GAMES FOR HEALTH EUROPE
2025

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GAMES FOR **HEALTH** EUROPE **2025** CONFERENCE

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T-Wrecks: an Indoor Cycling Exergame

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Games for **Health** Europe **2025**

Project Background / About Me

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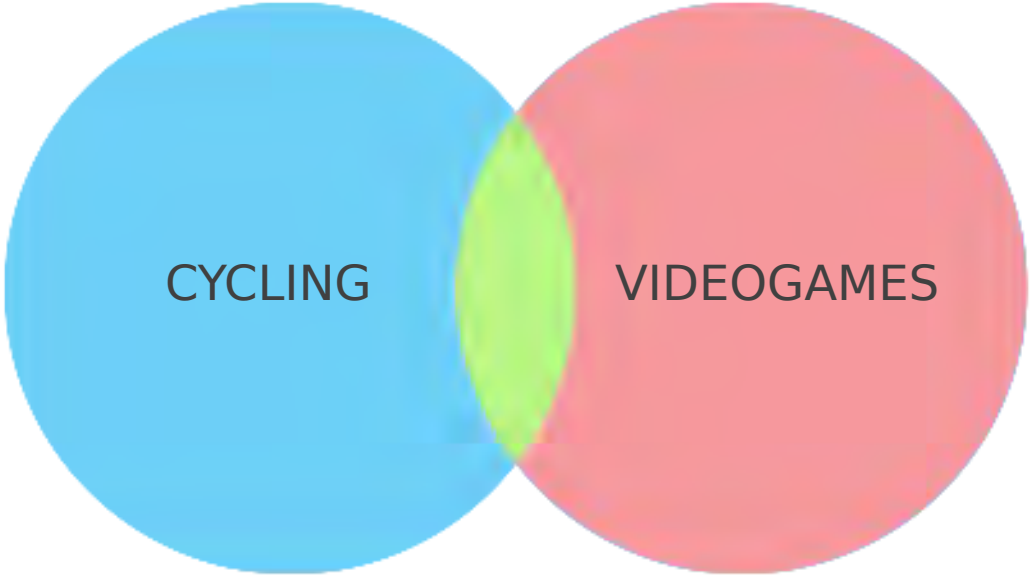
- **Rocksmith 2014 (Guitarcade)** - how to play guitar by playing retro videogames!
- Played sport at high level when I was younger, now cycling enthusiast.

Research Interests



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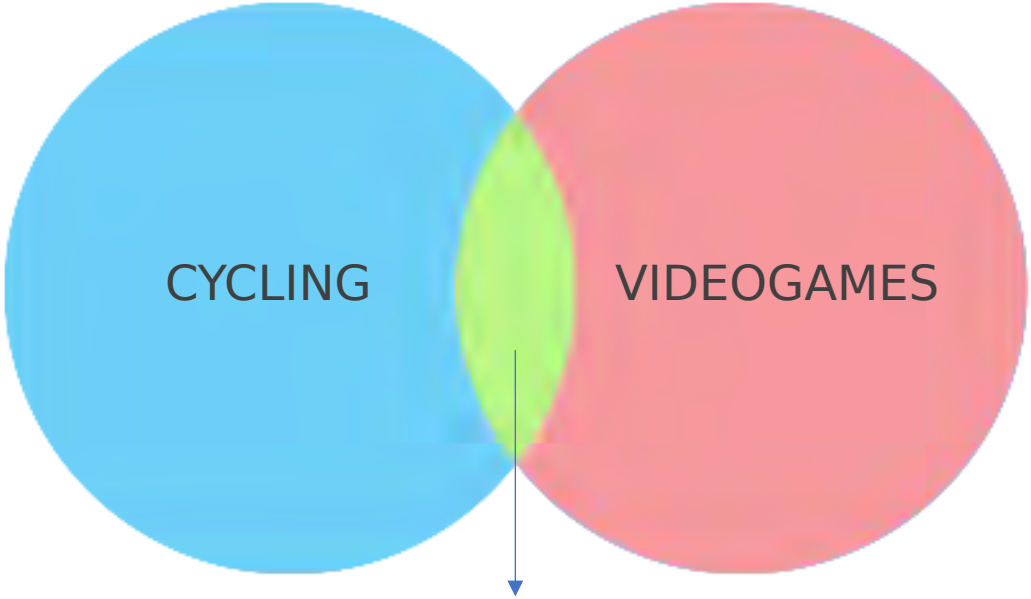

CYCLING EXERGAME

Motivation

- Indoor cycling is like being on a time machine…

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- Time passes slowly
- Rate of Perceived exertion appears to increase
- Hard work feels really, really hard.

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- I wanted to find out if it was possible to build an experience where indoor cycling didn’t feel like a chore.
- Where you didn’t feel every pedal stroke
- And your brain was more deeply engaged and connected to other events other than what your body was physically going through

Motivation

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- And keep your hand up if you enjoyed the experience

Motivation

- How many people in the audience have tried indoor cycling?
- And keep your hand up if you enjoyed the experience
- Do you play Zwift or use Peloton… or perhaps go to a spin class?

Indoor Bicylce Game T

Virtual Cycling Races
or
Spin Class Workouts

Market Size

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- That’s quite a lot of people that already have the right hardware that are ready for a different kind of indoor cycling exergame

Problem - Controls

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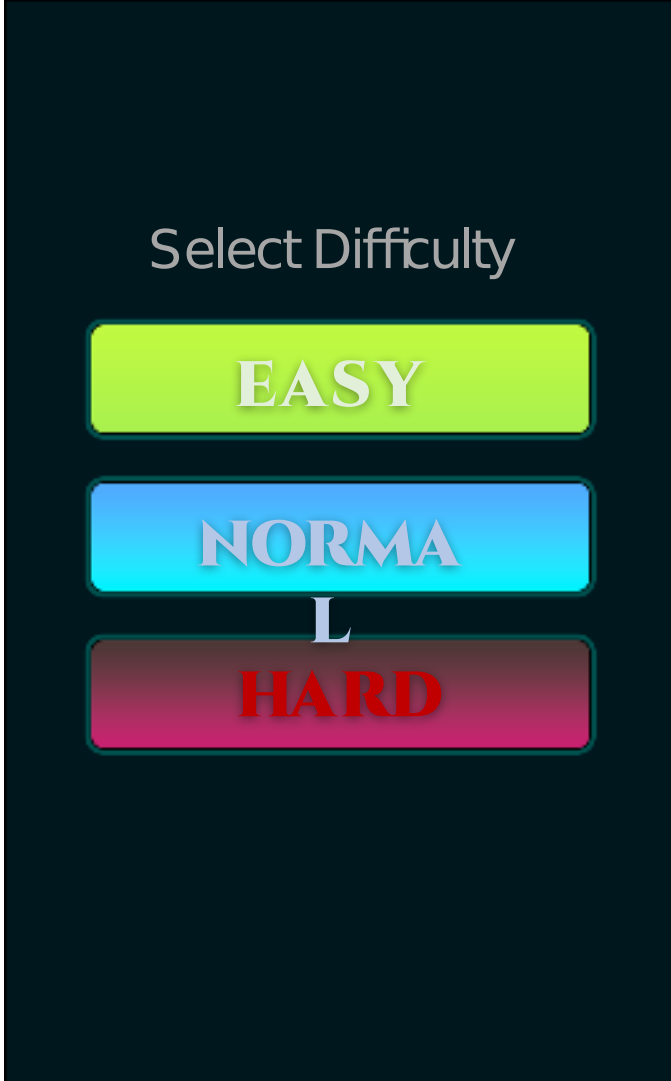
- How can you control (relatively) complex games, which just a single input?
- Indoor bicycles can broadcast speed, power and cadence.
- In our first game we used speed (which would go on to cause some issues later!)

Using Speed as the In

- The speed sensor attaches on the rear hub of the bicycle or it can be a traditional magnet that attaches to a spoke

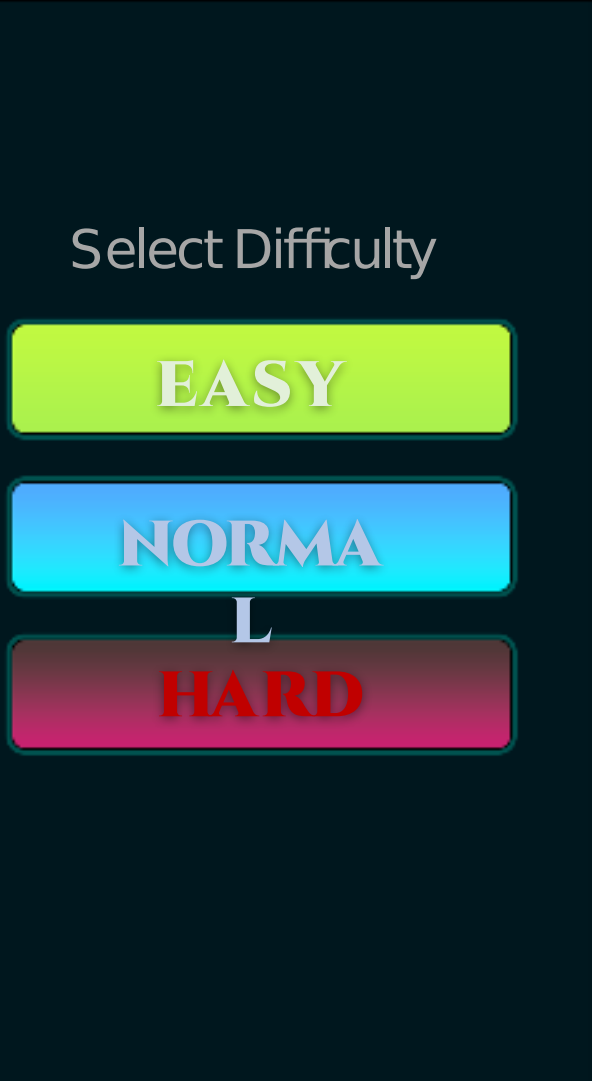
- The game receives a signal each time the wheel completes a revolution.

Determining Difficulty



Determining Difficulty

- How do we determine how physically challenging the game should be?



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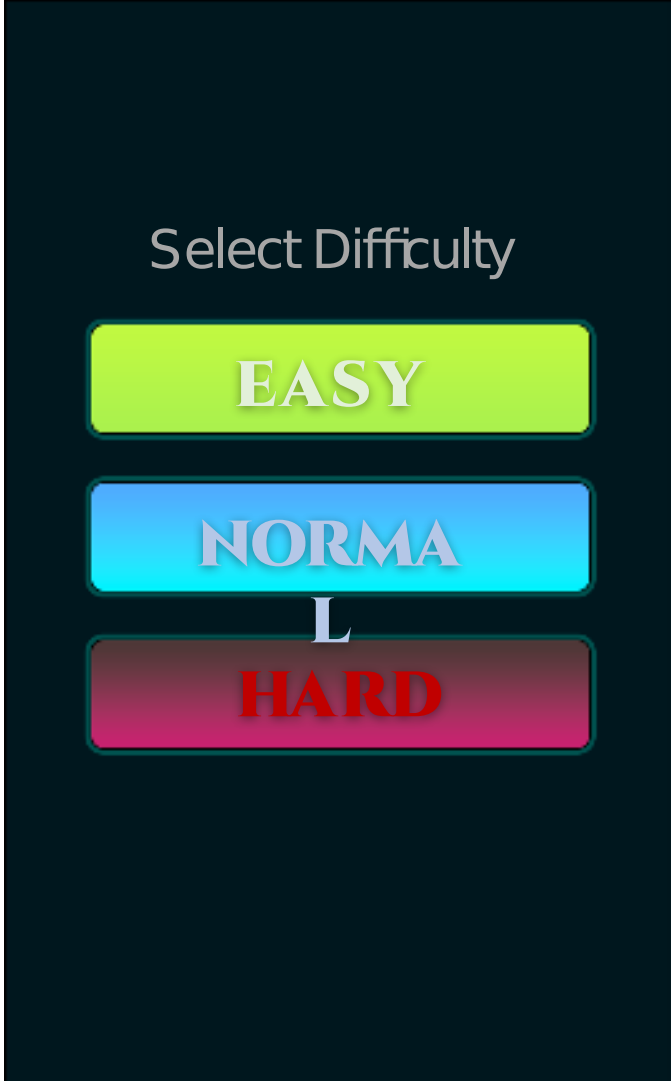

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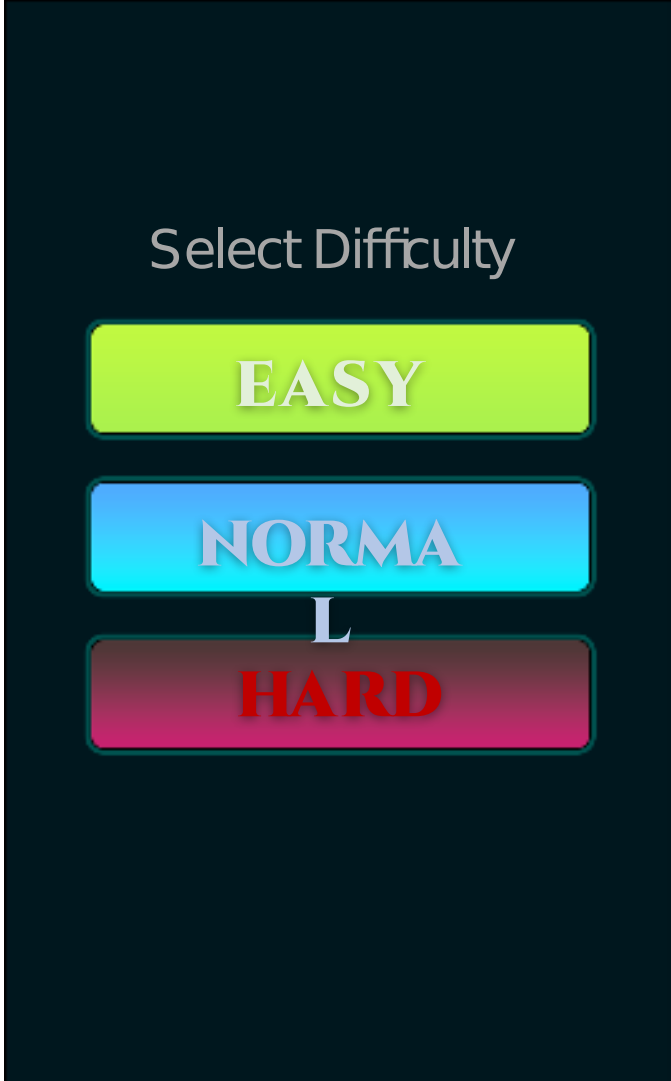
- How do we determine how physically challenging the game should be?
- Videogames often have difficulty options the player can select.
- Enthusiastic cyclists will know their FTP (Functional Threshold Power), but most people wont.
- Build a **fitness test** into the first play tutorial sequence.



T-Wrecks Study

Objective:
- Test difficulty/intensity scaling of the game

•Participants complete a playthrough of the exergame **T-Wrecks** using an indoor bicycle and a laptop.

•After a short recovery period, participants completed an **incremental step test** on the indoor Lode lab bicycle.

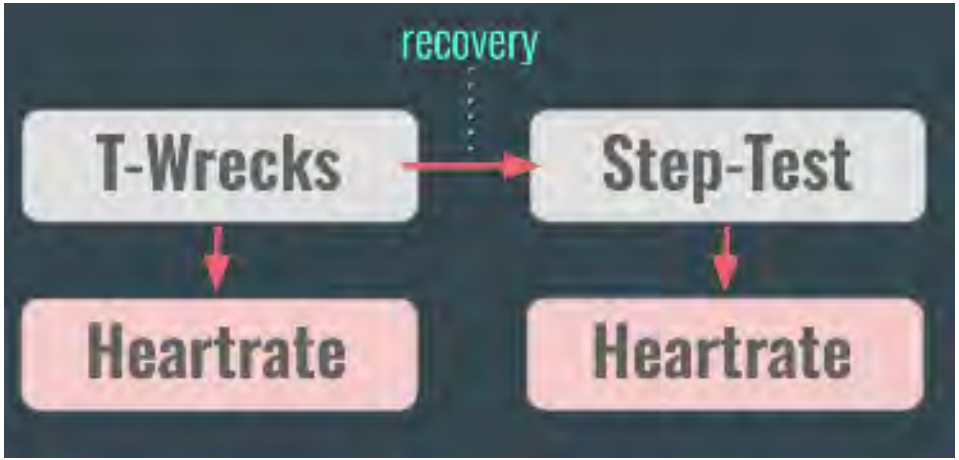
This test was an incremental maximal effort test to be completed to exhaustion. It starts easy and gets harder each minute.

T-Wrecks Study Desig

The incremental step test establishes the participant's maximum heartrate.

This could then be used to determine intensity zones.

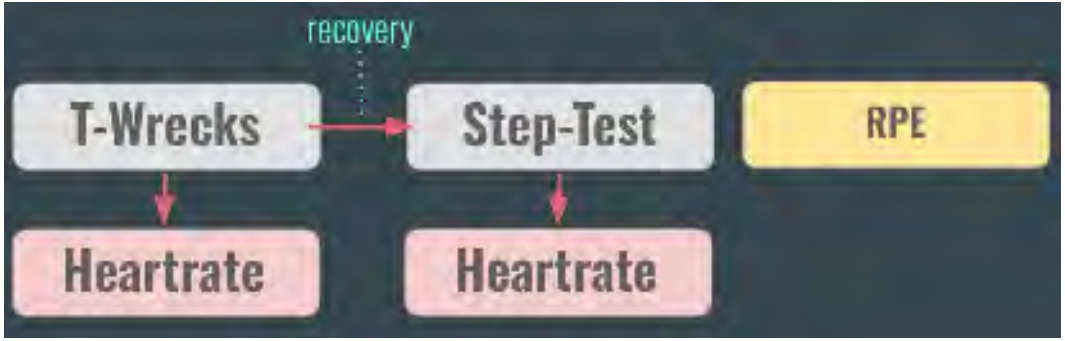
The zones were used to determine the relative physical intensity of a playthrough of **T-Wrecks**.



$\%HR_{max}$ zone range	
Weighting	Zone
5.5	97.5%–100%HR_{max}
	95%–97.4%HR_{max}
5.0	92.5%–94.9%HR_{max}
	90%–92.4%HR_{max}
4.5	87.5%–89.9%HR_{max}
	85%–87.4%HR_{max}
4.0	82.5%–84.9%HR_{max}
	80%–82.4%HR_{max}
3.5	77.5%–79.9%HR_{max}
	75%–77.4%HR_{max}
3.0	72.5%–74.9%HR_{max}
	70%–72.4%HR_{max}
2.5	67.5%–69.9%HR_{max}
	65%–67.4%HR_{max}
2.0	62.5%–64.9%HR_{max}
	60%–62.4%HR_{max}
1.5	57.5%–59.9%HR_{max}
	55%–57.4%HR_{max}
1.0	52.5%–54.9%HR_{max}
	50%–52.4%HR_{max}

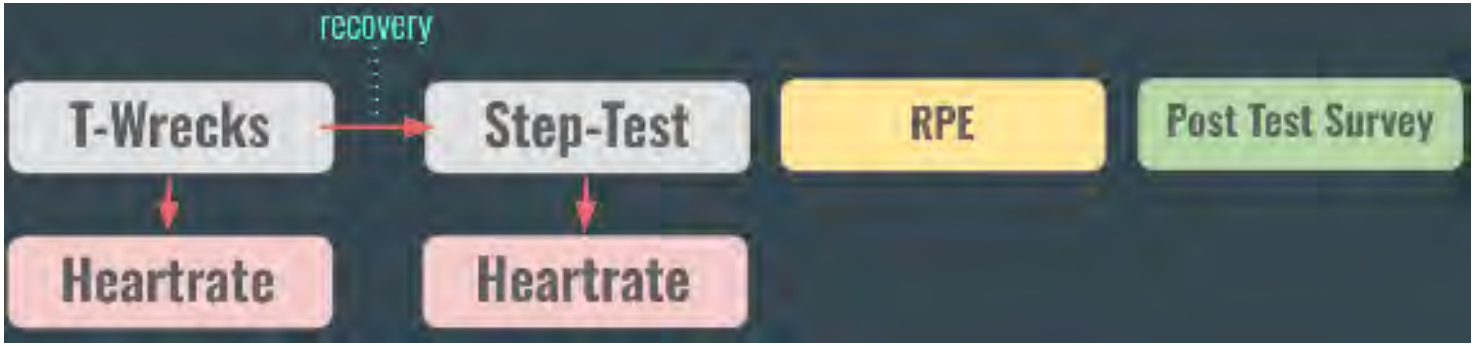
T-Wrecks Study Design

Rate of perceived exertion was captured using the Borg scale (Borg, G.A.V.) during the playthrough of T-Wrecks and at each stage of the exercise step test.



20-Grade Scale	
6	
7	Very, very light
8	
9	Very light
10	
11	Fairly light
12	
13	Somewhat hard
14	
15	Hard
16	
17	Very hard
18	
19	Very, very hard
20	

T-Wrecks Study Design



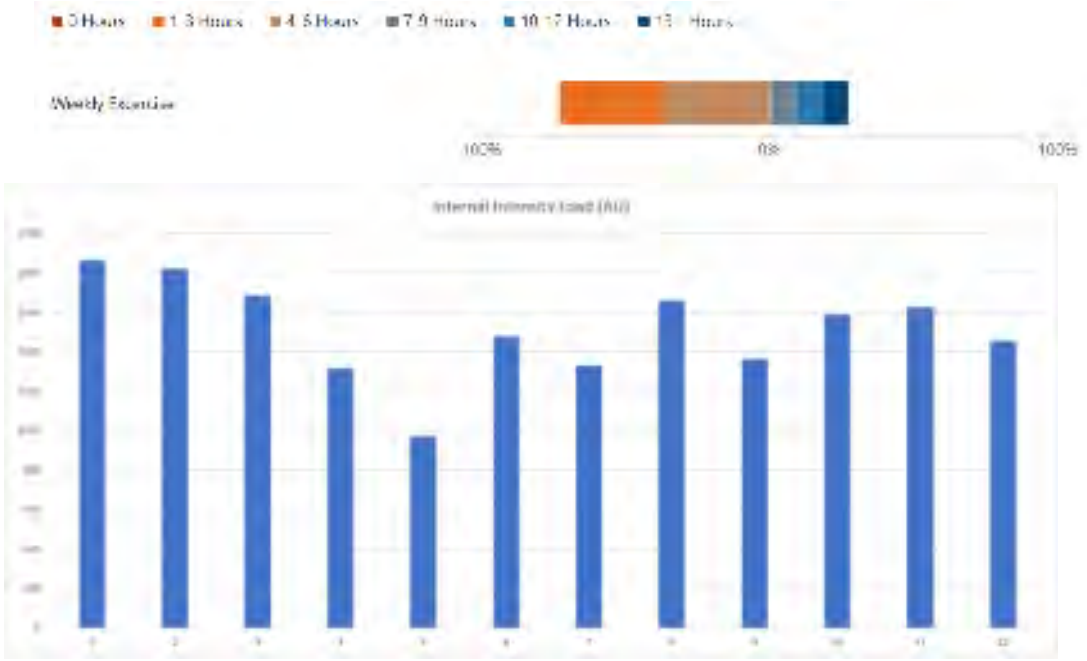
Participants were also asked to complete a short post-test survey.

This was designed to provide information on exercise habits and video game awareness.

Additionally, some insights on art direction and how functional the gameplay was were also captured.

DATA - INTENSITY LOAD DISTRIBUTION

- Participants had diverse exercise habits.
- Using modified summated training zones (Scanlan et al), we can see the relative intensity across the range of participants.
- Generally each participant found commonality in physical challenge and intensity, despite having diverse activity and fitness levels.

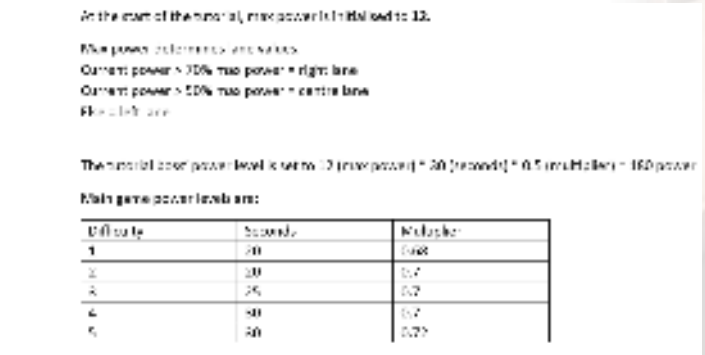


Why did this work?

During the game's intro tutorial, a **20 second maximum effort** is demanded from the player.

From this, the game establishes the maximum speed the player was able to achieve, and then uses **50%** of that value for the "**easy**" lane and **70%** of that value for the "**hard**" lane.

The intensity of the game is set **relative to the player's own fitness**.


At the start of the tutorial, max power is initialised to 12.

Max power calculations are saved.

Current power > 70% max power = right lane

Current power > 50% max power = centre lane

Else = left lane

The tutorial base power level is set to: 0 [max power] * 20 [seconds] * 0.5 [multiplier] = 160 power

Main game power levels are:

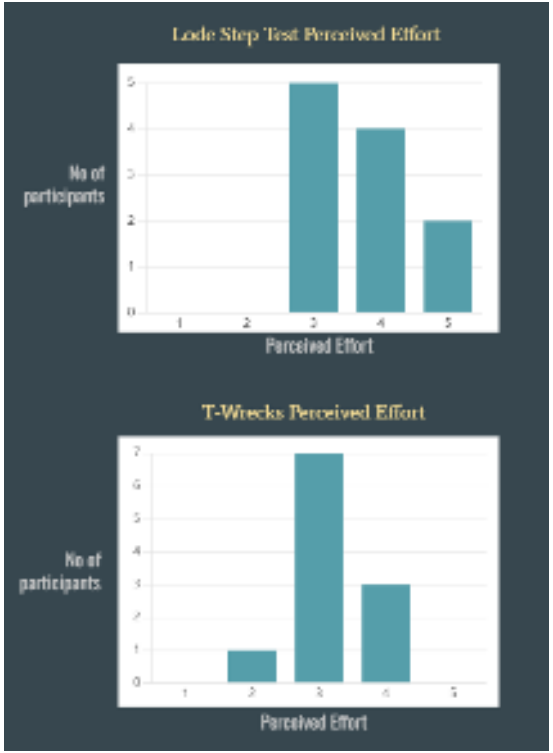
Difficulty	Seconds	Multiplier
1	20	0.5
2	20	0.7
3	20	0.9
4	20	0.7
5	20	0.9

How challenging did it feel?

Overall, participants perceived the physical effort of the T-wrecks game to be **LOWER** than the Lode step test.

T-Wrecks exergame test - How did this effort feel?

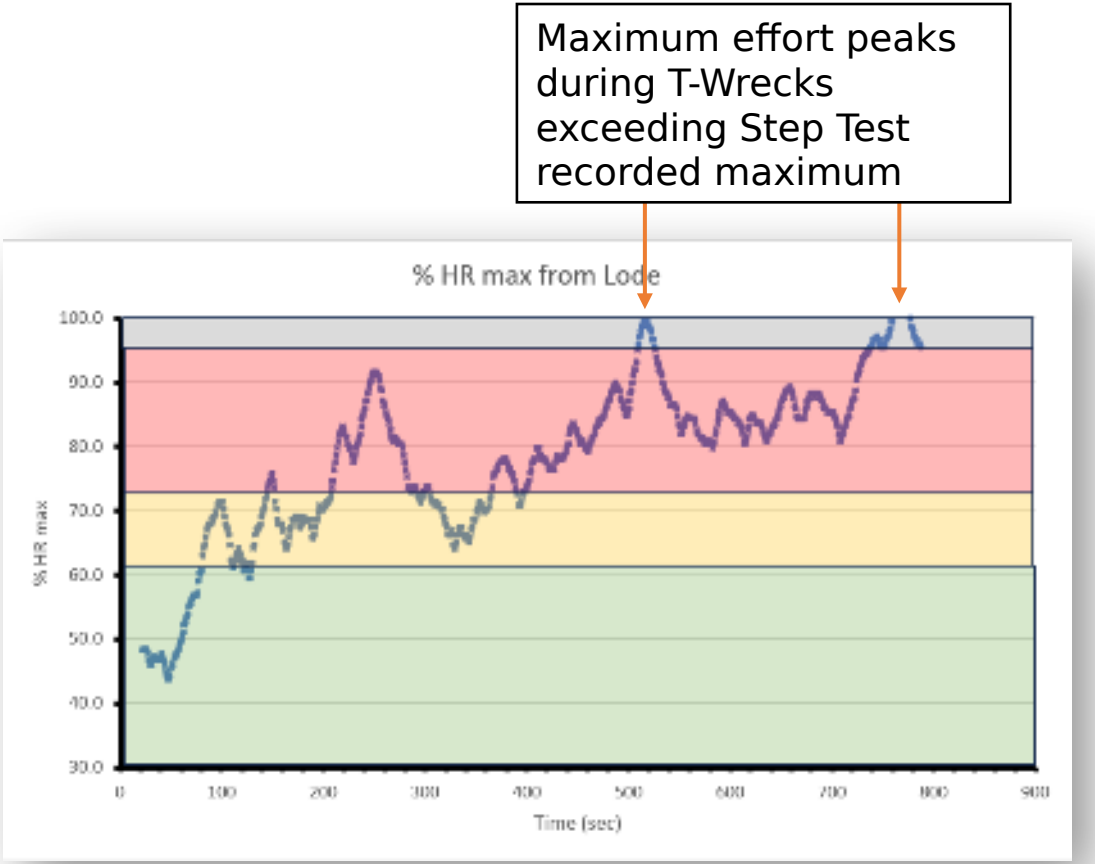
1 - Easy
2 - Moderate
3 - Hard
4 - Very Hard
5 - All Out



How challenging was it?

However, the heart rate data showed that participants generally worked **HARDER** during T-Wrecks, than on the Lode step test.

3 Participants recorded higher maximum heart rates during T-wrecks than the step test, and most equalled their Max HR several times.



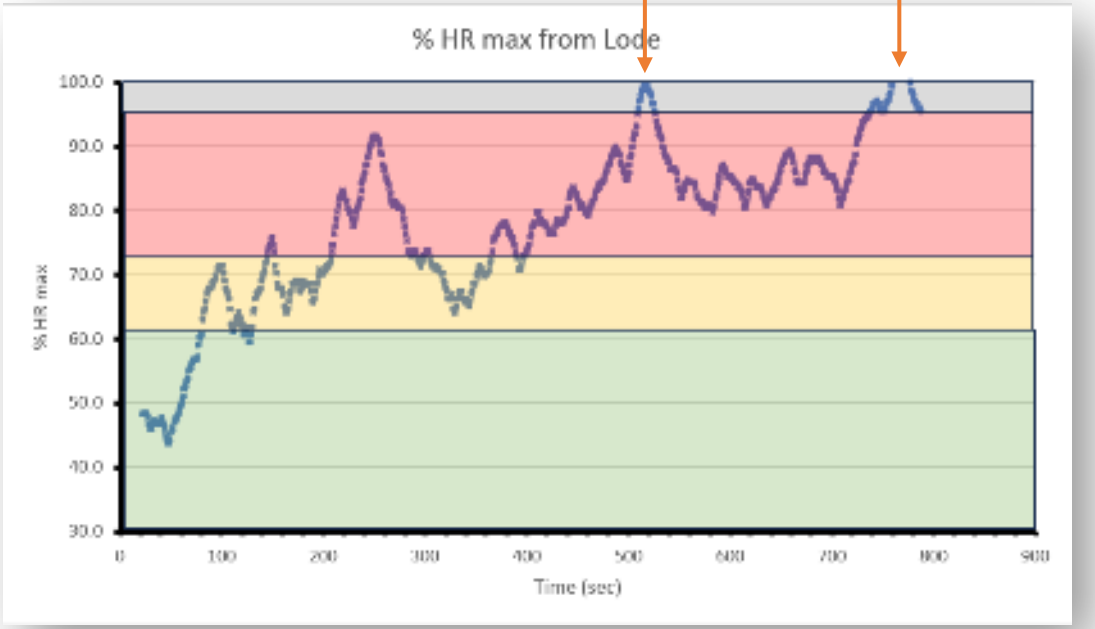
Participant Sentiment

Maximum effort peaks during T-Wrecks exceeding Step Test recorded maximum

The qualitative data supported this:

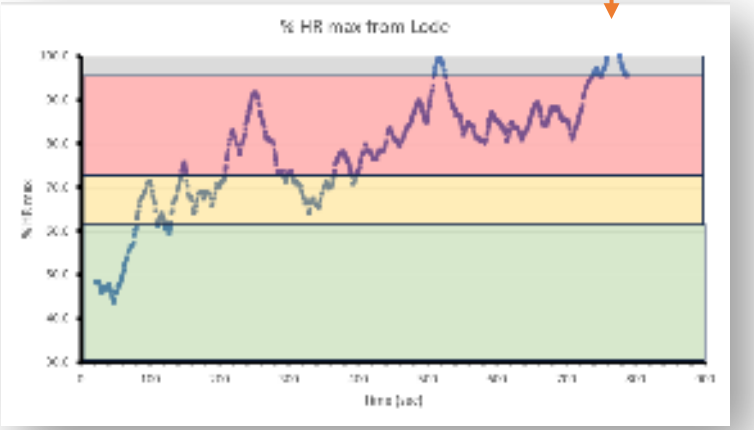
"The game took my mind off the exercising"

"The gamification of exercise does really well at hiding the effort you are required to perform in order to gain points."



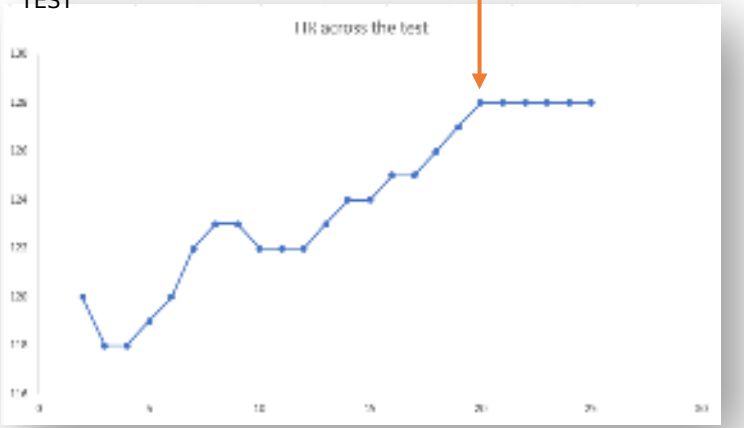
T-WRECKS

Final Boss Sprint



LODE INCREMENTAL STEP TEST

Exhaustion Point



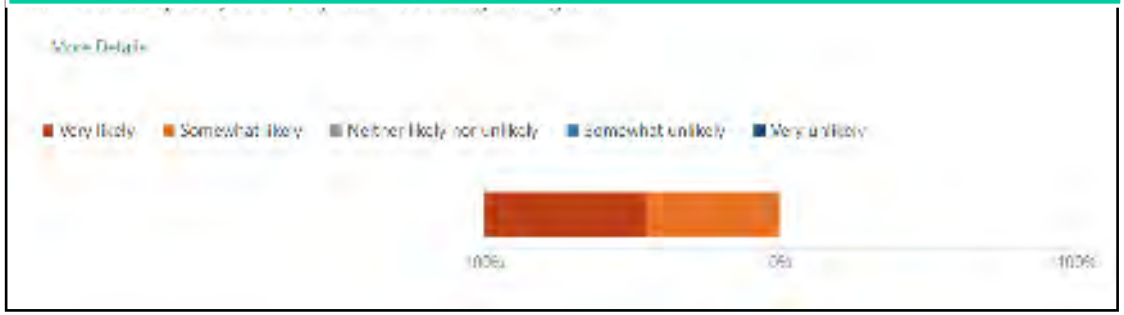
Additionally, RPE was taken before and after “Boss Fight” sprints during T-Wrecks, and also before and after the Lode step test.

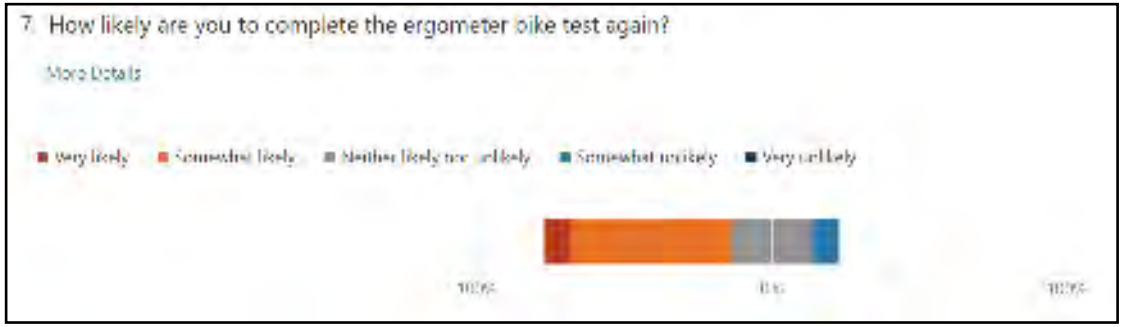
Most participants reported **LOWER RPE LEVELS** after the last boss sprint during T-Wrecks, than during the end of the Lode step test (as expected most rated the end of the step test as maximum - 20).

Participant Sentiment

- All participants indicated a desire to play more of T-Wrecks.
- But participants were less keen to repeat the Lode step test.

"Would love to play any other iterations of the game"





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"The boss battle gave very good encouragement to pedal at my fastest."

"Overall, it was a very enjoyable experience, and I would consider buying a cycling game like this in the future as a result."

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- Participants all noted the game took too long to respond – changes in lanes, particularly slowing down didn't happen quickly enough! This was due to us using a speed sensor on the rear wheel, when the player stopped pedalling the wheel continued to spin because of the freehub!

What's Next? Future Research

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- How much impact does the art have on player motivation?
  - Does it matter who or what you play as?
  - Does a specific virtual environment motivate you more?

Thank you!

Questions?

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