



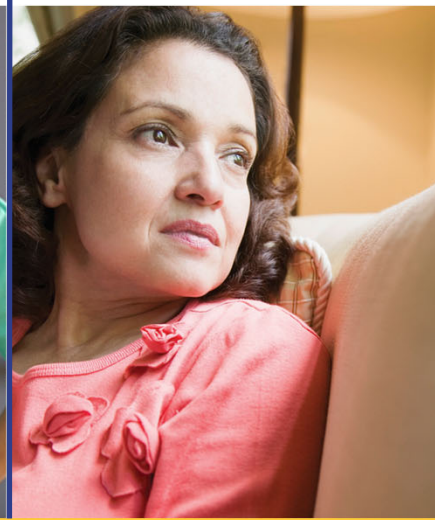
National Institute
of Nursing Research

Advanced Visualization Branch:

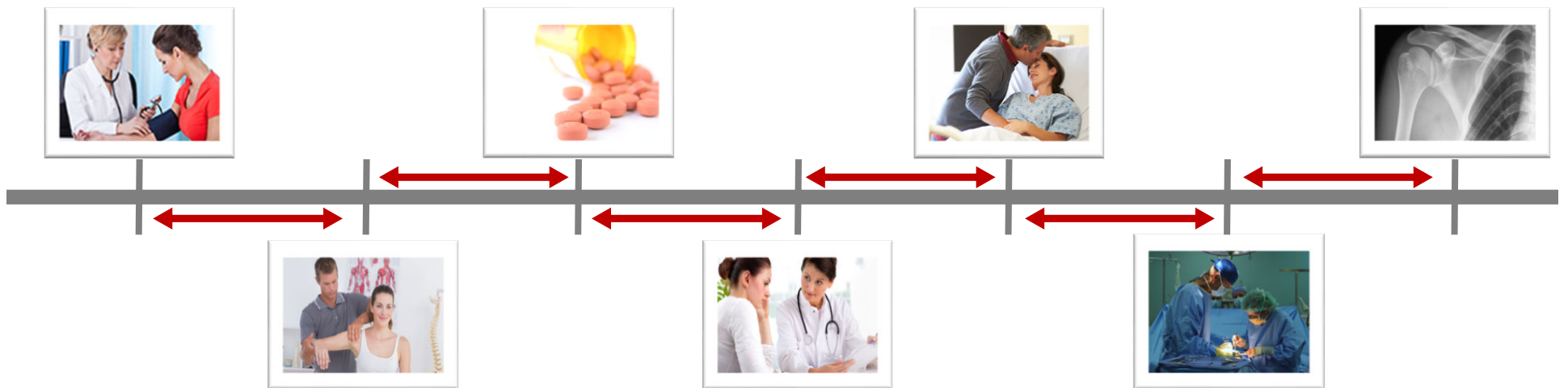
Bringing the Real World into the Lab

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NINR Council Meeting May 18, 2021



The Care between the Care



Go where the care happens.

Research Challenges in Nursing

- Supporting self-management
- Find creative ways to use emerging technologies to understand behavior in context
- Isolate, explore and intervene with micro-behaviors



Thinking in a new way....

We want to understand how people translate professional guidance into personal, everyday living

Characterize the *environment* as a nursing intervention

Focus on self-care, function, and high-level well-being not disease-focused

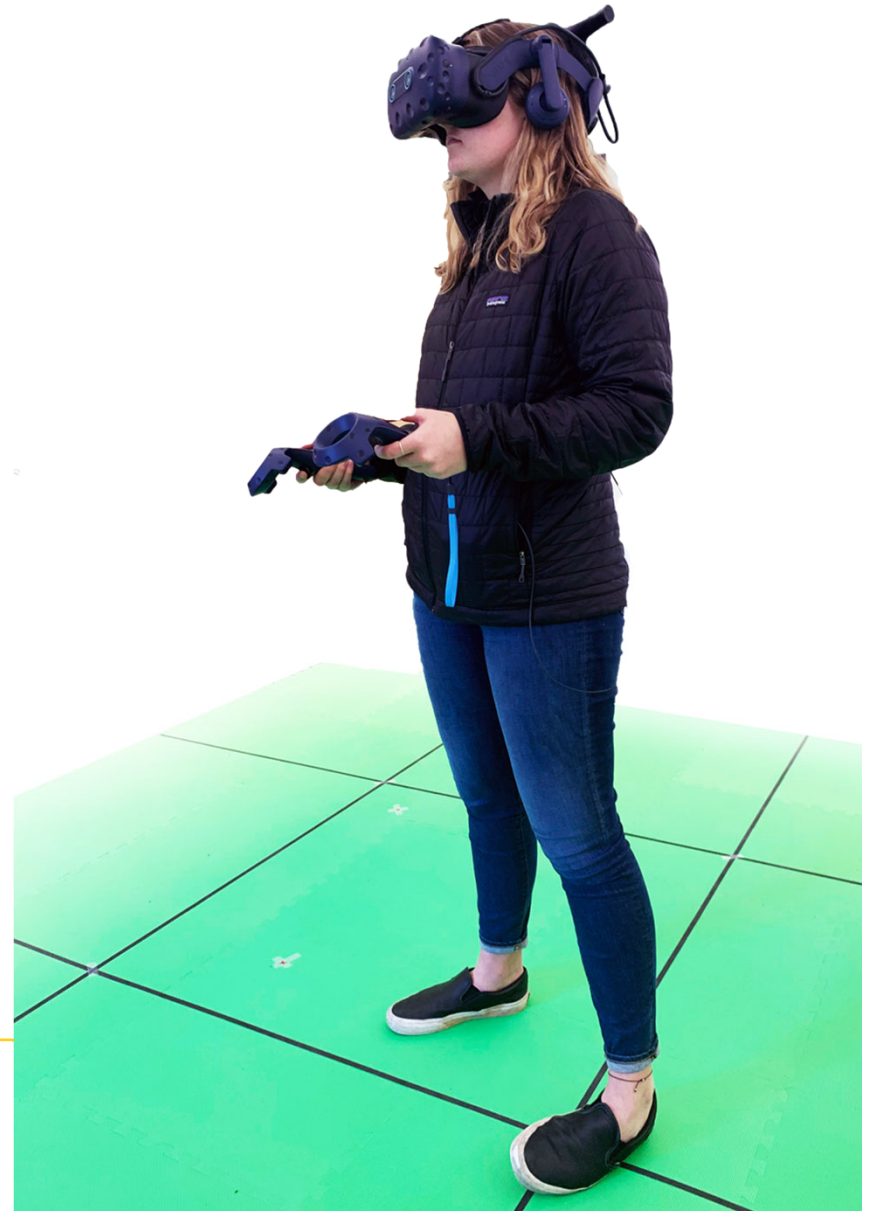
Figuring out what can be understood in vitro, what must be understood in vivo

Describe the context of microbehaviors



The Advanced Visualization Branch of NINR

- A newly formed **digital technology research group** focused on real-life self-care management
 - Evaluate the **usefulness** of IVR technology as a research platform
 - Design and build **real-world environments** to unobtrusively study factors impacting self-care behaviors & instrumental activities of daily living
-
- **Use IVR** environments as our investigational platform

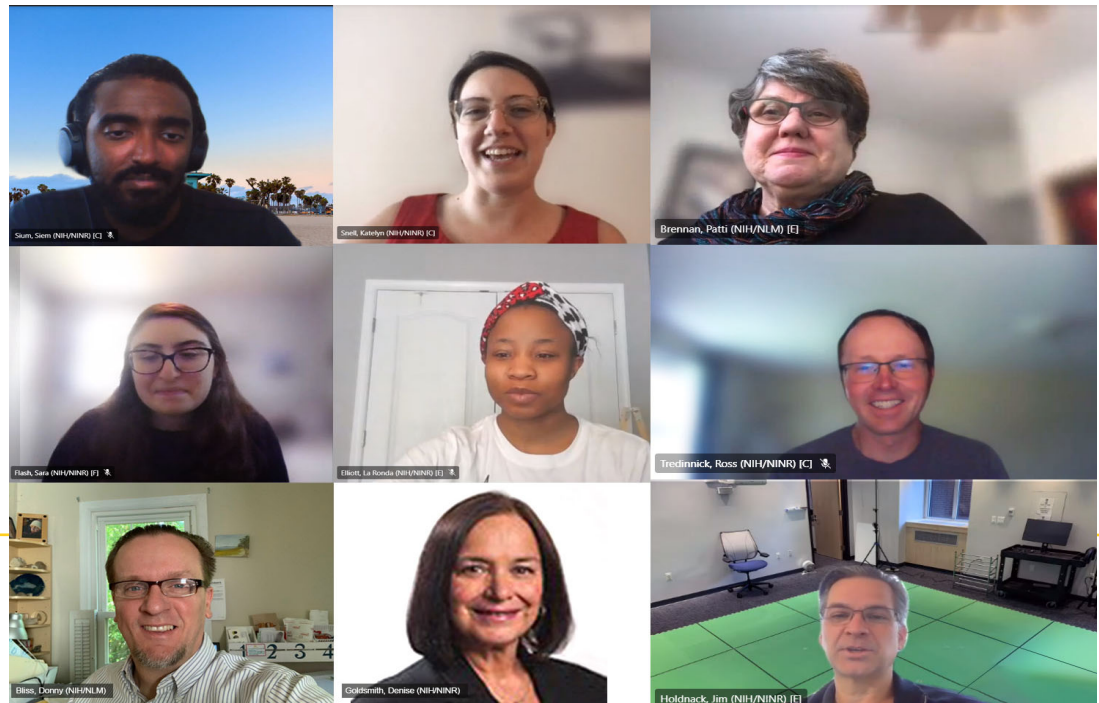


AVB Staff

Taps talents from a broad range of disciplines:

- Nursing
- Engineering
- Graphic design
- Research/Clinical/Neuropsychology
- Statistics/Psychometrics/Digital Test Development

Here's more information: <https://www.ninr.nih.gov/researchandfunding/avb>



VR a Research Platform

VR has been used a research platform for decades

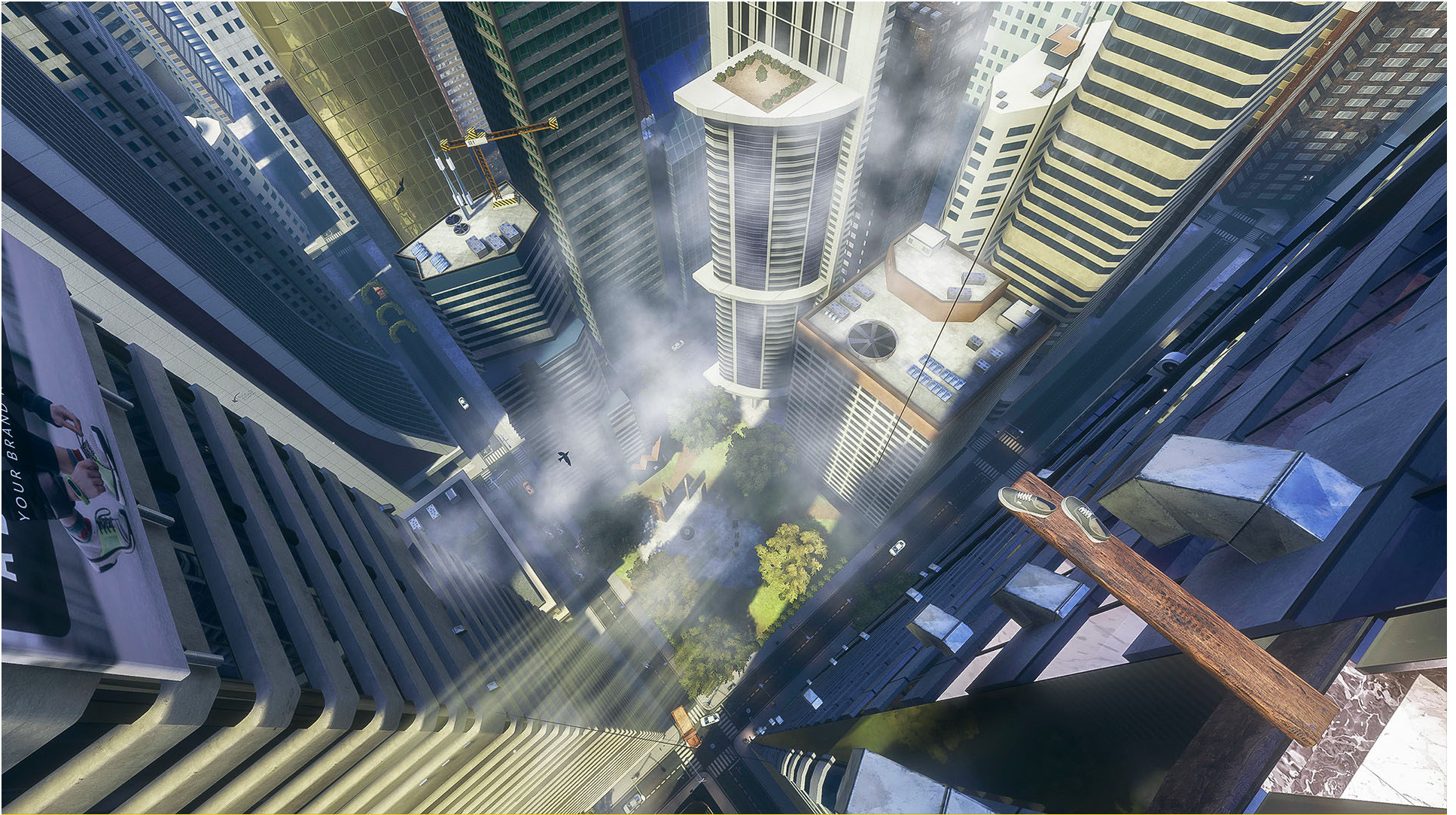
Behaviors in VR align well with real life behavior

Provides a safe environment to study complex behavior

- Fear of heights
- Social anxiety
- Addictions
- PTSD
- Stigma/bias



What can IVR do? Safely explore fear of heights



Ritchie's Plank Experience Image from STEAM



IVR as a Research Platform

Virtual Environments allow us to evaluate self-management behaviors and the impact of symptoms on daily living

- Self-Management
 - Medication taking
 - Dietary compliance
- Cognitive Fatigue
 - A common comorbidity
 - May be exacerbated by emotional factors
 - Also affected by individual differences



Our first environment in the AVB

Sorting pills in a virtual kitchen



Virtual Grocery Store as Research Platform

Establishes a controlled environment to parse cognitive from emotional factors associated with fatigue

Allows versatility to explore aspects of selfcare

- Impact of fatigue on shopping activity
- Examine movement, judgement & fatigue as part of self-management
- Understand individual differences that contribute to efficient self-management



Virtual Grocery Store as Research Platform

Grocery stores are a common well recognized complex environment that afford a high degree of visual/audio stimulation and invoke a variety of behaviors



Health behaviors in VR: Food Choice

Dietary restrictions frequently associated chronic medical conditions (e.g., sodium, sugars, fats, etc...) identified by clinical nurses as a challenge point in self-care.

Which one is best for your diet?



Virtual Grocery Store as a Research Platform

Search for items using a shopping list



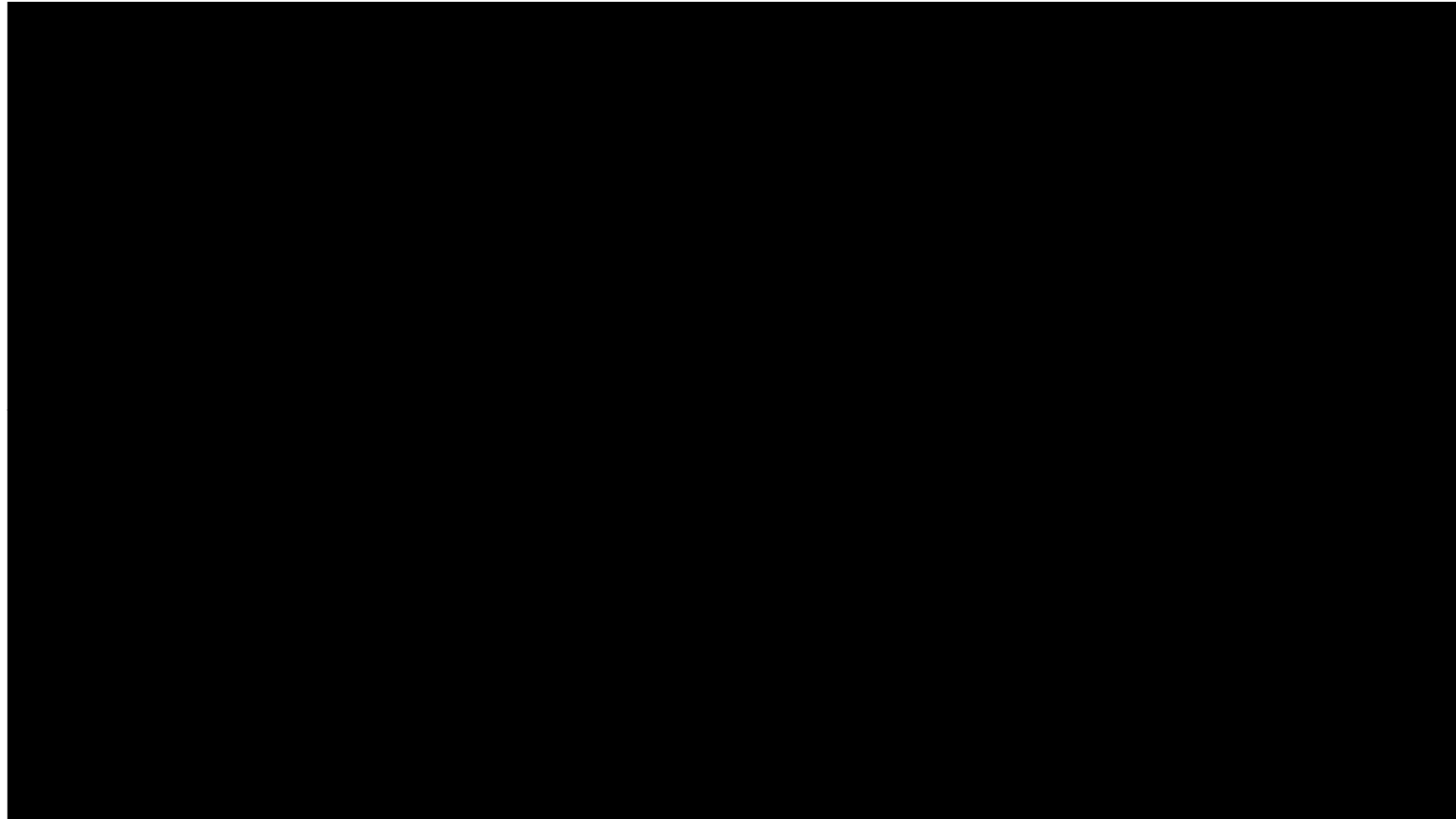
Virtual Grocery Store as a Research Platform

Get a text message



AVB Lab and Clinic

From development to ...



AVB Lab and Clinic

... engagement



Virtual Grocery Store as a Research Platform

- **Initial Questions:**

- Is immersive virtual reality an appropriate and useful tool for investigating cognitive fatigue?
- Does grocery shopping as a common IADL induce subjective feelings of cognitive fatigue? Do distractions and frustration increase feelings of fatigue?
- Can we identify objective markers of fatigue?
 - Performance: errors and activity rate
 - Eye-tracking: changes in focus and concentration
 - Movement: efficiency of movement in the environment (e.g. learning and planning)



Is a useful tool for studying individual differences in susceptibility to common symptoms observed in a “naturalistic” environment.



Measuring Fatigue and Workload


Track self-perceived symptoms/mental workload in the VR experience

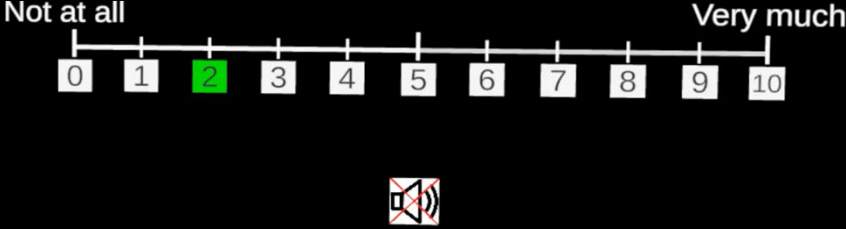
- Self-report fatigue pre- and post-shopping (VFAS)
- Workload – post-shopping (NASA-TLX)

Do you feel the desire to close your eyes?

Not at all Very much

0 1 2 3 4 5 6 7 8 9 10



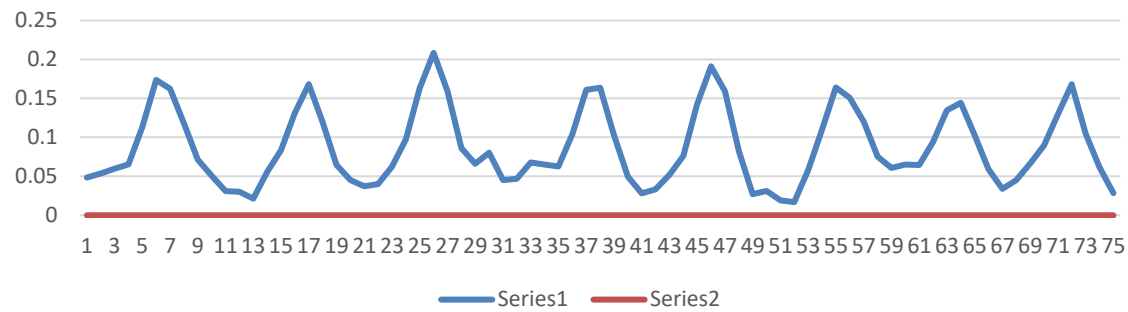


A horizontal scale from 0 to 10 with tick marks. The number 2 is highlighted in green. Below the scale is a speaker icon with a red 'X' over it, indicating muted audio.

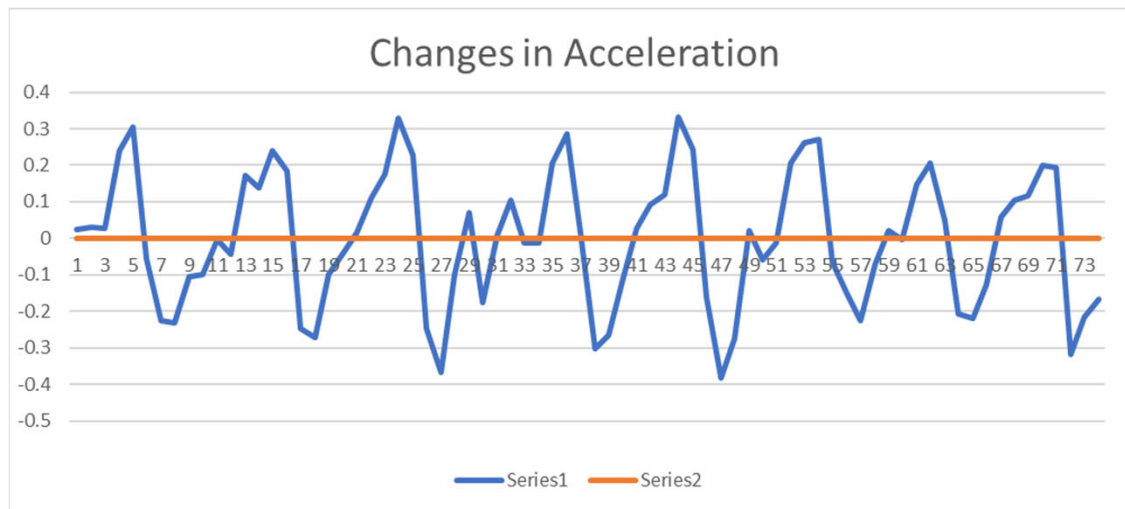


Visualize Movement and Learning

Velocity Changes



Changes in Acceleration

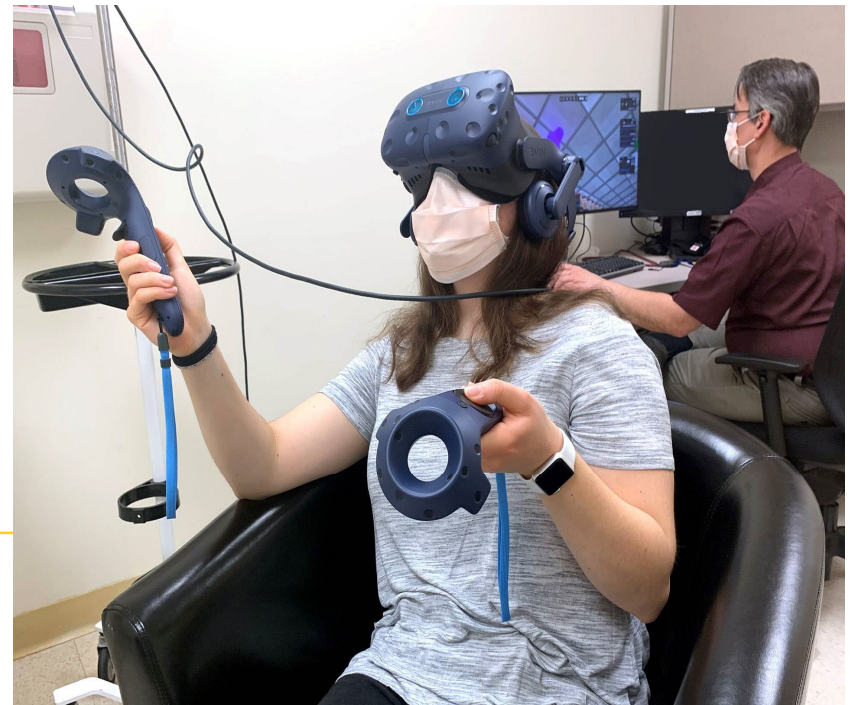


Where we are now: Beta Testing

Less Formal than User Experience

What we learned

- Point/trigger pull difficult for questionnaires
- Phone scrolling varies by phone type
- Different store brands can break realism
- Need a direction stream (though not realistic) for navigation
- Store highly realistic though many features not consciously noted
- Identify bugs like landing inside the fish display
- Legibility issues for some users



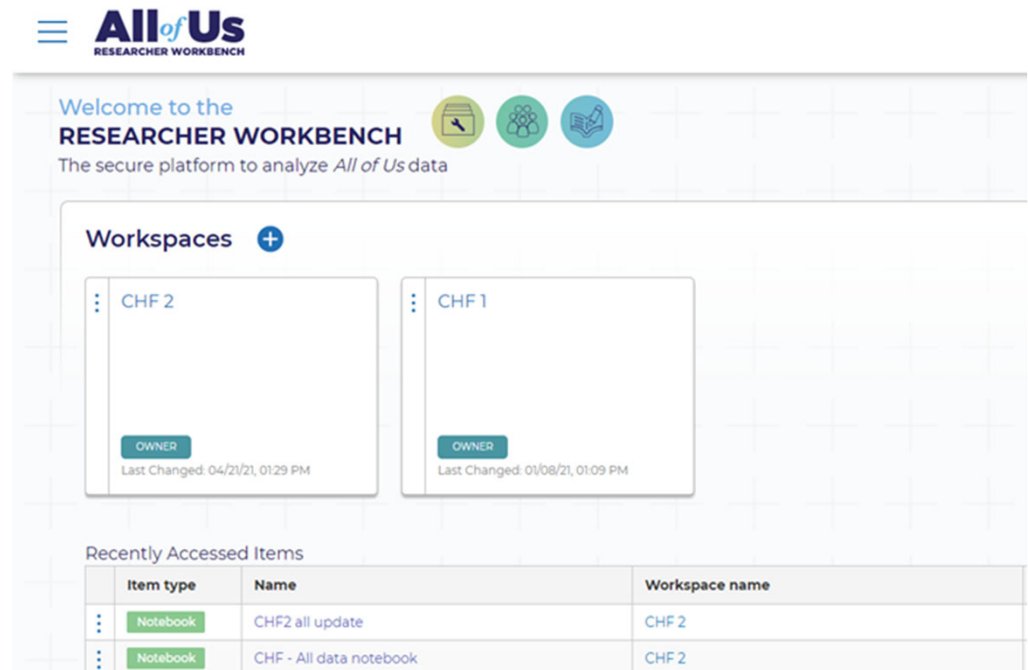
Future Areas of Focus

Home medication management

All of Us data

Common Data Elements

Collaboration



The screenshot displays the All of Us Researcher Workbench interface. At the top, the logo "All of Us RESEARCHER WORKBENCH" is visible. Below the logo, a welcome message reads "Welcome to the RESEARCHER WORKBENCH" and "The secure platform to analyze All of Us data". Three circular icons represent different features: a folder, a group of people, and a document with a checkmark.

The main content area is titled "Workspaces" and contains two workspace cards:

- CHF 2**: OWNER, Last Changed: 04/21/21, 01:29 PM
- CHF 1**: OWNER, Last Changed: 01/08/21, 01:09 PM

Below the workspaces is a section titled "Recently Accessed Items" with a table:

Item type	Name	Workspace name
Notebook	CHF2 all update	CHF 2
Notebook	CHF - All data notebook	CHF 2

