the instructions to the *\*blind participant\** using touch or simplified verbal sounds.

### *\*Challenge: A Collaborative Puzzle with Locks\**

- Some locks open with a code derived from tactile clues.
- Other locks require interpreting visual symbols.
- The mute participant coordinates between the other two participants to ensure the clues align.

### *\*Key Features for Empathy Building\**

- *\*Communication Constraints:\** Ensure that the trio can only succeed by using each other's strengths, emphasizing interdependence.
- *\*Reflection Space:\** At the end of the game, include a debriefing area where participants discuss the experience, highlighting the ingenuity required to communicate and solve challenges together.

- *\*Stories of Real People:\** Integrate narratives from individuals who are blind, deaf, or mute to contextualize the challenges participants face.

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## **Brainstorming:**

*What happens when we are not on our phones?*

*We eat, we walk, we laugh, ...*

*What happens when we lose our senses?*

*How do our senses interact with each other?*

*First: Eating, Seeing and Smelling*

- A) Eating something nice, with a lot of flavour, watching a serie/movie and smelling coffee,*
- B) Eating flavourless bread, smelling gasoline and watching a video of someone else eating nice (pizza or pasta, burger)*

*Second: Horror Movie: Watching and Hearing*

- A) Show a horror movie with the actual sound,*
- B) Show a horror movie with classical music*

*Third: Touching and Seeing*

- A) Show the images before touching the items*
- B) Show the images after touching the items*

*Fourth: Hearing and Eating*

*Through this project, we would study the way that the senses interact with each other to bring specific emotions, in order to create a conversation surrounding sensory disabilities and how they affect disabled people's perception of the world.*





*Sinesthesia*

*Conversation among two people*

*Simulation of crossing the street, (chicken cross the road game)*

*Escape Room:*

*Only one arm ?*

*Blind: uses their hearing and tactile senses*

*Deaf: uses their vision*

*Mute: acts like the communication bridge between the two colleagues*

***They wear devices that record heart beats to check stress level?***

***Some sort of facial expression recognition for specific parts of the challenge?***

***Sign language recognition for the last part to communicate with the deaf person?***

***Sign language for colors link [here](#)***