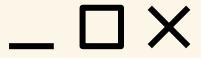




# **Sketching, Low-fi Prototyping and User Testing**

Here is where your presentation begins



>>>

# Table of contents

.....

**01**

**About us**

**02**

**03**

**04**

.....

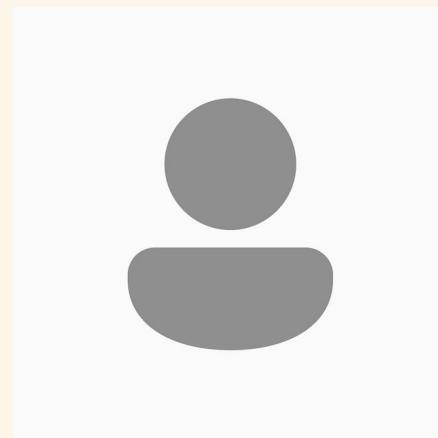
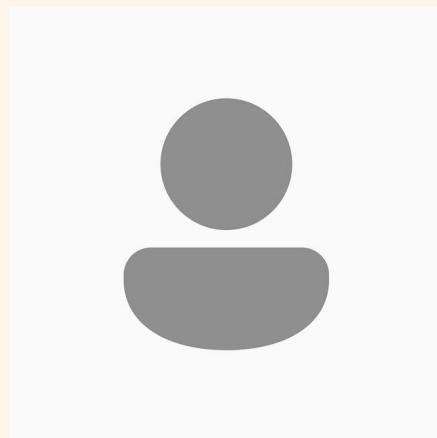
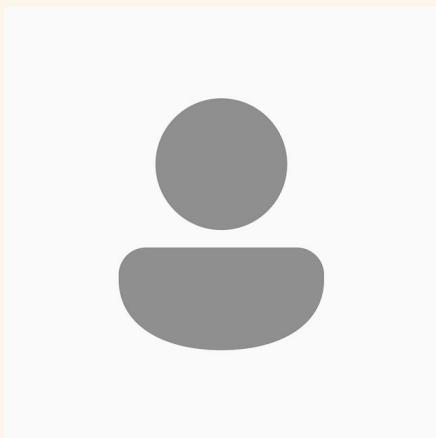
>>>>



# Meet the Team



\_ □ X



01

# About us



# Intro

InForm – Embodied Haptic Feedback for Safer Lifting

- Team Members: [Names]
- Value Proposition: A wearable band that provides real-time vibration feedback to correct exercise form without requiring screen attention.
- Problem: Casual gym-goers lack real-time form guidance and avoid filming or coaching due to cost, discomfort, or complexity.
- Solution: A lightweight band that detects incorrect posture and vibrates until corrected.
- Outline: Sketching → Selected Interface → Low-Fi Prototype → Testing → Results → Discussion

# Brainstorm Solutions

>>>

~~~~~  
.....

## Wearable Variations

1. **Single band on wrist** giving vibration patterns
2. **Multi-point bands** (wrist + knee + back) + app summary
3. **Compression shirt with haptics**
4. **Smart lifting belt** that tightens when core disengages
5. **Gloves that buzz when grip/form off**

## Audio Based

6. Bone-conduction **earbuds** whispering cues
7. One-word audio **cues**
8. **Tone-based** feedback (pitch changes)

## AR/Visual but private

9. **Smart glasses** showing joint alignment
10. Phone on floor showing **silhouette alignment**
11. Minimalist **smartwatch** indicators

## Environmental

12. **Smart mat** sensing stance
13. Barbell **collar** that vibrates
14. Machine handle feedback **vibrations**

## Hybrid

15. Band + quick post-set summary app



>>>>

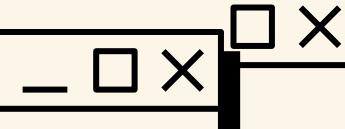
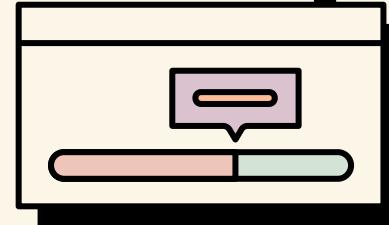
## Chosen Solutions

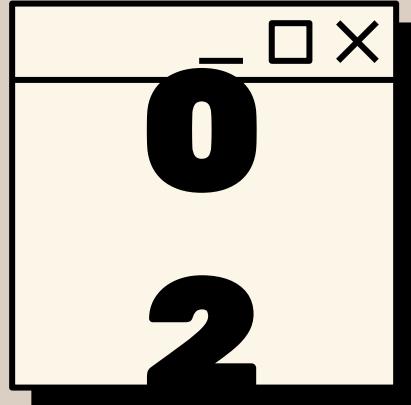
1. Multi-point haptic bands
2. Bone-conduction audio cues
3. AR smart glasses

Meet us



~~~~~  
.....





# Concept Sketches



Multi-point haptic bands, Bone-conduction audio cues, AR smart glasses

# REALIZATION A – HAPTIC WEARABLE SYSTEM

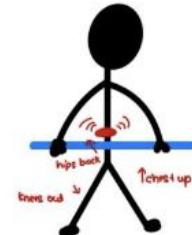


## Busy Gym Squat Rack



### BUSY GYM RACK

Lower-back tracker detects rounding → gives 2 short pulses.  
User corrects immediately without looking at a screen.  
Feedback stays private and invisible to others.



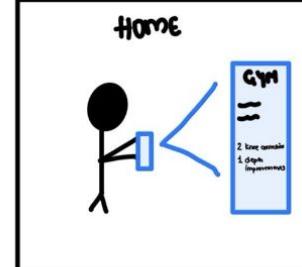
### DEADLIFT DIRECTIONAL CUES

Localized vibration shows where the issue is.  
Reduces thinking mid-lift.  
User stays focused on movement, not tech.



### MIRROR AVOIDANCE

Supports users who avoid mirrors/filming due to self-consciousness  
Feedback comes from body, not reflection.



### POST SET SUMMARY

Feedback only between sets to preserve flow  
Uses supportive language.

# REALIZATION B – AUDIO COACH



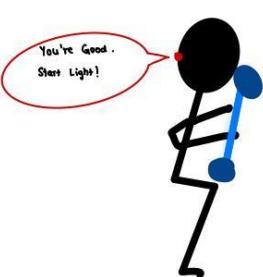
## ONE WORD CUE, MID REP

One-word cue reduces cognitive load.  
Only user hears it.



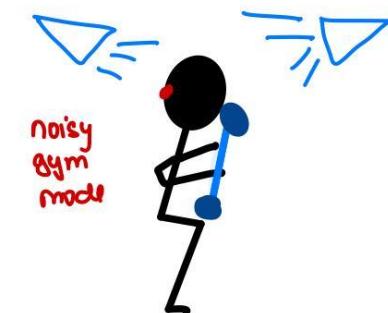
## BETWEEN SET COACHING

Timing cues between sets avoids interrupting reps.



## REASSURANCE FOR ANXIOUS GYM GOERS

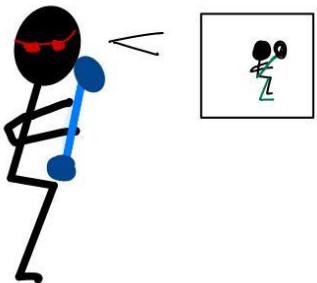
Addresses fear of judgment & anxiety  
Supportive, not evaluative.



## NOISY GYM MODE

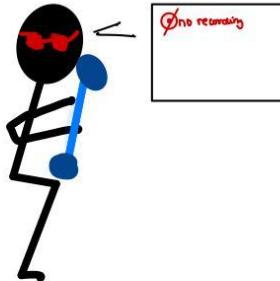
Tone patterns replace speech in noisy settings.

# REALIZATION C – AR GLASSES



**SQUAT OUTLINE**  
Shows target posture without filming.  
Private visual guidance.

**KNEE ZOOMED IN**  
Focuses attention on one joint to avoid overload.



**PRIVACY INDICATORS**

Builds trust in shared gym spaces.

# TOP 2 REALIZATIONS

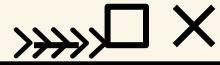
.....



- Haptic Wearables
- Audio Coach

We decided not to go ahead with AR as it is less realistic and more socially visible.

# ....HAPTIC SYSTEM KEY SCREENS

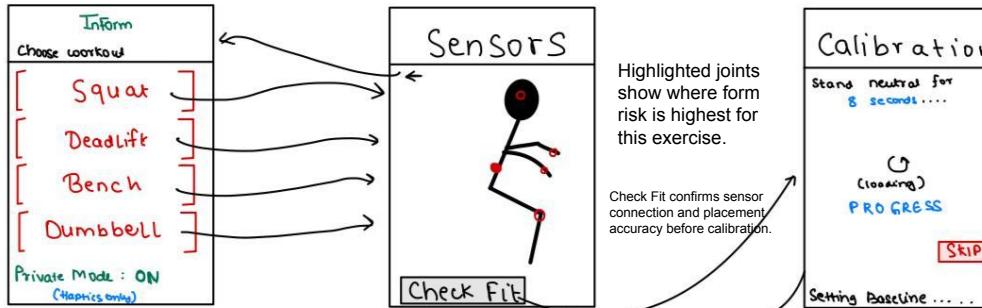


**Large workout buttons** reduce decision stress and support quick start for anxious gym-goers.

Exercise selection determines which joints are tracked and which form rules are applied.

**Private Mode** defaults ON to support users who feel self-conscious or fear judgment in gyms. No audio or visible alerts.

Haptic-only feedback preserves workout flow and avoids drawing attention.

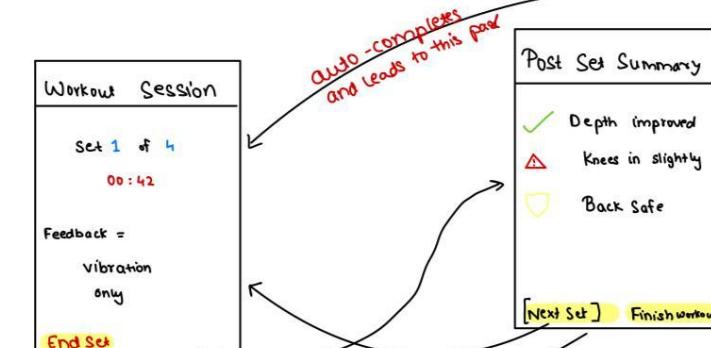


Highlighted joints show where form risk is highest for this exercise.

Check Fit confirms sensor connection and placement accuracy before calibration.

## Calibration

Live progress feedback reassures users that the system is working.



*auto-completes  
and leads to this part*

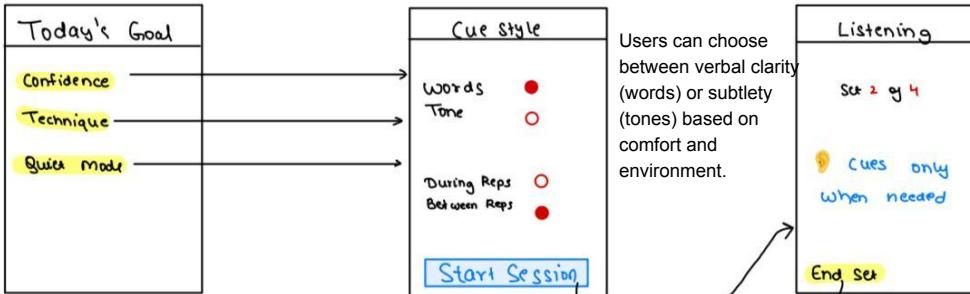
Gentle phrasing avoids judgment and keeps feedback supportive.

.....

# AUDIO COACH KEY SCREENS



Goal selection personalizes coaching intensity based on user emotional state and learning needs.



Reflection moments help convert feedback into long-term learning.

Quick Check-in

Where the cues helpful?  
1 2 3 4 5  
4 is circled in red.

Adjust form?  
Yes | No

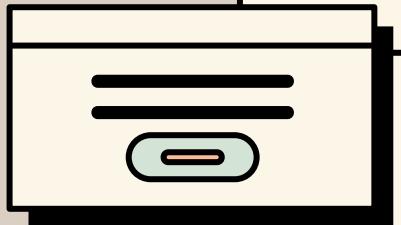
[Continue]

Sparse feedback prevents overwhelm and avoids feeling constantly corrected.

# Pros & Cons

>>>

~~~~~  
.....





>>>>

# HAPTIC WEARABLE

~~~~~  
.....

## Pros



- **Most private:** No audio or screen → ideal for self-conscious users.
- **Real-time correction:** Feedback during movement prevents injury.
- **Low cognitive load:** User feels cues instead of interpreting visuals/audio.
- **Flow-preserving:** No stopping to check phone.
- **Embodied learning:** Users learn through body awareness.

## Cons



- Learning vibration meanings takes time
- Calibration errors could reduce trust
- Less detailed explanation than audio
- Sensory sensitivity for some users



>>>

# AUDIO COACH

~~~~~  
.....

## Pros



- **Very clear cues:** Easy to understand.
- **Reassurance possible:** Can reduce anxiety.
- **Easy personalization:** Words/tones/frequency.
- **Familiar format:** Like a coach in ear.

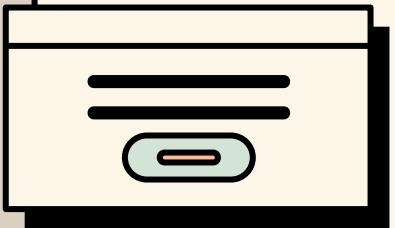
## Cons



- Earbuds visible → social awareness
- Gym noise interference
- Audio can interrupt focus
- Too many cues may feel judgmental

# Final Decision: Haptic Wearable System

>>>

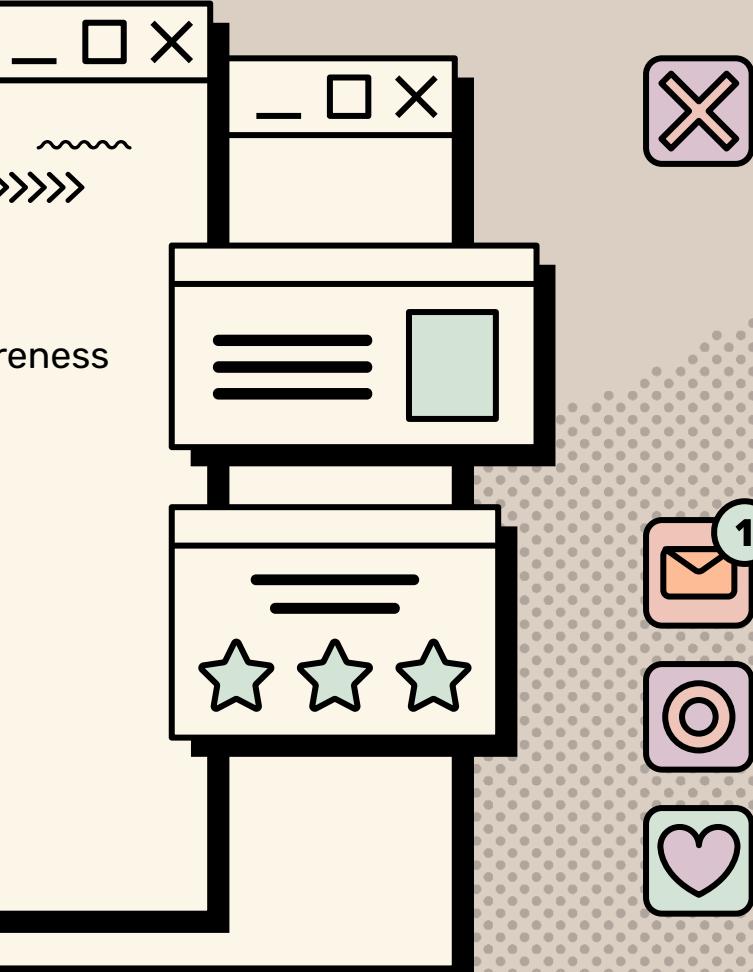


- **Best match for self-conscious users**
  - Many gym-goers avoid drawing attention to themselves
  - Haptics are invisible and fully private
- **No screens or visible devices during lifts**
  - Users don't need to look at a phone
  - No obvious earbuds or displays
- **Preserves workout flow**
  - Feedback happens during movement
  - No interruptions between reps
- **Supports embodied learning**
  - Users associate body sensations with correct form
  - Learning happens through movement, not analysis
- **Reduces cognitive load**
  - Simple vibration cues are easier to process mid-lift
  - No interpreting visuals or audio instructions



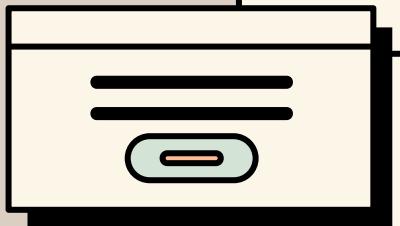
# Why not audio coach

- Earbuds are visible → may increase social awareness
- Audio can interrupt concentration during lifts
- Gym noise can reduce clarity
- Frequent verbal cues may feel judgmental or overwhelming

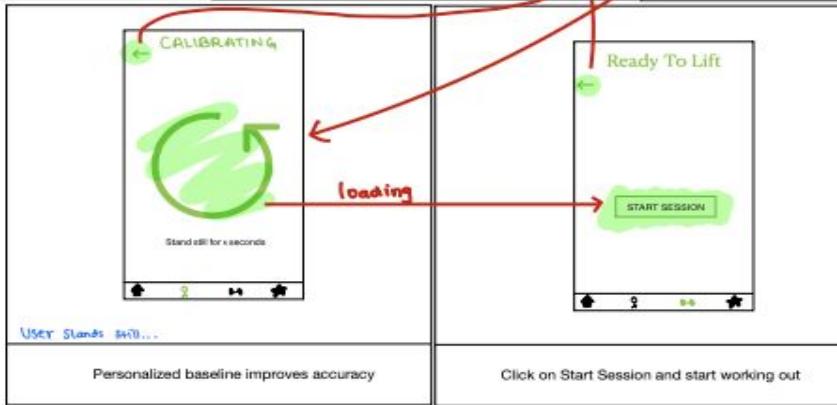
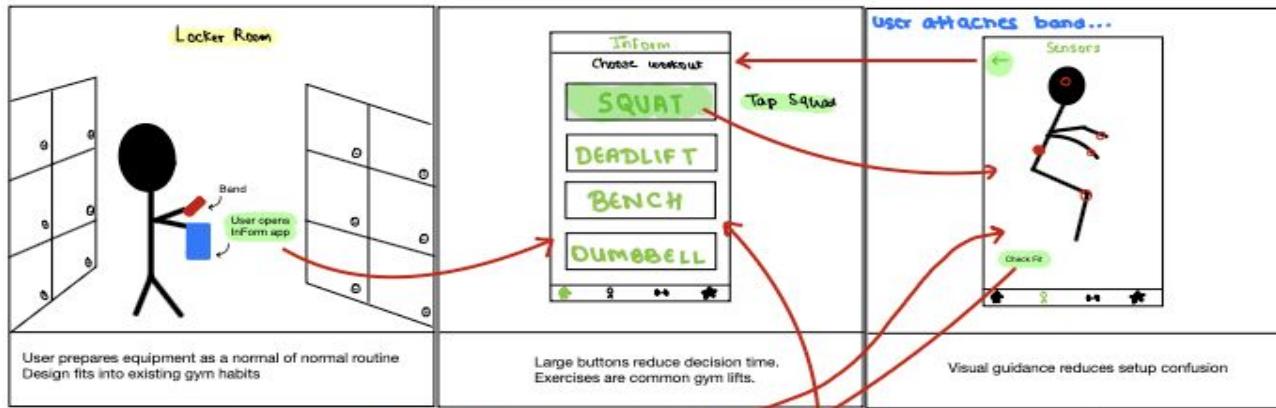


# Task Flows

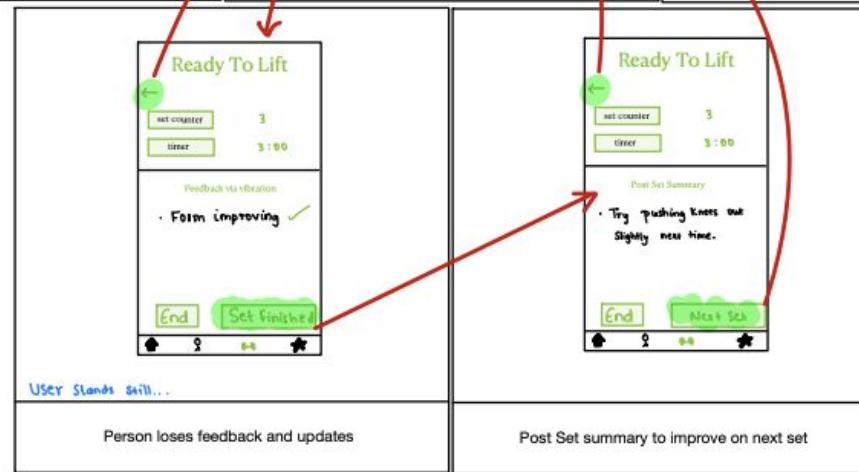
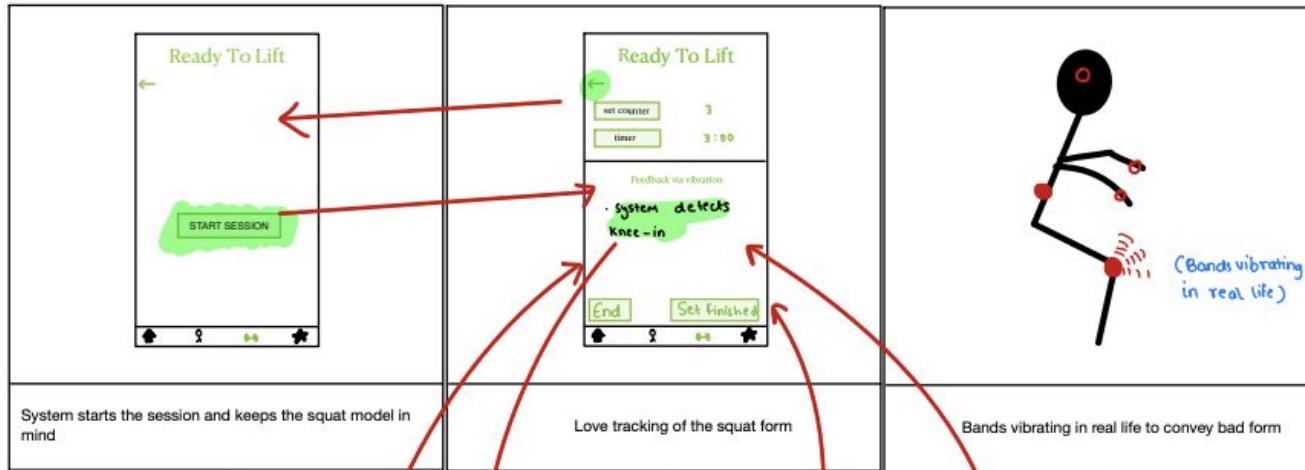
>>>



# Task Simple: Calibrate and correctly wear the InForm band before beginning exercise.

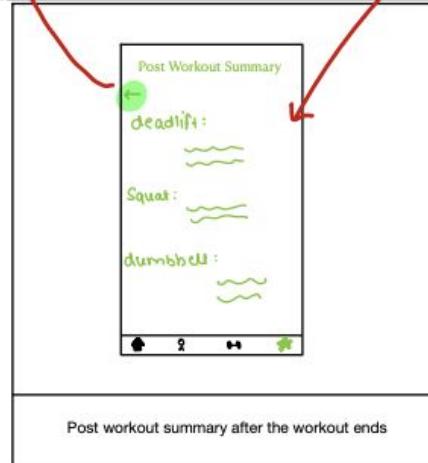
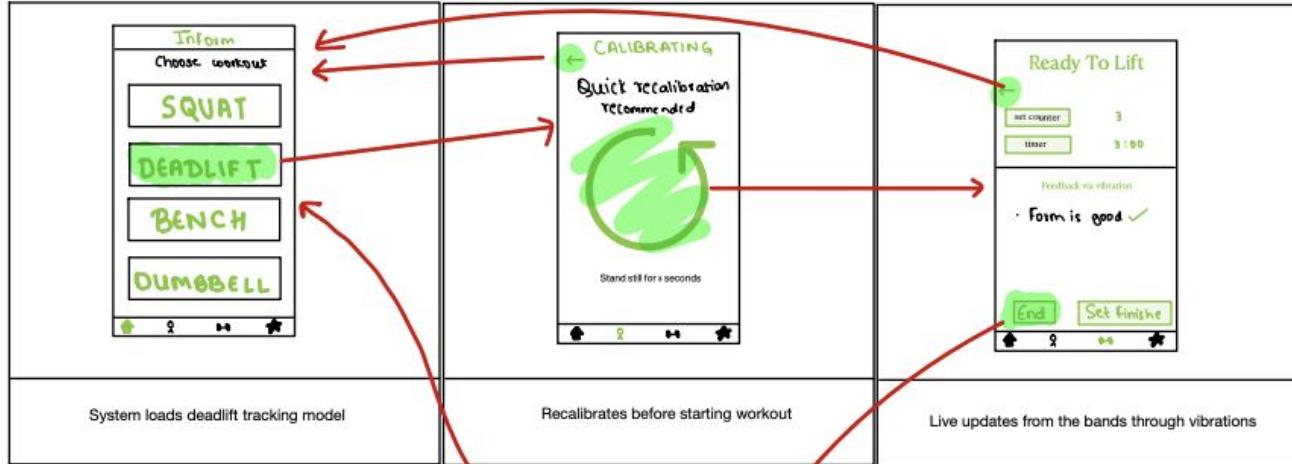


# Task Moderate: Respond to vibration feedback and correct posture during exercise. X



# Task Complex: Apply learned corrections across a new exercise with reduced feedback

—



**LOW-FI**

**PAPER  
PROTOTYP**

**E**



INFORM  
CHOOSE WORKOUT  
[SQUAT]  
[DEADLIFT]  
[BENCH]  
[DUMBBELL]

POST WORKOUT SUMMARY  
DEADLIFT:  
SQUAT:  
DUMBBELL:

READY TO LIFT  
←  
START SESSION

READY TO LIFT  
←  
SET COUNTER 3  
TIMER 3.00  
FEEDBACK VIA VIBRATION  
END SET FINISHED

TIMER  
00 : 00  
01 : 10  
02 : 20  
03 : 30  
04 : 40

COUNTER  
1  
2  
3  
4

SENSORS  
←  
CHECK FIT

CALIBRATING  
←  
STAND STILL FOR X SECS

# Construction

## DESIGN



- Initial interface concepts sketched collaboratively on iPad.
- Final screens transferred to paper, cut out, and traced in black marker for clarity.
- Built to simulate InForm's onboarding + feedback experience during a workout.

Includes:

- Exercise selection screen (e.g., Squat / Deadlift / Shoulder Press)
- Band calibration flow
- Real-time feedback state (Normal / Warning vibration)
- Correction confirmation screen
- Progress summary screen

## FEATURE

- Modular paper "overlays" to simulate:
- Vibration warning state
- "Correct form" confirmation state
- Exercise switching
- Dynamic states represented with replaceable paper components.
- Simplified UI to focus on embodied feedback rather than visual overload.

## FUNCTION

- Facilitator introduces scenario and assigns task.
- Participant taps paper screens and performs mock lifting motions.
- "Computer" role manually swaps paper screens when:
  - Incorrect form is detected (simulated)
  - User corrects posture
- Notetaker logs hesitation, confusion, and interpretation of feedback.

# Participants



John is my friend.



Zeel is young working profession.

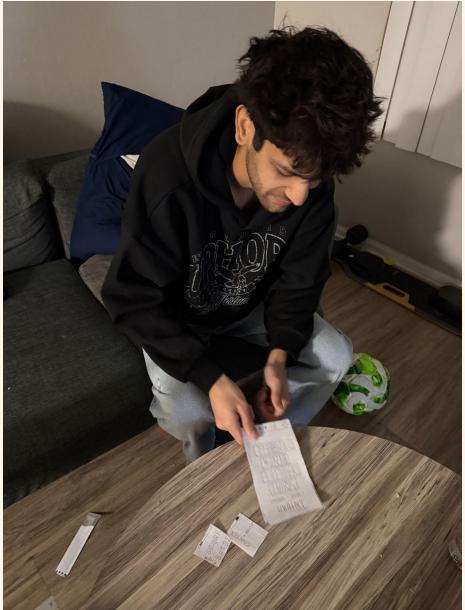


Rachit is member at dining hall.



Watermelon is a recent grad.

# Participants



# Environment & Apparatus

## Locations

- Test 1: [Gym corner / apartment / lounge]
- Test 2: ...
- Test 3: ...

## Apparatus

- Paper prototype screens + overlays
- Phone (used to simulate vibration)
- Timer (to measure correction time)
- Notes sheet (critical incidents log)
- Camera (to document setup)

## Setup

- Participant stands facing facilitator.
- Facilitator triggers “vibration.”
- Computer swaps screens when needed.
- Notetaker sits slightly to the side.

# Procedure

## Facilitator

1. Introduce the InForm concept and testing purpose.
2. Explain paper prototype interaction and simulation process.
3. Present one task at a time.
4. Prompt participant to think aloud during interaction.
5. Provide assistance only if participant is stuck for more than 30 seconds.
6. Administer post-task mental effort rating (1-5 scale).



***The same scripted protocol was followed across all participants.***

## System Simulation (Wizard-of-Oz Operator)

- Simulate vibration feedback during incorrect posture.
- Swap paper screens as exercises are selected.
- Stop vibration when posture is corrected.
- Maintain consistent feedback timing across participants.

## Notetaker

- Track confusion and hesitation.
- Record correction time (seconds).
- Log misinterpretations of feedback.
- Capture direct participant quotes.
- Document critical incidents.

# Usability Goals & Measurements

## Goal 1: Interpretability of Haptic Feedback

### Rationale:

InForm relies on vibration as the primary feedback mechanism. If users do not immediately understand what the vibration represents, the interaction model fails. This goal evaluates whether the haptic cue is intuitive and correctly interpreted during movement.

### Process Measures:

- Verbal reactions immediately following vibration
- Visible confusion or hesitation
- Clarification questions asked by participants
- Incorrect behavioral responses (e.g., stopping instead of adjusting posture)

### Bottom-Line Measures:

- Time (in seconds) from vibration onset to first corrective movement
- Number of incorrect interpretations per task

## **Goal 2: Real-Time Learnability**

### Rationale:

InForm is designed to support embodied learning through repeated exposure to feedback. This goal evaluates whether users improve their response to vibration cues over time.

### Process Measures:

- Number of repeated mistakes within the same exercise
- Visible trial-and-error adjustments
- Decrease in hesitation across tasks

### Bottom-Line Measures:

- Reduction in correction time from Task 1 to Task 2
- Fewer vibration triggers in Task 3 compared to Task 1
- Number of successful corrections without assistance

### **Goal 3: Low Mental Effort During Use**

#### Rationale:

The system is intended to preserve workout flow and reduce cognitive load. Feedback should guide correction without requiring sustained analysis or distraction.

#### Process Measures:

- Full pauses during movement
- Signs of frustration or visible cognitive strain
- Verbal feedback indicating distraction

#### Bottom-Line Measures:

- Self-reported mental effort rating (1-5 scale)
  - 1 = very low effort
  - 5 = very high effort
- Number of workout interruptions caused by feedback

# **RESULTS & DISCUSSION**

## **N**

# **Testing Results (Process Data)**

# **Testing Results (Bottom-Line Data)**



# Critical Incidents

# **Discussion & Design Changes**



# Limitations