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Virtual reality model as a means to fight obesity in Peru

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ABSTRACT

Obesity is a problem that affects health in different ways worldwide. It has been detected that one of the countries that suffers most from this condition is Peru. Therefore, the present study shows the use of virtual reality (VR), which is a growing technology, as a way to address obesity in the mentioned context. With this objective, the methodology to use is Design Sprint, with which two previous works were evaluated to investigate how virtual reality struggles against obesity through a propagation motivated by virtual reality, analyzing its results and using them to give problem to the referred conjuncture. The results of this work will benefit the population and the scientific world since the tools and advantages achieved in each study were analyzed with the aim of promoting the implementation of new technologies in the field of health and welfare of the population.

Key words : Design Sprint, Obesity, Virtual Reality.

1. INTRODUCTION

Sedentary life is a condition that afflicts society in general, regardless of the stage of life of individuals. According to the Centers for disease control and prevention (CDC), during the years 1980 to 2008 there was an increase from 7% to 20% of people under 30 years of age with obesity in the United States; in the same way it is noted that there was a similar increase from 5% to 18% in young people from 12 to 19 years of age and even children from 6 to 11 years of age were detected with this condition[1]. This is mainly due of the high rate of physical inactivity, plus not having a balanced diet with essential macronutrients for the body that this is more likely to develop a complication with high blood pressure and/or diabetes[2]. In addition, overweight children are more likely to become overweight adults and are at risk for even more health complications as the one mentioned before[3].
Due to the increasing population with obesity, it can lead to an increase in cases of diabetes, heart problems and cancer[4], [5]; therefore the importance of avoiding this physical condition is emphasized. To achieve this, it must be understood that the problem is linked to the contemporary lifestyle, since with the constant technological advances there is a dependence on them and a preference for a sedentary life; as well as there is an increase in exploitation in the fast food industry, which added to the lack of physical activity makes it difficult to maintain a healthy life and avoid obesity[6].
In this research work, the Design Sprint methodology will be used because of its great way of problems solving in a short period of time[7]. Nevertheless, by using this methodology, the problem is solved in a short time, but, it is necessary to have people trained in their fields, so that the debate will be more productive and there will be less mistakes [8]. The development of the before mentioned methodology will be through its various stages in which the use of virtual reality will be sought to benefit in the fight against obesity.
The aim of the study will be to show how obesity is produced and to demonstrate that, through virtual reality, specifically through mobility games, it is possible to reduce the probability of suffering from obesity.
For this purpose, the sections in the study will be developed as follows: Section 2 will detail the Design Sprint methodology. Then, section 3 will describe the case study; and the results and discussions may be seen in section 4. Ultimately, the conclusions of the study are presented in section 5.

2. METHODOLOGY

The Design Sprint methodology was developed by Jake Knapp, a former partner at Google Ventures, running it at Google in 2010. After two years, its creator decided to take it to Google Ventures where they perfected it, until it reached the process we have nowadays. From 2010 to 2016, this methodology was polished and finally the methodology was presented by Google Ventures, the venture capital company of Google, which in 2016 sponsored the launch of the book “Sprint: The method to solve problems and test new ideas in just 5 days”[9]. The method consists in 5 principal stages as shown in Figure 1.

Figure 1: Phases of the Design Sprint methodology[10]

The different stages considered are presented below according to [9], [10].

2.1 Understanding

In this phase the team is supposed to develop a common understanding of the context including the final goal of the project, the clients, their industry, etc. Through this, the team should be able to answer to the question "How could we…?" either by considering the client point of view, interviews, construction exercises, among other possible tools.

2.2 Diverging

At this stage the team should generate insights and concepts for solutions to the previous question exploring the maximum of possibilities. This might be led by brainstorming, taking notes, considering past projects in order to prompt, etc. The main purpose of this process is to explore all the approaches as possible.

2.3 Converging

After finalizing the two previous steps, the team will decide which way to go through either by honing all the thoughts in one single version to prototype or by voting for the best ideas.

2.4 Prototyping

At this point, a prototype will be developed considering the riskiest knowledge collected of the previous steps, taking into account that it must be a possible or realistic prototype since it will be the graphic representation of the experience.

2.5 Testing

Also known as the validating phase, it will be the phase in which the prototype will be tested by the existing or potential customers. At the end of this process, the knowledge gasps should be either validated or invalidated as the testing process enables us to receive a feedback in which the (possible) problems can be seen as the benefits of the project allowing us to make the necessary adjustments to eradicate them or enhance them respectively.

3. CASE STUDY

In this section we will begin to develop the Design Sprint methodology according to the stages explained.

3.1 Understanding

In order to develop this stage according to the case study 3 main concepts are presented as follows.

A. Obesity

It is understood as the excess of fat accumulation that an individual possess and may affect their health [11], as this condition may lead to more several diseases such as diabetes, heart problems or even cancer [5]. And even though this is a very well-known problem in our reality most people tend to do not avoid it, mostly because it would implicate a meaningful change of their lifestyles as being selective with their food, being in constant physical exercise, etc.

B. Obesity in Peru

In Peru it is estimated that between 2014 and 2018, obesity increased from 18% to 22% in people over 15 years of age [12]. This may be explained by the fact that Peru is among the first Latin American countries to consume ultra-processed foods and sweetened drinks (soda), as shown in Figure 2 [13].This case does not necessarily exclude the child population, since it has been identified that 15% of children between 5 and 9 years of age are considered obese[14]. Therefore, a study in this context is necessary.

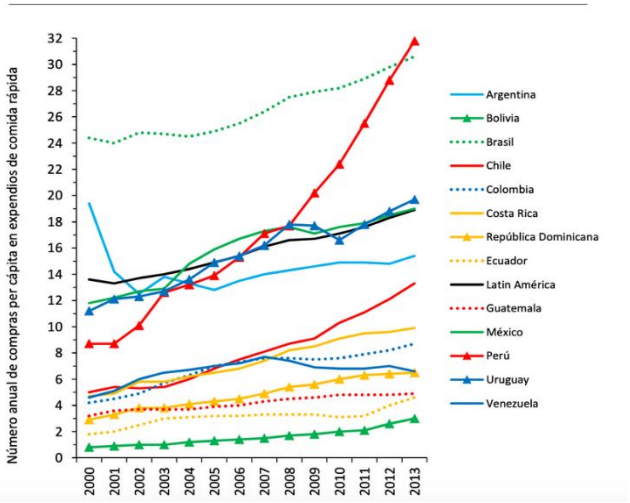

Figure 2: Between 2000 and 2013 fast food consumption increased in the region. Peru was the country that grew the most[13].

C. Virtual Reality

In Virtual Reality, the physical human being is treated as the center of the whole system, this happens when we need to interact in a virtual world, that for this purpose a type of device is needed, that will convert the physical movements and interpret them to virtual movements, for example when using an immersive screen placed in the head, with this device we can experience a virtual vision and also have other non-real virtual feelings [15].

Virtual reality is the creation of a whole virtual world that does not belong to the real world, in which we can observe what is happening thanks to special viewers that allow us to see it from a different perspective; and to interact with this new environment some devices connected to the system and the VR viewer are needed.

3.2 Diverging

For this phase we chose two specific projects that have used virtual reality as a means against obesity. Among them we have the AstroJumper project [16], [17]which was originally created to help children with autism to exercise and thus help them improve their senses and reflexes. A special virtual reality viewer was used which is linked to more components so that the system can recognize the movements made by the children. When playing AstroJumper, the user flies through an environment in outer space with a first-person perspective, avoiding planets by dodging, ducking and jumping. Points are automatically accumulated over time as long as the user

avoids colliding with an obstacle.

Another project is the creation of a virtual mascot that interacts with the user through the movements he makes[18]. This project decided to use a mixed reality, which is the mixture of augmented reality with virtual reality. According to their word: "We designed and built a mixed reality system that allowed children to exercise, play and train a virtual pet using their own physical activity as input".

3.3 Converging

In this phase we will discuss how each of these projects was implemented. In each one, a central problem can be found, and that is obesity. It was discovered that obesity is a problem that has been constantly increasing and even more so in children that is why we looked for a way in which to capture the attention specifically of them, so that they can exercise. In Peru one of the causes of obesity is sedentary, the problem becomes more complex when we add the time spent on the computer and games or on the Internet to the TV. E.g. a national study found that 28.6% of schoolchildren spent three or more hours per day engaged in sedentary activities [19].

From these data, an interesting factor can be observed, and that is that among the type of activity carried out in the sedentary lifestyle we can found video games as one of the favorite children activities as video games have always been something that attracts the attention of anyone. That is why the people who developed the virtual reality projects have focused their forces on applying their tactics through video games. In other words, active virtual reality (VR) video games, also called "exergaming", have become an emerging trend in entertainment, but also in the sectors of fitness, education and health as it requires body movements to play and function as a form of physical activity (PA) [20].

3.4 Prototyping

In this phase we will discuss the materials that were used for the development of the projects and how these were used to make the project work.

Regarding the first study: the case of the AstroJumper project[16], [17], which is a game in that has the goal to dodge planets and score points. To be able to dodge the planets in the game it is necessary that the person also dodges the planets with his body in real life, in this way the user not only develops their character in the game but also exercises in the real life.

However this sounds simple and straightforward, but unlike others, this study (and its game) uses the movements of the human body to be able to function, if it is necessary to dodge an object it is necessary to move the body to be able to dodge it; helping to improve the aerobic and anaerobic fitness in a short time with a more continuous interval.

This game was made possible by: circularly polarized glasses on the head of the user with a Polhemus Fastrak electromagnetic sensor attached to the edge of the glasses. Two more trackers were enclosed in sweat strips on the user's wrist, and a fourth tracker was attached to the bottom of a small backpack to track the waist. All cables were routed through the backpack to allow the user to move freely without becoming entangled. Physiological data was collected during the game using a BodyMedia SenseWear bracelet. A visual representation of the project can be seen in Figure 3.

Figure 3: A child with autism playing AstroJumper using a three-wall immersive screen projected backwards[21]

The second project to discuss was about a game in which a mascot would appear, which you can interact with through the physical movements that are detected[18]. This research shows that a mixed reality system that is of interest to children can be a powerful motivator for healthy activity by designing and builting a mixed reality system that allowed children to exercise, play and train a virtual pet using their own physical activity as input. The health, happiness and intelligence of each virtual pet grew as its associated child owner got more exercise, in this way the user interacted with their pet in an interactive way while achieves a constant physical exercise.

In order to develop this system, Zamzee activity monitors were used. These battery powered monitors periodically record activity every 10 seconds (with enough memory for approximately 1 month of data). The recorded activity value is an aggregate of several readings obtained from an integrated 3-axis accelerometer (Analog Devices ADXL345) [18], the final result is shown in Figure 4.

Figure 4: A child interacts using speech and gestures with a mixed reality virtual pet kiosk[18]

3.5 Testing

To defeat obesity, technology is doing its part creating a series

of technological inventions; as there are currently mobile applications that help young people and adults to move more times a day at home without the need to go to the gym. Likewise, virtual reality games are getting more impulse in the daily life motivating the new generation to improve their health and become physically active, thus having a higher quality of life in the future [22] either in a direct or non-direct way.

For this reason, much research has shown that virtual reality games help to increase motivation and enjoyment, as well as having greater adherence to these exercise programs and we can even find some of these that are made with a rehabilitative purpose. Virtual reality games have the potential to significantly improve health, because it is something new and attractive, but many of these are designed for a specific exercise, which makes the user restriction and the types of games and exercises that can be performed, as the game called Just Dance 2020, a game for PlayStation 4, helps you dancing while playing at the same time and thus exercising without notice it.

Regarding the virtual mascot project, we could see that there were good results, getting the child to interact correctly with the simulated environment in an interactive way. Therefore, considering both antecedents we can assume that more people should be involved applying these strategies worldwide to be benefited in the confrontation against obesity.

Finally, virtual reality in Peru is a kind of technologythat is still growing entering more into the branches of education and entertainment. However, an application of these games should be intended as it has a lot of potential, and at the same time would attract the attention of every child as well as every young person.

4. RESULTS AND DISCUSSION

4.1 About the Case Study

Regarding the development of AstroJumper[16], [17], the first project considered in the present study, it is worth mention that it was developed in 2013, when the technology of virtual reality was still very low, so improvements can be acquired. Nevertheless, as the technology has been improved over the years, a viewer, to have the same experience that theuser had in front of the screens, can replace the current method. Therefore, the wrist bands or the backpack in which the devices that recorded the movements would be no longer needed. On the other hand, large screens were used, on which the planets that the person had to avoid were projected, and a polarized viewer was also used, which gave the sensation of being in a different world completing the concept or definition of virtual reality.

Regarding the development of the study Mixed Reality Virtual Pets to Reduce Childhood Obesity[18] it should be noted that as well as the first study, improvements can be made as its creation was given in 2014. However, it is a great way to motivate children to do certain activities, although, more activities should be considered to be added as currently only possess eleven activities to be developed for the user.

Overall games were, are and will continue to be a very important factor in the lives of certain populations for generations to come, it will be best to take advantage of all the potential that games can offer nor only by stimulating their emotions, but also by helping them in their physical and personal development [20].

An advantage of virtual reality as a means of exercising is that it motivates the person who uses it to perform actions that he or she did not do before, in addition to the fact that each game can be programmed according to the person taste, and this makes it even more remarkable than other games, since it gives a person the feeling of being somewhere else while exercising, this without leaving the security of his or her home.

But in order to develop virtual reality today, the most widely used tool is Unity. For this, 3D features (such as characters, animations, landscapes, images, others) must be imported into the Unity 3D scene. To insert in the Unity project, simply place the objects in subfolders in an asset folder [23].Since it is a very useful tool when developing environments or 3D graphics, which are very necessary in the creation of virtual reality, but what is Unity? It is a multiplatform engine that was developed to be executed in games, was also created by Unity Technologies, and is used mainly for the development of games, both in 2D and 3D environments. It has a great developed environment that was based on a GUI, besides having support for C#.

In Figure 5 we can see the process followed to be able to perform a virtual reality in Unity [24]:

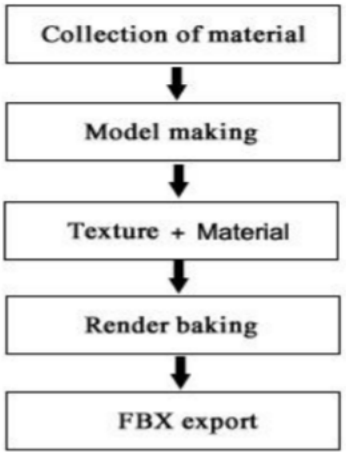

Figure 5: The process to perform a virtual reality in Unity [24]

According to Figure 5, it can be seen that creation is divided into phases, in which the first is the collection of materials, meaning the search for and understand all the environment and objects that are necessary for creation, even useful sketches and guide images. Then the modeling phase will begin to create within Unity the images and guides that were obtained. In the phase of textures and materials, design tools will be used to add colors and shapes to the objects being created. In the baking or render baking stage, you will focus on the more specific details, such as highlights and shadows.

And finally we have the export, in which the project will be presented already finished and exported so that it can be visualized and/or used.

Nowadays, virtual reality can be appreciated from special viewers that give the sensation of being inside a completely different world. Even cell phones can be adapted to fulfill this same function, and in this way taking advantage of all its potential. Thanks to this, it is much easier to access virtual reality, needing only a cell phone, a very common device these days.

4.2 About the Methodology

Applying the Design Sprint methodology allowed us to develop the research in a faster and more efficient way, since as its creator Jake [9] mentions, it serves to accelerate the tests to each week and in this way make better decisions at the time of developing the project, also, it helps to be able to use the time in a more productive way and thus to use it in an optimal way. Originally the Design Sprint methodology was designed to obtain a solution to the market problem, or for a company's ideas. But, it was adapted to help develop a research topic, following the same steps as it has been presented in the current study. On the other hand, it has been seen that this methodology can cause some difficulties, since the times are very fair and measured. E.g. if in one day it was not possible to clarify an activity, then it would be necessary to wait until the following meeting in the same day to be able to solve it, delaying the project. For this reason, the time used must be very precise and the team must be prepared to accomplish the tasks.

As it is the case of doing a Sprint focused on an electronic site and another Sprint for a podcast application, this methodology has its complications, because it requires a person who leads the entire project, this is known as the facilitator, who will have skills and make all members have good communication. In addition, generally, to use this method requires between five to ten participants and it is beneficial that they are from different areas to have a better performance, which will help as it will enable to have different perspectives of the problem [8].

As a research team, another study who have used the Design Sprint methodology [25] applied to digital technologies exactly in digital transformations of large companies, they explain that it is based on a one to five day workshop that goes on to quickly understand a challenge and to test the solutions with the users, in their research they apply this methodology in a novel way. On the other hand, there are several methodologies to be able to use and give the necessary application, for example, in case of developing a software in an optimal and necessary way, we have the agile methodology [26]since nowadays all the modern software developments apply this technology, it has a better reputation by its satisfaction of the client, few indexes of defects, and ,as well as the Sprint Design, makes times of faster development and as solution to requirements that are in constant change.

5. CONCLUSIONS

In the current research, a set of projects were presented in which virtual reality was used to combat the problem of obesity, from which it was possible to obtain the methods that were used and the tools that helped in the process. With these data, a physical improvement was discovered in the people who participated in the projects and how each time they used this technology they were more motivated to participate in it.

The Design Sprint methodology was used for the development of this research work. The original purpose of the methodology had to be modified, since it was initially focused on the issue of problem solving in 5 days, but, in order to use it in this research, phases of the methodology were adapted at our disposal, which led to the final result.

Finally, this work seeks to motivate other researchers to develop new emerging technologies for the benefit of sociality, and to extend the awareness about virtual reality focused on helping to overcome obesity to improve health and have a better physical condition.

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