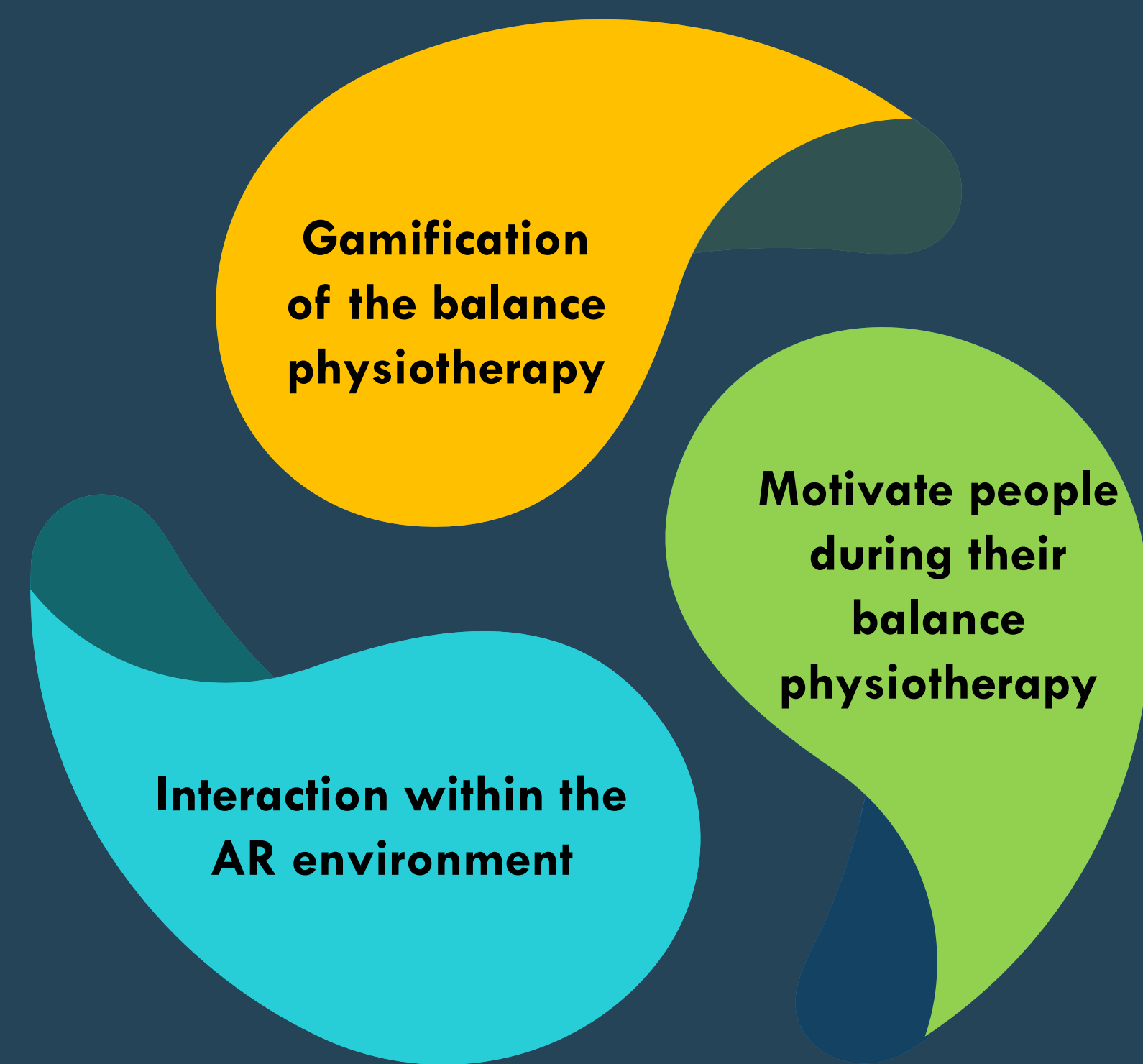


## Description

- The aim of this task is to develop serious games that can be used during balance physiotherapy
- The main aim of cognitive training and exercise games, is to create an environment for empowering and motivating people during their balance physiotherapy.



## Methodology

- AR enables interaction with the environment that cannot be ignored when it comes to maintaining walking, standing, or even sitting balance.
- Method for improving athletes' motor performance regardless of environmental complexities has been adopted in the CTG in order to cause patients to allocate their attention from the secondary tasks in order to process a primary task.
- Dual task is an untapped opportunity to more fully improve patient's functions through the reaction speed, accuracy, tolerance of distracting environments, and awareness of unsafe task demands.



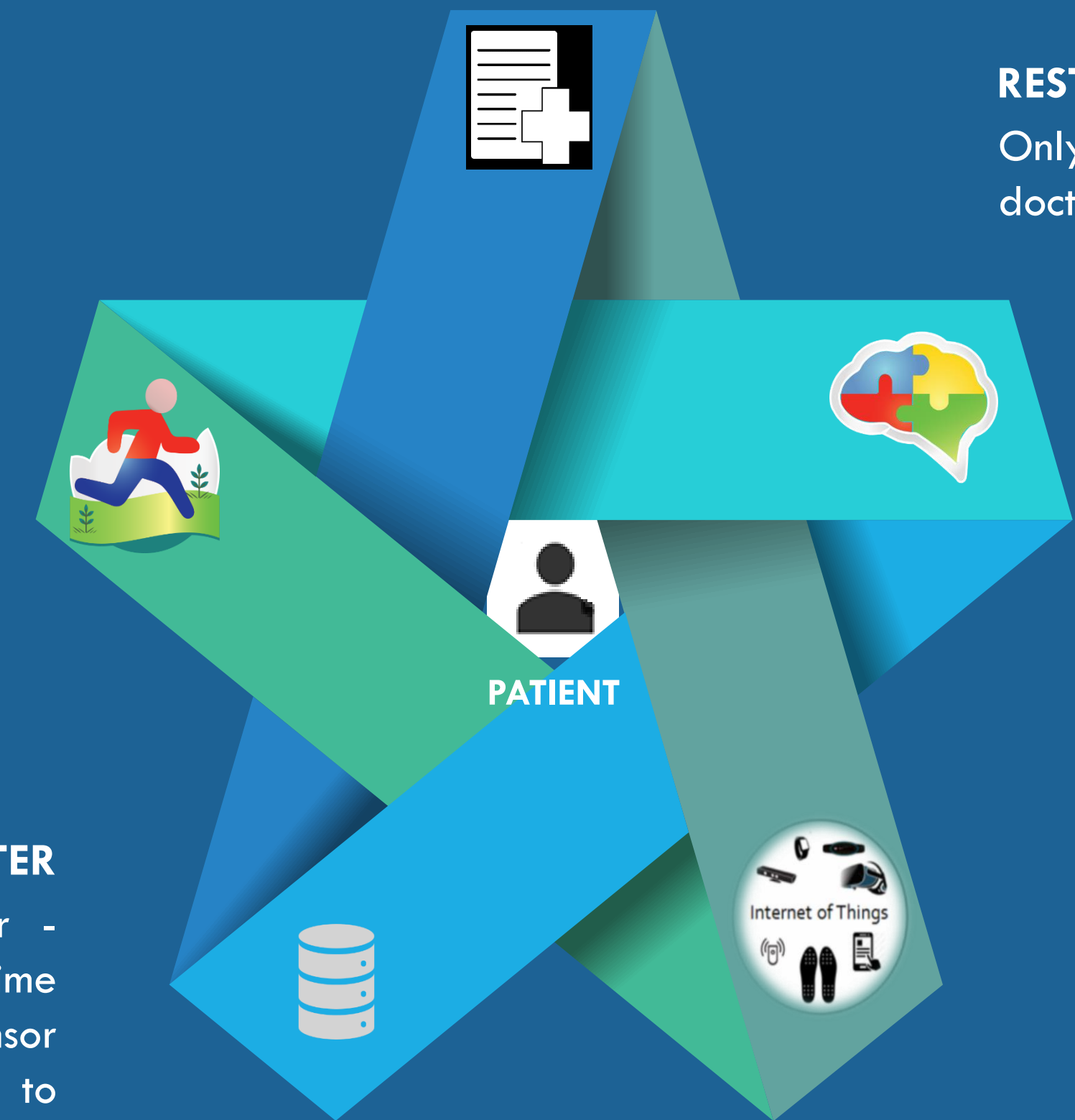
### EXERGAMES

Exergames present the gamification of the balance physiotherapy defined by clinicians through the flowchart.



### EDGE COMPUTER

Edge desktop computer - capable to run real time evaluations on the sensor captured data, in order to give real-time feedback



### RESTRICTIONS

Only games approved by doctors could be played

### COGNITIVE GAMES

The cognitive games provoke cognitive skills and physical movement of the patient - player

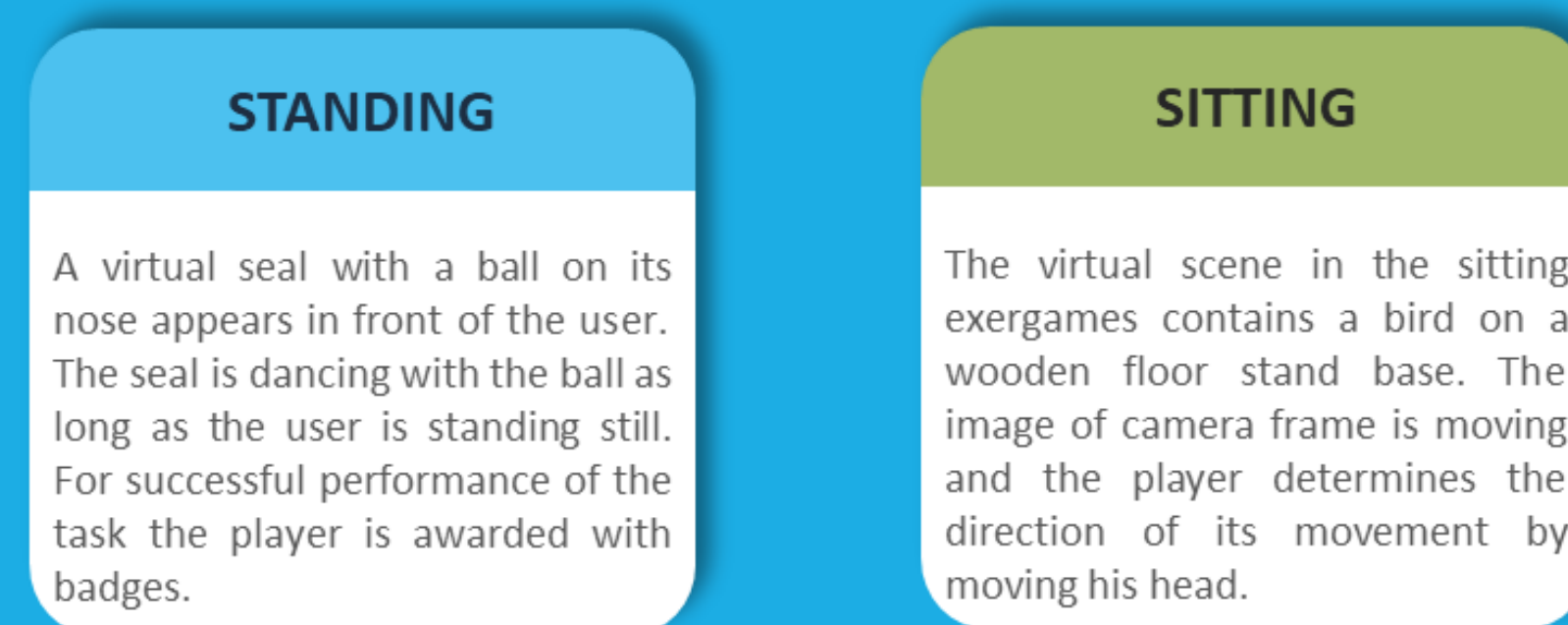


### INTERNET OF THINGS

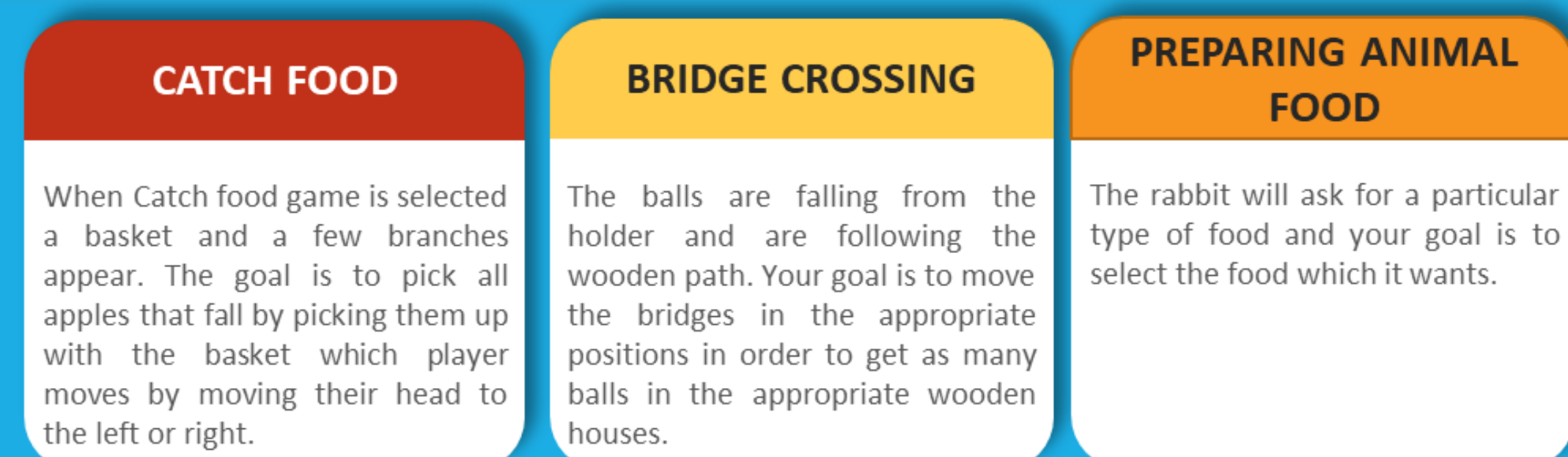
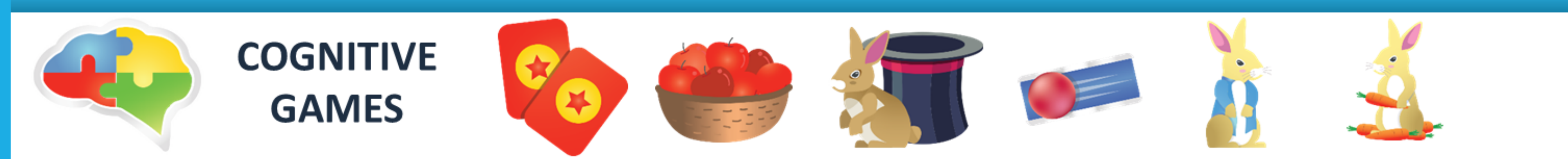
Sensors evaluate the results of the patient session and AR enables advance user experience

## Main Functionalities

All exergames are divided in four groups according to the exercises in the flowchart that player should do: standing, sitting, walking and bending.



The cognitive games have aim to improve following cognitive skills: problem solving related to visuospatial, rapid visual information processing, memory, reaction time and attention.

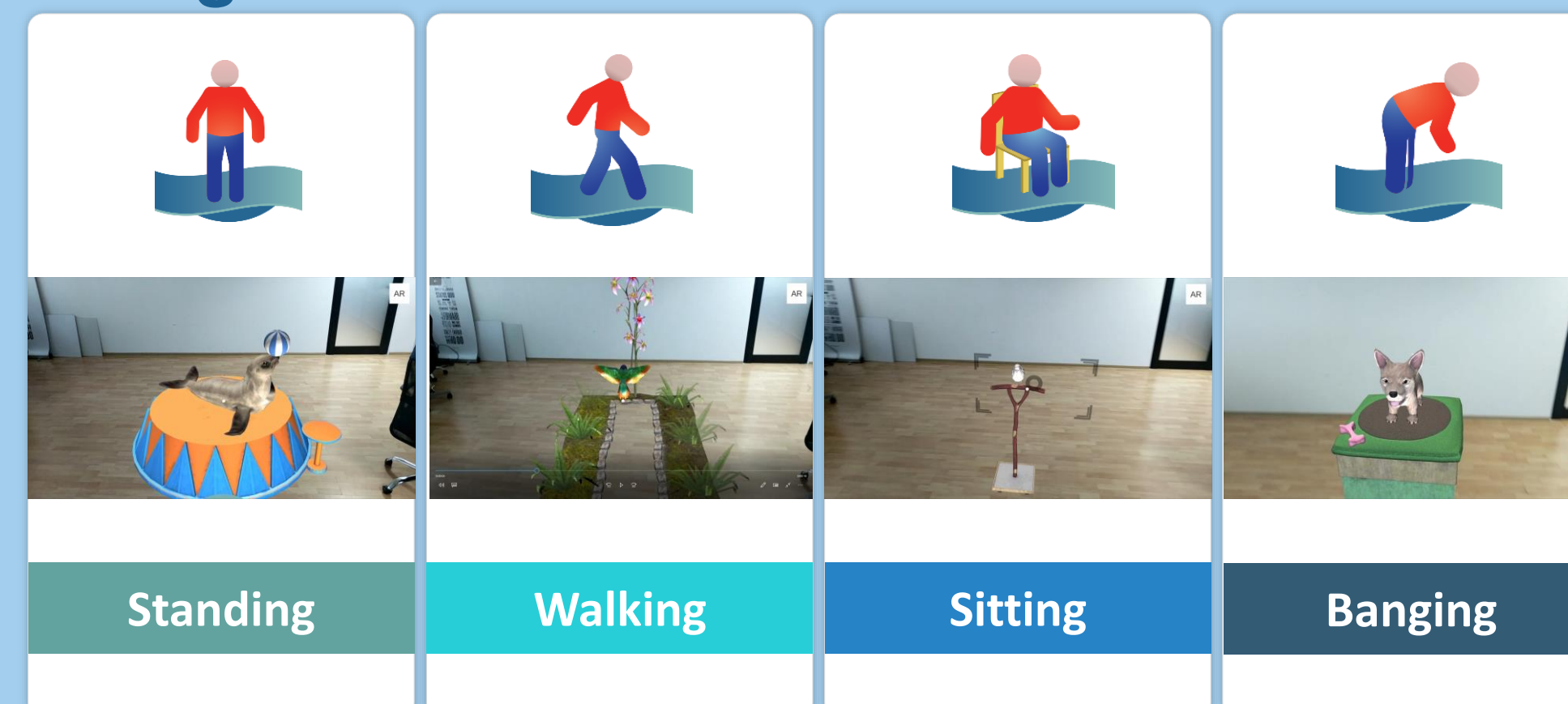


## Technology

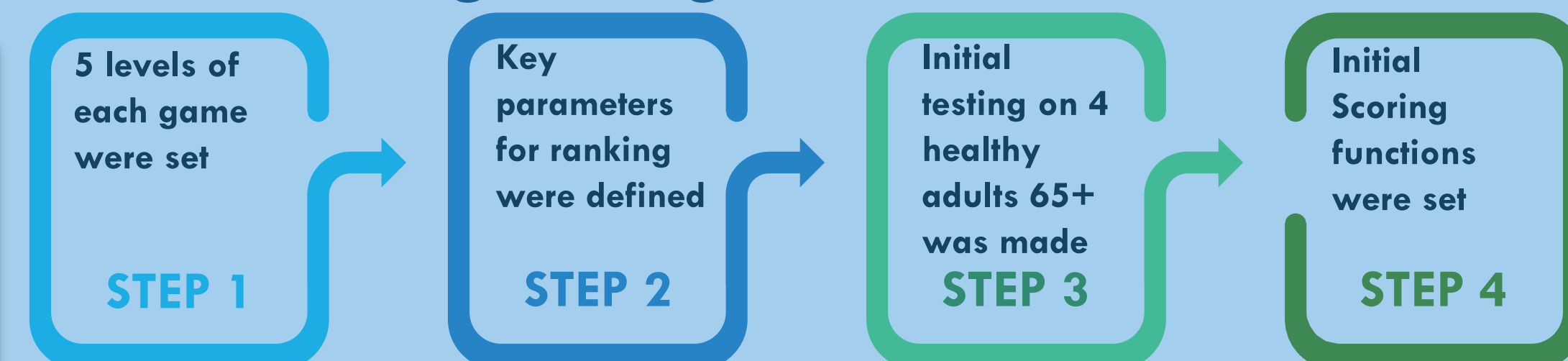
- Unity framework is enabling integration of CTEG with Android in unified manner. It provides access to all hardware resources of the smartphone enabling augmented reality presentation and interaction.
- REST APIs are used as protocol for communication between CTEG and Edge computer in both directions in stateless manner. Interface of this kind allows CTEG to receive feedback regarding evaluation of player performance in real-time and provides interoperability.

## Results/ Interfaces

### Exergames

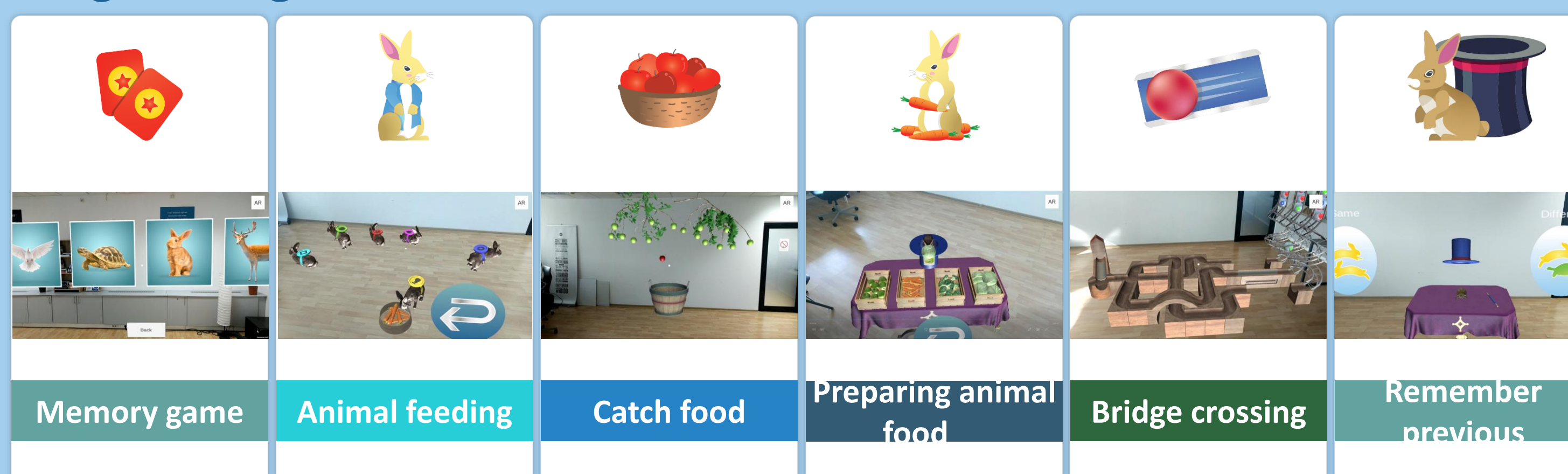


### Initial Scoring Setting



First setups of scoring functions have been made. The implementation of this task is going in tight cooperation with clinicians.

### Cognitive games



- The software communicates with the Edge computer which is responsible to estimate patient condition based on which the software will make interruptions and promote accessible interaction

- The first version of the software is hosted on the smartphone where user wears head mounted adapter to keep a smartphone at a set location on the head of the user.

## References

- Studer M. Making Balance Automatic Again: Using Dual Tasking as an Intervention in Balance Rehabilitation for Older Adults. SM Gerontol Geriatr Res. 2018; 2(1): 1015.
- Selma Papegaij, Floris Morang; Frans Steenbrink, Virtual And Augmented Reality Based Balance And Gait Training, Improve Human Performance, 2017