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Evaluating the use of Nintendo LABO as a rehabilitation tool

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Background

What is serious gaming?

- Using gaming for physical rehabilitation
- Commercial use and specifically designed for

Advantages of serious gaming:

- Increase patient involvement in rehabilitation
- Increase the likelihood of patients continuing treatment after progress stalls
- Increase mental health during treatment

The Nintendo Switch is not a well studied console for serious gaming, but the console is incredibly engaging and shows potential.

Process

The goal for this project was to identify ways to use the Nintendo Switch for physical rehabilitation by:

- Identifying candidate Toy-Cons for serious gaming
  - Build and test the Toy-Cons and their corresponding games
  - ToyCon02, The Robot Kit, was selected for analysis
- Tracking joint motion with commercially available software
  - Kinovea was used to record 4 planar motions that are used while playing with the Robot Kit.
- Biomechanically evaluate joint motion
  - Range of joint angles were evaluated during each of the four motions.
- Relate joint motion to real-world rehabilitation practices

Table 1: Joint Angle Displacements

Motion	Elbow Δθ (deg)	Shoulder Δθ (deg)	Hip Δθ (deg)	Knee Δθ (deg)
Step	3.0	5.8	41.9	70.0
Punch	88.9	66.1	6.6	3.5
Squat	21.8	26.7	62.4	69.7
Squat Punch	83.1	97.5	61.2	72.4

Figure 1: The ToyCon02 – Robot Kit [1]

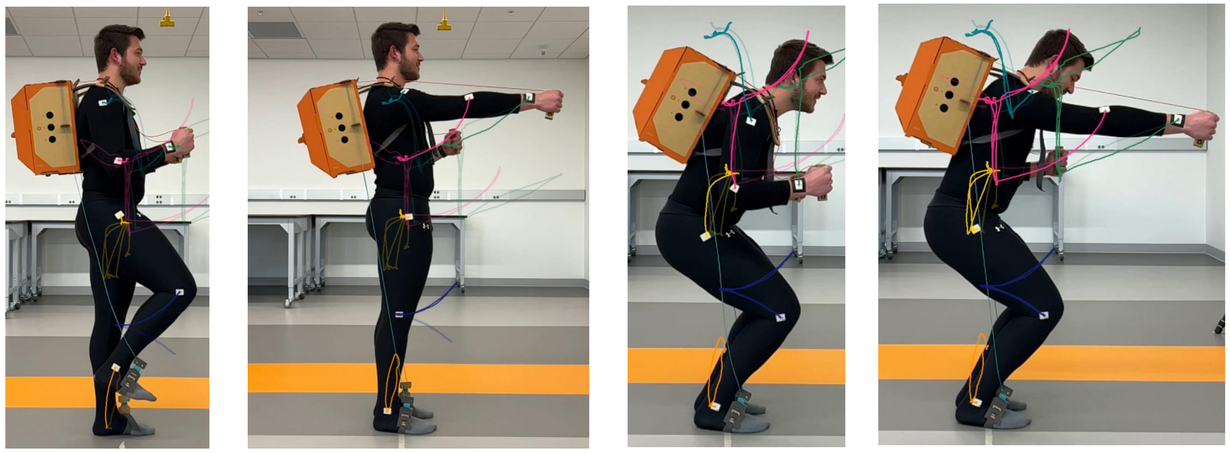

Figure 2: Frames from Kinovea analysis of the four planar motions. From left to right: walking, punching, squatting, and punching while squatting

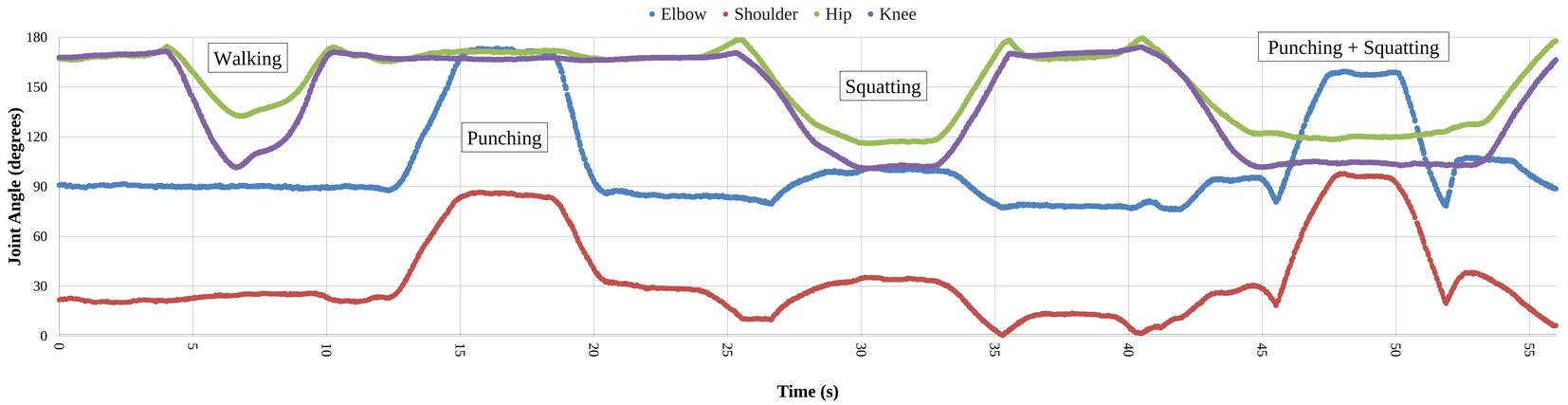

Figure 2: The four joint angles throughout the experiment

Future Plans

- Collaborate with occupational therapists
  - Inquire how they could implement them in practice
  - Do a trial experience with patients
- Develop a custom serious game
  - Use Game Builder Garage to program a new game
- Develop/Integrate useful products and tools
  - Create new and/or build onto current Toy-Cons
  - Design more durable/accessible Toy-Cons
  - Investigate other useful games like Switch Sports or Ring Fit Adventure.

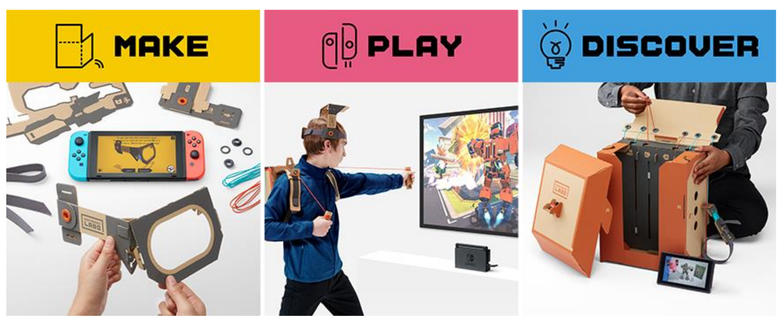

Figure 3: Nintendo LABO kits [1]

References

[1] “Make, Play, and Discover with Nintendo Labo™.” Nintendo. https://www.nintendo.com/sg/switch/adfv/index.html (Accessed Apr. 14, 2022)