

Developing for Immersion



What we'll cover today...

- Team Project Expectations
- Implementing Immersion
- Evaluating Immersion
- Case Study 1: VR Commuting Simulator
- Case Study 2: Experience Dementia
- A Glimpse into the Metaverse Industry, thru FromLabs



The screenshot shows a GitHub organization profile for 'sit-dia'. The top navigation bar includes links for Overview, Repositories (388), Discussions, Projects (5), Packages, Teams (19), People (150), and a search bar. Below the navigation, the title 'Team Project Details #4' is displayed, followed by the user 'chektien announced in Announcements'. The main content area is titled 'Team Project Details' and contains sections for 'Background' and 'Deliverable'. The 'Background' section describes 'The UniverSITy' as SIT's future virtual campus, aiming to provide immersive experiences. The 'Deliverable' section instructs teams to form 7-10 members to produce an immersive application, mentioning WebXR, ThreeJS, Babylon.js, A-Frame, and other javascript libraries. It also notes that the assignment can be on mobile phones, iPads, or HMDs. A user story at the bottom states: 'As an SIT student in the UniverSITy, I want to interact in an *immersive realm*, so that I can have an enhanced learning/student-life experience over traditional face-to-face or video-based interactions.'

Team Project Expectations

- Implementing Immersion
- Evaluating Immersion
- Documentation
- Software Engineering



Implementing Immersion

- designing for immersion
- translating design into implementation

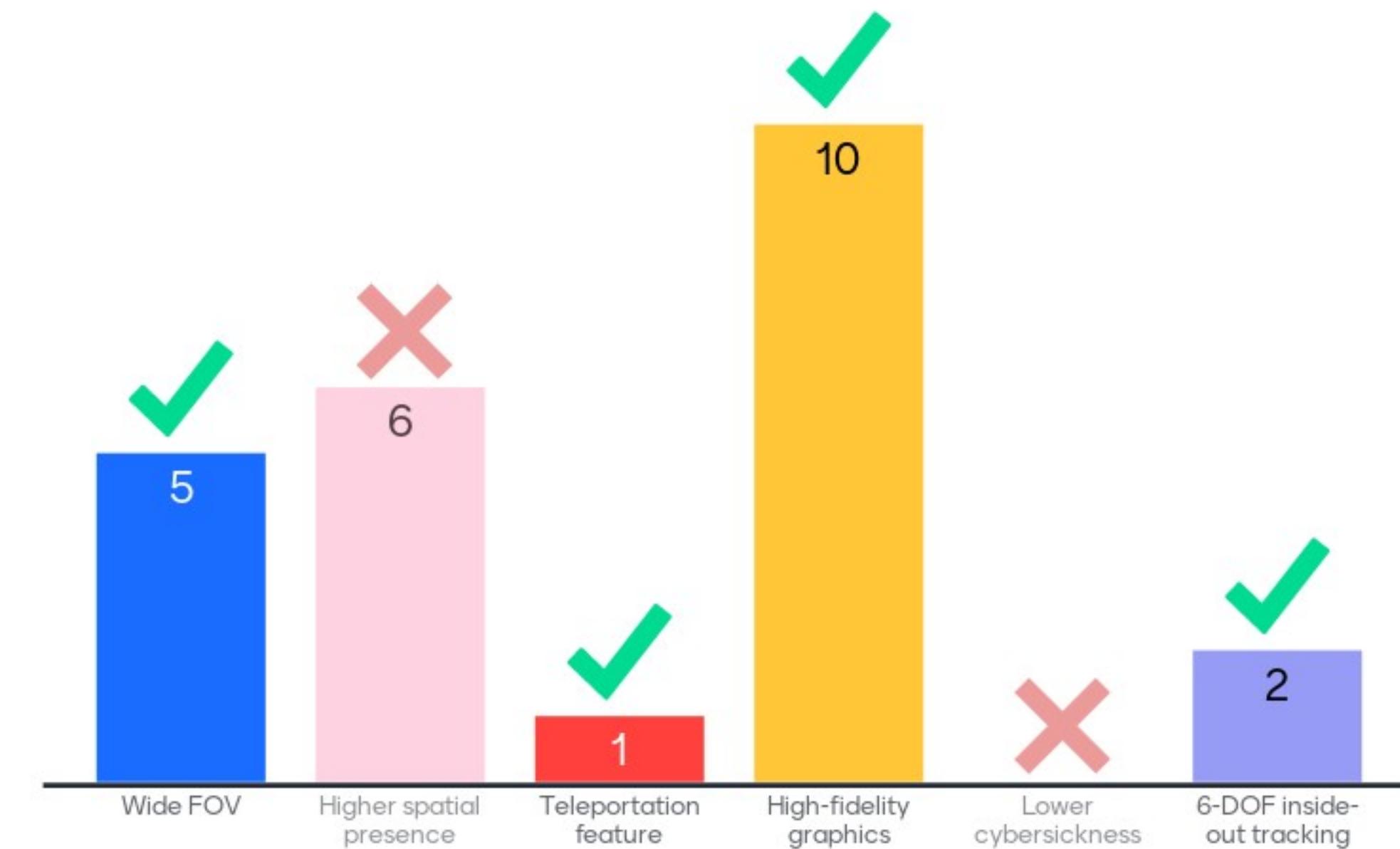


Evaluating Immersion

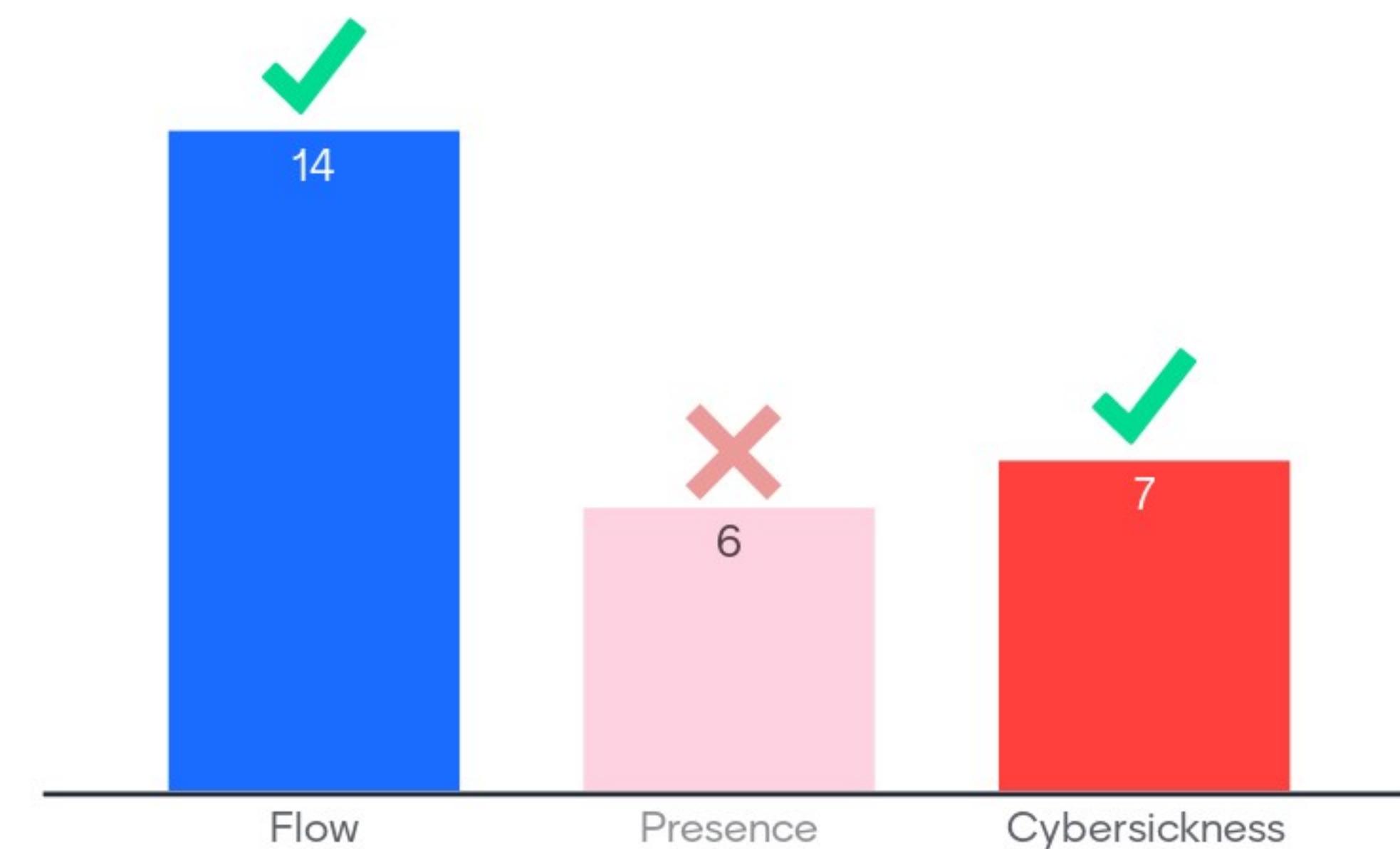
- data collection methods appropriate for experiential goals
- analysing data to form conclusions



Which of the following describes immersion from a systems perspective?



Which popular experiential construct(s) of immersion is/are relevant here?





Case Study 1: VR Commuting Simulator

Designing for Immersion

It is first essential to consider all stakeholders of the application

- **Users** - the general public
 - that can come into a VR lab
 - who are interested to contribute feedback on commuting experiences
 - and perhaps curious about VR
- **Collaborator** - LTA
 - aim to have a VR system to evaluate commuting experiences
 - so as to obtain higher quality data and reduce operational costs



Designing for Immersion

- feel like actually in Singapore HDBs [PRESENCE]
- locomotion close to real walking [PRESENCE]
- clear goals and fluent performance during commute [FLOW]
- minimal nausea and disorientation symptoms [CYBERSICKNESS]



Design ➔ Implementation

feel like actually in Singapore HDBs
[PRESENCE]

replicate the scale and visuals of a real
HDB estate



Real-world 3D Scans

Custom Point Cloud Processor



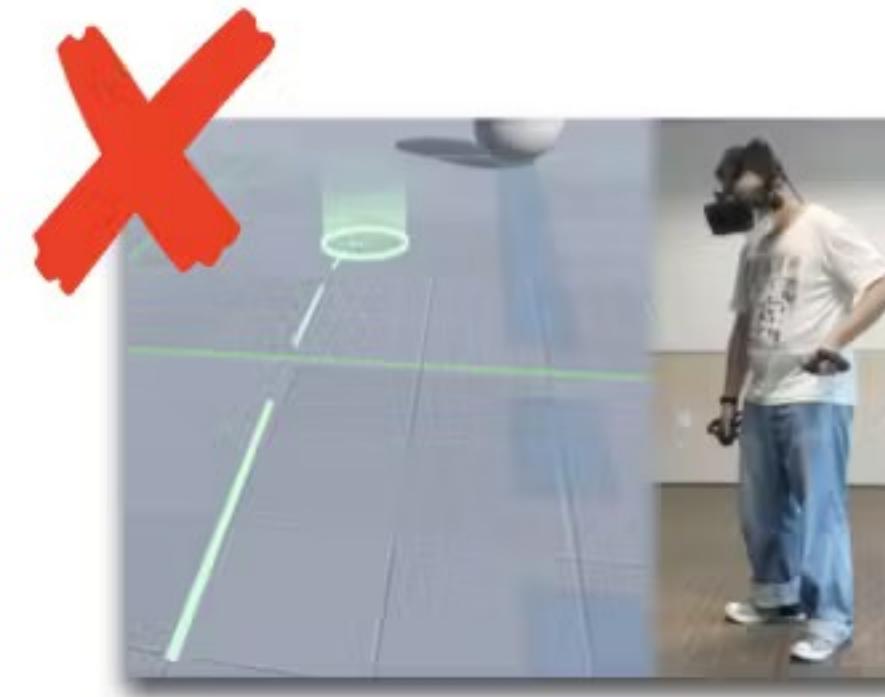
ArcGIS CityEngine



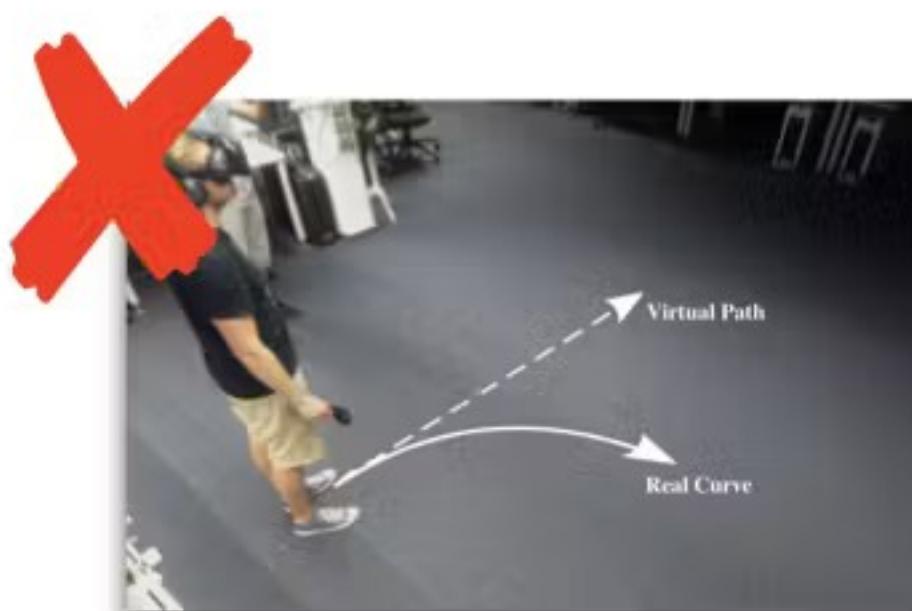
Design → Implementation

locomotion close to real walking
[PRESENCE]

clear goals and fluent performance
during commute [FLOW]



Teleportation

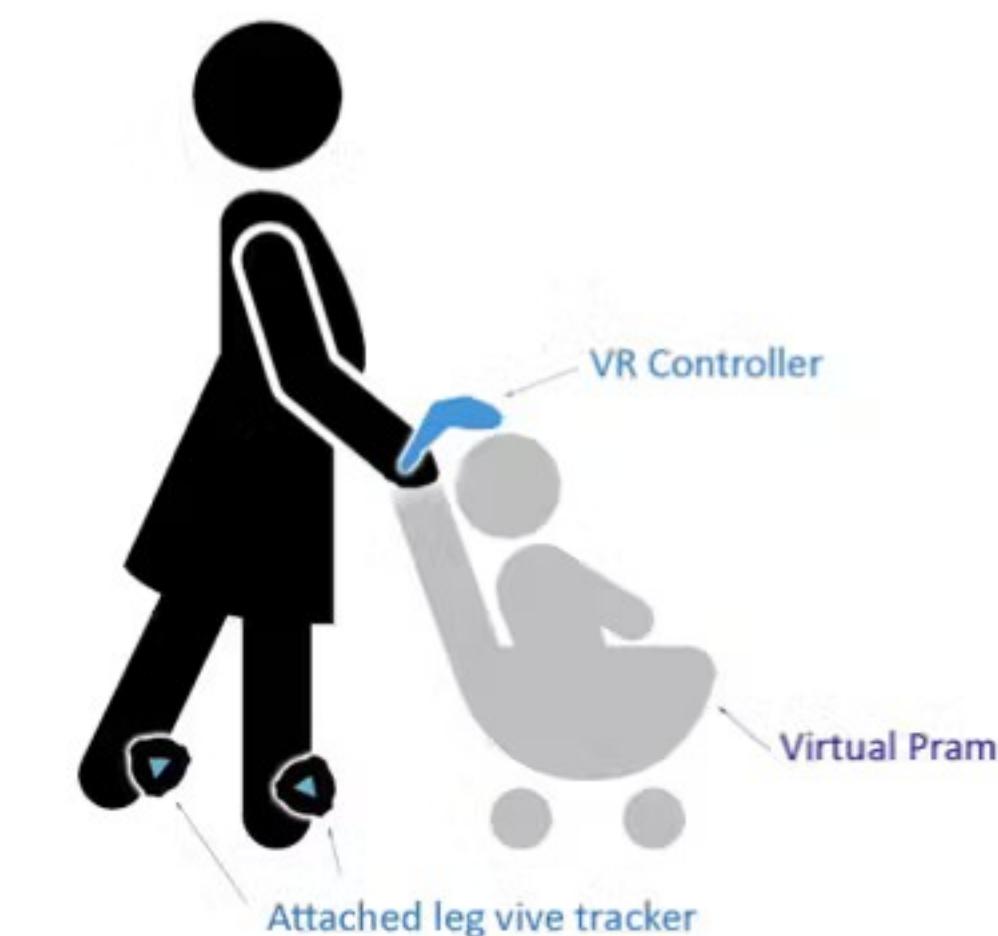
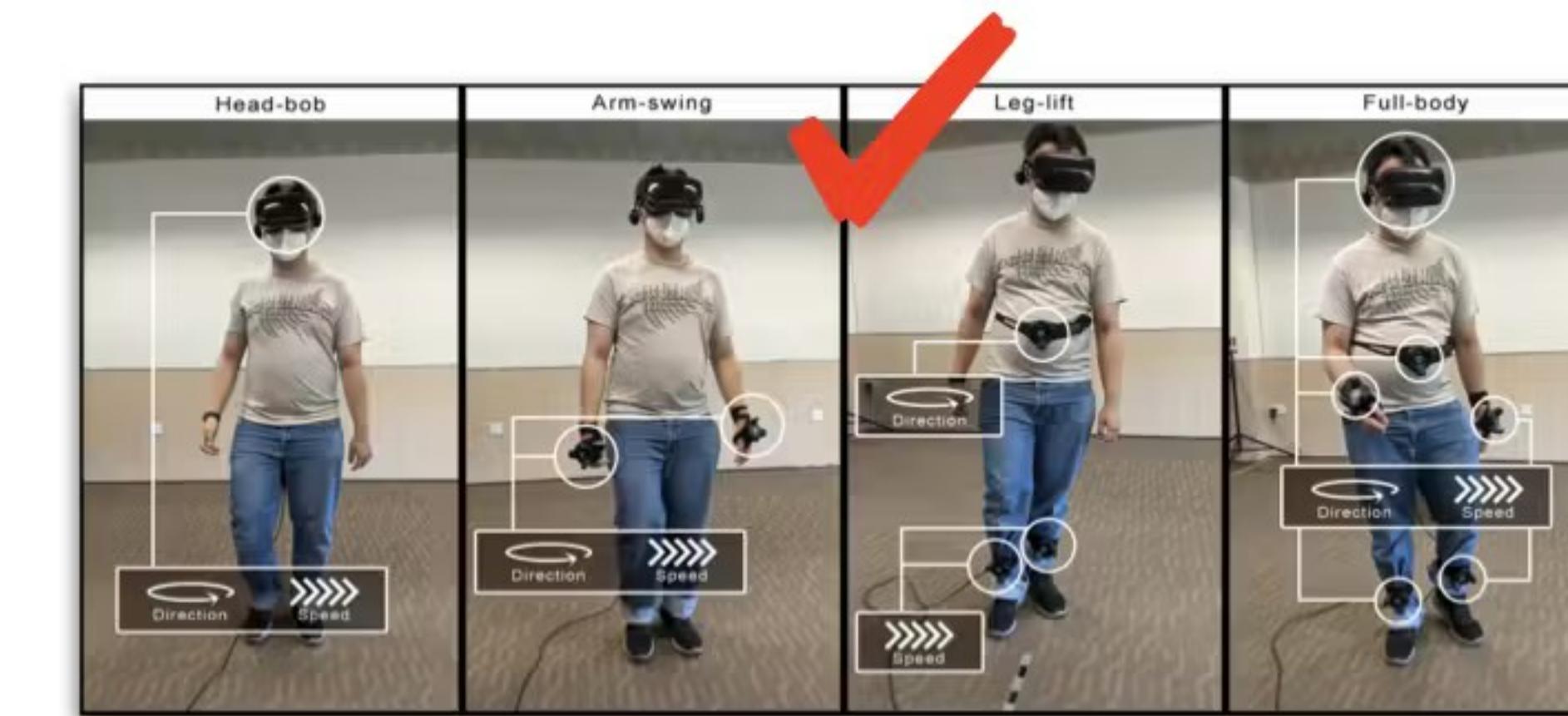


Redirected Walking in VR
(Langbehn & Steinicke, 2018)



VR “slidemills”

create a walking locomotion that is semi-natural yet easy to operate



Design → Implementation

minimal nausea and disorientation
symptoms [CYBERSICKNESS]

reducing common pitfalls that induce
visual-vestibular conflict



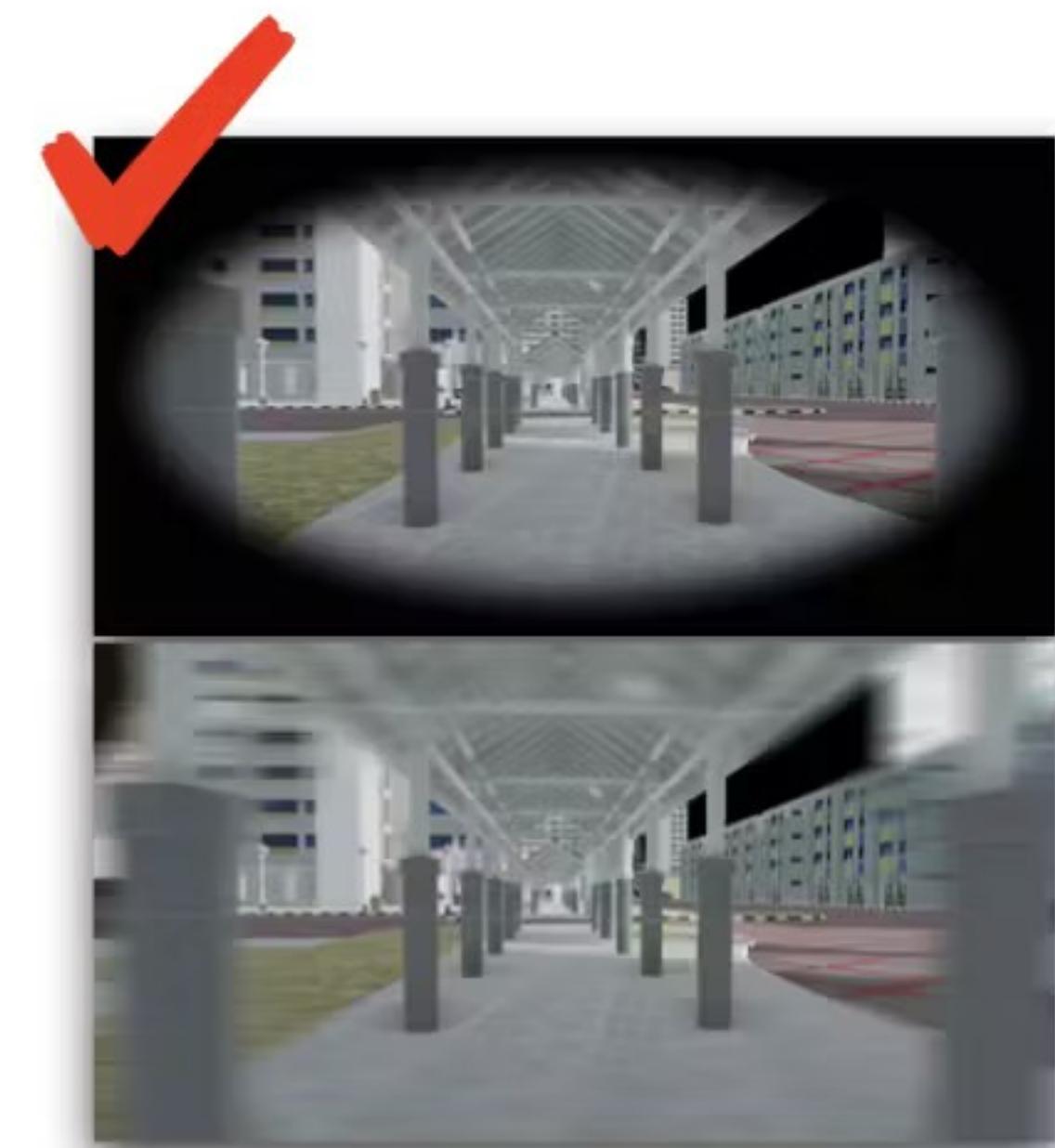
Joystick



Stationary

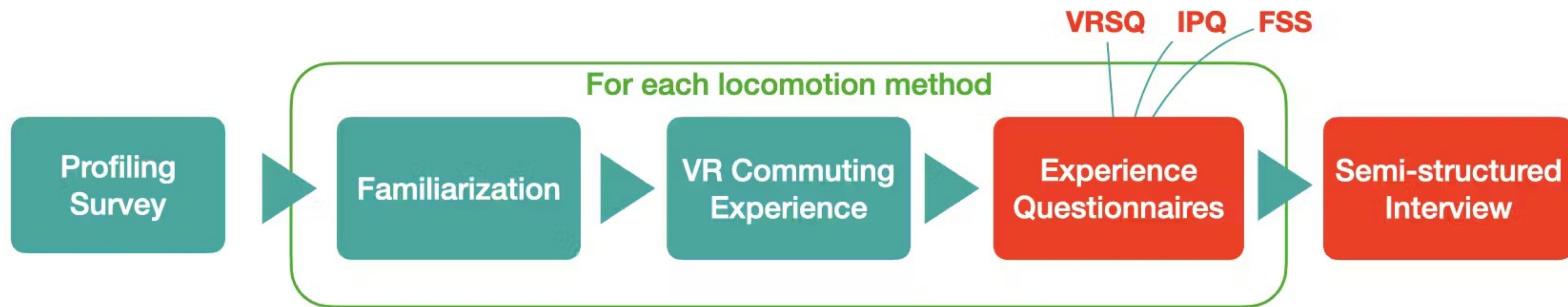


Walking Actions



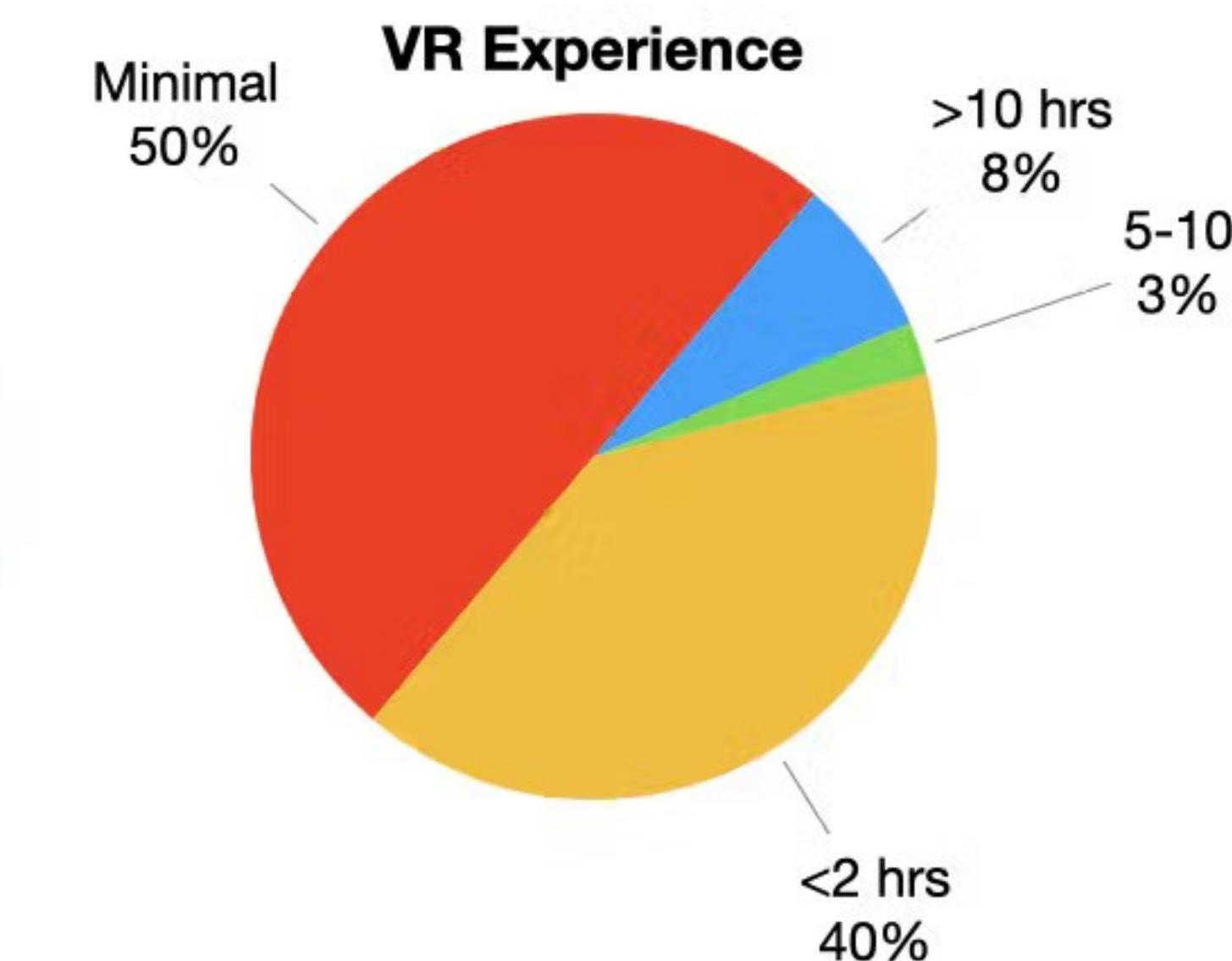
Visual mitigation
during movement

Data Collection Appropriate for Experiential Goals

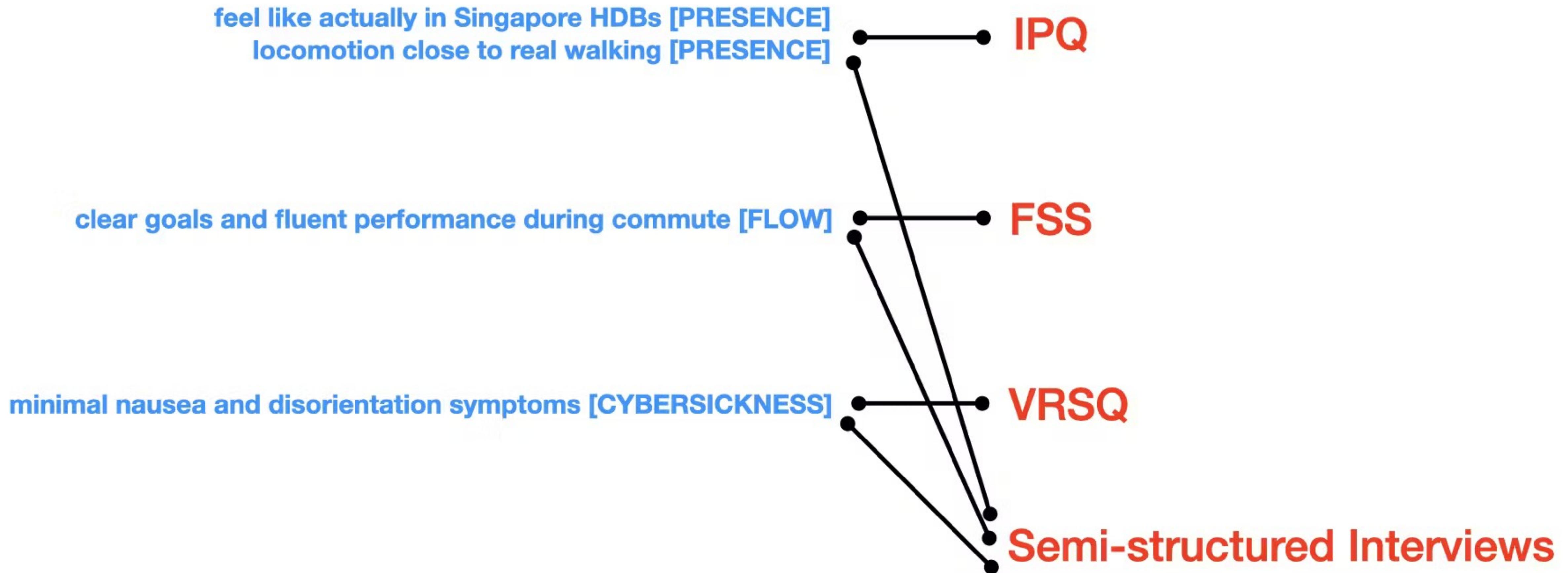


40 participants aged 21-45

Gender

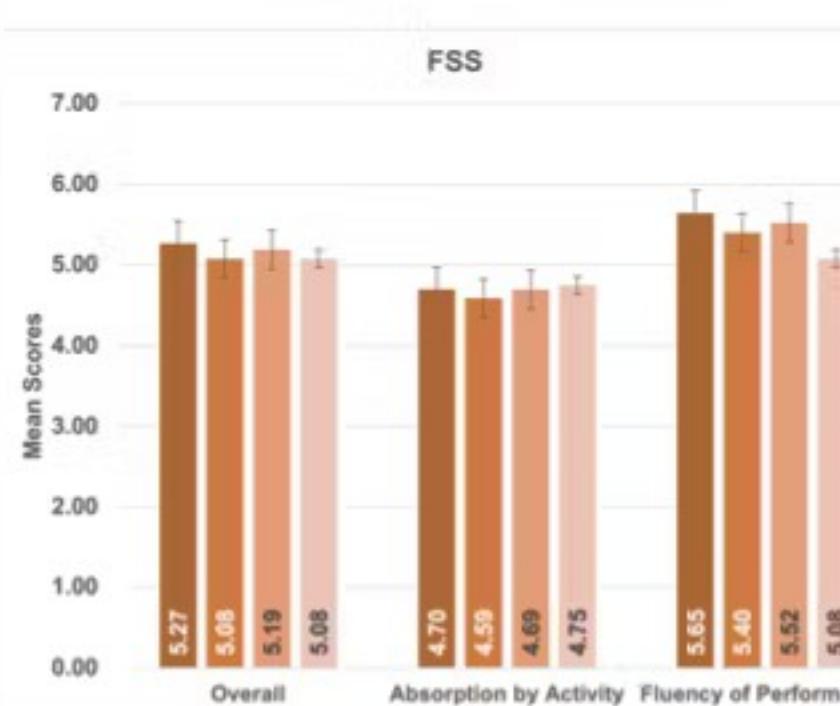
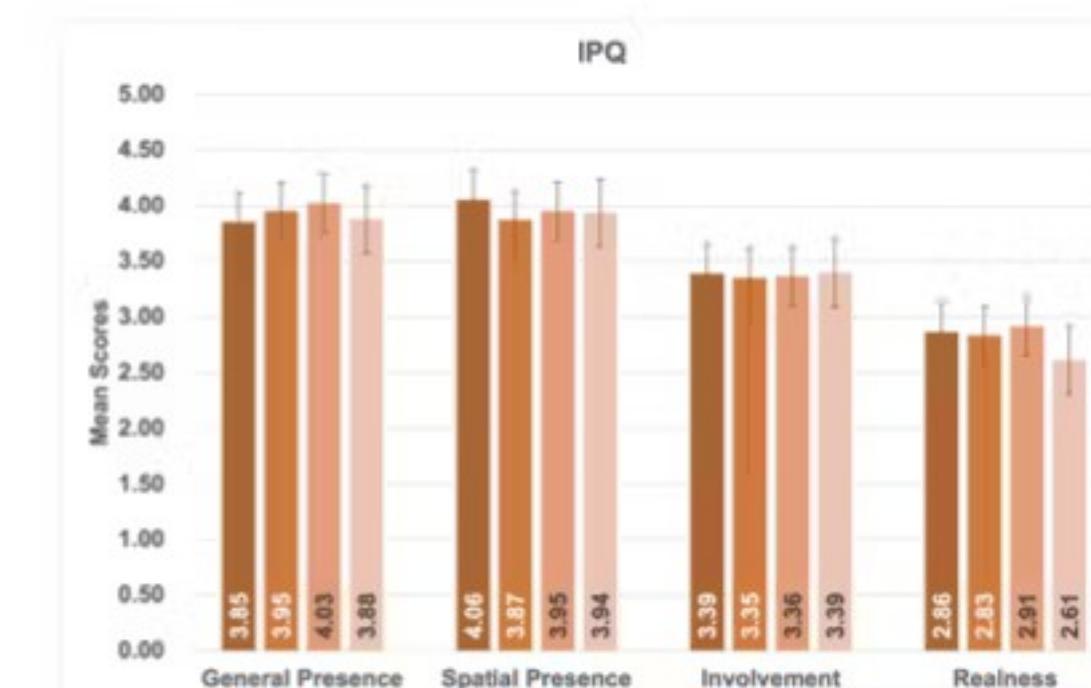
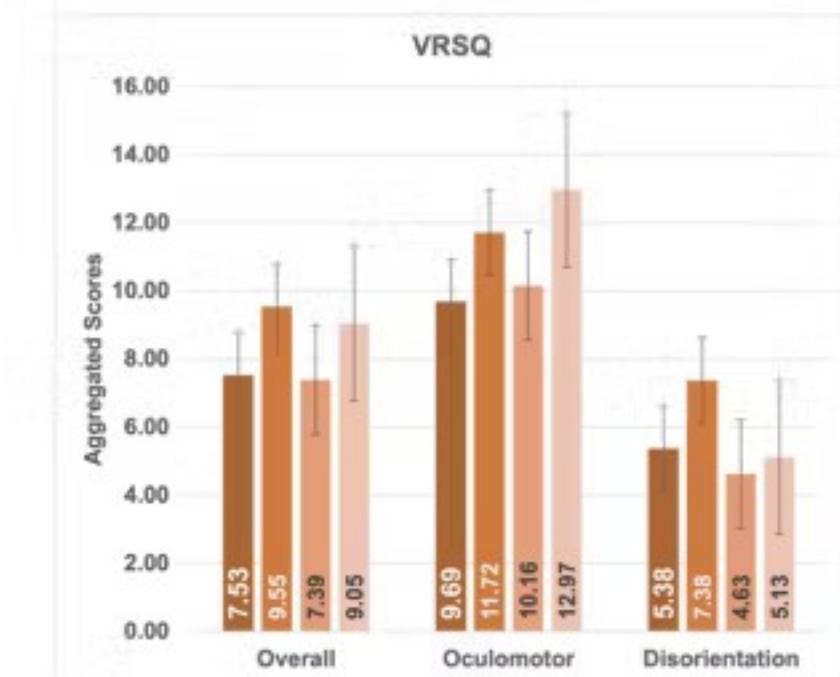


Data Collection Appropriate for Experiential Goals



Analysing Data to Form Conclusions

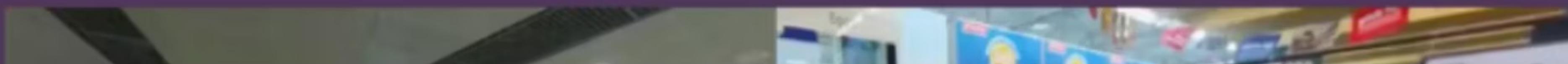
		CONTEXTUAL CODES					Total across CONTEXTs
		HEAD-BOB	ARM-SWING	LEG-LIFT	FULL-BODY	GENERAL	
Minimal cybersickness with WIP exertion	FATIGUING	8	0	7	7	5	27
	EFFORTLESS	5	8	1	0	1	15
	CYBERSICKNESS	2	7	0	2	1	12
Leg-lift method facilitated most positive experiences	POSITIVE-LOCOMOTION	6	7	25	1	6	45
	NATURAL	4	4	18	1	0	27
	PRESENCE	2	1	6	0	5	14
	EASY-TO-FOCUS	0	2	1	0	1	4
	NEGATIVE-LOCOMOTION	25	23	13	27	21	109
	UNNATURAL	11	14	4	14	3	46
	UNSURE-HOW-TO-LOCOMOTE	6	7	8	6	8	35
	HARD-TO-FOCUS	7	1	0	2	1	11
	DISCOMFORT-EQUIPMENT	0	1	0	1	5	7
	CONSTRAINED-BY-TRACKERS	1	0	0	3	3	7
	CONSCIOUS-OF-APPEARANCE	0	0	1	1	1	3
	AWKWARD-WIP-TECHNIQUE	7	13	5	7	1	33
Varying WIP gestures afforded by tracker positions	ADAPTED-WIP-TECHNIQUE	7	7	5	7	2	28
	AFFORDED-BY-TRACKERS	3	8	5	2	1	19
	LACK-SPEED-CONTROL	14	10	17	19	8	68
Perception of control was important for WIP	LACK-DIRECTION-CONTROL	5	9	10	8	2	34
	LACK-MOMENTUM	1	1	2	4	5	13
	SPACE-CONSTRAINED	3	4	7	4	5	23
Walking-"not"-in-place affects immersion	REQUIRE-SPATIAL-AWARENESS	3	4	2	4	8	21
	UNSAFE	0	0	2	2	7	11
	DISEMBODIMENT	1	0	1	2	2	6
	UI-GUIDANCE-WORKS-WELL	0	0	0	0	27	27
Visual qualities affect WIP motivations	UI-GUIDANCE-CONSTRAINED-EXPLORATION	0	0	0	0	22	22
	INCLINED-TO-EXPLORE	3	2	0	1	15	21
	LACK-OF-MOTIVATION-TO-MOVE	0	0	0	0	8	8
	DESIRE-FOR-MORE-ASSETS	0	0	0	0	45	45
	DESIRE-FOR-MORE-REALISTIC-ASSETS	0	0	0	0	21	21
	DESIRE-FOR-ANIMATED-ASSETS	0	0	0	0	15	15
	DESIRE-FOR-SOUNDS	0	0	0	0	9	9



■ HEAD-BOB ■ ARM-SWING ■ LEG-LIFT ■ FULL-BODY



Experience Dementia in Singapore - Uncle James on his way home



Experience Dementia

Designing for Immersion

It is first essential to consider all stakeholders of the application

- **Users** - the general public
 - gained knowledge to empathize with dementia
 - enhanced experience for someone with an HMD
- **Collaborator** - Dementia Singapore (dementia.org.sg)
 - aims to educate the public on dementia
 - aim for as many users as possible

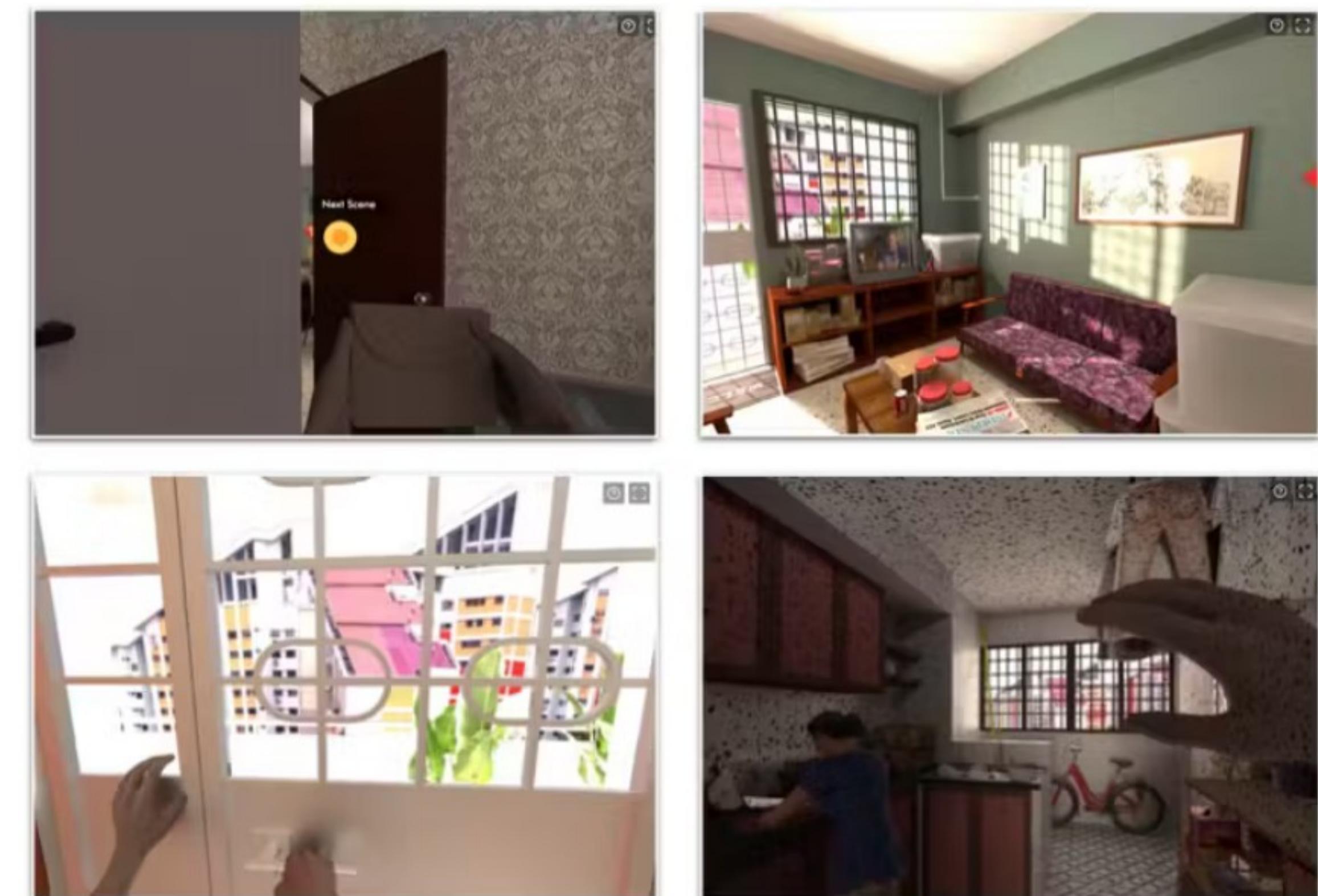
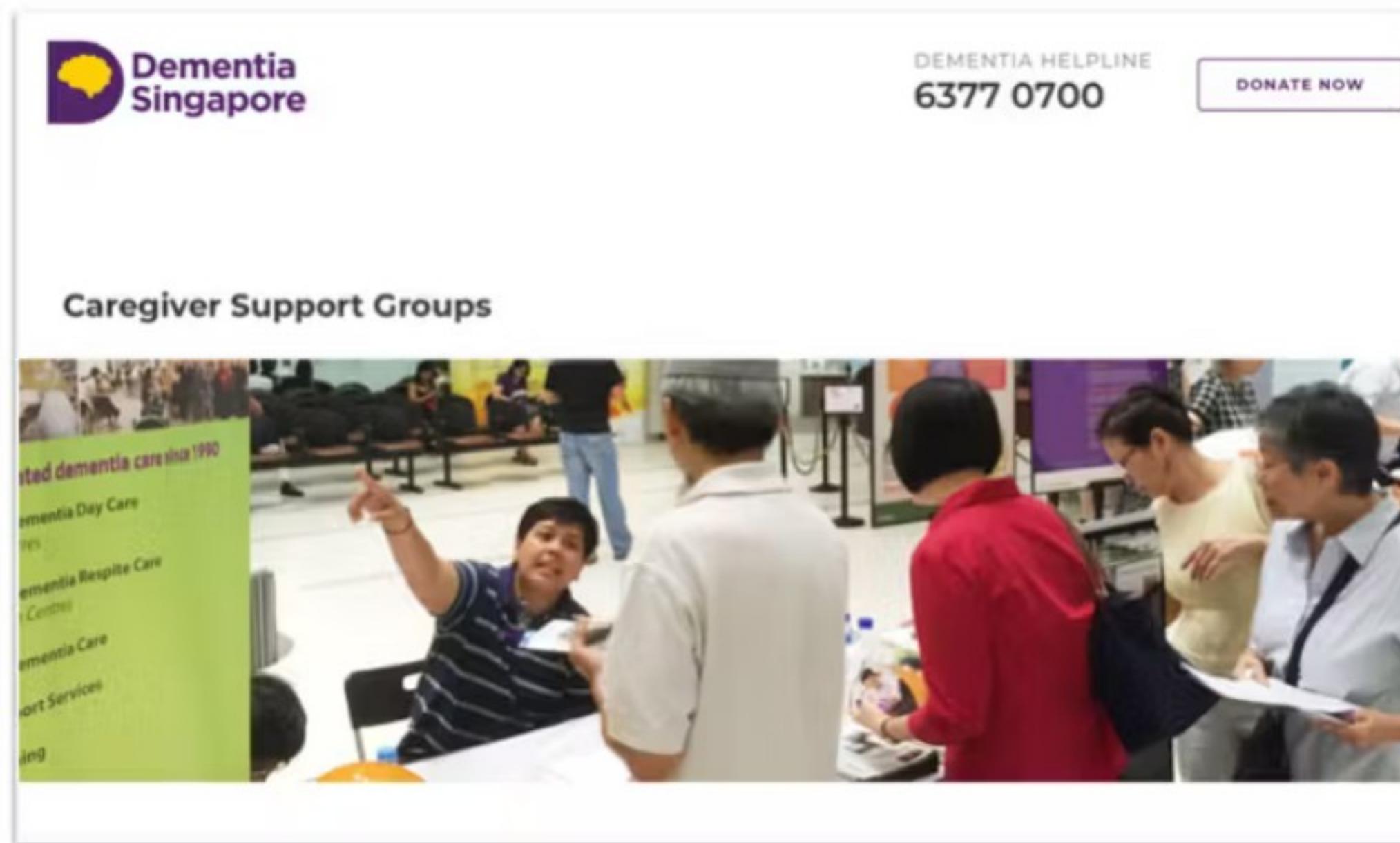
Having established the context, we craft key design goals for immersion

- improved empathy with dementia (both VR & Desktop) [EFFECTIVENESS]
- minimal physiological discomfort (both VR & Desktop) [CYBERSICKNESS]
- improved immersion in VR over Desktop [PRESENCE]

Design → Implementation

improved empathy with dementia
(both VR & Desktop)
[EFFECTIVENESS]

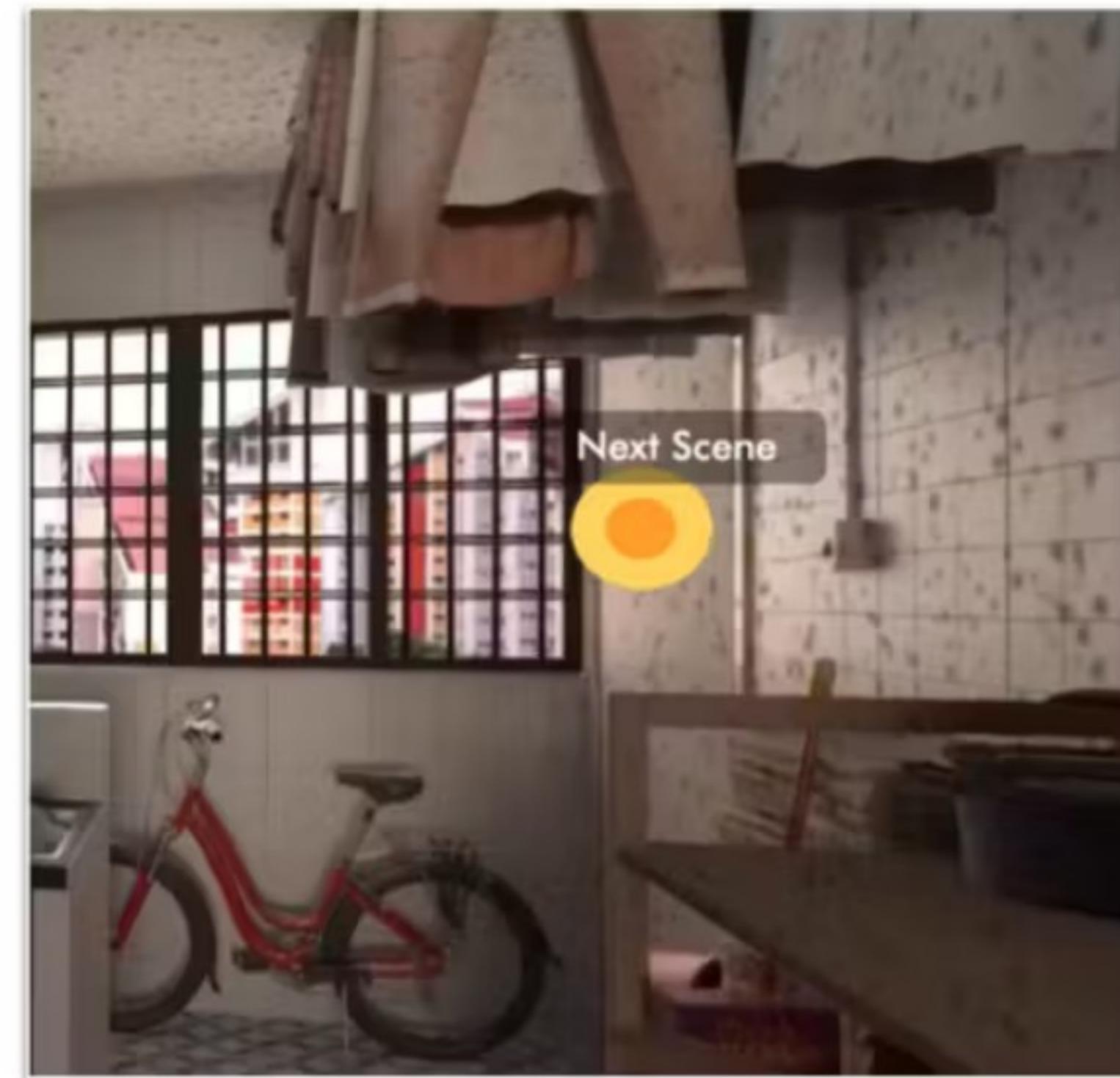
implement scenarios guided closely by
caregiver domain experts



Design → Implementation

minimal physiological discomfort
(both VR & Desktop)
[CYBERSICKNESS]

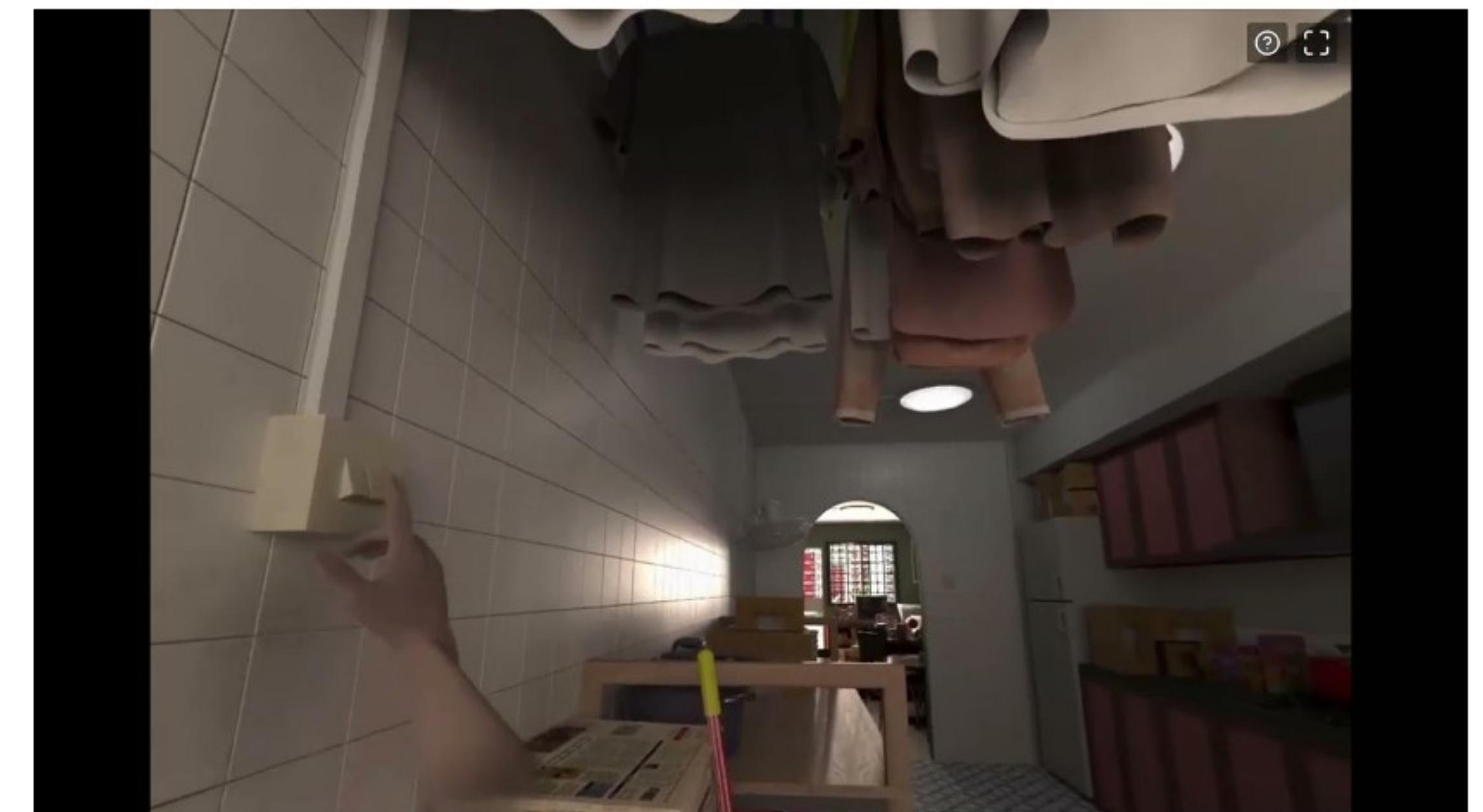
use minimal locomotion variability (a
point-and-click experience)



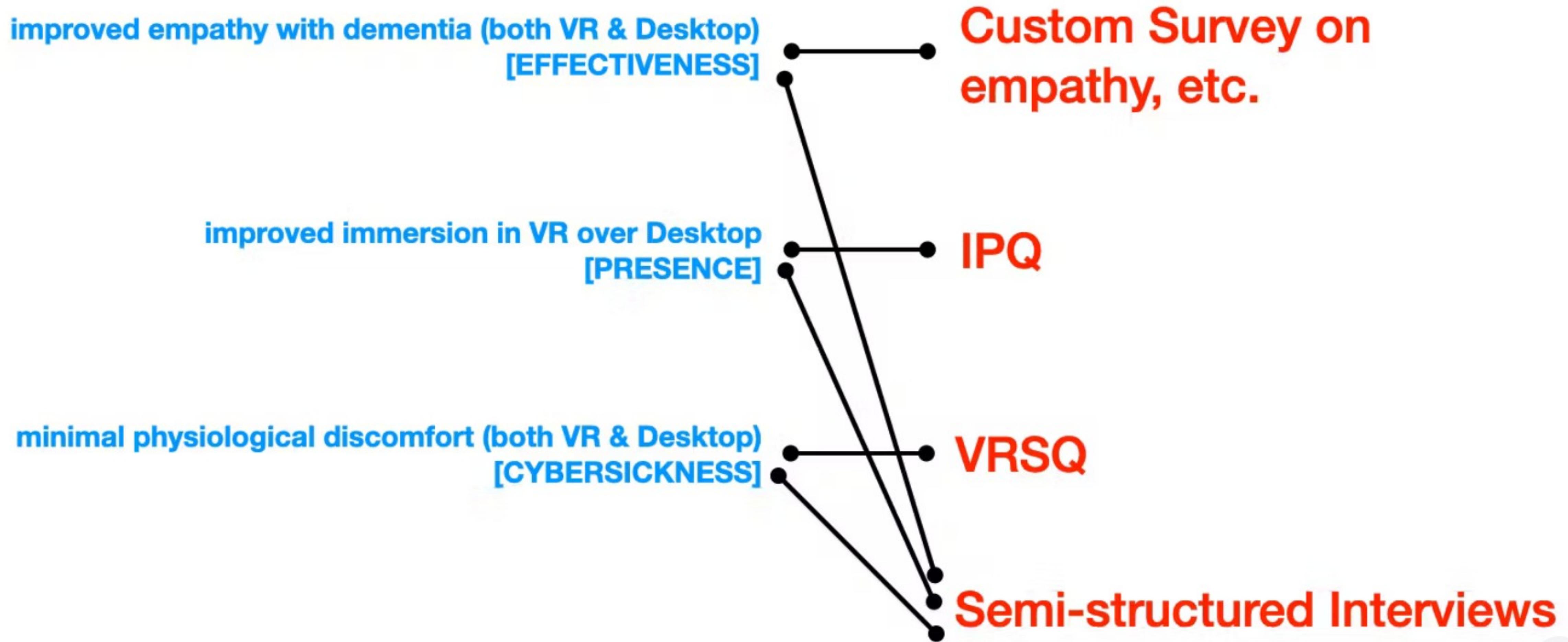
Design ➔ Implementation

improved immersion in VR over
Desktop [PRESENCE]

provide the most essential VR interaction
mechanic - viewpoint control



Data Collection Appropriate for Experiential Goals



Analysing Data to Form Conclusions

Median score change in pre/post, Mann-Whitney U Test

Measure	Web-based VR		VR-headset		z score	p (two tailed)	p (one tailed)
	Pre/post median change in score	Obs	Pre/post median change in score	Obs			
Dementia Attitude Scale	11	25	8	57	1.26	.21	.10
Dementia Knowledge and Attitude Scale	3	25	6	57	-3.06	.0022	.0011
Empathy and Understanding in Dementia Index	11	25	10	57	1.04	.30	.85

Mean score for Virtual reality sickness questionnaire (VRSQ), Man-Whitney U Test

Measure	Web-based VR		VR-headset		t score	p (two tailed)
	Mean score	Obs	Mean score	Obs		
Virtual reality sickness questionnaire (VRSQ)	3.03	25	11	27	-3.02	0.0026

Mean score for Igroup Presence Questionnaire (IPQ), and Independent t-test

Measure	Web-based VR		VR-headset		t score	p (two tailed)
	Mean score	Obs	Mean score	Obs		
Igroup Presence Questionnaire (IPQ)	-6.24	25	3.92	27	-3.86	<.001

I got to experience being a person with Dementia and learnt about some troubles I never thought persons with Dementia faced

The audio component of the web based VR made it immersive and helped invoked emotions (eg. heartbeat effect made me feel anxious while humming and the calm music made me feel calm)

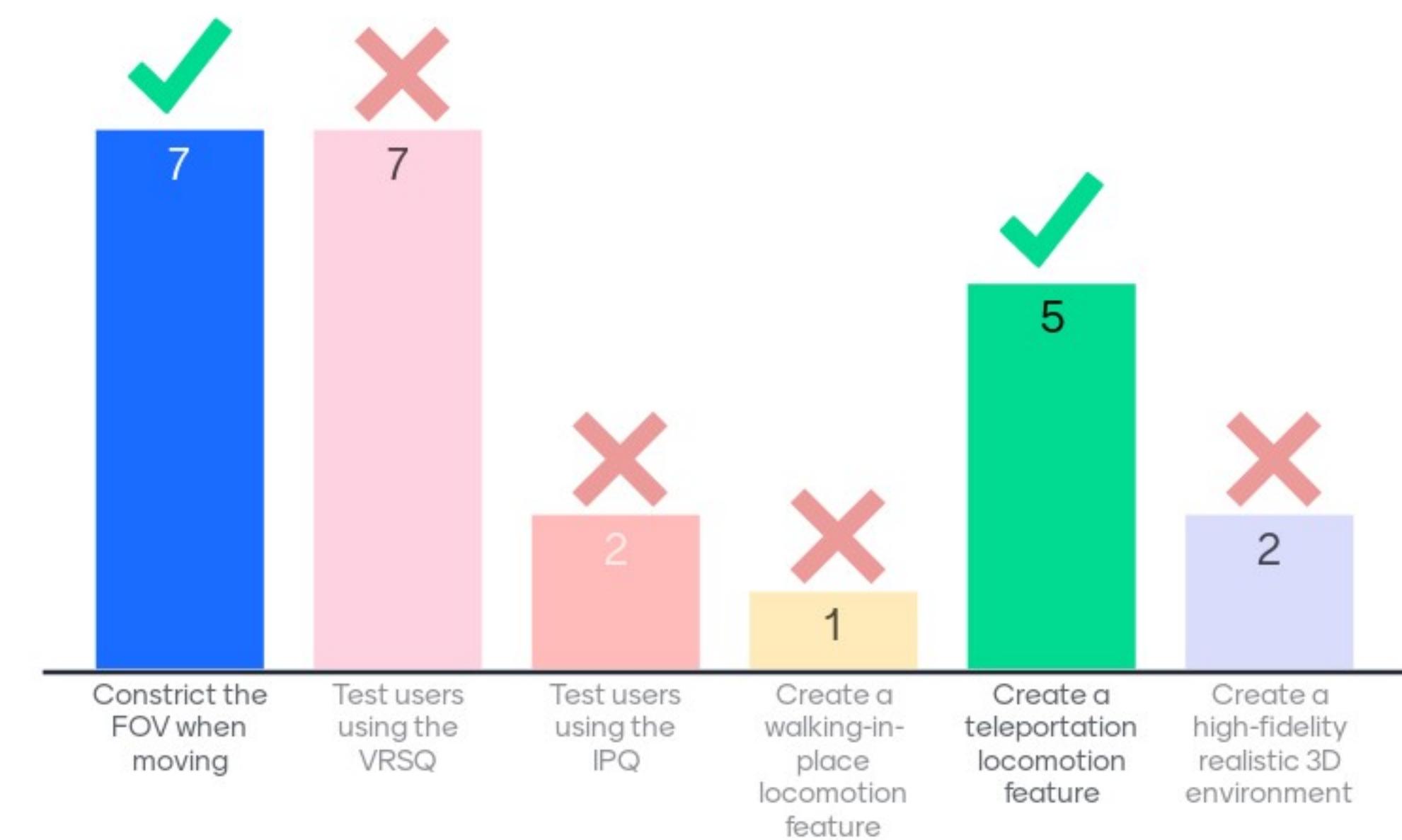
I liked the VR experience because I was able to understand and empathize PWDs better in their POV



Quiz time

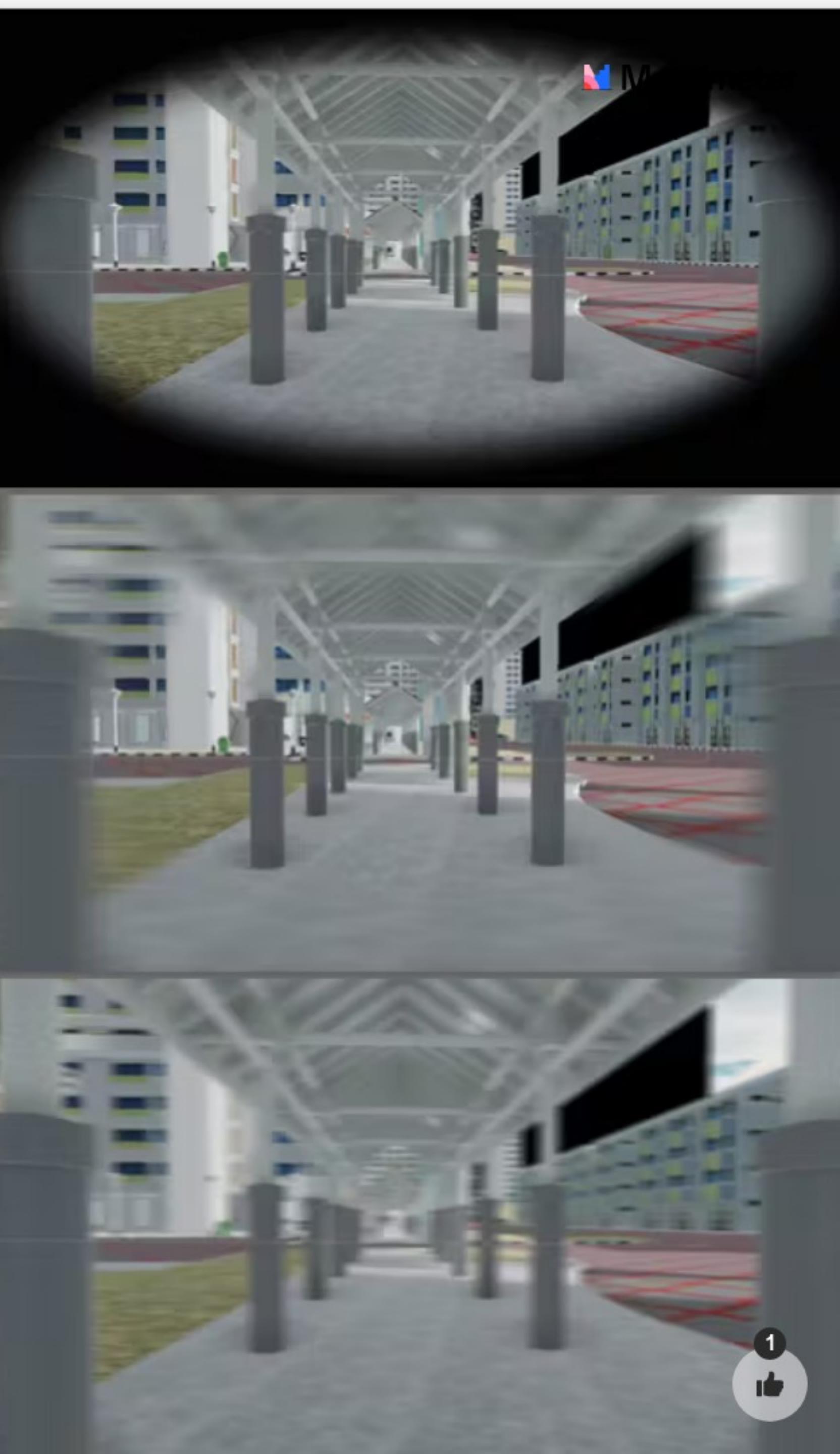


Which of the following implementations will this design translate into?

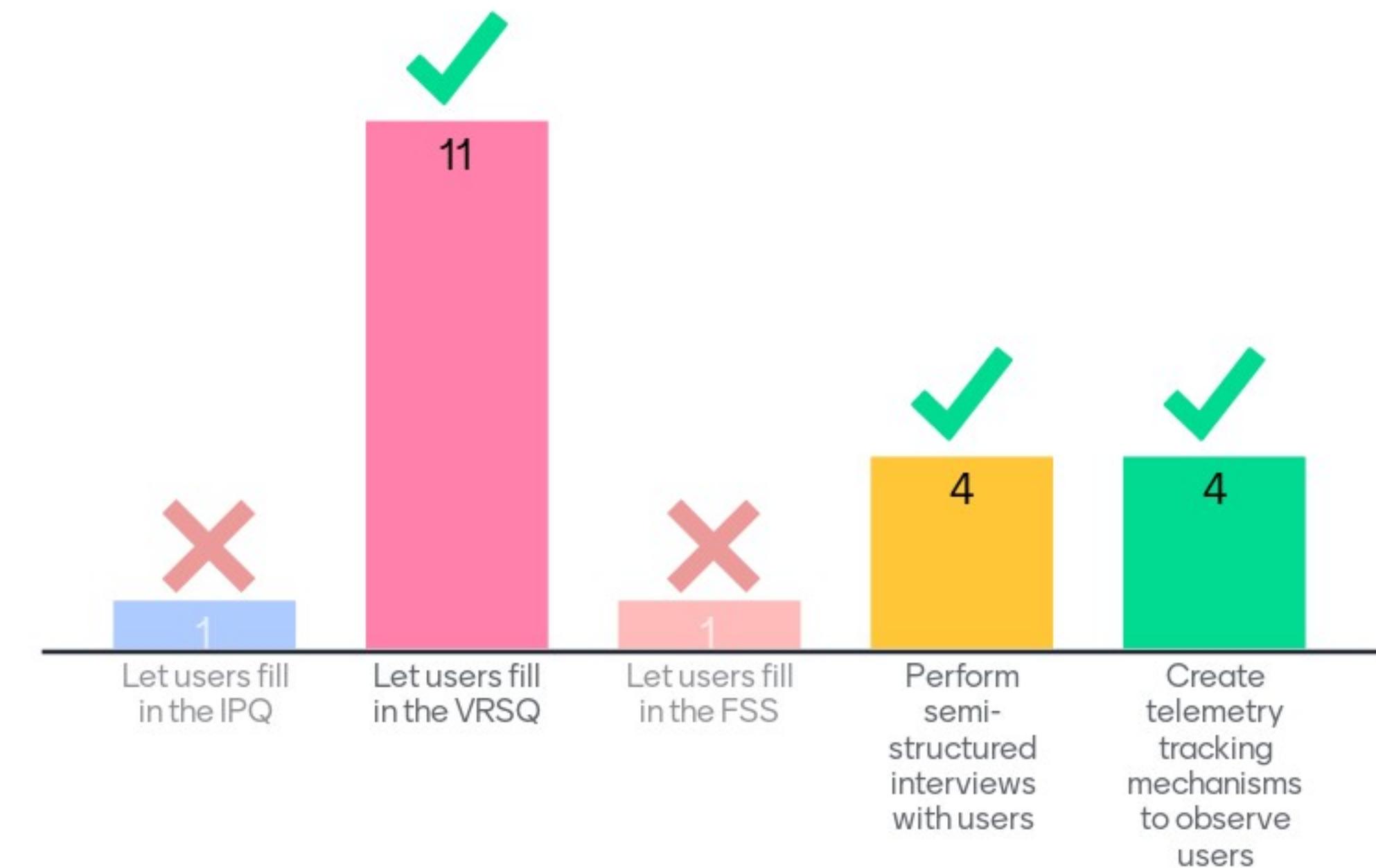


Cybersickness

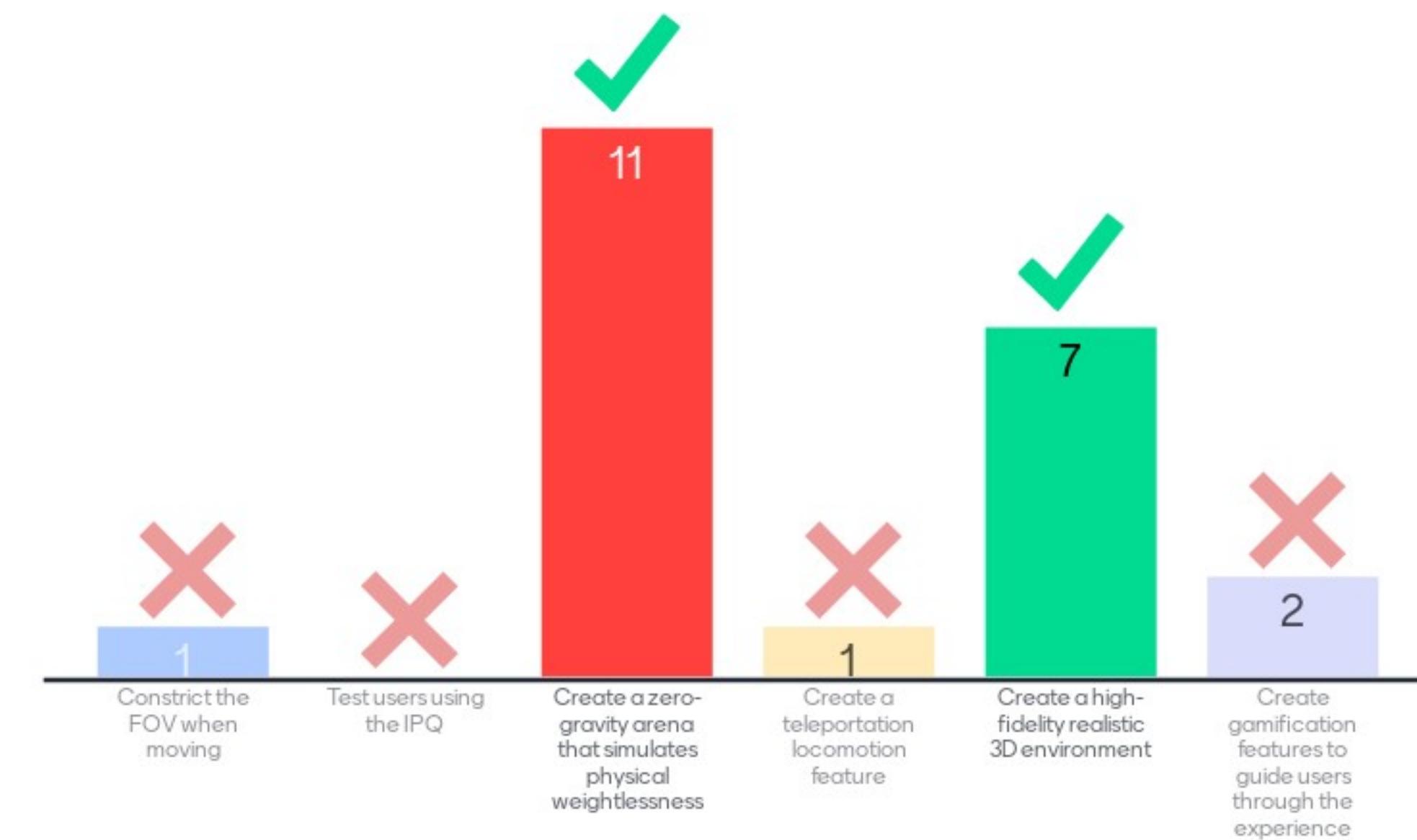
- We prototyped various ways to mitigate it...
- How the Presence and Size of Static Peripheral Blur Affects Cybersickness in Virtual Reality (Lin et. al. 2020)
- Narrative and gaming experience interact to affect presence and cybersickness in virtual reality (Weech et al. 2020)



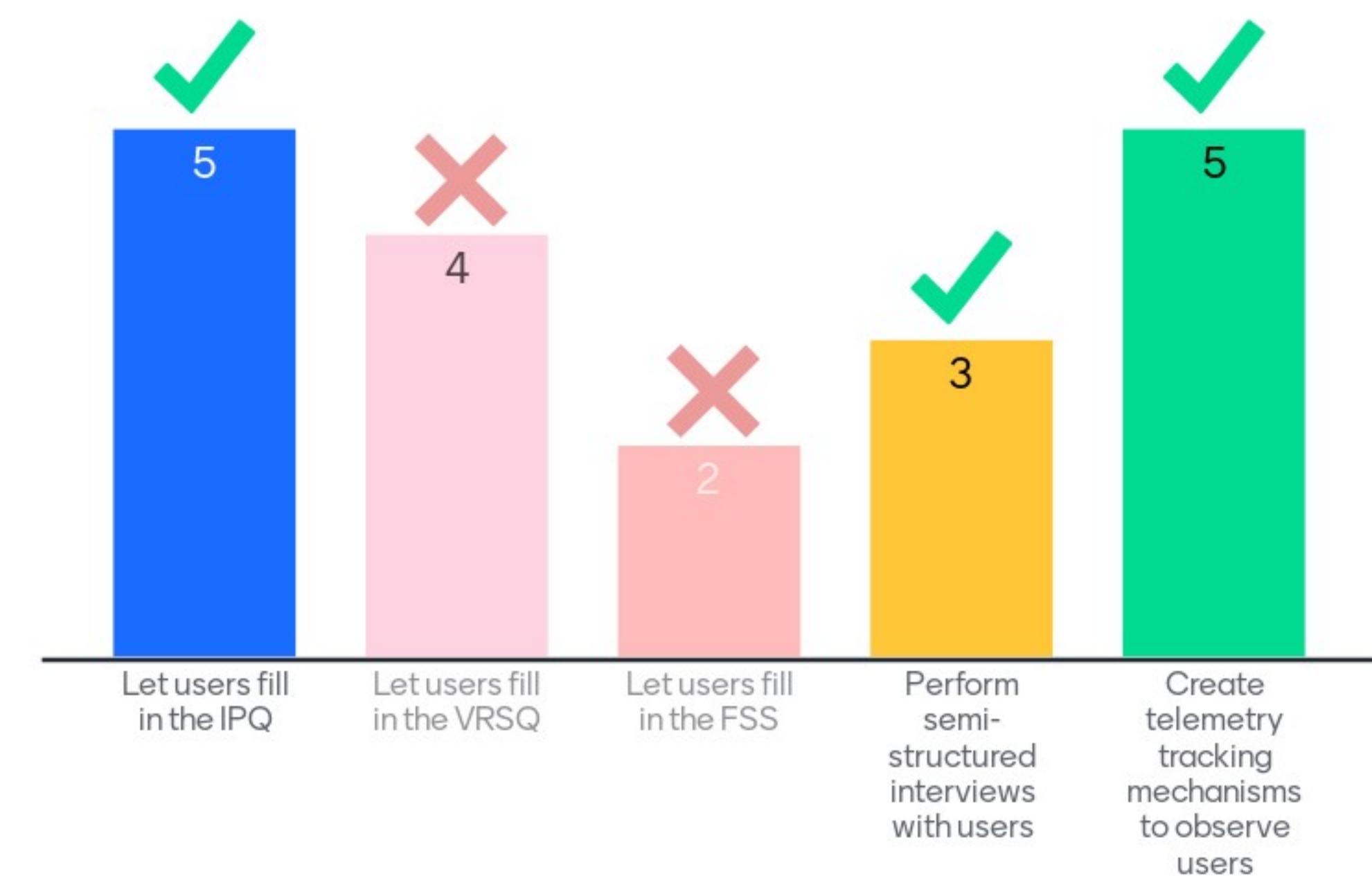
What data collection methods can be appropriate here?



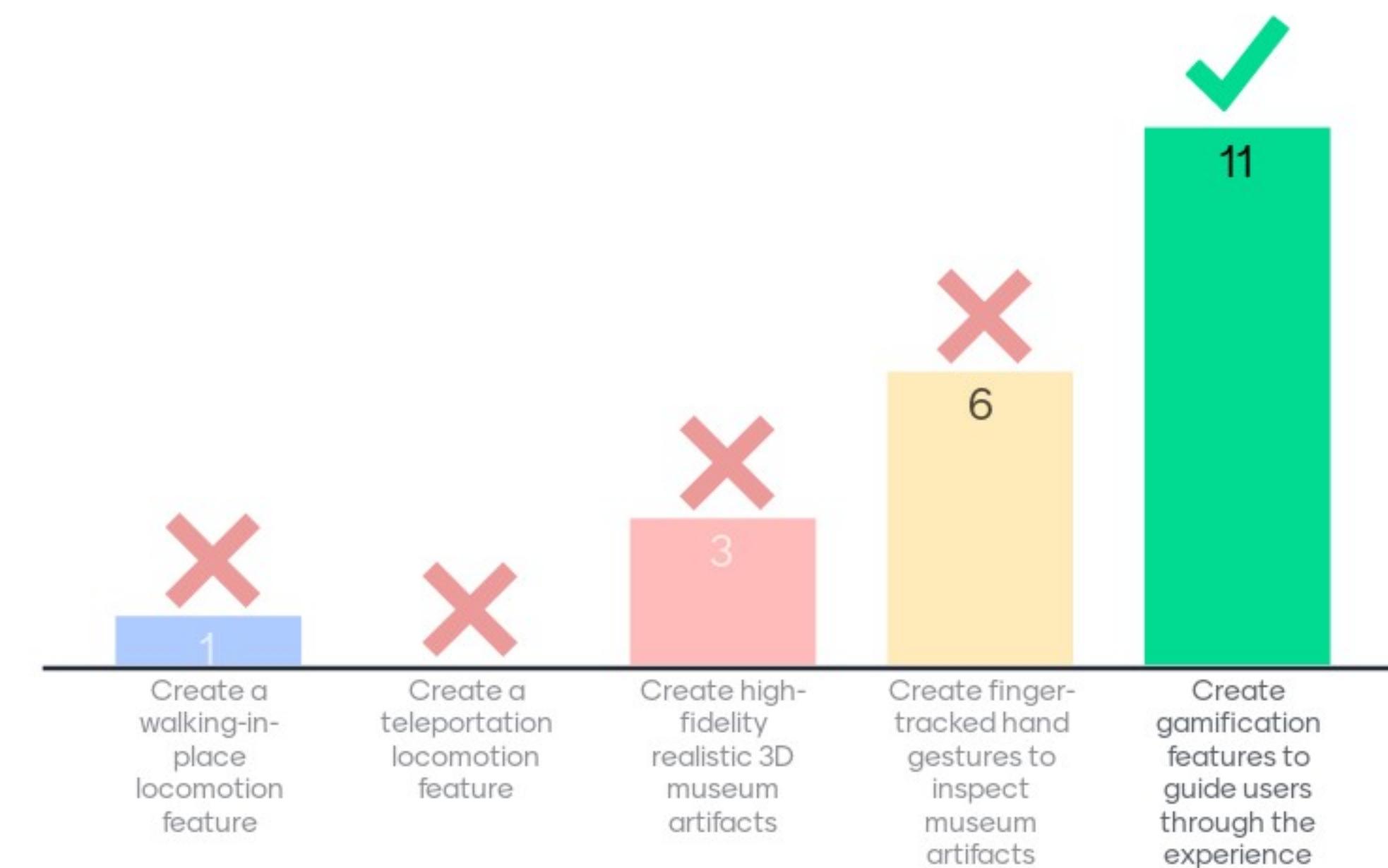
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What data collection methods can be appropriate here?



Which of the following implementations will this design translate into?



What data collection methods can be appropriate here?



Leaderboard



Ask me anything

0 questions
0 upvotes

