



The Haunted Desk:

Exploring Non-Volitional Behavior Change with Everyday Robotic Furniture

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The Haunted Desk: Non-Volitional Behavior Change

Definition of **Non-Volitional Behavior Change**:

“Infrastructure/environment-mediated intervention to **enforce a change in behavior** such as activity and posture”

Specific Use Case:

Build **automated sit-stand desks** to **fight sedentarism and promote healthy daily movements**



Motivation | Sedentary Lifestyle

- 41.5% of population worldwide spends **4 hours or more per day** sitting down.
- Sedentary lifestyles are associated with **poor overall health and increased mortality risk**
- **Movement every 30 minutes** may help people live longer
- $\frac{1}{3}$ of sit-stand desk owners use the sit-stand functionally **less than once a month**



Design | Autonomous Sit-Stand Desk

Final prototype (~\$80 for the electronic module):

- an electric height adjustable desk (Conset 501-27),
- an ultrasonic distance sensor (HCSR04) to control the height of the desk and prevent pinching,
- a thermal camera (MLX90640 550) to detect presence of the user,
- a microprocessor (Arduino Nano)

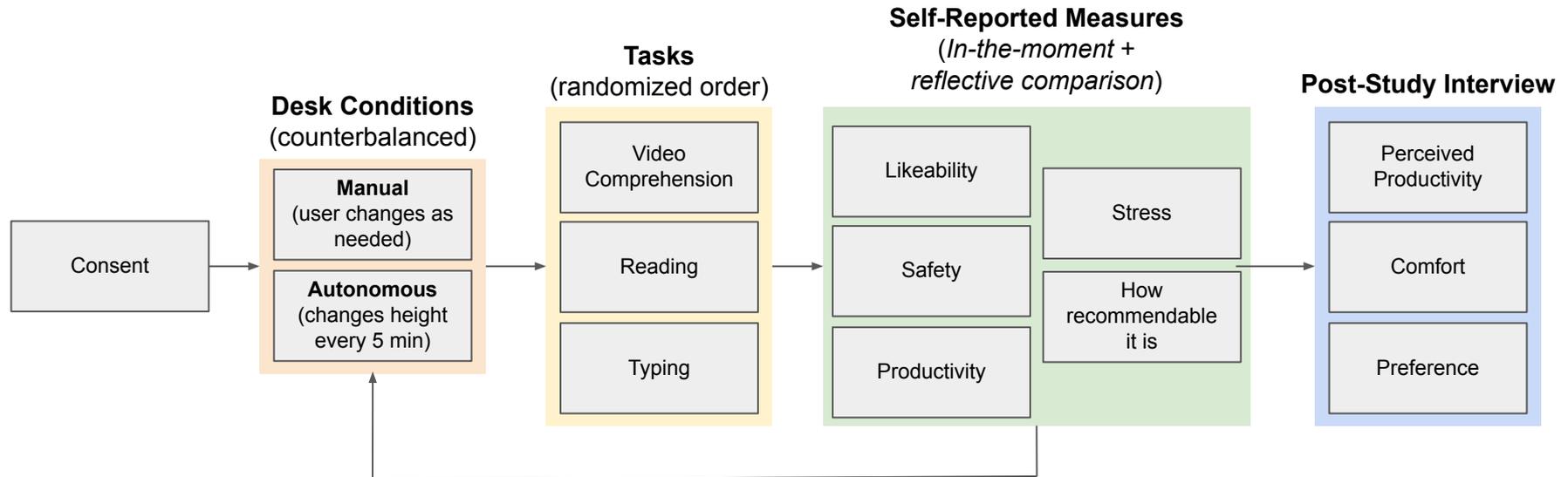


Method | Study Design

Aim: Understand user reactions to autonomous sit-stand vs. manual desk.

Method: Within-subject, randomized study with $N=16$ participants (8 female, 8 male, 0 non-binary).

Study Procedure:



Results | Self-Reported Ratings

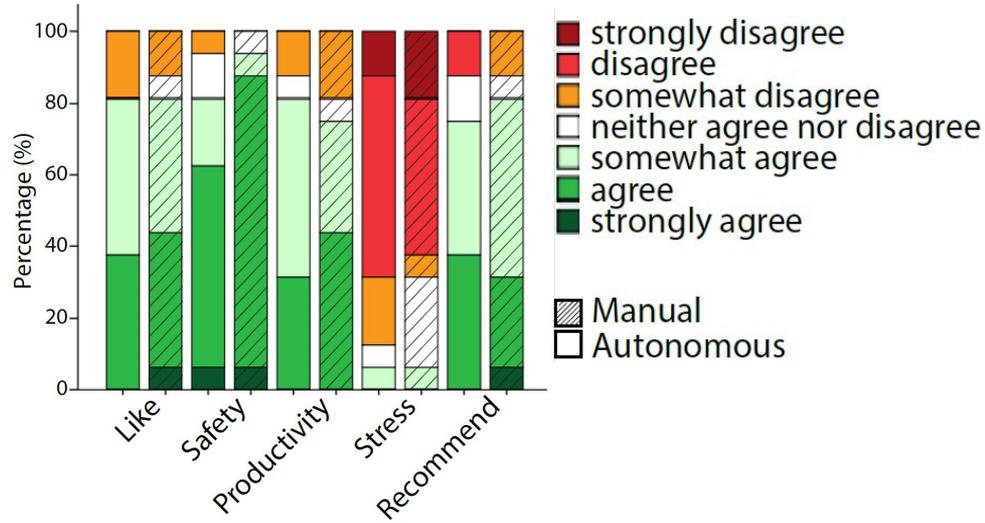


Fig 1. *in-the-moment* ratings

The *in-the-moment* ratings (e.g., likeability, stress) for the manual and autonomous desks were **similar** except for safety.

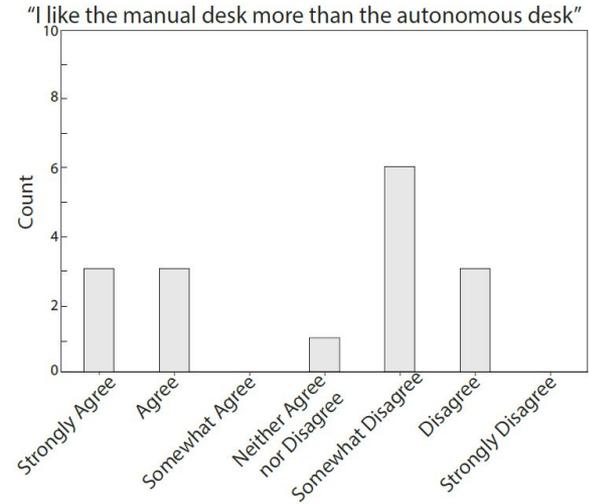


Fig 2. *Reflective comparison* ratings on likeability

However, we observed **bi-modal distributions** on the *reflective comparison* data for likeability, stress, and likelihood of recommendation to others.

Results | Qualitative Impression

9/16 participants preferred the autonomous desk because of its non-volitional height changes that forced them to alternate between sitting and standing as a means of **benefiting their health.**

“... I know I need to get up and down, but it is so easy to forget. Being "forced" to do so is better for my health...”

- P16

“want to move around to keep fit but I usually can't do that. The automatic one forces me to move.”

- P9

7/16 participants preferred the manual desk.

Four desired having **control** over the desk and two found the autonomous motion a **source of disruption.**

“I spend much of my day meeting with people at my desk. Thus, I would prefer to have a desk that didn't move independently...”

- P5

Automatic movement is “jarring and distracting. It would be more productive for me to choose when to change the height.”

- P13

Summary | Key Findings

Non-volitional robotic furniture, such as the Haunted Desk, have the **potential to improve our health and well-being** as our lives are increasingly being supported by automation.

From our exploratory study, we find that :

- Half of the participants are willing to **completely relinquish control for their health and well-being**,
- The remaining prefer to **retain control over the desk despite the health benefits**.

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