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Health Promotion Project

Childhood Obesity Prevention through Serious Videogames in Barakaldo

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ABSTRACT

Introduction: Childhood obesity and overweight are growing alarmingly at a global, state and a regional level, in Bizkaia. It is a public health problem because the excessive accumulation of fat in the body can lead to develop numerous pathologies in the adulthood. The cause of this increase has several aspects as risk factors, among which are having an unhealthy lifestyle related to nutrition and physical activity. Therefore, it is necessary to implement a health promotion project that is really geared towards children through the tool they best master, videogames.

Objective: Prevent the development of obesity in children (a decrease of 37%) from 9 to 14 years old in the municipality of Barakaldo, Biscay, through the use of the ICT (Information and Communication Technologies) to promote a healthy lifestyle related to nutrition and physical activity on a community and familiar level.

Methodology: A health promotion project is developed in which the child population of 5 randomly chosen schools of Barakaldo and their parents will participate. An smartphone application with an integrated serious videogame will be created to carry out the intervention. The project will approach healthy lifestyles using the Precede-Proceed activity planning model. The evaluative plan includes the process evaluation, evaluation of the results and impact evaluation.

KEYWORDS

Obesity, Videogames, TIC, Serious games, Children, App

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1. INTRODUCTION

Childhood obesity is a very common nutritional disorder that affects more than 340 million children and adolescents in the world between 5 to 19 years old^{1,2}. The prevalence of childhood obesity is increasing alarmingly not only at a regional or state level, but also at a global level, which is why it is one of the major public health problems of the 21st century³⁻⁶. Obesity is a disorder that includes neurological, psychological, cognitive behavioral, environmental and metabolic factors⁷. Therefore, in adulthood it is associated with an increase in risk factors that may trigger cardiovascular (hypertension, arterial alterations) gynecological (precocious puberty) metabolic (hipercolesterolemia³, type II diabetes) and psychiatric diseases and as well as a greater probability of death and premature disability^{2,4,8,9}.

The WHO defines obesity as an epidemic that in the future can damage the health of the children by the abnormal or excessive accumulation of fat in the body^{1,2}. According to the WHO, to classify obesity and overweight in adults, a simple index called body mass index (BMI) is used¹. It can be obtained by dividing the weight of the person in kilograms by the square of his height in meters (kg/m^2)¹. In adults having a BMI greater or equal to 30 means to have obesity and if it is superior or equal to 25 is overweight¹. In children from 5 to 19 years of age, instead, the obesity is defined as greater than 2 standard deviations above the median established by WHO in the childhood growth reference and overweight as 1 standard deviation, which also considers the sex and age of the children¹.

At the state level, the study enKid (1998-2000) found a prevalence of childhood obesity in a population of 2 to 24 years old of 13.9%¹⁰. The "Nutrition Survey of food habits and health status of the Basque population from 4 to 18 years" (2005) shows an obesity and overweight prevalence of 12.2% and 15.9%¹¹. In contrast, following the IOFT (International Obesity Task Force) criteria, in 2007 they published a prevalence of obesity of 5.4% and 22.9% of overweight in a Basque child population between 4 to 18 years old¹². In the "Encuesta Nacional de Salud 2011-2012", the prevalence of childhood obesity from 2 to 17 years old is relatively stable from 1987, on the contrary, adults, since 1987 until 2012 the line of obesity continues rising¹³. A 27.8% of children is affected by this nutritional disorder, 1 of 10 kids have obesity and 2 are overweight¹³. The ESCAV (Encuesta de Salud de la Comunidad Autónoma Vasca, 2013) states that the

prevalence of obesity in adults from 15 to 75 years old and older has stabilized, 14% of the men and 12% of the women are considered obese, but the proportion of people with obesity raises with the age significantly in young women¹⁴. The socioeconomic inequalities are very relevant in the prevalence of obesity that grows as social class and the level of studies descends¹⁴. In the ALADINO (2015) study, the latest study that has been carried out at a state level, the prevalence of obesity in a population of boys and girls between 6 and 9 years old in Spain was 18.1% of obesity and 23.2% overweight, according to WHO standards¹⁵. In the Basque Country, the overweight average is 23% and obesity is 11%¹⁵.

The main risk factors for developing obesity are genetic and family, social, environmental and risk factors related to lifestyle⁴. Social risks factors are associated with low socioeconomic status and being part of a single-parent or immigrant family⁴. The absence of breastfeeding, having a weight greater than 3,500 grams at birth or the overweight of the mother in the course of pregnancy set up the genetic and family risk factors^{4,10}. The environmental risk factors are related to the so-called obesogenic environment, which translates into the availability of foods with high energy content, a decrease in the frequency of family meals, urban expansion and traffic density¹⁶. The risk factors of life to develop obesity are related to unhealthy eating behavior, as fat intake equal to or greater than 38% of the total of the calories required per day, high consumption of pastries, soft drinks and sausages and low consumption of fruits and vegetables^{4, 8, 9, 10}. The sedentary life, viewing screens for more than three hours a day, reducing sleep hours and absence of sports practices are also part of unhealthy behaviors¹⁰.

1.1. ICTs as a tool against population's unhealthy lifestyle

One of the resources that are being used that can promote a greater physical activity in children are the ICTs. The use of the ICT's (Information and Communication Technologies) in health care has had a great impact in the health industry, creating the e-health⁶. This could be a good tool to help children change their bad habits and learn to eat healthier and to encourage them to do more physical activity⁵. There are many ICT systems that have been created to make an educational intervention in children to prevent obesity⁶. Serious games and the gamification are some of them. A serious videogame is a game designed to allow players change their behavior, educate, acquire knowledge or get some specific skills^{5,6,17,18}. A traditional videogame is created only to entertain, while a

serious videogame has a dual goal, that it consists in entertaining users and promote a change in behavior⁵. It has several applications in medicine, military, industry, education and research, inter alia⁶. The goal of a health videogame is to promote wellbeing and health using an application or a program⁸. The gamification is to apply in a non-game context elements and techniques of games in order to explain problems and attract players⁶. To rise the users commitment and motivation the gamification lets players design, personalize and custom characters and objects, it uses a game system for winning medals, level up and earn points or status⁶. This technique is commonly used in social networks and health education programs⁶. Lately some researchers have invented a term to describe a new type of entertainment that puts together the physical activity and the videogames, which is called exergaming¹⁹. The use of serious videogames and gamification is combined with social networking and the monitorization of vital constants and lifestyle routines⁶.

Therefore, the use of ICTs or videogames can be a great tool to prevent the increase of obesity in children and adolescents, since they don't reach the minimum recommendation for physical activity according to the guidelines that state that they should be training for 60 minutes per day of moderate to vigorous intensity activities^{9,18}. This may be linked to the recent increase in sedentary activities related to screen time (TV, computer, videogames)⁹. Since in a survey done in 2014 in which more than 3,000 children participated in Spain, reveals that in adolescents from 12 to 18 years of age, screen viewing time varies between 2 and 5 and a half hours per day²⁰.

The use of the ICTs as a preventive strategy for children obesity seems to be very efficient, as nowadays children and adolescents are considered native users of digital devices, because since they were born they have interacted with mobile phones and computers⁹. Around 97% of adolescents from 12 to 17 years in the United States play videogames and have access to smartphones, computers and high speed Internet, so an excellent way to tackle this population is via the ICT's, and more specifically smartphone applications^{5,18}. Smartphone apps or mobile health technologies have been used effectively in different studies to increase physical activity by setting goals, social support and getting feedback⁹.

The problem of obesity has been addressed through medication, behavioral intervention and surgery⁶. But nowadays, behavior change is sought with the use of serious videogames, since they seek to change behavior and not just

entertain⁵. Children and adolescents are users of digital devices, and video games form a large part of that experience¹⁸. So, the adolescence and the childhood are the perfect stages of life to set up healthy life habits that will persist in the adulthood, hence prevention is so important²¹.

1.2. Evidence of the use of serious videogames in health promotion programs

In 1986 the WHO defined health promotion as the “process of enabling people to increase control over determinants of health and improve their health”²². The aim of health promotion is to enable people to go from healthy lifestyles to well-being creating a supportive environment, as it is essential for health development²². It has been evidenced that health promotion is effective and that it can influence behavior changes towards lifestyle and create an impact on economic, environmental and social conditions that determine health²².

The use of serious videogames has been proven to work plus obesity related measures to control and prevent childhood obesity⁸. The systematic review of Shirong A et al⁸ shows that they obtained in 40% of the studies positive outcomes related to obesity and exergames. The study of Sween J et al¹⁹ shows that there is a link between increased energy expenditure achieved by the exergaming up to 300%. A game called “Creature-101” that promotes energy balanced-related behaviors, concludes that the game is effective for the reduction of consumption of processed snacks and sweetened beverages¹⁸. A systematic literature review of Quelly SB et al⁹ states that the use of mobile phone apps with educational component to prevent childhood obesity in a long-term should be studied, that in their study the BMI decreased and social support and knowledge about eating behaviors increased. In order to have an impact in anthropometric outcomes (BMI, waist circumference, body fat percent) some studies state that the duration of interventions should be longer than 20 weeks⁹.

Preserving child and adolescent health is one of the main objectives pursued by the Basque Government. In fact, the 2013-2020 Health Plan was created by the Basque Government to contribute to the improvement of the quality of life and to reduce inequalities in health²³. In the last Health Plan 2002-2010 the main conclusions were that the situation of obesity in the Basque Country has worsened considerably, hence the proportion of obese people over 16 is 25% higher than in 2002²⁴. The distribution of obesity by social class shows an

ascending gradient as the socio-economic level decreases but lastly the most favored groups have had an increase in the proportion of obese people²⁴.

The 2013-2020 Health Plan is composed of five priority areas²³. The fourth priority area is child and youth health, which addresses the competencies of children and young people regarding their health to adopt healthy and safe decisions, in order to improve their health conditions and opportunities.

The approach to childhood obesity is part of this plan²³. It aims to reduce obesity through a prevention plan with measures based on physical activity and healthy eating. Its first action is to promote inter-institutional agreements and collaborate with the food and hostelry industry to reduce in prepared foods saturated fats, sugars and salt. The plan aims to achieve by 2020 a reduction in overweight and obese children by consuming less than 5 grams per day of salt, less than 30% of the kcal of lipids and less than 10% of saturated fatty acids in the school canteens. It also aims to reduce the percentage of sedentary adolescents. The second one is to promote nutrition education and healthy living habits in the family, school and also in the community. The third action consist on the development of interventions for the correct diagnosis, treatment and personalized monitoring, trying to avoid the stigmatization of obese people. The current health promotion project is based on the second action, as it consists on promoting a healthy lifestyle.

1.3. Health status on the Autonomous Community of the Basque Country

In order to develop a health project to promote a healthy lifestyle, first, the health status of the Autonomous Community of the Basque Country (ACBC) is going to be analyzed. It is divided in 3 geographical areas, Araba, Biscay and Gipuzkoa, where both primary and specialized health care services are provided²⁵. In addition, there is a new organizational structure based on integrated health organizations or OSIs. In total there are 13 OSIs (6 in Gipuzkoa, 5 in Biscay and 2 in Araba). Those of Bizkaia are Ezkerralde-Enkarterri, Barakaldo-Sestao, Bilbo-Basurtu, Uribe and Barrualde-Galdakao. The 2013 ESCAV document shows data such as poor health and perceived quality of life, anxiety and depression symptoms, chronic diseases and also hypertension and diabetes data according to each OSI²⁶. The information shows that the general health situation of women and men in Barakaldo-Sestao in terms of chronic diseases and self-perceived health is worse than the rest of the ACBC. As for women, their socioeconomic situation is more disadvantaged and they tend to develop more frequently

obesity. On the other hand, men are more frequently exposed to tobacco smoke and their prevalence of unemployment is higher. As a point in favor, the men and women who belong to this OSI know and use ICTs to request health care.

In order to carry out a successful intervention in a health promotion project, firstly a health diagnosis of the municipality will be made, which is going to be intervened by gathering information of its characteristics. In this case it will be carried out in the Biscayan municipality of Barakaldo, which belongs to the OSI of Barakaldo-Sestao, for the reasons described and included in the aforementioned studies.

1.4. Health diagnosis of Barakaldo and target population

The municipality of Barakaldo, according to the data of the urban observatory of Garapen.net²⁷ in 2017, has a general population of 100,313 people (48,520 men and 51,793 women). The number of minors is of 16,892 children and the minors between 10 and 14 years old is of 4,060 children (2,069 boys and 1,991 girls). The surface area is 29 km², of which the 12% belongs to the area occupied by parks, gardens and urban green areas, and the density of the population is 3,403 inhabitants/km². The crude birth rate has decreased since 2010 from a 10.60‰ to a 8.30‰ in 2016, which is similar to the Basque Country with a 8.33‰. The gross mortality rate shows a growth in recent years, from 10.19‰ in 2013 to 11.02‰ in 2016, but since 2015, at regional level, mortality tends to decrease from 9.83‰ to 9.69‰. From March 2014 to March 2018 the unemployment rate in the municipality of Barakaldo has dropped from 20.7% to 14.7%. The latest data shows that 5,455 were the number of students attending primary school and 3,168 students enrolled in ESO in Barakaldo. In terms of immigration, 1,869 people are registered annually, coming from a municipality or countries outside the ACBC. There are 13 health centers that belong to the OSI Barakaldo-Sestao. In this case, the centers of interest for belonging to the town of Barakaldo are the Hospital of San Eloy, the Zaballa Specialized Care Center and the Health Centers of Rontegui, La Paz, Lutxana, San Vicente, Urban and Zuazo.

Therefore, the target population are boys and girls aged 9-14 years (4th grade of primary school - 2nd year of ESO) of 5 schools of Barakaldo, Biscay, that have ESO and primary school together (to avoid the abandonment bias). It is going to be a year and a half of follow-up (2 academic years). The very first visit is going to be done in October 2018, a 2nd visit in March 2019 and the 3rd visit in March 2020.

This target population has been selected because it has been seen that the peak of maximum prevalence of obesity in children resides between the group of ages from 11-14 years old (19,4%) in boys and 15-18 years old (15,6%) in girls¹¹.

In Bizkaia they are going to be selected randomly 5 schools that impart primary and secondary school in the same building, to avoid the abandonment bias when the children end one stage and they move to different centers. So, the estimate number of children between 9-14 years has been calculated and thus it can be obtained the percentage of the population in which it is going to intervene. If 5 schools are chosen, it is going to be intervened in 5 grades, there are 3 classes per grade and 20 children per class, so the number of children it is going to work with is of 1,500, approximately the 37% (the impact level of the project) of the children population from 9 to 14 years in Barakaldo.

2. HYPOTHESIS AND OBJECTIVES

2.1. Hypothesis

The eating habits and physical activity of the Basque children population, especially in the municipality of Barakaldo, can be improved. Therefore, there is a need to make changes in health behavior in this population. It clearly expresses the value that overweight and obesity have for the future of children when it comes to develop other diseases. So acting at an early age through the health promotion to acquire healthy lifestyle habits, before having a higher risk of developing obesity and overweight in children, would be a good method to prevent them.

With this health promotion project, physical activity and eating habits would be influenced, as they are the pillars of the prevention of obesity and associated problems in the adulthood. It is expected to prevent childhood obesity, an increase in physical activity and good nutritional habits and a decrease in sedentary lifestyle. This intervention will be carried out with the help of ICT's which had been proven to work in several studies. Children and adolescents are native users of these technologies that they enjoy and with which they can learn about health and exercise through serious videogames.

2.2. Goal

The main goal of this intervention project is to prevent the development of obesity in children (a decrease of the obesity probability in a 37%) from 9 to 14 years old

in the municipality of Barakaldo, Biscay, through the use of the ICT to promote healthy lifestyle related to nutrition and physical activity from October 2018 to March 2020. In order to complete this goal, the following objectives are proposed.

2.2.1. Main objectives

1. To promote changes in life habits (nutrition, physical activity) in children and their families during the project.
2. To increase knowledge in children and their families in healthy lifestyle during the project.

3. METHODOLOGY AND DEVELOPMENT OF THE HEALTH PROMOTION PROJECT

This health project is based on a model of community approach in schools through a smartphone application developed and created for the aim of this intervention. The intervention area of this project is education about healthy lifestyles regarding nutrition and physical activity on a children population and their parents.

It is intended to carry out a health promotion project aimed at boys and girls aged 9-14 years (4th grade of primary school - 2nd year of ESO) of 5 schools of Barakaldo, Biscay, that from the use of the app developed as a videogame with nutritional and physical activity challenges that are implemented both in real life and in virtual life, they are going to increase their knowledge about healthy lifestyle and have less probability of developing obesity or overweight. The parents that are taking part on this project will also increase their knowledge about healthy lifestyle.

This project is going to have a year and a half of follow-up from October 2018 until March 2020 and it is going to be led by a health team composed by nurses and a technical team composed by computer or telecommunication engineers and programmers of a company that develops videogames.

This section includes the design of the project together with the planning of the activities, which are divided into the phases of the project as place, objective, Technique to be used, content, duration and human resources and materials. The resources of the community, collaboration agreements and the group of people to whom the project is directed and how the relationship will be

established, will also be taken into account. Finally, the chronogram, the ethical aspects, and the economic and financial justification are presented.

3.1. Precede-Proceed model

The Precede-Proceed model has been chosen to perform this intervention. The health promotion activities planning model called Precede-Proceed was created by Green and Kreuter in 1991. In which it is explained that the educational diagnosis must precede the intervention plan, providing a structure to apply theories in which they use the most appropriate interventions according to the health needs of specific social groups^{28, 29}.

This model has 2 stages, "Precede" that refers to the diagnosis and evaluation of factors that determine the quality of life of the target population. Consisting in 5 phases: social evaluation, epidemiological evaluation, behavior and environmental evaluation (the behaviors that can be related to the problems found in the social and epidemiological evaluation), educational and ecological evaluation (it is about classifying the behaviors found in the previous stage in factors that stimulate or inhibit the change, skills needed to make the change and how the rewards influence the execution of the plan), and finally administrative and policy evaluation (a search for resources is made to undertake the project). The second stage, which is "Proceed", is made up of four phases that are the implementation (where the project is executed), evaluation of the process, of the impact and of the results^{28, 29}.

3.2. Videogames design techniques

In order to justify the decisions that are taken to develop the application, which is a videogame, some videogame design techniques that Anna Sort (a nurse and a gamer) explains in the book "From Games to Health. A Lesson Learnt from the Video Games Industry"³⁰ are taken as a model.

These techniques are of a great importance in order to motivate and engage the player to obtain a behavior change. They can be applied to healthcare as turning stress into a challenge, finding the right allies, believing in your own abilities, finding meaning, purpose and motivation and seeing the mind as a powerful tool³⁰.

From stress to challenge

When someone is put under a stressful situation it feels unwell, is unpleasant and it can be perceived as a life-threatening situation. The investigations show that a continuous exposition of threatening feelings can be a trigger to develop more likely anxiety and depression. But changing the body from a stressed state to a relaxed one it can be very difficult. It does not work to be rational when, in fact, the perception of risk is a mental matter. So, instead of trying to change what the body is experiencing, a modification in the mindset should be done, presenting the threat as a challenge. When someone is challenged the person feels different emotions and produces positive feelings.

Playing videogames can make to learn how to develop a challenge mindset by creating a challenge for the player, anxiety can be transformed into excitement. The success of the games for making people change their mindset from a dangerous threat into a challenge resides on the competence and the autonomy. The key is to ensure that the difficulty of the challenge is set for an appropriate level, as the humans love to solve problems that in the beginning were seen as hard. The autonomy in the development of a game is such an important matter because is related to the freedom and the independence that humans desire to have, to make decisions in order to control and influence the results of the game. These two psychological needs are part of the learning process. In the first phase of this process there is zero competence, but the subject is highly motivated. On the second phase, which is the toughest, the player realizes that perhaps is not as good as he/she thought he/she would be. On the third the subject has improved in learning the new skill and feels satisfied. Lastly, on the fourth phase, the player has achieved a great competence and it is no longer a challenge for itself, having the risk of losing the interest and motivation. In the first phases of a videogame, the new player has a few number of options to play with. But as the knowledge and competence develops, a new wide range of opportunities and abilities are shown in the videogame, letting players have more power and autonomy over their actions.

Allies

In order to achieve a closer relationship between parents and their children or between classmates at school, playing videogames among them can increase the connection, mostly in those games where the cooperation and support are rewarded. This way, children can develop significant social skills. Today's

videogames are naturally social because people need to connect with others, as humans have a need for love. But it wasn't like that some decades ago, where most games were for one or two players. One of the greatest powers of videogames is to bring diverse people together to collaborate and achieve the same objective. To make possible a change behavior, social interactions are the key, because they create a link and a sense of belonging in communities, patient families or a particular person in order to defeat a common enemy. School-based interventions provide a more appropriate help and support to children than a family or community based intervention. Even so, it can be said that family-based interventions are better when applying a long-term intervention because they have a constant help and can interact and observe more their children to achieve a higher adherence to the intervention⁶.

Abilities

As gaming skills are improved self-efficacy also raises, which is a state of mind of confidence in the abilities and skills acquired to accomplish a goal or to solve problems. Shooter games players have better spatial skills than those who don't play and they can learn faster some subjects related to them. "Digital natives" that are the very first generation of kids and teenagers that have grown up using digital devices, are used to solve problems through trial and error, commonly enhanced in videogames. Patients can change their mindset when it comes to their illness by short-term and long-term goals to keep the motivation and focus on the final goal of the videogame. In order to do that, the game should be designed to increase the feeling of self-efficacy. This way, players learn to trust their skills and the sense of competence and autonomy, which can be applied in healthcare.

Meaning, Purpose and Motivation

To satisfy basic needs motivation is needed, which is explained in the self-determination theory (SDT). This theory analyses the positive or negative cultural and social factors that have an influence on the subject's wellbeing, self-perception and initiative, among others. Videogames can give feedback from the actions that the player is taking to get to know how he/she is performing, and if he/she could do it better how he/she could modify his/her actions to get the reward. This feedback increases the secretion of dopamine, which is linked to the raise of the self-efficacy. This substance gives a powerful and pleasurable feeling stimulating memory and learning skills. The exact amount of frustration and

success defines whether a health videogame works or not. The fundamental point to break with an unhealthy routine resides in the willpower of the player, even if motivation and feedback are a relevant part in the process of behavior change. Humans by nature try to attach to their comfort zone rather than exploring and taking risks. But this behavior disappears when playing videogames, because in the case the player fails, he/she can start over again. Researchers think that rewards play an important role in order to increase the persistence and perseverance of the gamers, because they put more effort into solving difficult tasks and besides they aren't afraid to fail, as they know that they can try again whenever, they feel positive emotions such as excitement, curiosity and enjoyment. A great lesson that videogames offer is resilience, which can be applied when solving conflicts in real life.

Powerful State of Mind

Perfectly designed healthcare videogames merge education with pleasure. Pleasure can be found in a state of flow that appears when the player is totally immersed in the videogame, losing the notion of time and self-consciousness, as the power of the level of focus and the sense of clearness becomes bigger. This state of mind can even help the player to feel less pain. This is why healthcare is so interested on "gamifying" medical interventions, as it has a great variety of positive health outcomes. Playing 20 minutes per day can help people feel focus and peaceful.

3.3. Development of the smartphone application videogame

The main tool of this intervention resides on a smartphone application or app that should be developed following these ideas. To prevent obesity it must act on the factors that cause it the most, such as nutrition, physical exercise and social factors. In order to explain better how each section is going to be affected, the rules of the game will be explained, referring to the videogame design techniques and factors in which a behavior change will be attempted to do.

The game is a multiplayer shooter (videogame of team shots) called "Game of Gods" or "GOG" where each child will have a customizable avatar in his image or how the child likes it best. This avatar will have a name that will not be their real one, but a fictitious one, to preserve anonymity, since being a social game, only their closest friends and the ones that the child considers appropriate will know who they are in the game. Although at the beginning of the application, they will

have to enter their real name, age, sex, school, academic course and class. Once these data have been entered, they will be checked with the server data, they will be stored and with a personal password that will be given to each child, data will be confirmed twice, in order to avoid errors when collecting the information. This information will not be in the public domain, all data will be confidential.

After the avatar is created, where they can choose the type and the color of the hair, eyes, skin, body pose, face style (freckles, glasses, beard, moles, scars) and grimace, children will perform a small test on habits of physical exercise, nutrition, sleep hygiene and energy level. These data will be used to classify children into four kinds of characters. They will be classified in each class according to the field in which they obtain the most points. There are the Witchers (highest score in sleep hygiene), the Architects (highest level of energy and positive emotions), the Warriors (highest level of physical exercise) and the Healers (highest score in healthy nutritional habits). In case of a tie, the child can choose the class. Each type of class has specific skins (types of suits) that identify them as a group and other general types shared with the other classes.

The game is divided into three main parts, the Thunderbolt, the Real Missions and the Virtual Missions. There are seven different Greek gods that guide the player and give them advice to advance in the game.

The **Thunderbolt** is a daily test that only appears when the player performs more than 5,000 steps a day, which is calculated by their smartphones. The test is created by Zeus, the King of the Gods of Mount Olympus and the thunder god, where four questions are asked:

1. Nutrition: Have you consumed more than 5 fruits today? Have you not eaten any pastries or sugary drinks?
2. Exercise: Have you walked more than 5,000 steps today?
3. Sleep: Have you slept at least 8 hours?
4. Energy: Have you felt enough energy during the day and not felt tired?

If you get the maximum score in the test, Zeus throws a ray at the player's profile and adds 1 level.

The **Real Missions** (long-term objectives) are missions that the player must perform in real life. It could be classified as the serious or educational part of the game. They are divided into missions related to nutrition and physical exercise (see ANNEX 1). Each mission has a different objective and duration, which once exceeded, increases the level of difficulty of the next mission. There are missions that must be completed individually and others collectively together with another classmate or with a group. As a reward, the game gives you coins with which you can buy objects to personalize the avatar with clothes, accessories, hairstyles, faces, grimaces, gestures, weapons, ... Besides unlocking special skills of each class, which can be acquired as the player gains sufficient level of autonomy and competence. Only one mission of nutrition and another of physical exercise can be carried out at the same time and higher level missions can not be done without having overcome the previous ones. This way it creates a sense of challenge in which if the player loses, learns to become frustrated and when wins the player is awarded with rewards that increase the excitement and motivation to complete more challenges.

In the Real Missions different gods will appear ordering the player to complete challenges if he/she is more than 3 days without doing any. Ares, the god of war, will propose to the player challenges related to sports and Demeter, the goddess of agriculture and harvest, will be the one who proposes nutritional challenges. By motivating the player a change behavior in lifestyle can be obtained. For example, in the area of nutrition a challenge could be to eat at least 1 fruit per day, when the player completes the task can go to the next level and eat at least 2 fruits a day. Easier tasks could be completed again other days, and more difficult tasks can be completed when the previous ones have been done. Another challenge is not to drink for a week sugar drinks. Related to exercise these are some challenges: to go for a 30 minute walk per day during 1 week, to make a routine of a number of launches, abdominals or jumps and to try new sports. All these challenges are based on recommendations of the Spanish Society of Pediatric Endocrinology related to childhood obesity³¹.

When special abilities are obtained each god will be the one that teaches the player to use them in the virtual game and when he/she completes the tutorial, it approves the player. Athena, goddess of war, will reward those who develop Warrior skills, Apate the god of deception to those who develop Witcher skills, Hestia, the goddess of architecture, to the Architects and Higia, goddess of healing, to the Healers.

The **Virtual Missions** (short-term objectives) explain the story of the game, which adds intrigue and emotion. This would be the fun and social part of the game. The video game is a shooter, so it is a shooting game in which there are different modes. There are three types of games to play as a team, class vs. class, course vs. course and school vs. school in which the players enter different random maps with themes related to the Greek gods in different imaginary places. It's about making the most kills of the rival team and surviving. The team players who manage to survive win the game. So as to kill, each class of the game (Witcher, Architect, Warrior and Healer) has special abilities that are enhanced as Real Missions are completed, enabling its unlocking and the purchase of the skills the player likes the most through virtual coins. There are some abilities that can be developed for the Virtual Missions to be more productive. Witchers can throw tranquilizer darts at enemies, leaving them asleep for 5 seconds and throw slowing potion at enemies, reducing their movement speed by 50%. Architects are able to build more robust walls to protect against enemy fire or hide and they can create an invincible protection shield for 3 seconds. Warriors are able to run 20% faster than other players and can increase the damage of weapons against enemies by 10%. Healers can regenerate health every 5 seconds if the character has not received damage during that time and can create life packages every 60 seconds.

Another modality is all vs. all in which players enter a map and have to wait until a list of 50 players who want to play at that moment has been completed. Once it is filled with players, each one will appear on a special point of the map bordering its perimeter. To give an example, one of the maps would be "Mount Olympus" located in the center of the map. The goal would be to climb to the top and get the golden goblet. But the doors to climb Olympus are only unlocked when there are 4 players left. So during the game, they should eliminate each other until one of them gets it. The number of kills that each player makes is also counted, rewarding each player according to the achievements made. The greatest reward of the Virtual Missions is to level up and gain prestige, since the other players will know which avatar is the one that manages to survive and gets the golden goblet or who is the one who has done the most kills, for their battle skills.

Parents have an important role in the game. They must have the application downloaded in their smartphone and through a code, the data of their children will be downloaded. They will see which Real Missions have complied and if they have been able to complete a Thunderbolt. This way they can encourage their

children to keep trying if they give up. Parents can also play the game, create their own avatar and perform missions. It is not mandatory for parents to play, but it would be interesting to see if adherence to the project increases or decreases in children playing with their parents. Each month parents can give a special reward to their child, which will be a legendary object to customize the avatar. It will only be achieved if the parent sees that the child is working hard and is achieving goals.

As it is a long project, almost 2 years of duration, in order to maintain the level of adherence to the project and the game, and children do not get bored completing the same Virtual Missions, with each change of season or holiday season (Christmas, carnivals, Halloween, Easter) new skins related to the theme will be unlocked. Also a section of Special Missions will be added where by teams they will be able to fight against a common enemy that will be handled by the video game.

3.3.1. Proposed sessions

The following activities are proposed below to achieve each of the objectives proposed in this health education project.

Table 1. *Objective, activities and process indicators of the videogame “GOG” of the health promotion project.*

OBJECTIVE	GAME OF GODS ACTIVITIES	PROCESS INDICATORS
Promote changes in life habits (nutrition, physical activity) in children and their families during the project.	Complete the “ Real Missions ” and the “ Thunderbolt ” daily tests.	Nº of tasks completed regarding nutrition and/or physical activity. Nº of daily tests completed with the maximum punctuation.

Place: The explanations of the videogame will be made on the first visit in October 2018 during tutoring time convoking each course on the meeting room. The information is going to be spread by using some simple leaflets that they can take home to show their parents. From there onwards children should be able to play anywhere.

Objective: Promote changes in life habits (nutrition, physical activity) in children and their families during the project.

Content: It's a serious videogame to promote healthy lifestyle, regarding nutrition and physical activity, among children in school, through "Real Missions" and the "Thunderbolt" daily test.

Duration: From October 2018 until March 2020.

Human resources and Materials: Every child participating in this project should have access to a smartphone with Internet. The app is for free and it is available for Apple and Android.

Collaboration agreements: Osakidetza will collaborate to create a health team that develops the nutrition and physical activities missions and a technical team that creates the videogame. They both should discuss the decisions that are made based on the experience nurses have with patients and how their adherence to the treatment usually is and what is possible to program.

Group of people to whom the project is directed: Children aged 9-14 years (4th grade of primary school - 2nd year of ESO).

How the relationship is going to be established: During the second week after the school starts in September 2018 the leader of the intervention project should go to each school and talk to the school director explaining the project. After making an arrangement the leader should give some leaflets of the project explaining how the intervention works for parents. The health team would make a meeting with them in the afternoon to clear doubts and if they are interested in participating, both parents and children, sign up their informed consent.

Table 2. *Objective, activity 1 and process indicators of the health promotion project.*

OBJECTIVE	ACTIVITY 1	PROCESS INDICATORS
Promote changes in life habits (nutrition, physical activity) in children and their families during the project.	Virtual Bilbao	Nº of participants

Place: The first center of virtual reality in Bilbao called "Virtual Bilbao".

Objective: To promote physical activity in children and their parents through virtual reality videogames.

Content: Children will do physical activity through playing virtual reality games with their parents and friends.

Duration: During the month of December 2018 each course will perform the activity per day. Next year, on October 2019 they will play again.

Human resources and Materials: As parents are going to take part in the activity, it should be performed in the afternoon, when most parents are out of work and can carry the children to the center. They will use VR headsets led by the center and the monitors of the videogames will advise them about what games they should try to play.

Collaboration agreements: As a lot of children are going to take part in the activity, the project executors will talk to the Virtual Bilbao center to make a discount, as it will be afforded by the parents of the children.

Group of people to whom the project is directed: Children aged 9-14 years (4th grade of primary school - 2nd year of ESO) of 5 schools randomly chosen in Barakaldo, Biscay. Children are going to be divided in groups to play videogames according to their age, preferences and multiplayer options. Their parents are going to adapt to their selection.

How the relationship is going to be established: The information of the activities during the project is described in the informed consent of the intervention, so parents will know about them. The pay will be made through a bank transition to the number indicated in the photocopy of the report. The meeting days and hours will be delivered to the schools directors a month before, in November.

When the activity is completed, a reward of a legendary skin will be obtained for the “GOG” videogame. This reward can only be obtained with a password that will be given on a secret envelope to the children that have participated to unlock the object.

Table 3. *Objective, activity 2 and process indicators of the health promotion project.*

OBJECTIVE	ACTIVITY 2	PROCESS INDICATORS
Increase knowledge in children and their families in healthy lifestyle during the project	<p>“Myths”</p> <p>Before and after having played the game, children and their parents are going to be tested by doing two tests, on the one hand about what they know about nutrition, and on the other hand about physical exercise (see ANNEX 2).</p>	Nº of right questions

Objective: Increase knowledge in children and their parents in healthy lifestyles.

Technique to be used: A section of the “GOG” videogame.

Content: An advice about nutrition and exercise will be given to the players (children and their parents). The one that gives the advice, myth or curiosity is the god that represents the missions in the game (see ANNEX 3).

Duration: Everyday an advice will be sent from October 2018 until March 2020.

Group of people to whom the project is directed: Children aged 9-14 years (4th grade of primary school - 2nd year of ESO) of 5 schools randomly chosen from Barakaldo, Biscay, which take part in the project of the “GOG” videogame and their parents.

How the relationship is going to be established: This is included in the “GOG” game.

Both parents and children will do individually, and each one through their app, two tests each, to assess the level of knowledge about nutrition and physical activity before playing the game. As soon as the children and parents start using the app, a warning will appear on the mobile phone every day, as if it were an emergent message, with a recommendation or curious information about nutrition and physical exercise. These data will be stored in a section called "Myths", where they can be reread them when the user wants.

3.4. Chronogram

Table 4. *Distribution of the activities.*

	2018				2019								2020						
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
<i>GOG videogame activities</i>																			
Real Missions																			
Virtual Missions																			
Thunderbolt																			
<i>Activity 1</i>																			
Virtual Bilbao																			
<i>Activity 2</i>																			
Myths																			
Catchment																			
1st visit																			
2nd visit																			
3rd visit																			

3.5. Ethical aspects

In order to carry out the health promotion project, it must first be evaluated and approved by the Basque Country Clinical Research Ethical Committee.

The documents that will be presented to the participants of the project, both parents and children, will be the informed consents, along with the information regarding the project and the rules of the videogame. The evaluation methods of each objective will also be explained in those documents. The information will be transmitted first to schools, to ask for permission and participation from both parents and teachers. In the informed consent, it will be explained that participants can leave the project without any commitment and without having to give explanations.

All data related to personal information of the participants will be confidential and only the team that will analyze the data will have access to them. In the videogame the users will have fictitious names, reason why they will be anonymous.

3.6. Economic and financial justification

The economic needs of this project are divided into personnel, medical equipment and consumable material.

As the aim of this project matches with the purposes of Osakidetza, they could support the health intervention project. Osakidetza will be the promoter of the project, so they will employ 10 nurses (2 per school), in order to obtain the data faster. They will be paid 200€ in each visit for taking the measures, adding them into the database and at the end of the project doing the evaluation of the results. These nurses would have to request 3 free days from their current job. A company from Bilbao that conducts studies of videogame development, interactive applications and 3D simulations will be employed, whose name is "Binary Soul". The budget to create the videogame is modest, since the price can range between 10,000 to 100,000€. The necessary medical material are, two height rods, two tensiometers, two measuring tapes and an electric bioimpedance machine, for each school. The consumables are made up of informative leaflets for the school and participants and the informed consents. An agreement will be done with the AMPA, the association of mothers and fathers of the school to pay for the Virtual Bilbao activity. The total economic needs required to carry out the health project are of 42,900€.

Table 5. *Economic costs of the health project.*

PRODUCT	UNITS	1U	TOTAL
Height rod	10	100 €	1.000 €
Tensiometer	10	30 €	300 €
Measuring tape	10	1 €	10 €
Electric bioimpedance machine	5	100 €	500 €
Office materials (paper, leaflets)	3000	0.03€	90 €
PERSONNEL	Nº	1 VISIT	TOTAL
Nurses	10	200 €	(3 visits) 6.000€
Virtual Bilbao	3000	7 €	15.000 €
Binary Soul Company			20.000 €
TOTAL COST			42.900 €

4. MONITORING AND EVALUATION

In order to carry out an evaluation plan with a community perspective, the evaluation will be developed in the next 9 phases, following the “Evaluative Guideline in the Community Level”³²:

1. Establish the evaluation group and the roles

The ideal would be to create a working group that has experience in the evaluation in which all the parties that make up the intervention are represented, such as the community group, the participants, children and parents, the people who finance the project and the researchers, in this case nurses. Coordination meetings will be held to see the level of involvement of parents and children (level of participation that can be measured according to the number of times they have accessed the app) to see if the objectives previously set have been accomplished or not. It will also be assessed if the researchers have carried out the monitoring of the project within the established period (compliance of the chronogram).

2. Resources for the evaluation

It is important to preserve money initially from the moment of planning the project, to perform the evaluation, which will be carried out by the nurses mentioned.

3. Describe the intervention and the context

The characteristics of the community have an influence in the implementation and also in the result of the intervention, so the context needs to be evaluated. The model used to perform this community intervention health project is the Precede-Proceed.

In each one of the three visits of the nurses to the school, it will be monitored some constants such as BMI, weight, height, blood pressure, heart rate and waist and hip circumferences. In addition to filling a history related to metabolic diseases (DM1, 1M2, overweight and obesity) of both parents and children. The method to measure the BMI will be made by using the method of the Z-score. The formula to calculate the Z-score is to rest to the BMI the 50th percentile and divide the result between the standard deviation of the table that corresponds to the sex and age of the child. Children with a result between -2 and +1 have a normal weight. If they have a number between +1 and +2 they might be considered overweight. Finally if they achieve a result higher or equal to 2, they have obesity. These results can be obtained with the tables of Orbegozo Foundation that graphically represent statistical values for each anthropometric variable³³.

The results at the end of the project in March 2020 should be better than those of October 2018. The second visit is made to track health and see if there is any expected result in relation to the activities of the videogame "GOG". It will be also seen if there is any change in behavior by the number of activities completed in the game. The increase in knowledge in children and adults will be assessed through the application by doing a test on what they know about the section of the videogame "Myths".

4. Define the evaluation questions from the model

On the one hand these questions are related to the process of the group work and its satisfaction and on the other hand the questions are related to the interventions developed depending on the structure, process and results.

The feedback with the player is important because it can mean the difference between an intervention that works from one that does not. As in videogames, the participant must have a motivation to perform the game. If the game is not attractive enough, because of the story, the characters, the activities, or the missions, a modification in the game should be considered. Therefore, every few months in the application would appear a survey of the game, on the gameplay, difficulty of the tasks, motivation to play and an option to write annotations to make improvements of the game. In this way, adherence to the project would increase.

5. Develop methods to answer questions

The effects and process that will be measured are related to the community group and to the interventions. In order to evaluate the community group work, the participation, the generated initiatives, communication between the health and the technical group, communication between the investigators and the intervention group a survey will be fulfilled. To evaluate the interventions there are four types of evaluations: formative evaluation, process evaluation, results evaluation and impact evaluation²⁹.

The process evaluation conforms a bunch of activities aimed to evaluate progress in the implementation of a program. Once the program has started it describes what happens and helps to understand why and how interventions are working and which elements are contributing to its success. It can also explain the reasons why a program has not worked. The most common measurements of process evaluation according to a practical guide to evaluate health promotion programs are³⁴:

- Exposure: The need to evaluate if participants were aware of the aim of the project. It will be tackled by doing a survey through the app.
- Participation: To identify how the groups participating in the project (children, parents and schools) were recruited. Rates of participation may explain if the project has been successful or not. The number of people that were expected to participate must be calculated and then the people that are really participating in the project. This will be done by seen the rate of participation in the server of the app being this number a representation of the participants. Also there will be a control over the subgroups that have not attended any activity to tackle the reason why. It is also important to measure the satisfaction of the participants, this will be done via app. The monitorization and documentation of the engagement time should be measured, to see how long it did take to start the project.
- Delivery: To assess if the project has been carried out using the designed methodology.
- Program satisfaction and usage: To see if the participants have found the project interesting and relevant for their use.

- Context: To examine the reasons why the project has been implemented the way it has. The examination of the problems that the project has had at the time of performing the intervention. To interview part of the staff and participants about the factors that have influenced the reasons of the implementation of the project. If in the course of the intervention some activities have been made on a different way, to make a record of them.

Table 6. *Results evaluation.*

ACTIVITIES	VARIABLES	OBJECTIVE
“Real Missions” and “Thunderbolt” from the “GOG” game. Virtual Bilbao	N° of tasks completed regarding nutrition and/or physical activity in “Real Missions” N° of daily tests completed with the maximum punctuation in the “Thunderbolt” N° of participants	To promote changes in life habits (nutrition, physical activity) in children and their families during the project.
“Myths” from the “GOG” game.	N° of right questions	To increase knowledge in children and their families in healthy lifestyle during the project.

Table 7. *Impact evaluation.*

ACTIVITY	VARIABLES	OBJECTIVE
1st, 2nd and 3rd visits to the schools	BMI, weight, height, blood pressure, heart rate, electrical bioimpedance and waist and hip circumferences	To decrease the probability of obesity development in children in a 37%.

The impact evaluation of this health promotion project is approximately of the 37% of the population of children from 9 to 14 years old in Barakaldo, which are 1,500 children from 4,060 that are in total. So as to assess the impact evaluation it has to be calculated the number of children that finally had participated in the intervention and check how many of them at the end of the intervention have developed obesity. Then it should be calculated again the real impact level, not the expected one, and see if there has been a significant outcome.

6. Collection of information

The method used to collect the information is going to be qualitative. Through the use of surveys the process of the project is going to be evaluated to assess the satisfaction of the participants.

The quantitative data as anthropometric variables and the achievements of each “Real Missions”, “Thunderbolt” and the tests of “Myths” will be also recollected.

7. Evaluative design

In this intervention there is not going to be a control group to compare the data with. So, a pre-intervention measure of the data required to develop the project will be made, in the middle of the project there will be another measure and once the intervention has ended there will be a post-intervention measure.

8. Analysis and data interpretation and communication of the results

Once the field work is done a statistical analysis has to be done in quantitative methodologies explained before and also in the qualitative recollected data. After that, a report should be made with the main conclusions of the study and improvements to be delivered to participants, researchers and those who have taken part in the project.

9. Maintenance or modification of the intervention and periodic monitorization

Depending on the results obtained in the evaluation, it should be considered whether or not to follow the project and implement it again. If the results are favorable and demonstrate the effectiveness of the project, it could continue to be carried out and it would not be necessary to make an evaluation of results annually, but a process evaluation.

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6. ANNEX

ANNEX 1: “REAL MISSIONS” LIST

NUTRITION	PHYSICAL ACTIVITY
Eat at least 1 fruit today	Go for a 10 minute walk today
Eat at least 2 fruits today	Go for a 10 minute walk today with a friend
Eat at least 3 fruits today	Go for a 15 minute walk today
Eat at least 4 fruits today	Go for a 15 minute walk today with a friend
Eat at least 5 fruits today	Go for a 20 minute walk today
	Go for a 20 minute walk today with a friend
Drink 3 or less sweetened beverages today	Go for a 30 minute walk today
Drink less than 2 sweetened beverages today	Go for a 30 minute walk today with a friend
Drink less than 1 sweetened beverages today	
Don't drink any sweetened beverages today	Go for a 30 minute walk per day for a week
	Go for a 30 minute walk per day for a week with a friend
Try a new fruit today	
Try a new vegetable today	Make a routine of 20 launches
	Make a routine of 20 abdominals
Eat at least 1 vegetable today	Make a routine of 20 jumps
Eat at least 2 vegetables today	
	Try a new sport
Avoid fast food, pastries and snacks today with a friend	
Avoid fast food, pastries and snacks today	
Avoid fast food, pastries and snacks for a week	
Avoid fast food, pastries and snacks for 2 weeks	

Annex 1: “Real Missions” list. Source: Recomendaciones del Grupo de Trabajo de Obesidad de la Sociedad Española de Endocrinología Pediátrica sobre hábitos de alimentación para la prevención de la obesidad y los factores de riesgo cardiovascular en la infancia. Personal elaboration.

ANNEX 2: NUTRITION AND PHYSICAL ACTIVITY TEST

NUTRITION

QUESTIONS	ANSWERS
<p>The most recommended type of diet to prevent cardiovascular diseases and so obesity and overweight, is the Mediterranean diet. What do you know about it? Which are the recommended foods? Which should be avoided? If you know, specify the quantity of each food per day.</p>	
<p>Do you know what macronutrients are? And micronutrients? Could you give examples of each group?</p>	
<p>Is it important to have breakfast every day?</p>	
<p>What do you think about fast food, snacks and sweetened beverages?</p>	
<p>Do you think that every food is sell in supermarkets or announced in TV is good for you?</p>	
<p>Do you know what BMI is? How is it calculated?</p>	

PHYSICAL ACTIVITY

QUESTIONS	ANSWERS
How do you know if you are sedentary, moderate or active?	
What are the benefits of doing physical exercise every day?	
Do you know how to play any sport or exercise? Could you explain the rules, nº of people that take part, benefits and risks, how to perform it,...	

Annex 2: Nutrition and Physical Activity Test. Source 1: Primary Prevention of Cardiovascular Disease with a Mediterranean Diet.* Source 2: Recomendaciones del Grupo de Trabajo de Obesidad de la Sociedad Española de Endocrinología Pediátrica sobre hábitos de alimentación para la prevención de la obesidad y los factores de riesgo cardiovascular en la infancia. Personal elaboration.

* Estruch R, Ros E, Salas-Salvadó J, Covas MI, Corella D, Arós F et al. Primary Prevention of Cardiovascular Disease with a Mediterranean Diet. N Engl J Med. 2013;368(14):1279-90.

ANNEX 3: MYTHS TOPICS

Topics that will be addressed in the activity regarding nutrition:

TOPICS	GENERAL EXPLANATIONS
Macronutrients: Carbohydrates, Lipids, Proteins	Definition, how affects human body, composition, main foods that are made of them. <ul style="list-style-type: none"> - Carbohydrates: Promote a diet rich in slow absorption carbohydrates. Limit the consumption of carbohydrates with a high level of glycemic index. - Lipids: Promote a diet that limits the lipids in 30% of total calories. Saturated fats should not exceed 7-10% of the total calories. It is recommendable to avoid trans fats and reduce the cholesterol intake. The increase of lipids consumption is related to the development of obesity. - Proteins: Try to avoid red meat and eat white meat instead.
Micronutrients: Calcium, Vitamin D, Sodium, Iron, Magnesium, Fiber	Definition, how affects human body, composition, main foods that are made of them. <ul style="list-style-type: none"> - Calcium: The consumption of calcium from 9 to 18 years old should be of 1.300mg per day and it is related with the prevention of obesity, because calcium interferes in the intestinal absorption of lipids and on an intracellular level, increments the lipolysis. - Vitamin D: Patients with a deficiency of vitamin D are usually obese or overweight. - Sodium: Eating more sodium than the recommended increases in pediatric age the probability to have a greater weight gain and its' reduction the probability to decrease blood pressure. - Iron: The deficiency of iron is related to an increase in body fat. - Magnesium: Obese and overweight kids tend to have lower levels of magnesium than kids with normal weight. Therefore, the increase of its contribution could play an important role in the prevention of insulin resistance and diabetes mellitus type 2 development in this type of patients. - Fiber: The fiber has demonstrated to control the weight and to decrease the body fat, especially the visceral fat.
Importance of having breakfast	Kids that don't have breakfast have a higher risk of developing obesity or overweight. Some benefits of having the breakfast are: <ul style="list-style-type: none"> - To have a higher control of the appetite. - To have a higher attention at class in the mornings - A better nutritional quality in the election of the meals, with a higher consumption of fresh foods and fruits.
Fast food, snacks and sweetened beverages	The increase in fast food consumption is related to an increase in weight. Also known as junk food, are made of bigger portions, higher caloric density, lower fiber content and a greater palatability. Snacks are energetically dense and have a high content of sugar and fats and low nutritional content. The prevalence of obesity and overweight in kids and adolescents it is higher when they eat at least 3 snacks per day. Consumption of sweetened beverages should be limited and be replaced with water.
Misleading TV advertisements	Learn how to read food labels.
Quantity and quality of food	Recommended to have more than 4 meals a day of bigger rations of fruits and vegetables to lower the energetic density of the meals. The size of food ration should be appropriate for each child, taking into account age and body size.
Mediterranean diet tips	Recommended: <ul style="list-style-type: none"> - Olive oil - Nuts (more or equal to 3 servings/week) - Vegetables (more or equal to 2 servings/day) - Fresh fruits (more or equal to 3 servings/day) - Fish, seafood (more or equal to 3 servings/week) - Legumes (more or equal to 3 servings/week) - Sofrito (more or equal to 2 servings/week) - White meat (instead of red meat) Avoidable: <ul style="list-style-type: none"> - Soda drinks (less than 1 drink/day) - Commercial bakery goods, sweets and pastries (less to 3 servings/week) - Spread fats (less than 1 service/day) - Red and processed meats (less or equal to 1 service/day)
BMI: What it is? How can you calculate it?	The body mass index (BMI) is a value used to classify a person in underweight, normal weight, overweight or obese. It can be obtained by dividing the weight of the person in kilograms by the square of his height in meters (kg/m ²).

Topics related to physical activity:

TOPIC	GENERAL EXPLANATION
Are you sedentary, moderate or active?	<p>In children:</p> <p>Sedentary: Activity associated to daily life</p> <p>Moderate: Exercise of 2.4-4.8km per day plus the activities of daily life.</p> <p>Active: Exercise more than 4.8km per day plus the activities of daily life.</p>
Benefits of doing physical exercise every day	<p>The time that is recommendable to spend doing physical activities. Positive emotions as motivation, happiness and concentration can be obtained when training.</p>
List of sports you can try: how to play, how to perform a perfect exercise, rules, where you can practice it, benefits and risks.	<p>This part is explained in the Real Missions, on the topic of exercise, where some of the challenges promote to try new sports and explain on what they consist.</p>

Annex 3: Myths Topics. Source 1: Primary Prevention of Cardiovascular Disease with a Mediterranean Diet.* Source 2: Recomendaciones del Grupo de Trabajo de Obesidad de la Sociedad Española de Endocrinología Pediátrica sobre hábitos de alimentación para la prevención de la obesidad y los factores de riesgo cardiovascular en la infancia. Personal elaboration.

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