ABSTRACT

Current VR technologies open up possibilities for more active gaming styles. We explore the effects of typical game design elements and mechanics, i.e. music, score and lighting on engagement in performance in a VR exercising game with short activity intervals of fixed duration. Many participants reached a heart rate suitable for High-Intensity Interval Training.

EXPERIMENT

19 participants (4♀, 15♂) aged from 20 to 59. Only 7 never used an HMD before. Each participant played 6 conditions. Order randomized in a Latin square design:

- Default: No music, no score, no direct lighting.
- Light: Constant direct lighting.
- Dynamic Light: Light intensity linearly increases with the player’s pulse.
- Points: Hit targets give points to the player which are displayed on the bow.
- Music: Background music with static speed.
- Dynamic Music: Background music adapts its speed depending on the pulse.

Differences in mean- and max pulse increase (significant, trend)

Players shot with an accuracy of 85.8% and were able to evade 86.7% of the shots fired by targets.

Simulator Sickness Questionnaire [1]

Before: M=2.84 (SD=2.85) after: M=6.11 (SD=4.48) mainly caused by sweating.

The Slater-Usoh-Steed [2] mean score (sense of being present in the virtual environment) indicated a high sense of presence with M=4.763 (SD=0.81).

The heart rate was close to 80% of the maximum heart rate in all conditions (no significant differences) which suggests KiVR Sports is suitable for High-Intensity Interval Training [3].

GAME

The player is surrounded by multiple targets that they can shoot with bow and arrow. If a target is hit it fires an oriented row of projectiles back at the player which the player needs to dodge. The random orientation encourages the player to use many different movement patterns. A hit target releases fruits that are picked up by a little Kiwi companion. Targets explode on their own after a while (without dropping food) but warn the player audio-visually before.

PLAYING FIELD & GAME ELEMENTS

Hardcore Heart Rate and Pulse Logger: Sensor data was collected via http-interface and was used for real-time adaption of the scene as well as general data collection.

HARDWARE

HTC Vive head mounted display featuring controllers that provide simple haptic feedback. The corresponding lighthouse tracking system was used for positional tracking and calibrated for an available walking space of 4m × 4m.

Fakultät

FÜR MATHEMATIK, INFORMATIK, UND NATURWISSENSCHAFTEN

