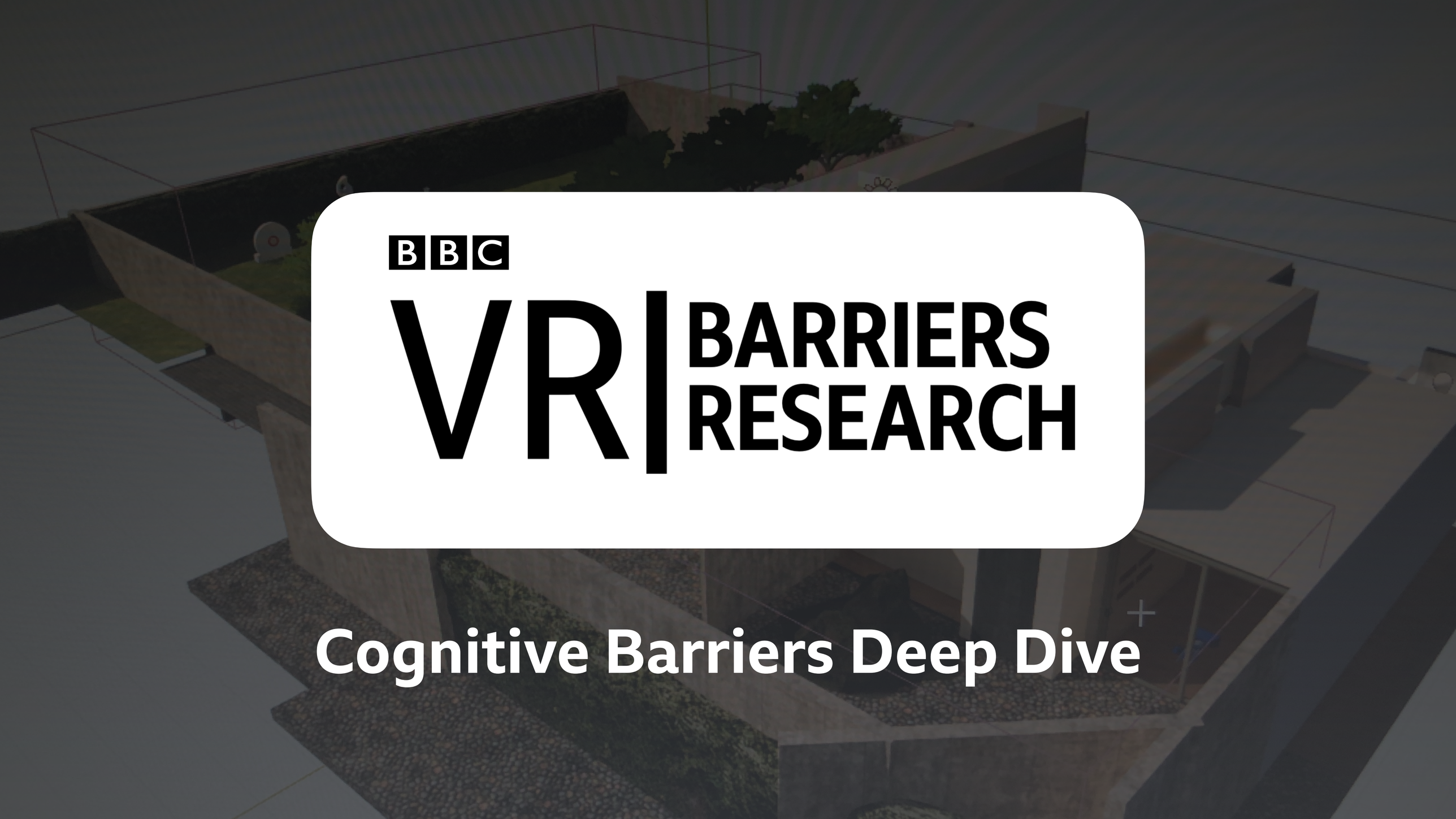


BBC

VR | BARRIERS RESEARCH

Cognitive Barriers Deep Dive

Speech is Hard

I’m having a weird week

I am **not** fine

I am not fine

Jamie + Lion

BBC Senior Research Engineer

@jamieknight

“Our goals is to make sure our websites, apps and services **don't disable people.**”

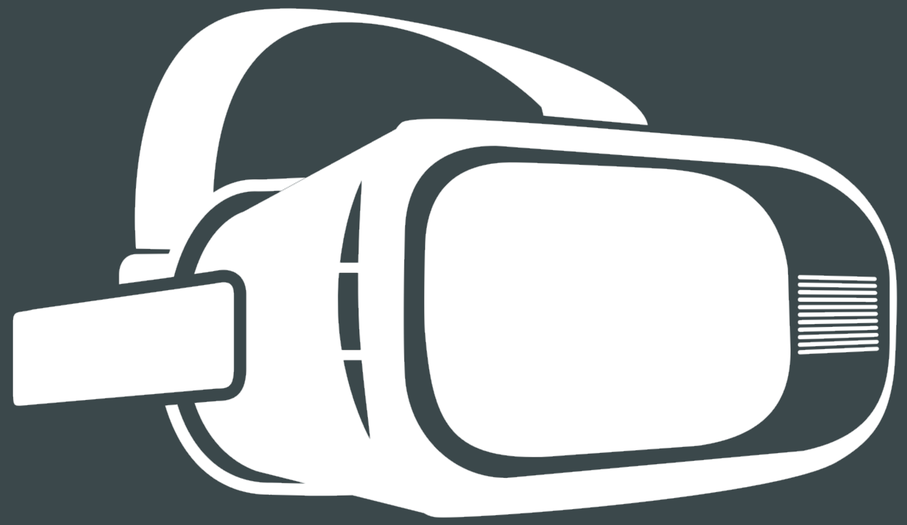
“Our goals is to make sure our websites, apps and services **don't disable people.**”

Disability has many **lenses**

Impairment
+ Environment

Disability

We **disable** people when we create barriers in environments



VR is the creation of new **environments**

& the creation of new **barriers**

BBC

VR | BARRIERS RESEARCH

Started in late 2017

Project Goals

1. To build a **dataset** of observed **barriers** faced by a wide range of users within VR environments

2. To consider if the current **inclusive design principles** encompass all observed barriers

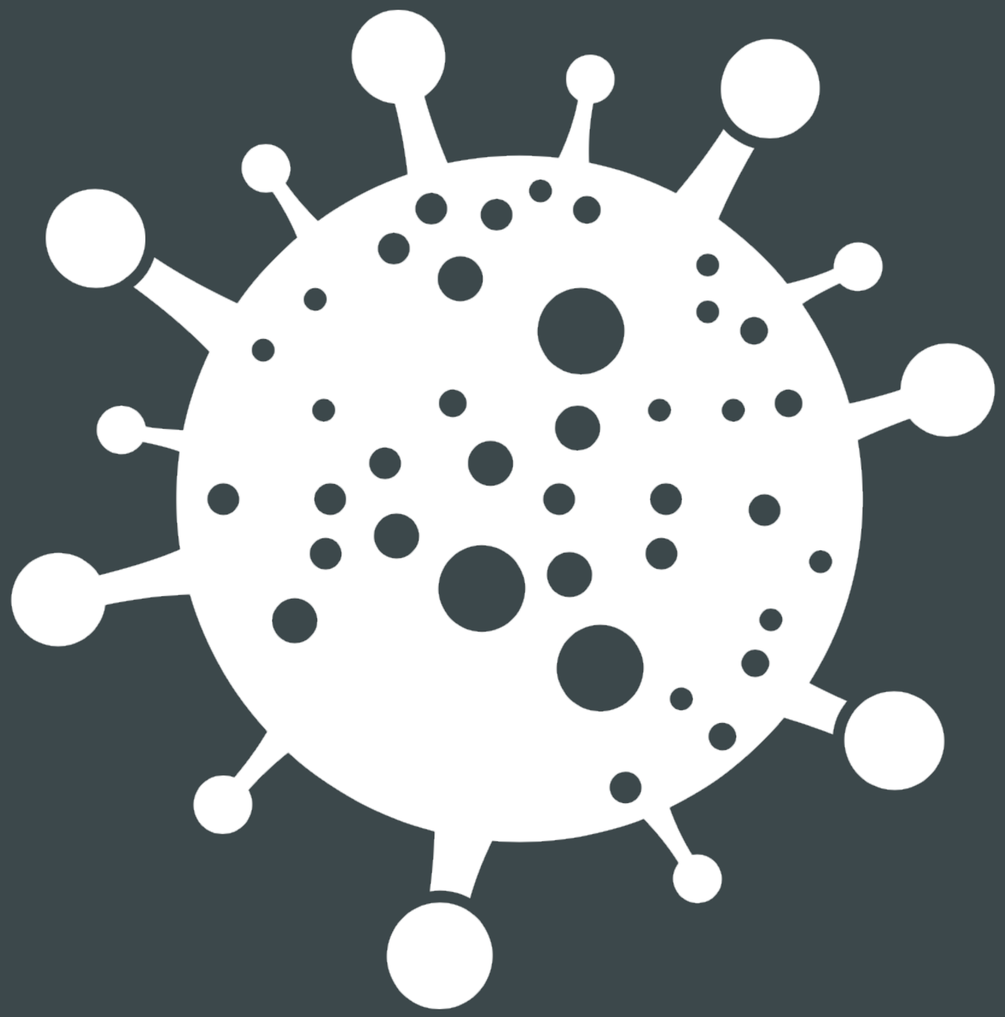
3. To develop a **methodology** and **environment** for user testing VR with a diverse user group.

Project Goals

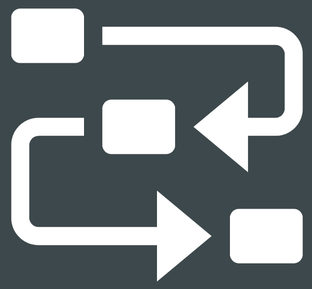
1. To build a **dataset** of observed **barriers** faced by a wide range of users within VR environments

2. To consider if the current **inclusive design principles** encompass all observed barriers

3. To develop a **methodology** and **environment** for user testing VR with a diverse user group.



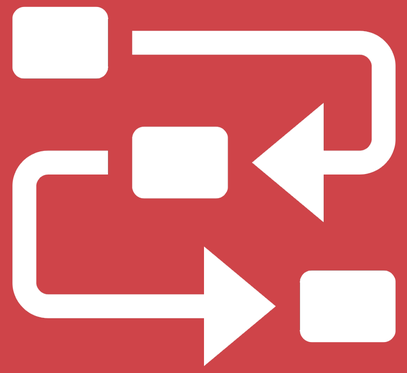
Cognitive Barriers Deep Dive



Collecting the Data

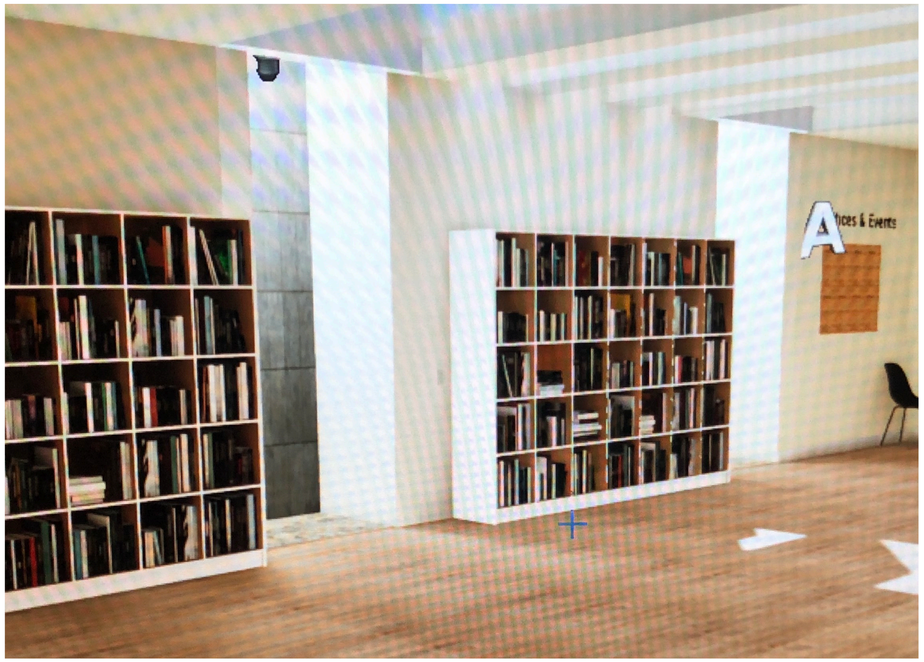
Common Cognitive Barriers

Adaptions We Made



Collecting the Data

Methodology + Data pipeline



Methodology

1. **Invite participants** to explore our **test enviroment**.
2. Ask them to complete tasks relating to **navigation**, **interaction** & **information gathering**
3. **Observe** what happens and note down any **barriers** which occur

Data pipeline

Observations - The barriers we observed the participate experience

Barriers List - All the observations deduplicated, annotated & sorted

Barrier Groups - Barriers grouped by impairment & described

Data pipeline

~1700 Observations over ~100 sessions

Barriers List - All the observations deduplicated, annotated & sorted

Barrier Groups - Barriers grouped by impairment & described

Data pipeline

~1700 Observations over ~100 sessions

Barriers List - All the observations deduplicated, annotated & sorted

Barrier Groups - Barriers grouped by impairment & described

Data pipeline

~1700 Observations over ~100 sessions

~70 Barriers

Barrier Groups - Barriers grouped by impairment & described

Data pipeline

~1700 Observations over ~100 sessions

~70 Barriers

Barrier Groups - Barriers grouped by impairment & described

Data pipeline

~1700 Observations over ~100 sessions

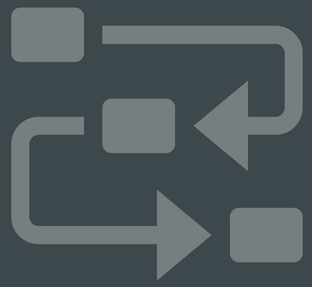
~70 Barriers

~20-30 Barriers across ~5 groups

Barrier groups so far

- Motor Barriers
- **Cognitive barriers**
- Low vision barrier
- Research barriers
- …

Cognitive Barriers Deep Dive



Collecting the Data

Common Cognitive Barriers

Adaptions We Made

Common Cognitive Barriers

How environments disable users

1

2

3

4

5

6

1

Comprehension

2

3

4

5

6

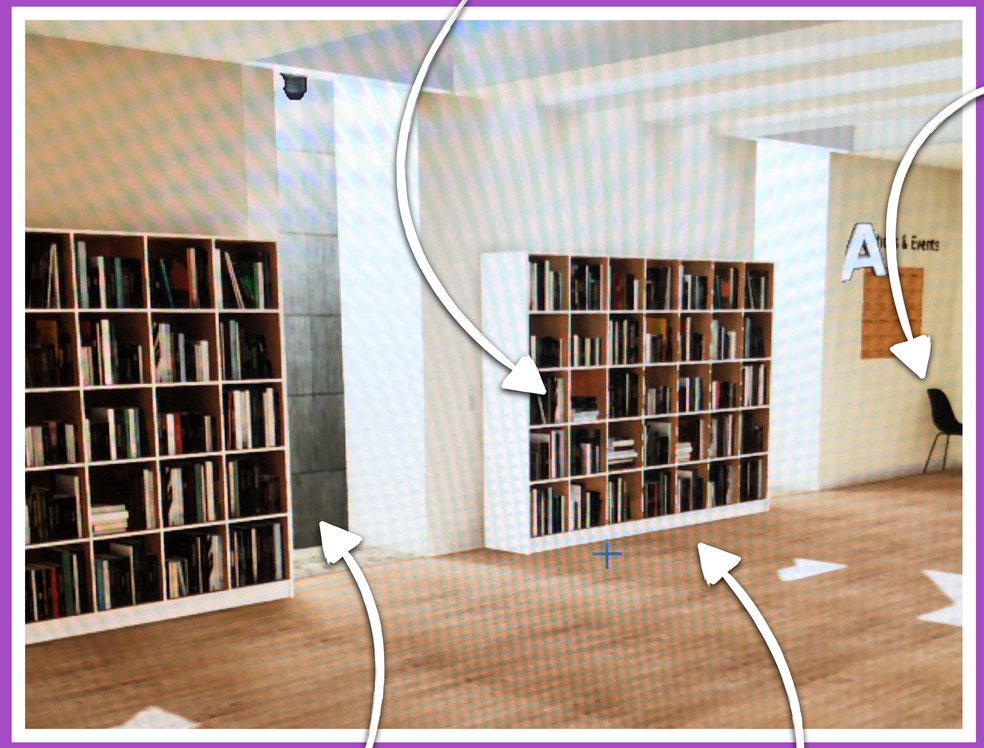
1

Comprehension

This barrier occurs when an experience requires the user to **understand unexplained aspects** of the environment in order too:

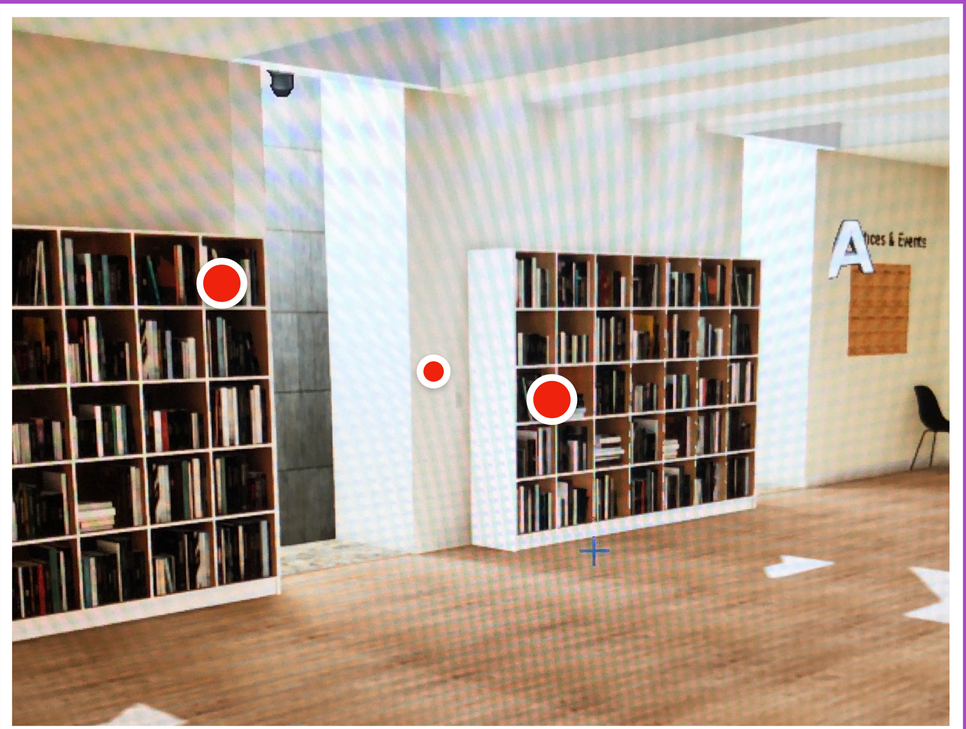
- Determine what is **possible.**
- Determine what is **interactive.**
- Determine the **next action**

Example



1. **Determine what is possible.**
2. Determine what is interactive.
3. Determine the next action

Example

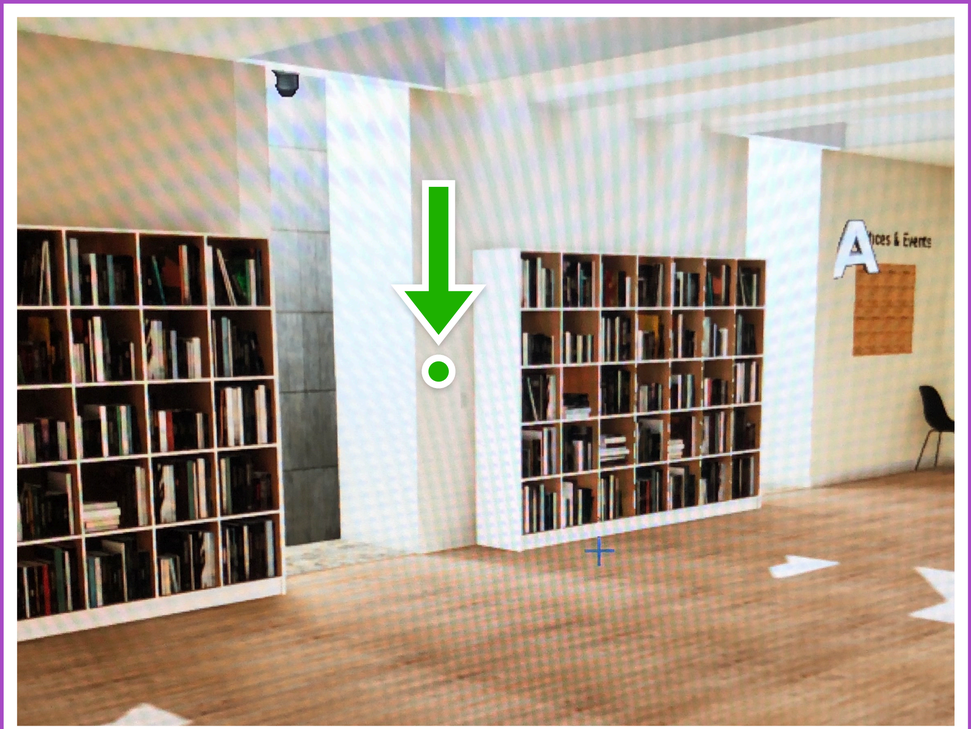


1.Determine what is possible.

2.Determine what is interactive.

3.Determine the next action

Example



1. Determine what is possible.
2. Determine what is interactive.
3. **Determine the next action**

1

Comprehension

2

Expectations

3

4

5

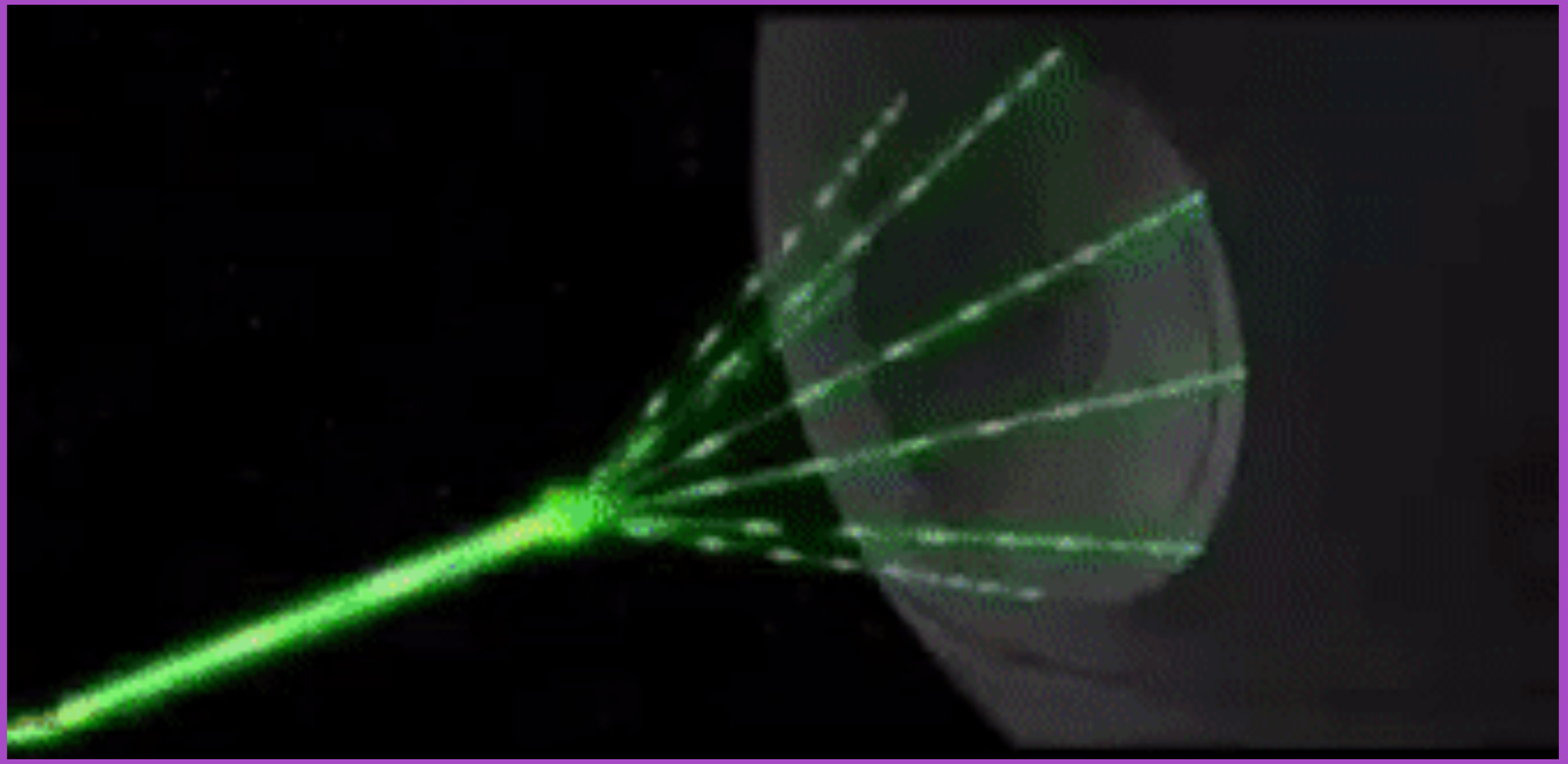
6

2

Expectations

This barrier occurs when an experience **breaks a users expectation** such as**:**

- Expected audio, visual, force & haptic feedback
  e.g sounds, shadows, physical response
- Expected bodily representation like **hands / legs etc.**
- **Unexpected** placing the user into a simulated **unsafe situation.**



2

Expectations

This barrier occurs when an experience **breaks a users expectation** such as**:**

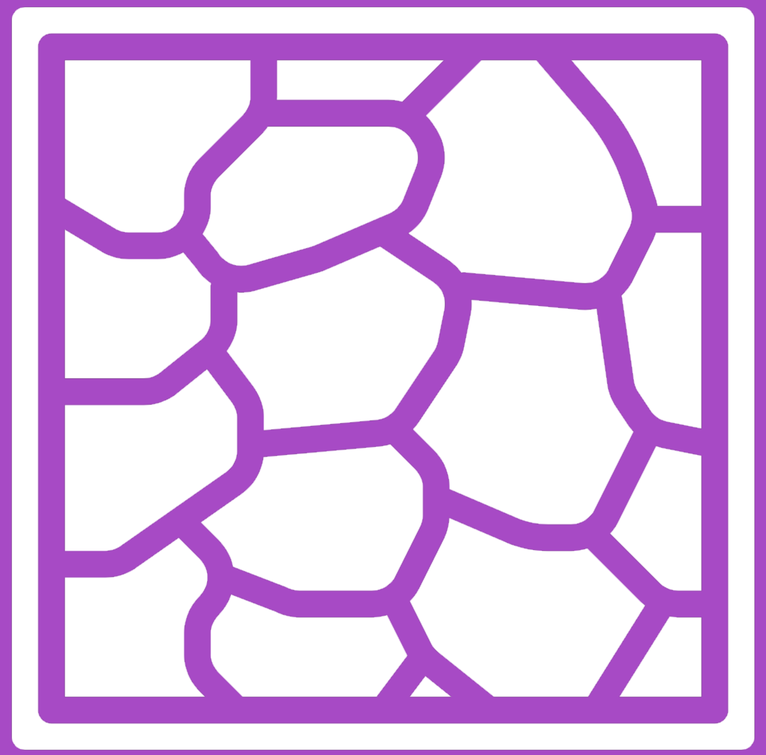
- Expected audio, visual, force & haptic feedback
  e.g sounds, shadows, physical response
- Expected bodily representation like **hands / legs etc.**
- **Unexpected** placing the user into a simulated **unsafe situation.**

Example

Unexpected & Unsafe

Surprising the user without **adequate warning** that the situation they are about to enter into **would not be safe in the real world.**

Example



Unexpected & Unsafe

Unsafe is very **user specific**. For example certain paving may be unsafe, to **some users**

Expectations vary widely in the real world and **flexibility is key.**

1

Comprehension

2

Expectations

3

Way Finding

4

5

6

3

Way finding

This barrier occurs when an experience requires the user to **route across an environment** to reach a **specific point**

- **Navigating** from one place to another
- **Positioning** in a specific location

1

Comprehension

2

Expectations

3

Way Finding

4

Timing

5

6

4

Timing

This barrier occurs when an experience introduces **a time limit** relating to:

- Interactive elements
- Narrative events
- Gameplay decisions

1

Comprehension

2

Expectations

3

Way Finding

4

Timing

5

Focus & Memory

6

5

Focus & Memory

This barrier occurs when an experience requires the user to **remember information** and **direct their attention.**

- Remembering **controls, next steps, & location** of items.
- Maintaining & targeting **focus.**
- **Recovering** from **distraction.**

Example

Distraction

Distraction is a process which builds on barriers such as **memory** and **decision making.**

Distractions can quickly stack into an **unrecoverable barrier.**

1

Comprehension

2

Expectations

3

Way Finding

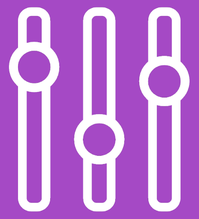
4

Timing

5

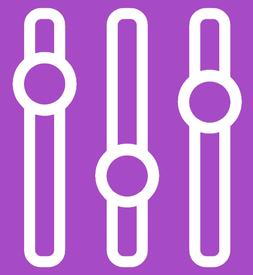
Focus & Memory

6



Sensory

6



Sensory

This barrier occurs when a **mismatch occurs between the users sensory needs** such as:

- Physical elements, such as **headsets & controllers**
- Content elements, such as **sound**, **brightness, texture** and **movement**

Example

Straps are **sensory hell.**

1

Comprehension

2

Expectations

3

Way Finding

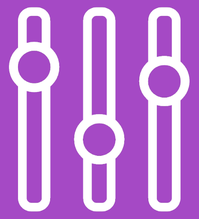
4

Timing

5

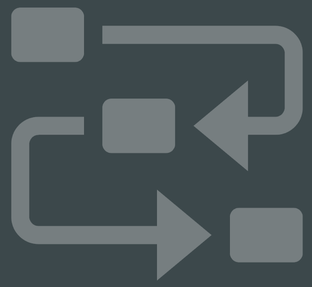
Focus & Memory

6



Sensory

Cognitive Barriers Deep Dive



~~Collecting the Data~~

~~Common Cognitive Barriers~~

Adaptions We Made

Adaptions we made

Out experiments with alternative controls

Adaptions

We explored adaptions in two areas:

- **Environmental:** Attempting to design away common barriers
- **Facilitation:** Adapting how we interacted with participants and supported them through the experience.

Adaptions

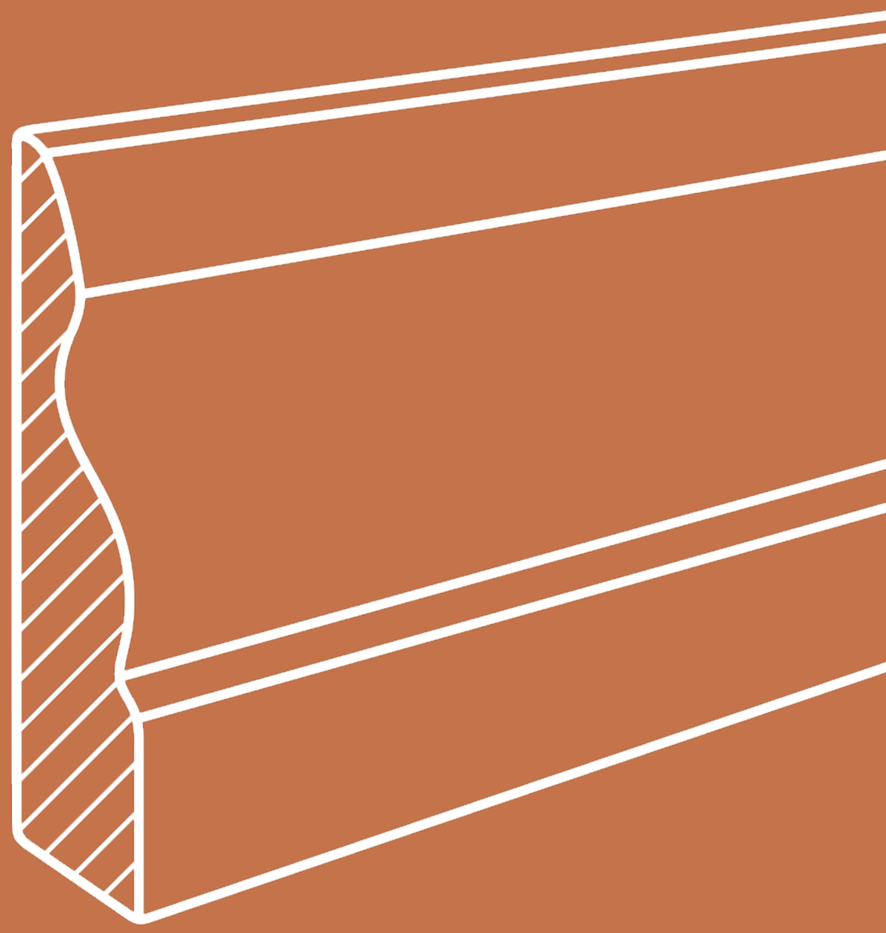
We explored adaptions in two areas:

- **Environmental:** Attempting to design away common barriers
- **Facilitation:** Adapting how we interacted with participants and supported them through the experience.

Environment Adaptions

- **Simplicity** - removing fluff
- **Familiar setting** - small library
- **Flexible starting position** - reception, sensory room etc.
- **Remove spurious affordances** - seating, door handles, etc

Many people noticed when the **skirting board** was missing.



Adaptions

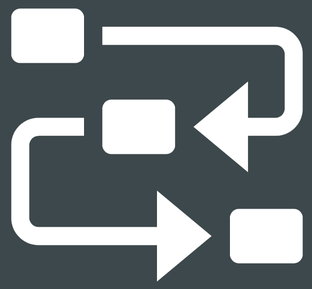
We explored adaptions in two areas:

- ~~**Environmental:** Attempting to design away common barriers~~
- **Facilitation:** Adapting how we interacted with participants and supported them through the experience.

Flexible Support

- **Order of session** - Controls first, then headset!
- **Get to know likes and dislikes -** taking time to understand
- **Sensory** - straps, weight, etc etc
- **Reassurance** - taking time to reassure & communicate

Cognitive Barriers Deep Dive



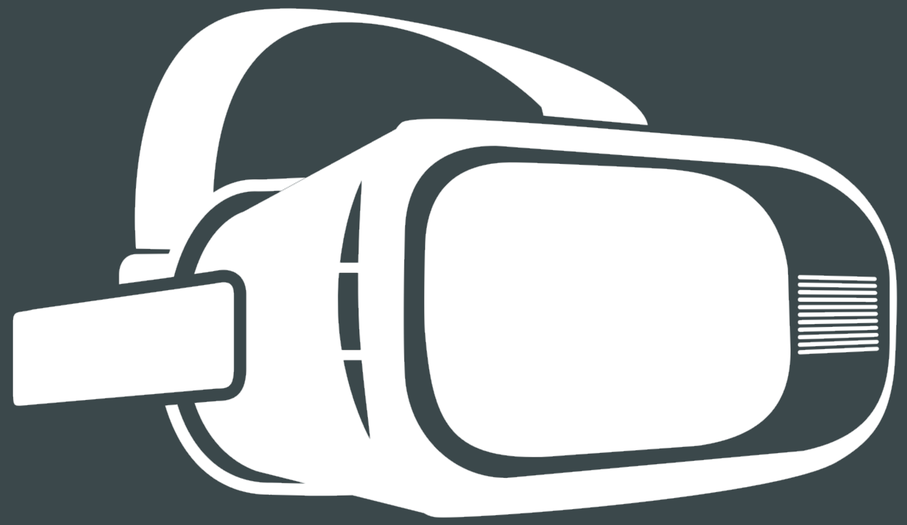
Collecting the Data

Common Cognitive Barriers

Adaptions We Made

Extremely Encouraging

Participants describing VR as more accessible than the real world



VR is the creation of new **environments**

& the creation of new **barriers**

If we get this right we can turn **potential** into **reality** for **billions** of users.

Q&A

Thank You.