



STUDENTS AS CO-CREATORS

A Disciplinary Research Collaboration

Knuckle Sandwich

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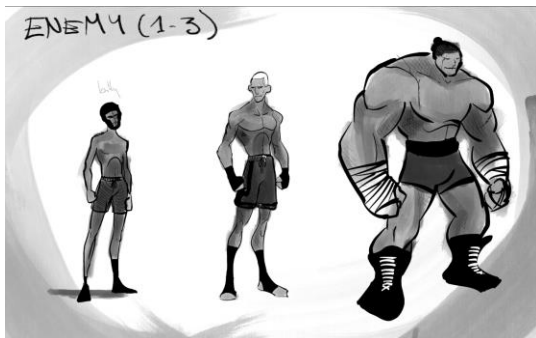
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1. Executive Summary

The project is to test the viability of external proprietary hardware to enhance VR experiences.

To do this, we established a team to create an Artefact in unity. The artefact created would need to be an experience that could exist without the addition of proprietary hardware, but that we think it could be enhanced by the peripherals. We chose this to follow regular game conventions to minimise the number of variables we needed to keep track of.

The experience we have chosen is boxing in a ring against various opponents because boxing is a good fit for VR as it doesn't require much spatial movement, but it does require extensive arm movement in turn. Additionally, player feedback in boxing is immediate and unambiguous: you get hit, or you don't, which will have made our data collection easier, and clearer.



We have determined that there is potential for auxiliary peripherals, although the current available options are unsuitable. The VRGO chair is a health and safety risk, while the Woojer Vest 4 is unresponsive and difficult to work with.

2. Background and Aims

Background: The initial plan for the project came after we realised that there hadn't been much research in alternative hardware to enhance VR experiences. Additionally, outside of dedicated arcades, VR had not made much of an impact in terms of pay-per-play gaming.

Aims: We sought to create an artefact that used external hardware to enhance a VR experience in a way that regular headsets simply couldn't achieve.

Objectives: We acquired a couple experimental pieces of hardware for this project.

- A VRGO brand chair that can track the degree of leaning based on an internal gyroscope.



- The Woojer Vest 4 that creates vibrations based on surround sound, using several small motors.



This research has helped us better understand how to work with proprietary hardware and software.

3. Methods

The primary method for this project was a hands-on approach to investigate and compare haptic feedback devices that could be used as accessories for the game. Initial research focused on the VRGO Chair, including information from Ignitec, to understand its design, operation and potential safety considerations. The VRGO Chair required substantial core and body movement from the user, which could potentially cause physical strain during extended use. Its stability was also considered a concern, as it requires a suitable flat surface with sufficient space to reduce the risk of the user tilting or losing balance which can cause injury. These factors were taken into consideration when evaluating its suitability for the project.

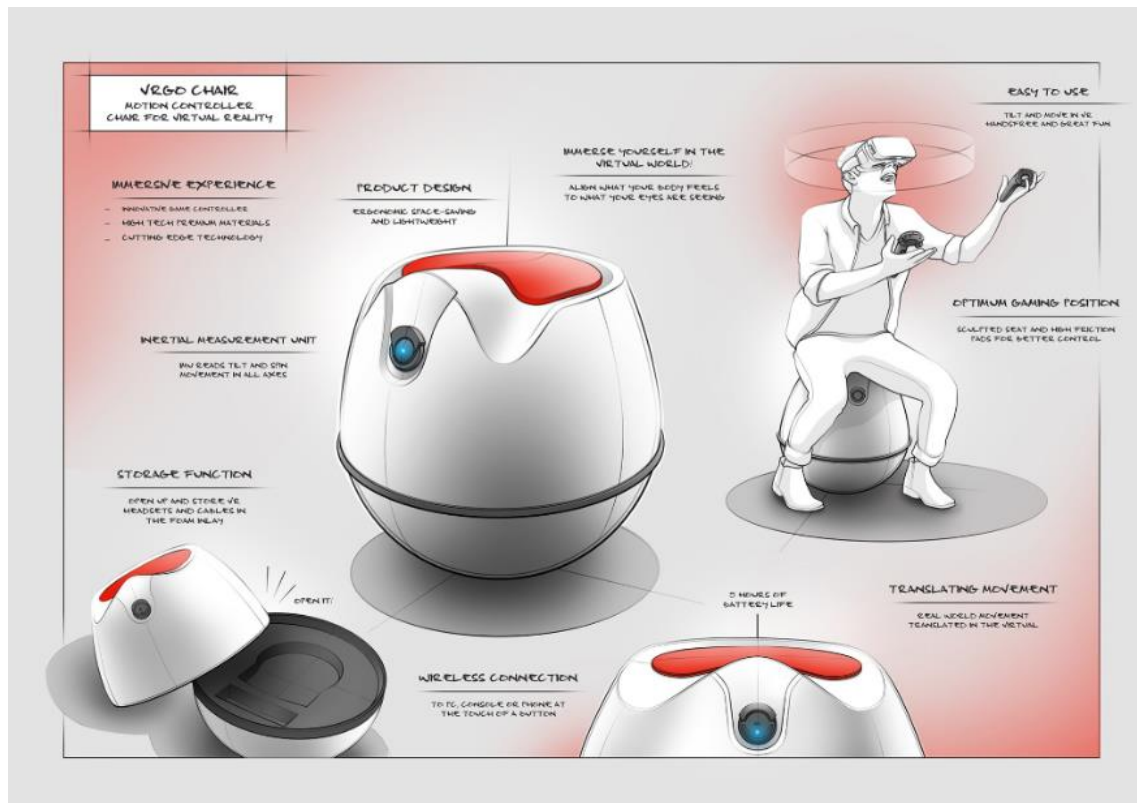


Figure X – Ignitec VRGO Chair Concept

The Woojer 4 vest was purchased and physically tested as an alternative device. Testing focused on how the vest responded to different types of audio and whether its haptic feedback could provide a suitable level of immersion for the game. Sound effects were manipulated using Audacity to test how changes in audio characteristics affected the resulting vibrations. (Provide Figure images)

The research therefore, combined background research with direct physical testing of the devices. Safety and ethical considerations were taken into account throughout the comparison, particularly the possibility of physical discomfort or injury associated with prolonged or unstable use. The findings from the VRGO Chair and Woojer 4 were then compared to determine which device provided the most practical and appropriate solution for the project.

4. Results

Physical testing of the Woojer 4 demonstrated that the vest could provide an additional layer of immersion through haptic feedback. When audio was played through the device, the functioning haptic pads responded with physical vibrations. The intensity of the vibrations varied depending on characteristics of the audio, such as its volume and frequency, while rhythmic audio such as music also produced a changing vibration pattern.

A significant finding was that the vest could not be directly programmed by the group to produce specific haptic effects. Instead, sound itself had to be used to influence the haptic response. Audacity was therefore used to record and manipulate sound effects, allowing the group to experiment with characteristics such as volume and frequency in order to produce

more appropriate vibrations for different moments of the game. This provided a practical compromise between the limitations of the hardware and the desired haptic experience.

Testing also identified a hardware limitation with the Woojer 4. Although the vest contains six vibration pads, only the two pads positioned at the upper front of the vest produced haptic feedback during testing. The two lower front pads and the two rear pads did not vibrate. Despite this limitation, the functioning pads were sufficient to demonstrate a noticeable physical response to game audio and showed potential for enhancing immersion.

Overall, the physical tests demonstrated that the Woojer 4 could translate game audio into physical feedback, while also identifying limitations in both the programmability and functioning hardware of the device.

[Video Demonstrating the Woojer Vest](#)

5. Discussion

The research highlighted that selecting suitable technology involved balancing functionality with ethical and practical considerations. The VRGO Chair offered an immersive approach but raised concerns regarding physical strain and stability during use. The Woojer 4 provided a less physically demanding alternative, although its limited programmability and partially functioning vibration pads presented their own limitations.

6. Conclusion and Recommendations

We have found that both pieces of equipment we used were not suited for VR experiences due to various reasons.

- The VRGO chair was dangerous, the gyroscope inside was not sensitive enough requiring degrees of leaning that would run a very high risk of falling and hitting the ground.
- The Woojer Vest 4 was not designed to be friendly to developers at all. Several of the motors were found to not operate properly, while the rest could only be triggered by sound. We asked the creators and we found out that there was no possible way to trigger them manually by code. Additionally, it took the same connection to a PC as headphones would, which meant that playing sound required more unnecessary work.

If we were going to pick this project up again, we would require to find different peripherals to test, and to be able to reuse the previously mentioned hardware, we would need them to receive updates, or a new version that fixes the aforementioned issues.

7. Dissemination

Daniel: I have learned the importance of proper communication and planning for projects. A project like this requires constant clear communication from everyone.

Adela: I learned that time management is an underrated part, but one of the most important ones, as the team needs to continue working consistently, as well as communicate and document progress.

Mohammed: One of the main lessons I learned was the importance of making effective use of the tools available and having contingencies when there is no direct solution. The Woojer 4 was the best example of this, as I used Audacity to manipulate the audio and achieve the desired haptic feedback indirectly.

8. Research Team Reflection

Daniel – I think I succeeded at organising and bringing together a team with a wide variety of skills. I believe that communication was the biggest issue we ran into. There were several issues that we could have avoided by communicating them sooner. Additionally, planning out each week of work in advance would have ensured that there was no time wasted. I think our successes came primarily from the wide variety of skills in the team, which meant that we had the right people for the right jobs most of the time.

Adela: The team was great, with a strong idea, and I was glad I could be part of it. The only thing I felt was missing was having one more person in my “department,” as I felt the need for clearer artistic direction and someone to consult with and discuss different options.

Mohammed: I found that collaboration within the group was effective, with semi-regular meetings allowing us to discuss plans, share progress and decide on the next steps. We also used Miro to track our progress and organise the project. The main difficulty was dealing with circumstances outside of our control, particularly when some group members were absent due to personal circumstances.

References

Ignitec (2026) VRGo: Translating movement in the real world into motion in the virtual world. Available at: <https://www.ignitec.com/case-studies/vrgo/> (Accessed: 29 August 2026).