

# BeatBox

**Group 5 – Design Thinking and Electronic Prototyping**

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# OUTLINE

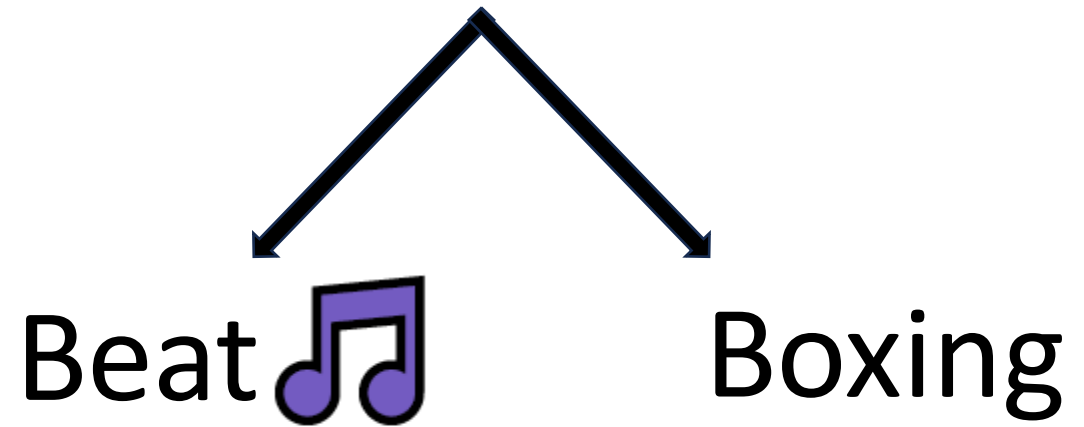


DESIGN CONCEPT

# Design Concept



## BeatBox



# Design Concept

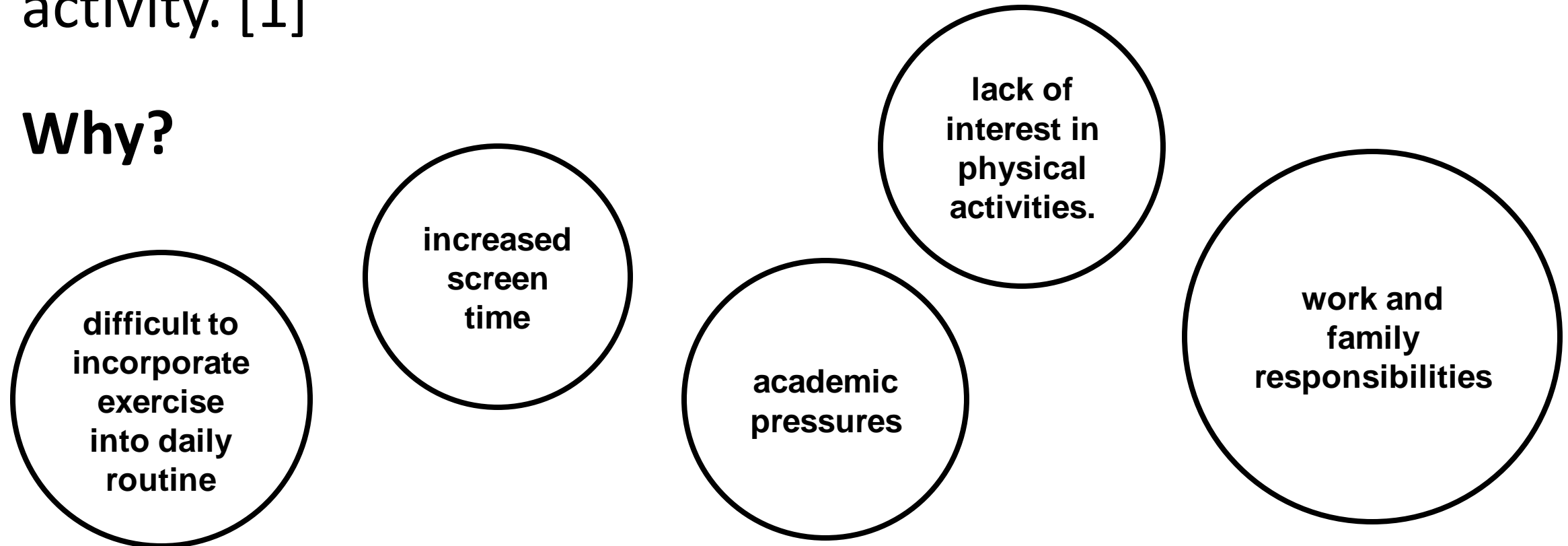
## **Intended Users:**

- People who are interested in boxing, especially beginners
- People who need to engage more in physical activities

# Design Concept

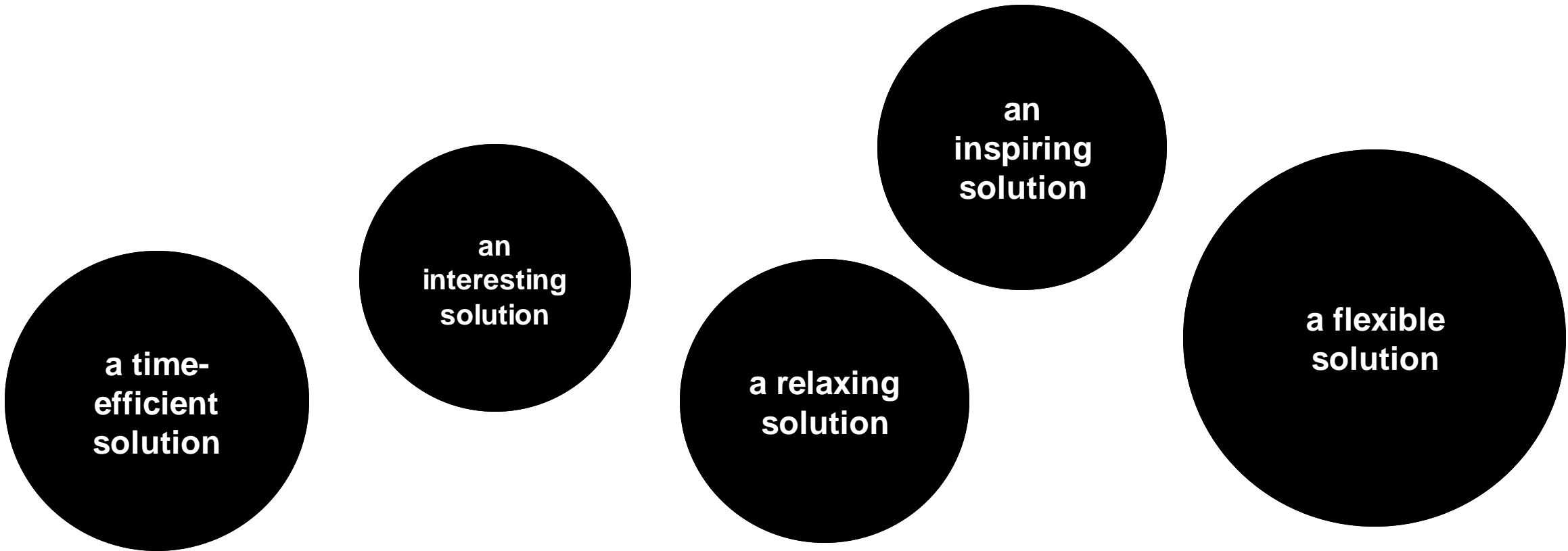
**Problem:** More than **80%** of adolescents and **27%** of adults do not meet the recommended levels of physical activity. [1]

**Why?**



# Design Concept

- How to address the problems?



**a time-  
efficient  
solution**

**an  
interesting  
solution**

**a relaxing  
solution**

**an  
inspiring  
solution**

**a flexible  
solution**

# Design Concept

BeatBox has all the attributes.



11L x 6W x 4.36H dimension, easy to carry

Speaker to play songs and button to change songs. LED provides visual effects.

USB Mini B connection port to customize songs

Can measure statistics: velocity, frequency, session length



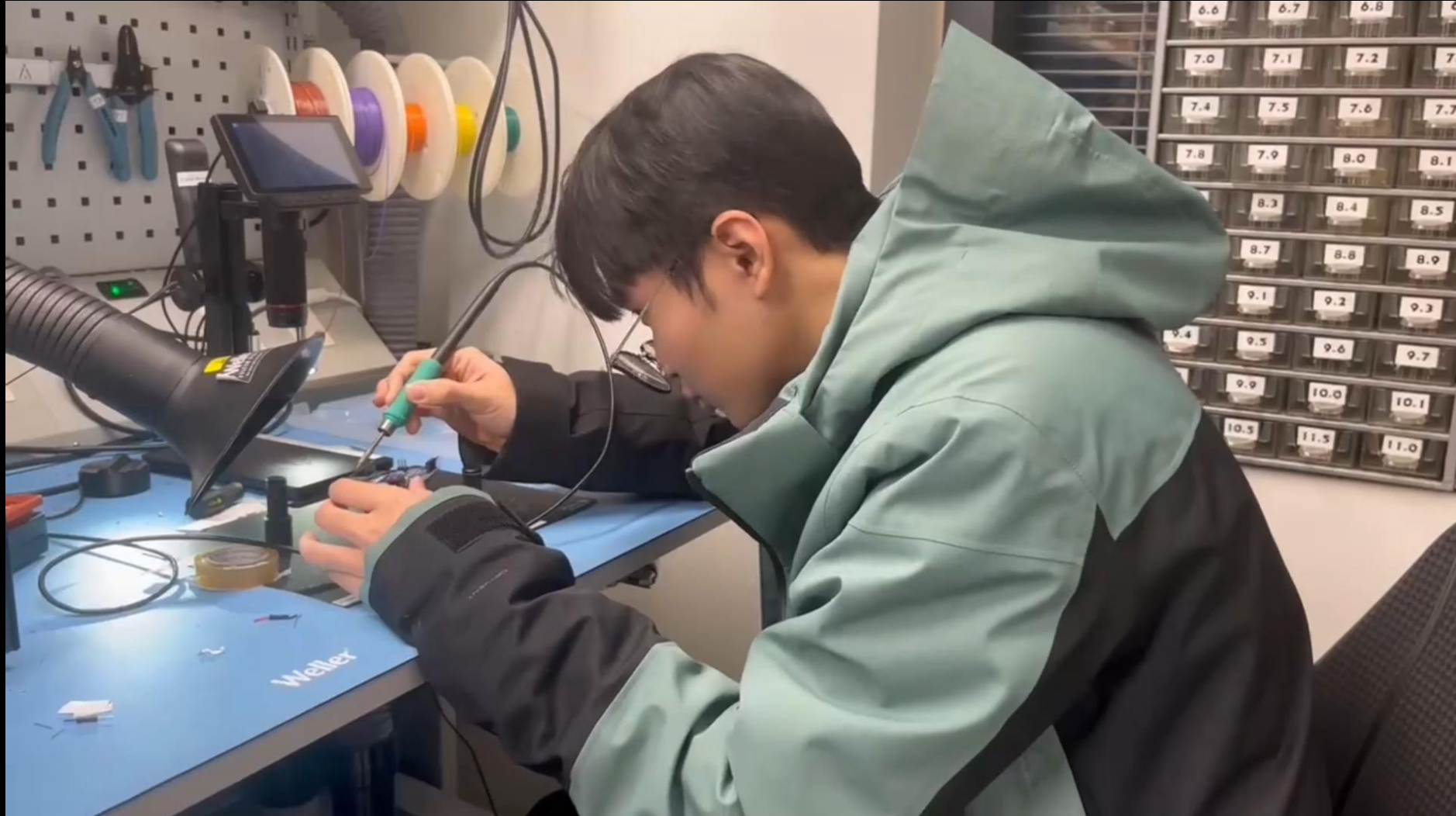
Number of punches: 39  
Maximum velocity: 5.16 m/s  
Workout session: 171 s





# Design Concept

[Link to  
external  
media](#)



# Design Concept

Other device that aid boxing on the market and their problems:



**Reflex ball:** Require extreme accuracy → not suitable for beginners

# Design Concept

Other device that aid boxing on the market and their problems:



**Punching pad/bag:** Require certain experience/strength to avoid wrist injury  
→ not suitable for beginners



# Design Concept

BeatBox is an injury-free device, suitable for beginners  
of all ages

# DESIGN PROCESS

# I. Idea exploration



- Too big and heavy
- Few real benefits
- Easily lead to broken, accidents

[Link to external media](#)



- Safer
- Still play music
- Smaller and compact
- Real benefits





## II. Technical study



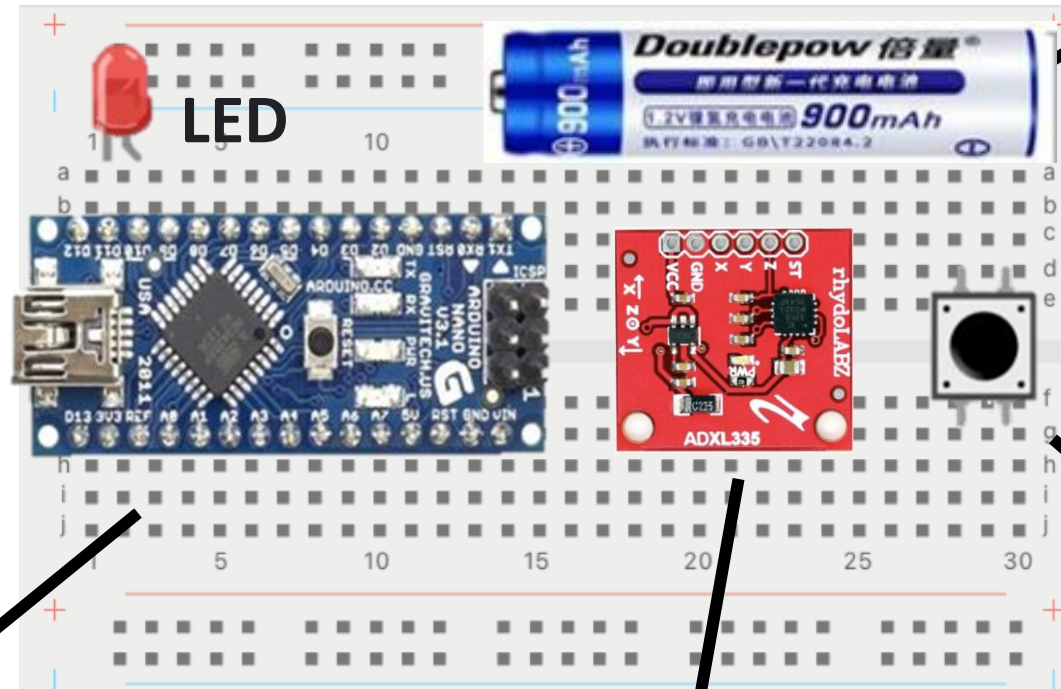
**Speaker CMS-28528N-L152B**

- + Diameter: 28mm
- + Minimum voltage 4V

### Arduino Nano

- + Compact
- + Work with Mini-B USB cable2

An 84x56mm **breadboard** acts as a base



### Accelerometer ADXL335

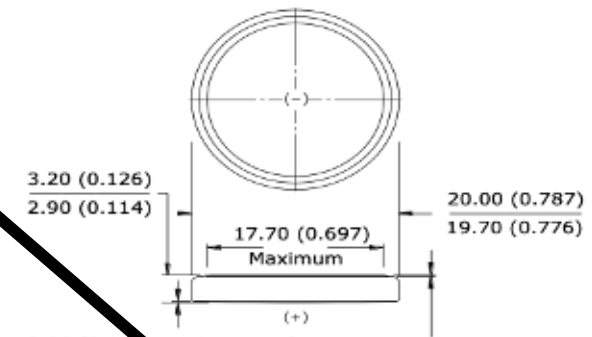
- + Measure acceleration resulting from motion  
=> Convert into velocity
- + Output unit: mV/g

### Battery (addition)

- 1.2v 900mAh
- AAA rechargeable battery

### CR2032 battery holder

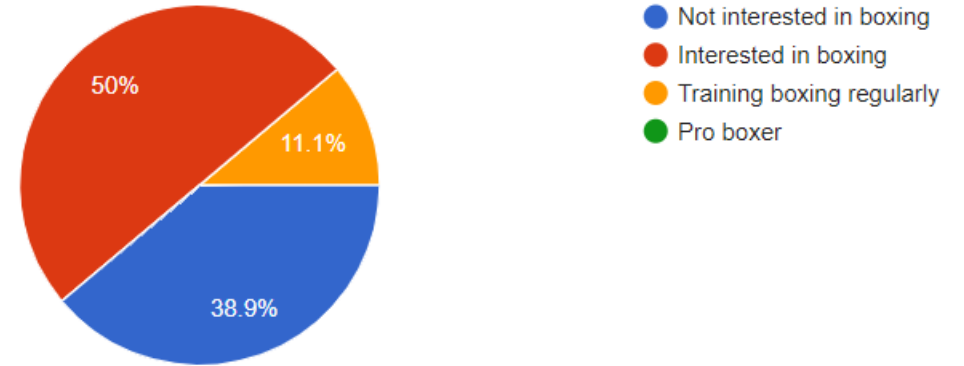
- + 3V
- + 51x32x6mm



### Pushbutton

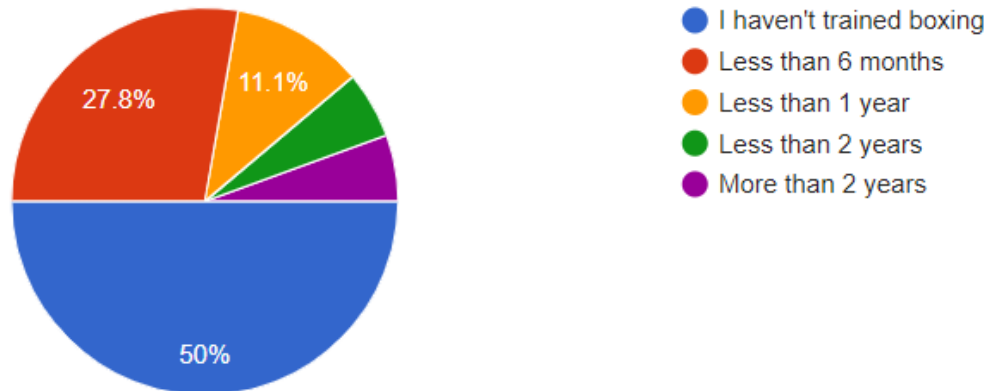
# III. User study

You are  
18 responses



How long have you been training boxing?

18 responses





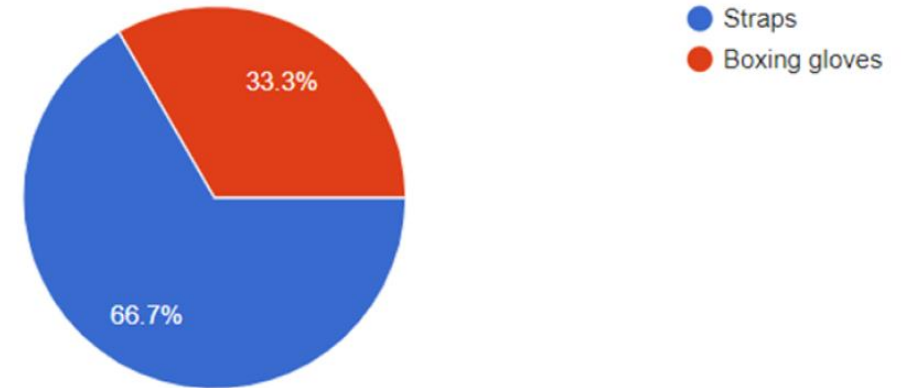
# III. User study

- **Boxing gloves → Velcro straps**

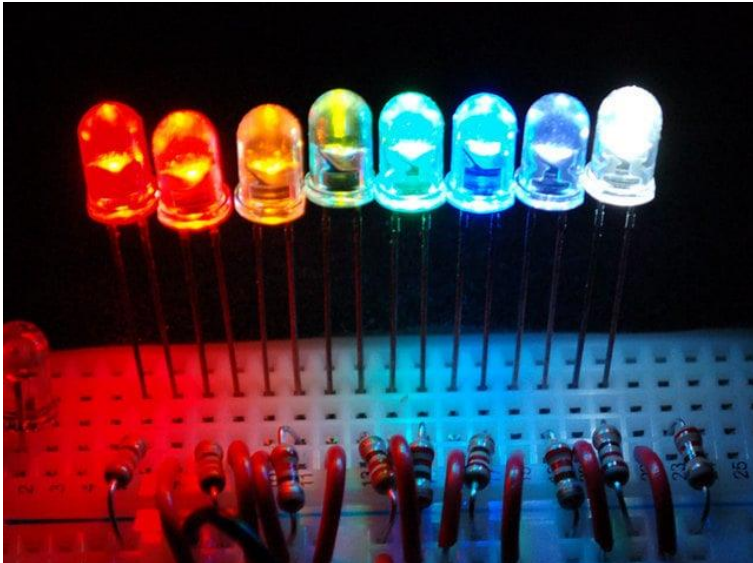


Do you find attaching the device to a strap or a boxing glove more convenient?

18 responses

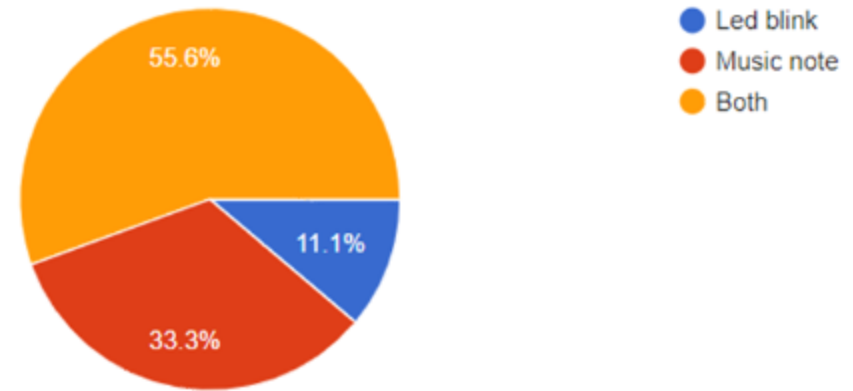


# III. User study



Which one do you prefer, a led blink or a music note for each movement? Or any other idea?

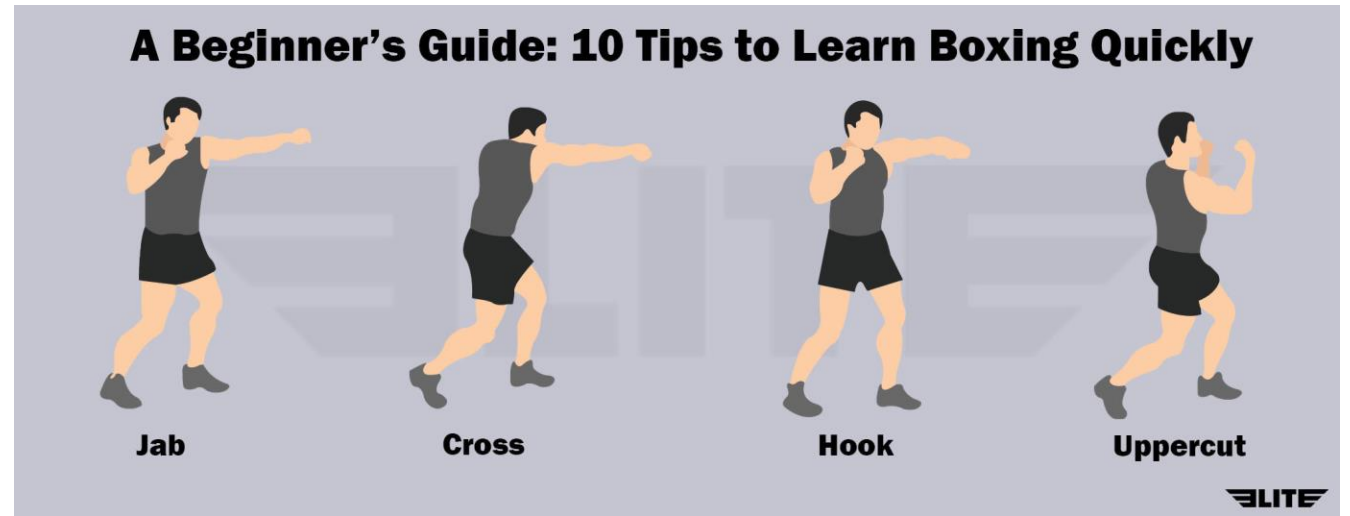
18 responses



- Just music notes → both LED and music notes

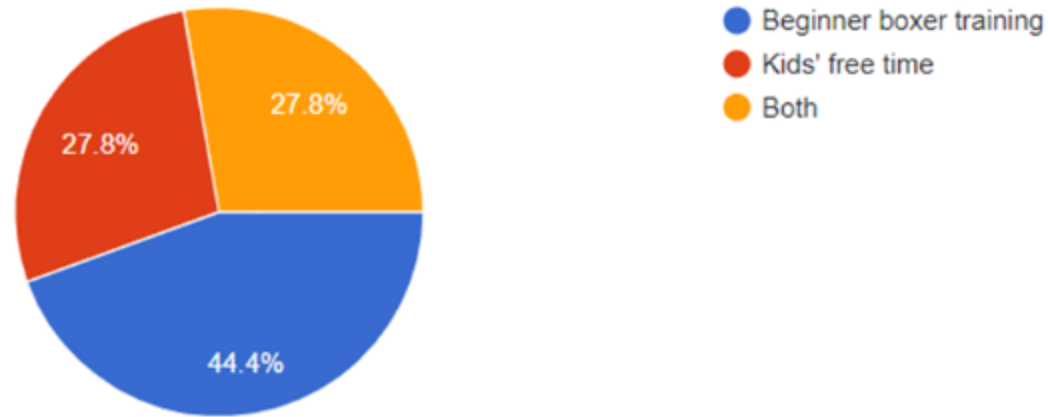
# III. User study

- Kid's toy → beginner's device



Is this device more suitable for beginner boxers' training sessions or kids' free time?

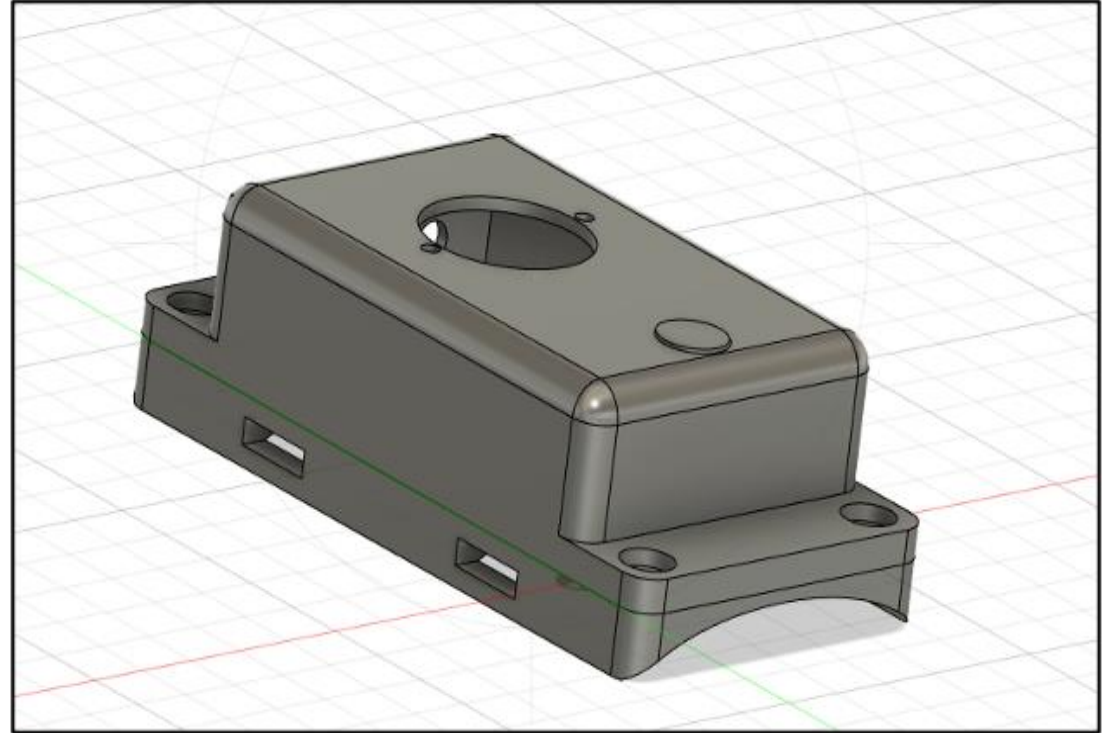
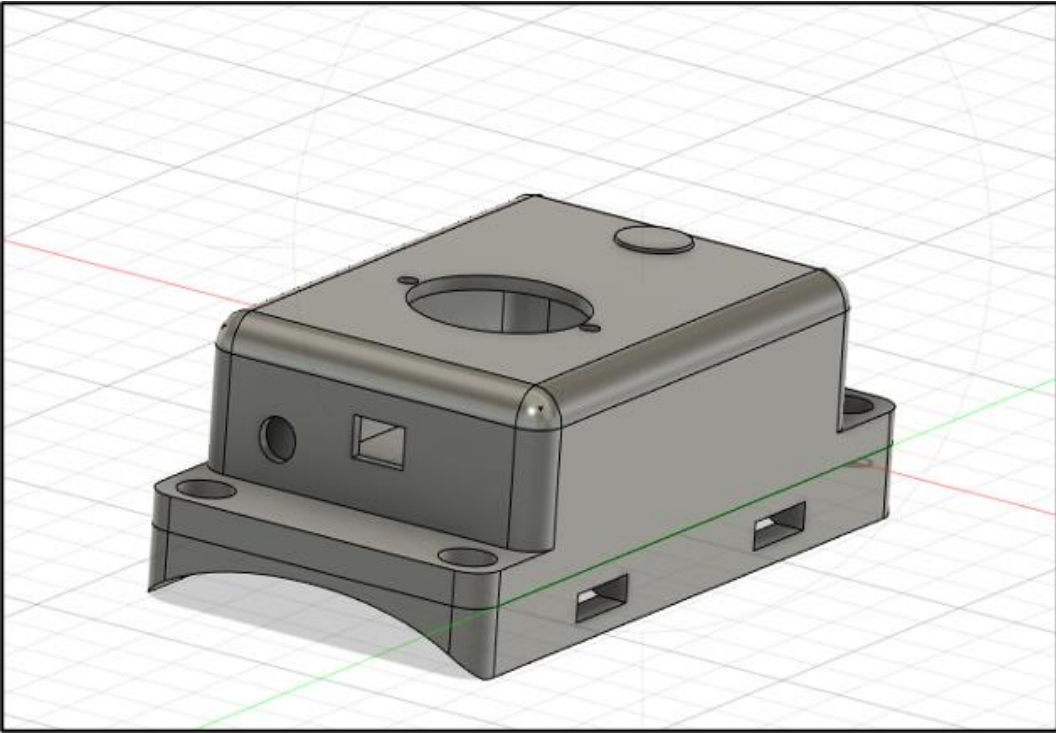
18 responses



# IV. Iterations with sketches and prototype

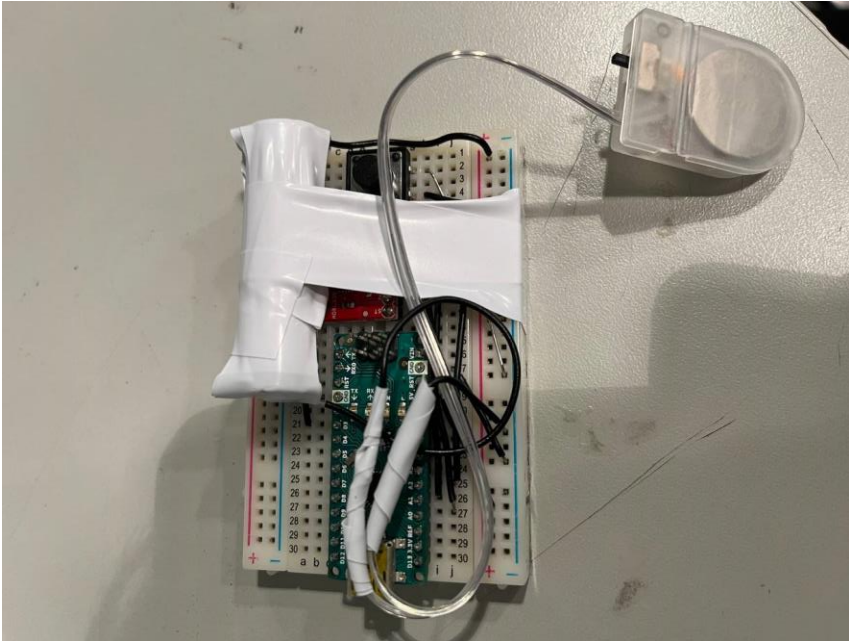


## IV. Iterations with sketches and prototype





# IV. Iterations with sketches and prototype



DEMO

# Can

## Entertainment:

- + Play a note in a song
- + Light the LED
- + Customize the song

## Productivity:

- Show user's statistics:
  - + Number of punches
  - + Maximum velocity
  - + Workout session time

# Cannot

- Enable two hands
- Use another battery
- Not easy access to the statistics
- Customize the song requires programming
- Not stable when having strong punch



# THE END

Thank you for your attention!

# Reference

- [1] “The Global Status Report on physical activity 2022,” World Health Organization, <https://www.who.int/teams/health-promotion/physical-activity/global-status-report-on-physical-activity-2022> (accessed Nov. 19, 2023).