



Eye Tracking for Assessing Cognitive and Perceptual Change in Virtual Environments

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Introduction

Do immersive environments improve how we learn and apply complex procedures?

Training effectiveness depends on **transfer to real-world performance**, not just learning.

VR is increasingly used for procedural training, but its advantage over 2D instruction is unclear.

What?

VR vs. 2D training using eye tracking and real-world task performance.

Why?

Test whether VR improves **attention and transfer**.

Measures:

- Eye-tracking metrics (attention)
- Task performance (recreation)

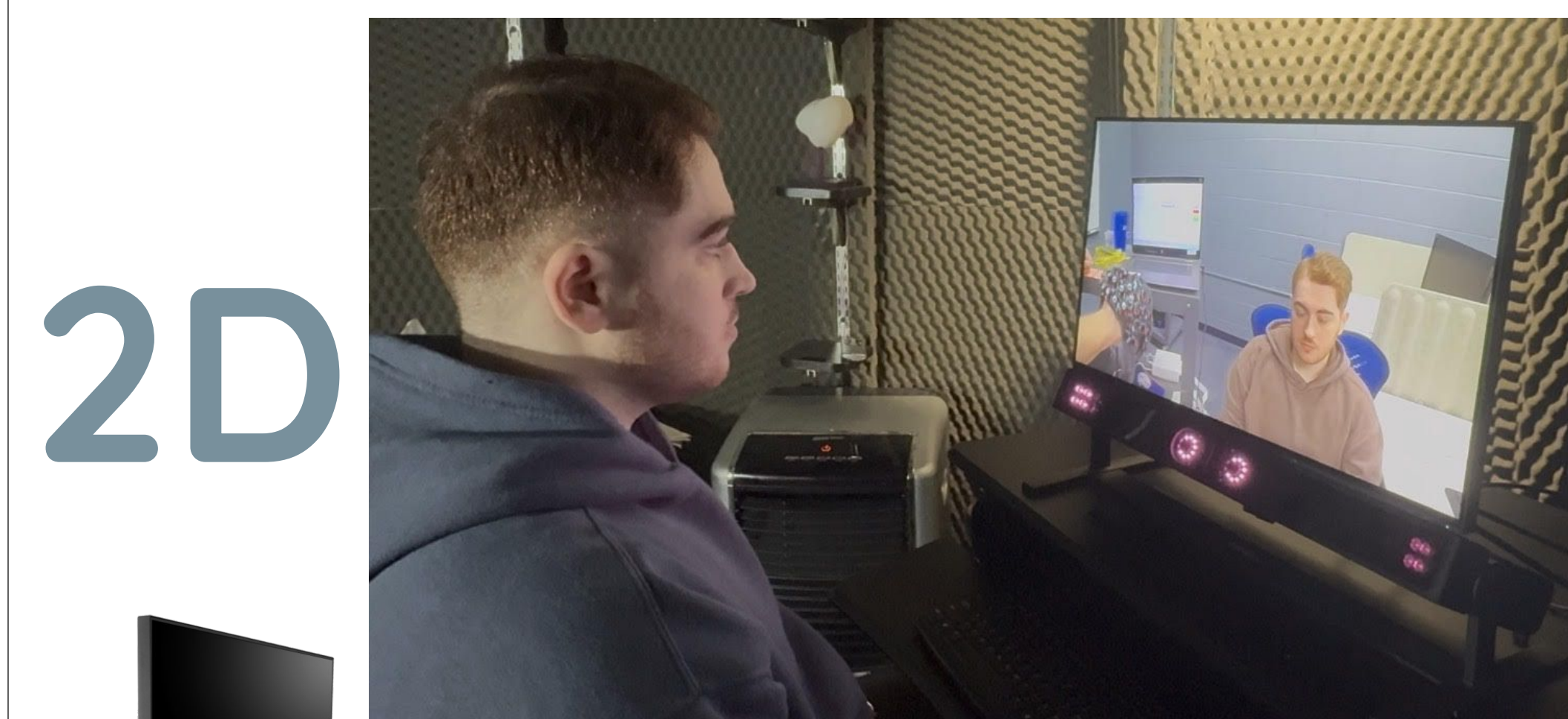
Objective:

Evaluate how training modality affects **attention and real-world transfer**.

Method

Design:

Between-subjects comparison of training modality (VR vs. 2D video) with within-subject assessment of transfer to real-world task performance.



2D monitor-based eye-tracking video for control condition



Left Eye View

Right Eye View



Immersive VR headset for 3D training condition



Real-World Task

Eye-tracking system to record gaze behavior (dwell, scanning, fixation)

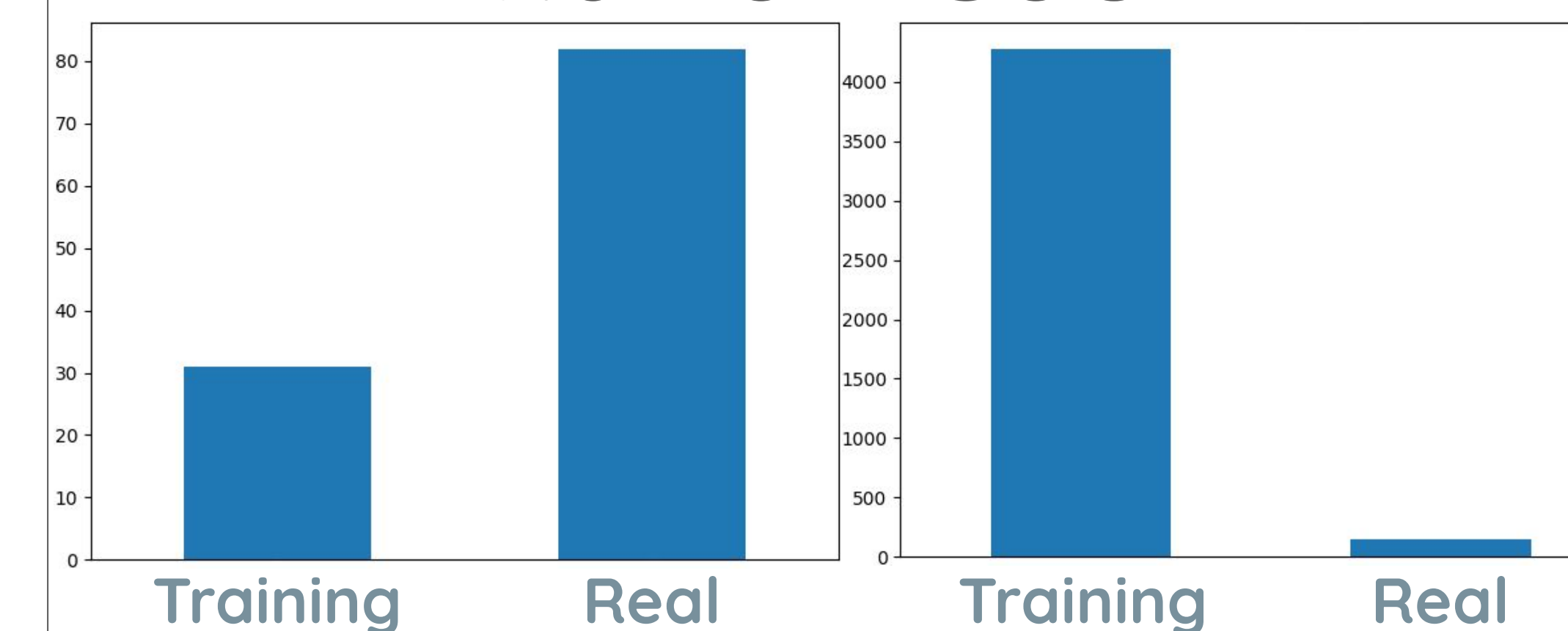


Results

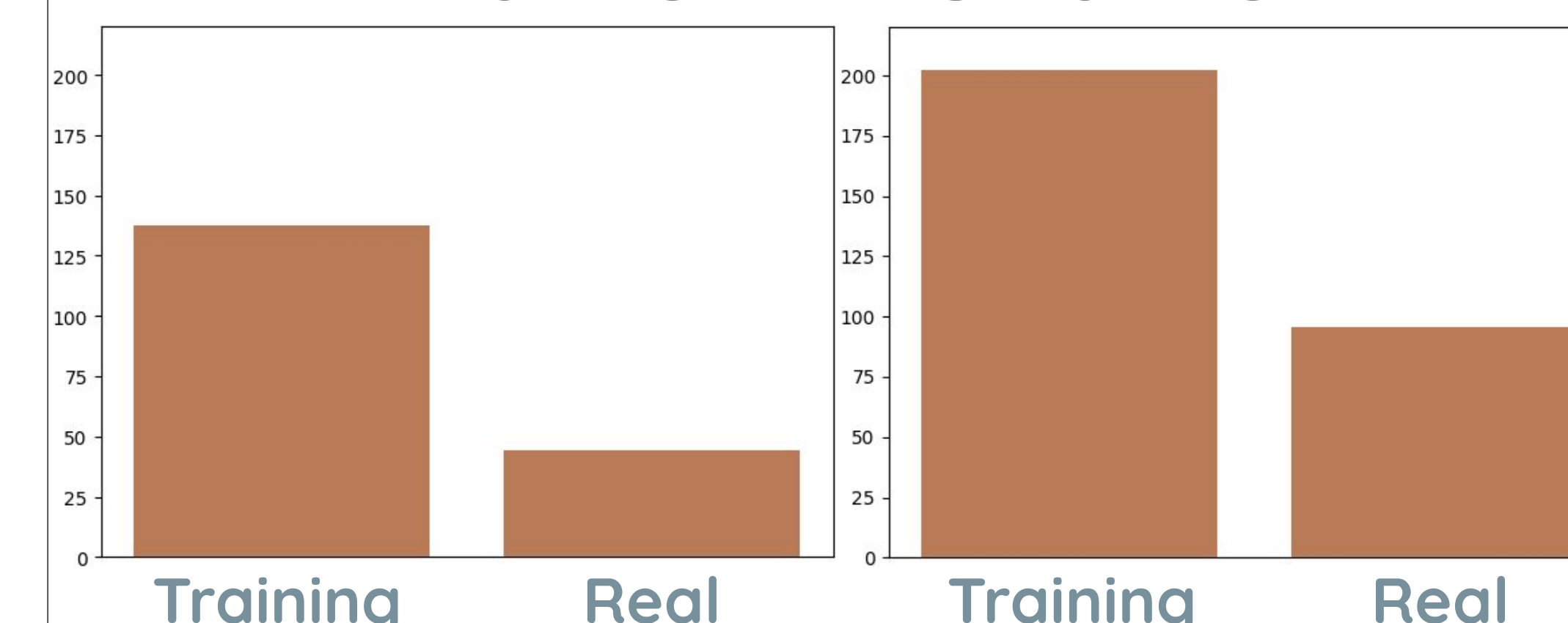
2D

3D

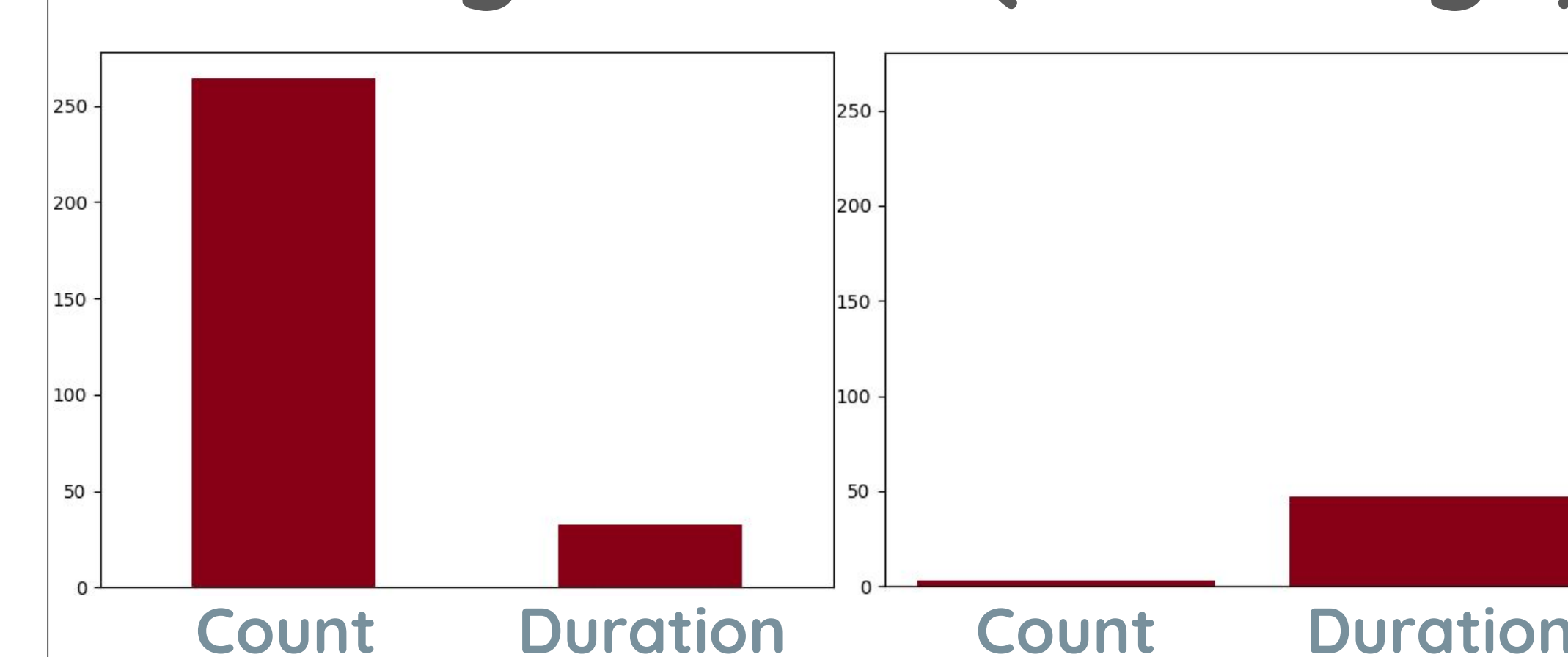
Fixation Count



Fixation Duration



Training → Real (% Change)



Low Engagement = Increased Effort

High Engagement = Efficient Attention

Conclusion

Expected Outcomes:

VR training is expected to **increase attentional engagement** (more sustained dwell, structured scanning, and task-relevant fixations) compared to 2D instruction, with **potential improvements in real-world task performance**.

Findings:

VR → higher fixation duration and greater real-world attentional engagement

Interpretation:

Immersion may improve **attention during training** → **better transfer**.

Implications:

VR may be more effective for **procedural training requiring sustained attention**.

Limitations:

- Pilot data (small sample)
- Measurement differences across systems
- High “off” gaze

Future Work:

- Expand sample
- Complete full data analysis
- Refine gaze classification
- Additional tasks & training environments