Adding biofeedback to video games

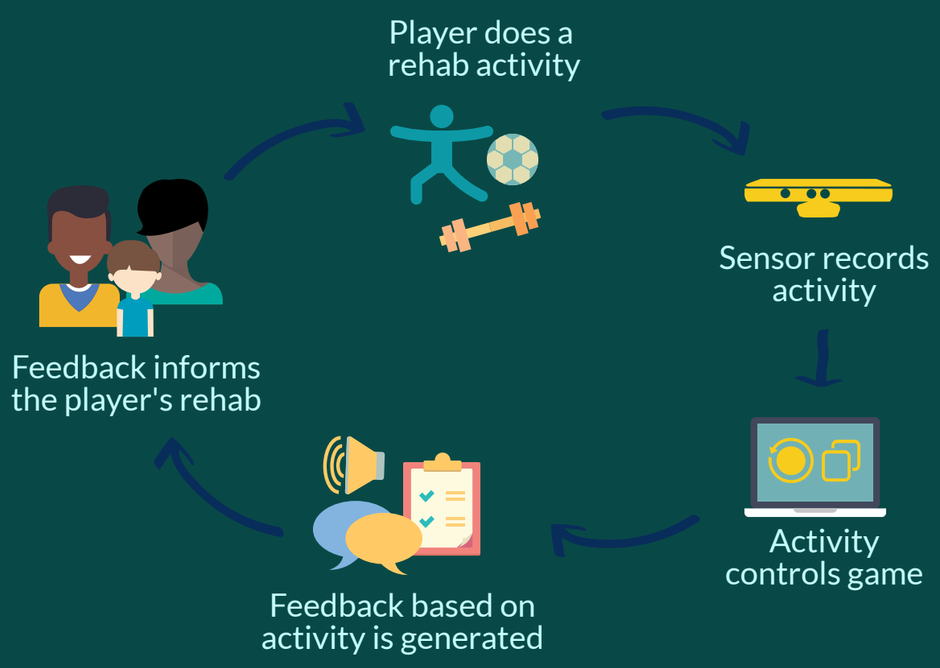
Making a rehab video game takes input from clinicians, developers and players. Here are helpful tips for teams looking to add biofeedback into their video games

What is biofeedback?

Biofeedback gives people information about their body. People use biofeedback to learn how to control their body better. Biofeedback can help in learning new skills.

Biofeedback in games

Games can deliver biofeedback to promote learning:



Well integrated biofeedback closely links game feedback with the rehab activity.

Biofeedback design characteristics

Feedback can be about:

- movement (speed, accuracy, distance)
- performance (good or poor)
- health data (heart rate, muscle activity)

Feedback can be delivered in different ways:

- audio
- visual
- tactile

Feedback can be given at different times:

- during or after a game
- when the player performs well or poorly
- with decreasing frequency as the player improves

Systematic review source

MacIntosh, A., Lam, E., Vigneron, V., Vignais, N & Biddiss, E. (2018). Biofeedback interventions for individuals with cerebral palsy: A systematic review. *Disability and Rehabilitation*, DOI: 10.1080/09638288.2018.1468933

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Feedback should match the player's needs:

Player goal

Practice

Goal: increase repetitions
- ↓ feedback
- ↑ error tolerance

Mastery

Goal: improve technique
- ↑ feedback
- ↓ error tolerance

Player needs can be determined by a clinician, themselves or a computer

Skill difficulty

Simple skills

Give instructional feedback

Complex skills

Give success/failure feedback

Simple skills are usually a single step
Example: wave hand up

Complex skills are usually many steps
Example: shooting a basketball

Player skill level

Novice

- ↑ detail in feedback
- ↑ instructions

Expert

- ↓ detail in feedback
- ↓ instructions

Novices benefit from being shown how to do a movement
Example: instructions

Experts should explore and find what works best for them
Example: thumbs up

Here are 3 approaches to feedback that are hardly used even though they can be effective.

Build in choice

Giving players choice can help motivate them to learn new skills. They might choose to:

- get feedback
- ignore feedback
- customize feedback

Less is more

As players get more skilled, they should rely on themselves more than on the feedback. Only give feedback when they need it:

- once a skill is learned, no longer provide instructions
- only provide feedback when the player succeeds/fails

Mix it up

Changing how feedback looks helps the player become more independent. Variations can be:

- giving feedback at the end of the level instead of during the level
- going from more detailed feedback (e.g. instruction) to less detailed (e.g. a sound)