



## ANALYSIS OF HEART RATE AND OXYGEN SATURATION IN ADOLESCENTS AT THE TIME OF NETWORK PLAY

Wilver Auccahuasi<sup>1</sup>, Orlando Aiquipa<sup>2</sup>, Edward Flores<sup>3</sup>,  
Fernando Sernaqué<sup>4</sup>, Sergio Arroyo<sup>5</sup>, Ingrid Ginocchio<sup>6</sup>, Aly Auccahuasi<sup>7</sup>,  
Felipe Gutarra<sup>8</sup>, Nabil Moggiano<sup>9</sup>

<sup>1,2,3,4,5,6,7,8,9</sup>Facultad de Ingenieria, Universidad Continental, Huancayo, Perú

E-mail: <sup>1</sup>wauccahuasi@continental.edu.pe, <sup>2</sup>oaiquipa@continental.edu.pe,  
<sup>3</sup>eflores@continental.edu.pe, <sup>4</sup>fsernaque@continental.edu.pe,  
<sup>5</sup>sarroyo@continental.edu.pe, <sup>6</sup>iginocchio@continental.edu.pe,  
<sup>7</sup>aauccahuasi@continental.edu.pe, <sup>8</sup>fgutarra@continental.edu.pe,  
<sup>9</sup>nmoggiano@continental.edu.pe

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### Abstract

*Technology is changing people's daily lives because of the electrical devices that make people's day-to-day life easier. One of the most influential fields is the entertainment field, proof of this is the variety of video games. These are constantly evolving both in the technical requirements and in the complexity of the games that nowadays, strategy games are booming. These games have new ways of interacting with the player. The most characteristic is the level that the player occupies the game and proof of this are the long times that young people devote to the moment of playing. This excess time causes a change in the personality of adolescents as well as causing certain changes in cardiorespiratory effects. Sudden changes of the emotions associated with a high level of stress at the time of playing are causing the heart to react differently to these sudden changes in oxygen requirement. In this paper, we analyze the strategy games that are in full swing at this time such as the famous FORTNITE game. The research consists of a monitoring of 10 young people to whom they have been subjected at long game times. On an average 5 hours in a row, in which they have been evaluated for oxygen saturation and heart rate at the times that players are developing various emotions such as stress, frustration, joy among others. The results show that when young people win and are promoted to higher levels, they present positive emotions such as tranquility and are happy, while when they lose and lower them, they present negative changes presenting frustration, they deny, in some cases they present aggressive attitudes, throwing things. These changes are reflected in an excess of oxygen consumption reaching saturation at 99% and presenting of high heart count greater than 85 beats per minute. It should be noted that young people who are under study, do not present any type of health problem*

*and we end with some recommendations to take into account when playing these video games that require time prolonged subjected to video games.*

**Keywords:** Video game, Saturation, Oxygen, Heart rate, Frustration.

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## **I. Introduction**

Video games are becoming very important in recent years. From its development to the effects they are causing in its different uses. Performing a literature review, we found many works, where we can indicate that video games are used to help in the realization of therapies in older adults, by the interaction between the player and the video game provided by the Nintendo Wii console [V]. The excessive use of these video games is causing certain types of addictions, occurring more frequently in young people; recommending that its use be controlled [III]. Another of the research topics, about the effects of video games that are changing the way children and young people relate, trying to understand why teenagers have a preference for video games according to certain criteria [II]. Video games are experiencing certain changes both in the complexity of the games and in the level of violence that develops. Evidence of works that measure the level of violence that develops in videogames and how they affect young people [I]. Another area where research is how it affects video games is health. Therefore, measurements are taken on oxygen consumption during the time the game is made and compared with activities related to watching television programs. The measured indicator is cardiorespiratory responses [IV] [VI].

The present work is related to oxygen consumption and the evaluation of heart rate. Especially when network games are held, where they have a higher level of complexity, related to the interaction between players, which makes them develop certain behaviors to raise their level in the game. Making them want to win at all times to improve their level and when they lose, they lower the level causing frustration in the players.

## **II. Materials and Methods**

### **Types of Videogames**

Video games have undergone many changes in their interaction with the player. Developing different ways of interacting, from basic games like Pac-man, to reaching strategy games like FORTNITE. Where a graphics card is required. These games are presented on both consoles and personal computers. Below is a description of the types of games we can find:

- Strategy: Role play, where you choose any fictional characters with different abilities. Mostly, they can carry the magic genre.
- Sports: Sports simulation games.
- Action: Game that goes with the action genre. Mostly, these games have both fire and melee weapons.
- Creative: Game where you can do what you want. Create a new house, a building, among others.

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### **Oxygen Saturation**

We understand that oxygen saturation is characterized by the amount of oxygen that is contained in the blood. The Heart works to provide blood to the whole body. In this work, oxygen binds to red blood cells, allowing oxygenation of the entire human body. Normal oxygen levels are between 95 and 100%; levels below 90% are considered pathological values.

When playing for extended periods. There is a high probability of developing saturations below 90%, caused by the player's overexposure and the level of stress that develops due to the fatigue that occurs.

### **Heart Rate**

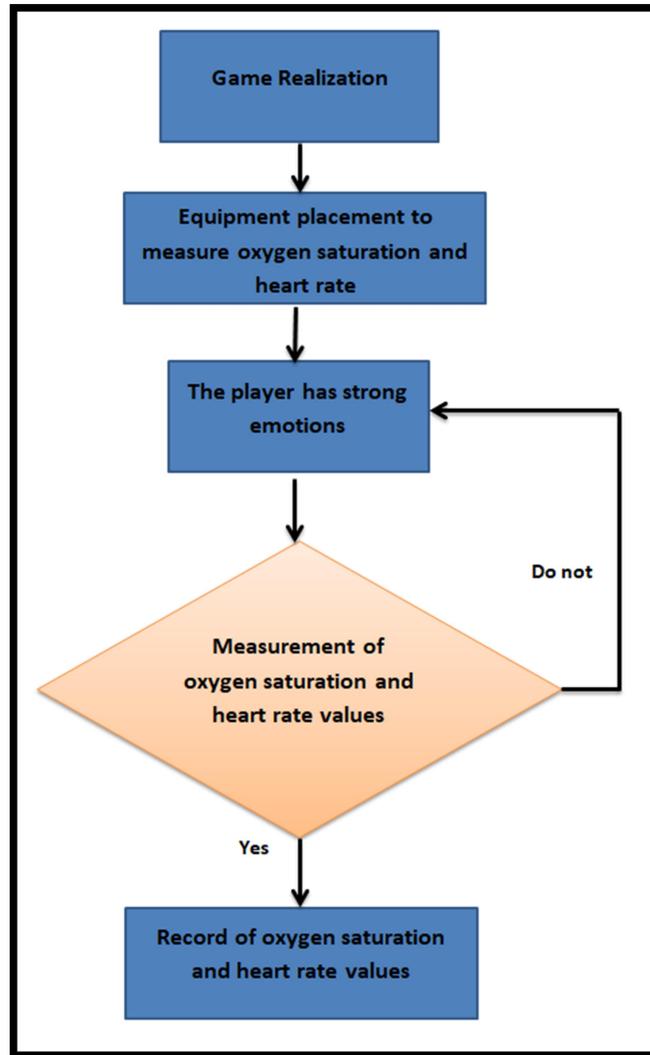
We understand as heart rate the amount of contractions that the Heart performs in a minute. For the human body to function properly, the heart rate must be between 50 and 100 beats per minute. At the time of exercise, the heart functions at maximum capacity and it is at this time, when it produces up to 100 beats per minute. One of the most frequent problems occurs when 100 beats per minute occur, in this situation the human body may suffer some decompensation. This feature must be taken into account when subjected to great emotions when playing for long periods of time.

### **Proposed Methodology**

The proposed methodology is characterized by measuring and evaluating the values of oxygen saturation and heart rate. When the player is subjected to strong emotions caused by the action of the game. For positive emotions when the game wins, causing a level increase in the game. Or when he has negative emotions, when he loses, where he presents frustration wanting to cry and in some cases wanting to break things.

The objective of this methodology is to analyze what happens in the heart of the player when these emotions occur. The game chosen for the evaluation is FORNITE, because it presents different levels in the game. It is important to be able to realize these emotions to find some pathological characteristics that may present later problems and be able to make some recommendations to the player. They can also provide important information to avoid some type of cardiac difficulty in the player.

It is important to indicate that the methodology developed is a characteristic aspect of the evaluation. Being able to perform the measurement at the time the game is performed, at peak moments of emotions and also be able to measure throughout the game for short periods.



**Fig. 1:** Flow chart of the proposal.

### **III. Results**

The results obtained at the time of performing the proposed methodology, are characterized by the measurement of oxygen saturation and heart rate, at peak moments of maximum emotion when playing, for long periods of time. It is also important to know the appreciation that young people have regarding the game and the emotions they feel in the development of the game.

From the appreciation of the player. The game is an entertainment that allows distraction and allows you to have a good time with friends who are connected to the game. The game is characterized by playing alone or playing with connected friends, for this feature it is important to know the emotions that arise. This feature is directly related to the competition and develops on the pressure of the game group. If they win they feel important and with greater acceptance in the group. Another characteristic is to be able to evaluate in the maximum points of the emotions that is present in the negative emotions, it is the case when they lose and the frustration of the group takes place. The values presented are obtained from the measurements made to the youth group when playing.

Below are the levels of oxygen saturation and heart rate at four different times, when playing a network game. The values presented are the averages of the 10 young people who have been evaluated.

The first moment of evaluation is when you are in a normal situation, without playing, the values that are registered are normal, the oxygen saturation has a value of 93% and the heart rate on average 78 beats per minute, in Figure 1 you can appreciate the values.

Normal situation	Value
Oxygen saturation	93
Heart rate	78

**Fig. 2:** Registration values in a normal situation.

Second evaluation was carried out when players get ready to start the game, the values show that the oxygen saturation drops to 90% and the heart rate begins to increase achieving 92 beats per minute, as can be seen in the image3.

Preparing to play	Value
Oxygen saturation	90
Heart rate	92

**Fig. 3:** Registration values when you are getting ready to play.

The third moment of registration is dedicated when the players are playing, at the moment when they are winning and leveling up, oxygen saturation values are presented in 93% and the heart rate is shot towards 104 beats per second, this situation is presented when you are at the maximum peak of the game.

Winning	Value
Oxygen saturation	93
Heart rate	104

**Fig. 4:** Registration values when playing and winning.

The fourth moment of the evaluation is when the players lose and frustrations appear, the values indicate that the oxygen saturation is triggered at 98% and the heart rate rises to 108 beats per minute.

Frustrated - losing	Value
Oxygen saturation	98
Heart rate	108

**Fig. 5:** Registration values when you are losing and experiencing frustration.

#### **IV. Conclusions**

As indicated in this document, video games can help improve people's health. But when it is overused, there is a risk of causing high risks in people's health- In this work it was possible to demonstrate that when he submits to long play times, the player presents many changes in his emotions, from joys to frustrations They resorted to taking measurements on oxygen saturation and heart rate, to assess what is happening in your Heart and how is oxygen consumption. With these measures it is possible to analyze by the biophysical changes that the player develops, in short periods of time and by various factors. The emotional part is important to evaluate, because normally players play in a group and need to feel accepted, so the need to win.

It is concluded that when you are preparing to play, the values are in the normal ranges. When you are playing strong emotions are present, when you are winning or when you are losing causing frustration. When you are playing, the oxygen saturation levels are almost at maximum oxygen consumption and the heart rate is activated at maximum values. Records between 104 and 108 beats per second are evident. These values are much higher when physical exercises are being carried out, which could cause future heart problems. It is very important to understand the fatigue of young people when the game ends.

As a final conclusion. We can indicate that when they undergo long playing times, young people have many emotions in short periods of time, in most cases, these emotions tend to be antagonistic, from being happy to getting frustrated, and

everyone feels the pressure of the group. It is recommended to control the emotional states of young people who play for long periods of time, as well as if they show fatigue, agitation, when they play, which could be a sign of a later problem that can affect the cardiovascular system.

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