

UNIVERSITY OF TARTU

FACULTY OF EXERCISE AND SPORTS SCIENCES

Hugo Clavijo Brito

OBESITY, DISEASES RELATED TO OBESITY, RISKS FOR HEALTH AND
HOW WE CAN USE PHYSICAL EDUCATION AND PHYSICAL EXERCISE
TO TREAT THEM

Bachelor thesis

Physical Education and Sports

Supervisor: Eva-Maria Riso

Tartu 2013

INDEX:

1. INTRODUCTION.....	pag. 4
2. OBESITY.....	pag. 6
2.1 FACTORS THAT CAN IMPROVE THE RISK OF OBESITY.....	pag. 8
2.2 NON COMMUNICABLE DISEASES (NCD).....	pag. 9
3. IMPORTANT HEALTH PROBLEMS RELATED WITH OBESITY.....	pag. 9
3.1 DIABETES MELLITUS.....	pag. 9
3.2 HEART DISEASES.....	pag.11
3.3 CANCER.....	pag. 13
4. HOW TO PREVENT OBESITY IN CHILHOOD.....	pag. 14
5. PHYSICAL ACTIVITY IN PERSONS WITH OBESITY.....	pag. 14
5.0.1 PROPERTIES AND BENEFITS.....	pag. 15
5.1 SYSTEMS TO TREAT OBESITY.....	pag. 20
5.1.1 DIETARY SUPPLEMENT.....	pag. 20
5.1.2 OBESITY PREVENTION.....	pag. 21
5.2 CONSIDERATIONS FOR PATIENTS WITH DISEASES...	pag. 22
5.2.1 EXERCISE PROGRAMS FOR DIABETIC PATIENTS...	pag. 23
6. CONCLUSION.....	pag. 25
7. REFERENCES.....	pag. 27

1. INTRODUCTION

In this study, the main point we are going to study is the obesity itself from the perspective of a world spreading disease that can cause serious problems to the organism including even death in severe cases, mostly focused on type II Diabetes Mellitus, we also include heart diseases and cancer cases, and the most important of all of this is to prove how the Physical Activity is helping and need to be use to treat those problems as it's a natural method that is not going to damage the organism if all the risks are taken into consideration, and even its able to prevent obesity if used correctly in early ages.

Obesity is a disease where the excess of fat in the body starts to cause different kinds of problems to the health and quality of life. As the OMS stated a person is obese when his BMI exceeds of 30kg/m².

Some of the problems related to obesity are related to the heart, type II diabetes, cancer, osteoarthritis and obstructive sleep apnea, its caused by the excess of energy that usually comes because of the excess of calories that we eat, its also related to genes or endocrine disorders among other things.

The main problem that we currently find is that more and more young people tend to suffer this disease because of their way of living, everything is faster than a few decades past, basically our rithm of life, so, they have less time to provide themselves with a healthier diet (having meals away and quick instead of cooking fresh food at home), and this carries a problem that with the time may also change the metabolism, making this disease even worse.

On this study we want to find how to help these people with a proper physical training according to their possibilities, as we have to be careful because its not possible to ask the same

intensity to a student or a person with obesity and a healthy person, also we won't base our study just in young people as we can use it to help older people with the same disease taking into consideration the risks that the same training could occasionate to different age people.

We will use and recommend different physical activities to the different groups as well as the use of physical education as a method to prevent that, by that we will obtain rewards for our body, and we will be able to evaluate the progression of these people, we need to be careful sometimes because we will encounter different types of obesity which would affect in different forms.

Also we want to demonstrate that the best way to treat this disease is using the physical education where we will include special kind of trainings and a good diet, and that by that you will get benefits for the rest of your life and not just temporary benefits that we can obtain through medicaments.

2. OBESITY

All of this is because Obesity is one of the major several problems with public health and its considering that it may become an epidemic if its not already, because its spreading rapidly around the world and those rates are alarming in childhood and adolescence, in years between 6-11 it has more than doubled and in ages from 12 to 19 more than triple (J. Hwang, Y. H. Kim, 2013)

Sedentary behavior in this matter implies a health outcome totally different to those who actively practice moderate or vigorous physical activity, leading to a sedentary physiology, using the accelerometer data provided by the U.S. National Health and Nutrition Examination Survey (NHANES) it's a bad symptom that the majority of the time during their non-sleeping time are dedicated to sedentary behavior with a percentage of 58%, or even very light physical activity with the 39%, getting an alarming 3% of the time where the moderate or vigorous physical activity are practiced, taking this in consideration we could even state that the only one risk for obesity and health problems related to that is the sedentary behavior, sadly there are more factors, even though is alarming that inside that sedentary behavior time we can find persons who spent more than 7 hours/day just watching the TV (Barbara Strasser, 2013)

According to the inactivity of physiology paradigms, person who doesn't practice exercise regulary will have increased risk of metabolic diseases in the future as we can observe in the following graph, where sedentary behavior will push the fitness-mortality curve. (Hamilton et al. 2007)



For too long Obesity has been considered simply as an unbalanced energy budget, and then we have to consider the association that takes place between the excessive food intake and obesity, that has been beyond historical memory, and a lack of control of what we eat, and it's really sad because most of those beliefs still remain active in our era, all the problems that Obesity implies has been empowered thanks to the advances in medicine and what we know from the past century, so the main problem with this start when the effort that we realize toward fight the obesity are not in pair with the efforts that we realize to fight other diseases, and one of the most common causes is that we can blame the diet or the food intake that we have, other than to find solutions to avoid that. There has been attempts worldwide to combat the obesity by campaigns of restricting the intake of carbohydrates, energy, fats and other dietary components, but all of this has been in vain as the numbers are growing each day like we said before, and now it looks like an epidemic, but we also gain a good thing, that is the fear of people to become obese, and the limited effects of anti-obesity therapy, and the knowledge of the disease made possible that now we consider it as a life-shortening disease, without a metabolic origin, so the scientist were persuaded for research in genetics matters as the source of obesity in humans. (X. Remesar et al. 2000)

Figure1. We can see here a simple diagram of how the body weight is controlled, signals from the intestine are the ones who control the hypothalamic control of food, as well as the level of metabolites in the blood, these also control efferent signals through the sympathetic nervous system, regulating fat mobilization and thermogenesis, for the other two major elements that complete the picture, insulin, the main endocrine agent, and ponderostat signals coming from the adipose tissue. (X. Remesar et al. 2000)

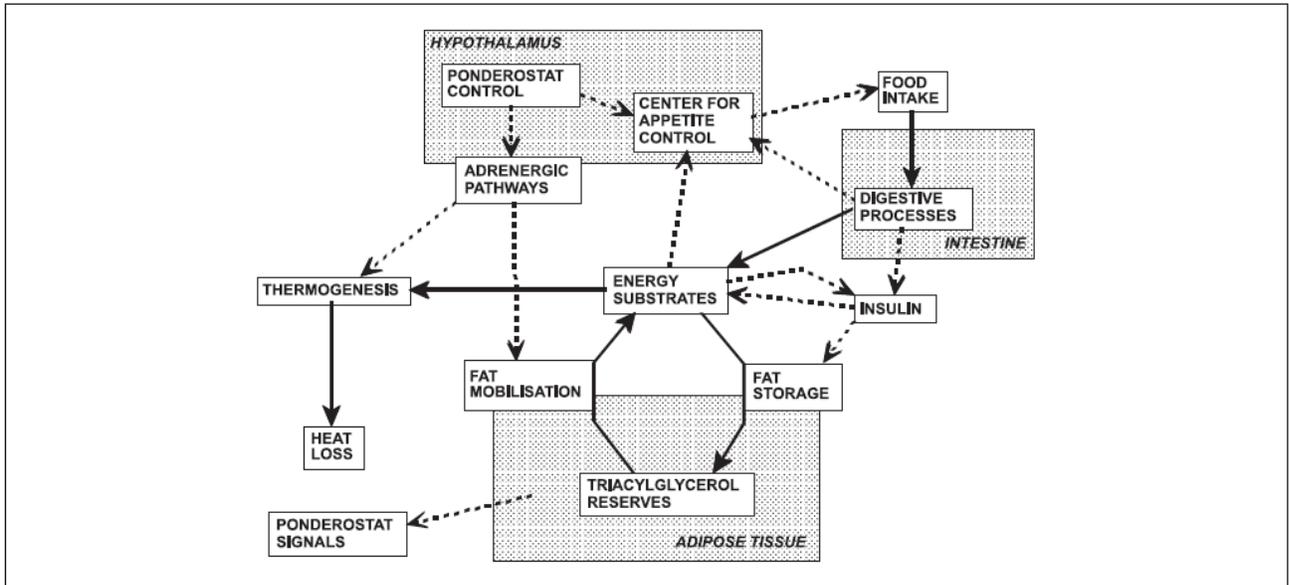


Figure 1. Main mechanisms controlling the mass of body fat reserves.

2.1 FACTORS THAT CAN IMPROVE THE RISK OF OBESITY

a) Genetic Factors:

- Obesity in parents give between 60% to 80% chances that the child will suffer this disease
- Obesity just in father or mother, the risk low to a 41% to 50%
- No obesity in parents, the risk decrease to a 9%

b) Environmental: The Sedentarism caused by the commodities of the cities.

c) Nutritional: High consumption of fat, sugars and low intensity of fibers

d) Physical Activity: Low physical activity practice

e) Communication: It promotes sedentary lifestyle and a high consumption of high fat nutrients

f) Biological: Some people are propense to be obese

g) Sociocultural: It differ between cultures, in some cultures obesity can be a sign of wealth.

(Lujan et al, 2010)

2.2 NON COMMUNICABLE DISEASES (NCD)

We want to state that various investigations about NCD, that are the main cause of death in most region, claim that not only the socio-economic level, that we can consider the most important thing in this cause, but also the physical condition of the organism, are responsible of that, some of the risk factors of NCD are the lack of physical activity as well as unhealthy diet between others, that's why even if it's not only related to obesity we should take into consideration that a good diet with a regular physical activity will help to prevent NCDs. (Bruno Linetzky et al. 2013)

3. IMPORTANT HEALTH PROBLEMS RELATED WITH OBESITY

3.1 DIABETES MELLITUS

Diabetes mellitus (DM) constitutes one of the most widespread health problems in the world, as it is estimated that its prevalence of 171 million observed in 2000 will increase to 366 million in the year 2030 " (Wild S. et al, 2004)

One of the main factors of DM are physical inactivity and obesity that are related along with stress and genetical factors, thanks to those factors the body suffer an alteration in his glucose homeostasis reducing the glucose tolerance where around 85-95% of the cases are related with this. As a result of this and independently from what source it comes from, the negative hyperglycemia will negatively influence the structure as well as the function of different organs, focusing on most of the cases on the cardiovascular, renal and nervous systems, while the first one is the one who causes more Deaths. (P. Moungee, 2006)

Inside the DM the two most common types are DM type I or "insulin-dependant diabetes mellitus" and type II "non insulin-dependant diabetes mellitus" we also can encounter a third main form on pregnant woman without a previous diagnostic of diabetes develop a high blood glucose level.

In this Table we can check the criteria to check the existence of Type II DM

Table 1: Criteria to check for the existence of type II DM in Adults

1. Subjects aged more than 45 years

(When normal, the checkup should be repeated every 1-3 years)

2. Occurrence of symptoms like polyuria, polydipsia, and unexplained weight loss

3. Asymptomatic subjects carrying at least one of the following risk factors

3.1 Have a first-degree parents with diabetes

3.2 Overweight or with a BMI > 25kg/m²

3.3 History of impaired glucose tolerance

3.4 Hypertension (>140/90 mmHg)

3.5 A plasma high density lipoprotein cholesterol level <35mg

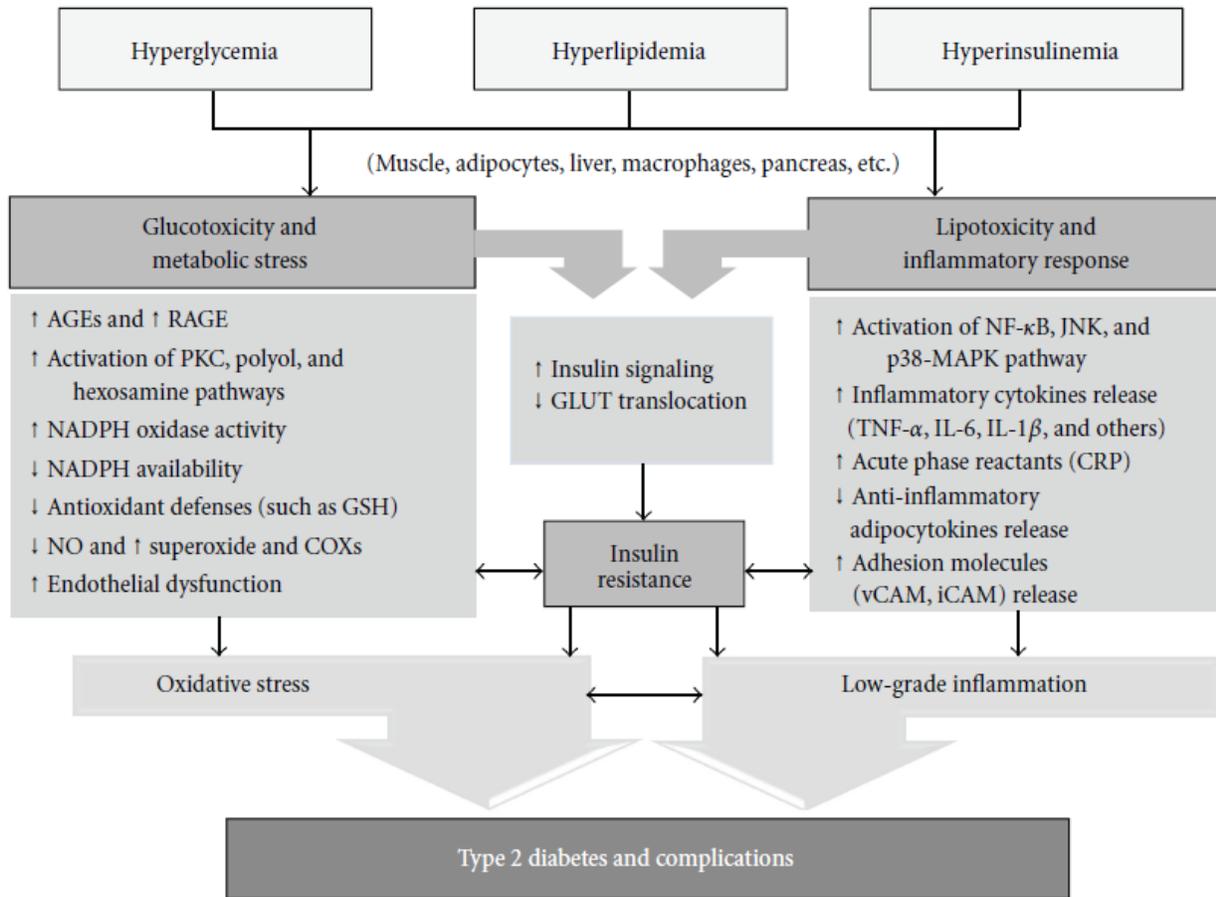
3.6 History of gestational DM or of a newborn child with more than 4.08kg

3.7 Sedentary life

3.8 Other clinical condition associated with insulin resistance.

Is known that youth with Diabetes Mellitus have poor physical activity habits, and spend little or nearly no time in moderate to vigorous Physical Activity, and most of the time they practice sedentary activities, provoking important implication in their future health. (Andrea Kriska et al. 2013)

In this table we can observe different kinds of pathophysiological aspects involved in Diabetes Mellitus type II. (Teixeira de Lemos et al, 2012).



3.2 HEART DISEASES

The first indicator of CAN is a decrease in HRV (Heart rate variability) that is the physiological phenomenon of variation in the time interval between heartbeats, if the patient seems to have a reduced HRV this is related with poor cardiovascular health. Thanks to physical activity we can improve the HRV, also because the reduction in BRS (Baroreflex sensitivity) could mean a impaired regulation of blood-pressure, ANS imbalance and instability in the myocardium, increasing the risk of cardiovascular diseases related to mortality (Christina Voulgari et al. 2012)

Measurements of autonomic function.

Investigation Method	Definition	Normal Values (mean±SD)
Heart Rate Variability Time domain measures of R-R intervals	Difference between the longest and the shortest R-R intervals, the standard deviation of 5-min average of normal R-R intervals (SDANN), and the root-mean square of the difference of successive R-R intervals (rMSSD)	SDNN: 141±39 (ms) SDANN 127±35 (ms) RMSSD 27±12 (ms) HRV triangular index: 37±15 (ms)
Spectral Analysis of Stationary Supine 5-min Recording	Components of the HRV obtained by spectral analysis which provide information about both the sympathetic and parasympathetic influences on the heart	Total power 3466±1018(ms.2) High Frequency (0.15-0.4Hz): 075±203 Low Frequency (0.04-0.15Hz):54±4 Very low Frequency (0.003 to 0.04 Hz) LF/HF ratio 1.5-2.0
Baroreflex Sensitivity BRS	Reflects the extent of change in heart rate per unit of change in systolic blood pressure. Measured noninvasively by the Valsalva maneuver, the neck chamber technique (via carotid baroreceptors), and the analysis of spontaneous variations of blood pressure and RR interval	<3ms/mmHg: depressed autonomic function >3ms/mmHg: preserved autonomic balance >6ms/mmHg: well preserved autonomic function
Muscle sympathetic nerve activity MSNA	Measurement of efferent sympathetic activity in the skeletal muscle at rest or in response to various physiological perturbations. It can be directly recorded and measured via microelectrodes inserted into a fascicle of a distal sympathetic nerve to the skin or muscle (microneurography) more commonly at the level of the peroneal nerve. MSNA bursts are related to an inhibitory effect of systole on the arterial baroreceptors, and the burst frequency increases during reductions in blood pressure and vice-versa	Women* Age: ≤ 24±1 year: 10±1 bursts/min ≤ 66±1 year: 18±3 bursts/min Men* Age: ≤ 24±1 year: 25±1 bursts/min ≤ 63±1 year: 39±6 bursts/min

HRV, heart rate variability; SDNN, Standard deviation of the NN intervals, often calculated over a 24-h period; SDANN, Standard Deviation of the average NN intervals calculated over short periods, usually 5 min; RMSSD, the square root of the mean squared difference of successive NNs; HRV triangular index

overall HRV activity; BRS, baroreflex sensitivity; MSNA: muscle sympathetic nerve activity; *Ng AV, Callister R, Johnson DG, Seals DR. Age and gender influence muscle sympathetic nerve activity at rest in healthy humans. *Hypertension* 1993;21 (4):498-503.

We can talk a little about SCD (Sudden Cardiac Death), that can affect young competitive athletes and if we take this into consideration we can deduce that its tragic because the cause it's a unknown cardiovascular disease, from this point we can conclude that it would be good to restrict physical activity in subjects who may experiment this problem, but, what is the cost of this? Although mid or moderate exercise should be good to practice and wouldn't imply risks, but for this we have to know the safe realm of the disease. (Marmar Vaseghi et al. 2012)

3.3 CANCER

"The alleviatory effects of life-long physical activity upon multiple cancer forms are promising" (Pukkala et al. 1993)

There are proofs that thanks to exercise in adults who survive cancer there is an improvement in bone health (Stone et al. 2010) as well an improvement in the immune cell function (Hutnick et al. 2005), antioxidant defense (Meijer et al. 2002) and epigenetic factors (Campbell et al. 2007)

In a study involving 15 healthy subjects were 8 of them were provided with an exercise procedure and 7 of them were the resting control group. Muscle biopsies is taken just after exercise and after that at 1.5, 3, 6 and 12 hours, for the resting group muscle biopsies were taken at the same time, the author concluded that it caused a retardation on the progression of the tumors and on the survival time for those who practices exercises (Trevor Archer et al. 2011)

We can conclude the physical exercise as the unique type of non-pharmacologic intervention that will improve the body immunological insufficiency in the matter of cancer, as well as endurance and physical resistance, with this we can adapt physical activity to different types of cancer to if not stop it completely, to retard the progression of the matter, that's why exercise regimes used in this subject have to be consistently directed towards individuals and varying on ages and not towards big groups, we also have to adapt it to the particulars demands of diagnosis, intervention and prognosis that we can find in the different stages of the autoimmune disorders. Along with this we can affirm that in a general way nutritional and genetic intervention that

boost antioxidants didn't increase life-span, in this matter physical exercise that cause even high levels of oxy-radical damage, can increase life-span. (Trevor Archer, 2011) In the opposite side sedentary lifestyle as we stated before, will accelerated aging, increased organ failure and impaired immune and vascular function, along with heightened brain aging (Brewer 2010).

4. HOW TO PREVENT OBESITY IN CHILDHOOD

In the first stages of the life as the child is not well aware of how he should do the exercise or the sport and also they don't know the risk of this we have to focus in some important things, and the parents have to be well aware of this:

1. Food has to be healthy and we have to ingest water before, during and after any kind of activity, if we focus on strength exercises they will improve the bone mineralization
2. Moderate effort is more than enough to improve health, if we are not going to compete as professionals in the ambit of the sport and we just want a healthy life its more than enough.
3. It's good to evaluate the risk and choose the perfect place and the perfect activity for the subject.

(L.A Moreno et al, 2012)

5. PHYSICAL ACTIVITY IN PERSONS WITH OBESITY

We can define physical activity as a corporal action that produce an energetic loss covering the basic needs of the daily life, it includes physical exercise, as a result of a program of physical activity with the sole objective of recover or keep the good health condition, as well as improve, we don't have to mix it with sport, as this one is a physical activity with a competitive

nature and that its regulated by rules (Garcia Ferrando, 2007)

The benefits of physical activity are greatly and well known, even more when we talk about MVPA levels (Moderate-to-Vigorous-Physical-Activity) this include at least 150 mins in 5 seasons or more, those levels are generally low, specially in some places like the US, but they have been increasing during the recent years because they alarming growing of overweight and obesity. (Mitch J Duncan et al. 2012)

5.0.1 PROPERTIES AND BENEFITS

Exercise can be defined as any activity that make the person generate a force by activating any of the muscles in the human body (McArdle et al., 2000)

There is other definition of exercise where you have to plan previously what you want to improve by doing physical activity, where it include anything from improving or maintain fitness or boosting the immune system to protect the body towards different diseases, including cardiovascular disease, heart diseases, diabetes mellitus and obesity (Hu et al., 2000)

One of the most importants thing about physical exercise is that thanks to that the human body improve their immunomodulatory functions by releasing adrenaline, cortisol, growth hormones and other agents (Handschin and Spiegelman, 2008) also the palliative effects of training to people who have cancer can't be underestimated because thanks to the improvement of the physical function, the cardiorespiratory system as well as the big improvement in the quality of life, the mortality and effects of the fatigue are reduced in great numbers (Hamer et al., 2009a)

Even if it's not really strong evidence, we can conclude that thanks to the evidence of significant benefits upon cardiorespiratory fitness, fatigue reduction, muscle strength and quality of life in adult survivors (24 studies) this matter is really promising and in childrend (13 studies), there was a really strong evidence related the muscular strength and cardiorespiratory fitness in this regard about cancer. (Maddocks et al, 2010), thats why, with this its the role of exercise its really important for patients with incurable cancer, because it will prolongue their life and make

it better.

In Shandong, China, there was a study, were more than 25000 children from more than 16 districts of Shandong, between 10-18 years old were involved, (14578 boys and 14452 girls) and they were divided in group of ages from 10 to 10.9, 11 to 11.9 and so on.

Measurements for this study were driven by different teams of technicians, to obtain height, children (without shoes) have to be near (0.1cm) to the wall with metric values. For weight students have to be only with underwear and using lever scales. Thanks to the superior border of the iliac crest and the lowest rib they measured the waist circumference, also Skinfold thickness was measured using the same method in every subject.

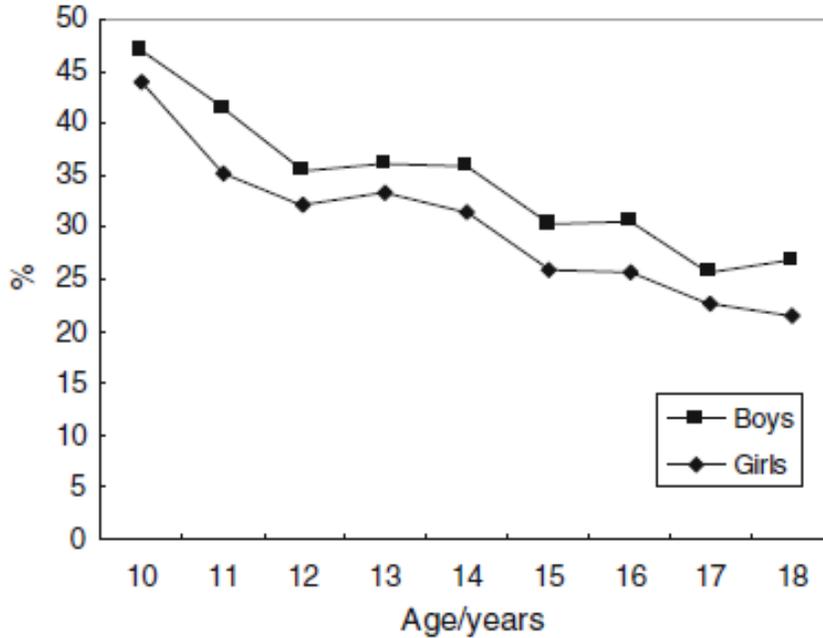
In this table we can appreciate the % of students who practice more than 1h of Physical Activity each day, and the classification of them between different school years.

Table 1 Distribution of PA time for students by academic stage and gender

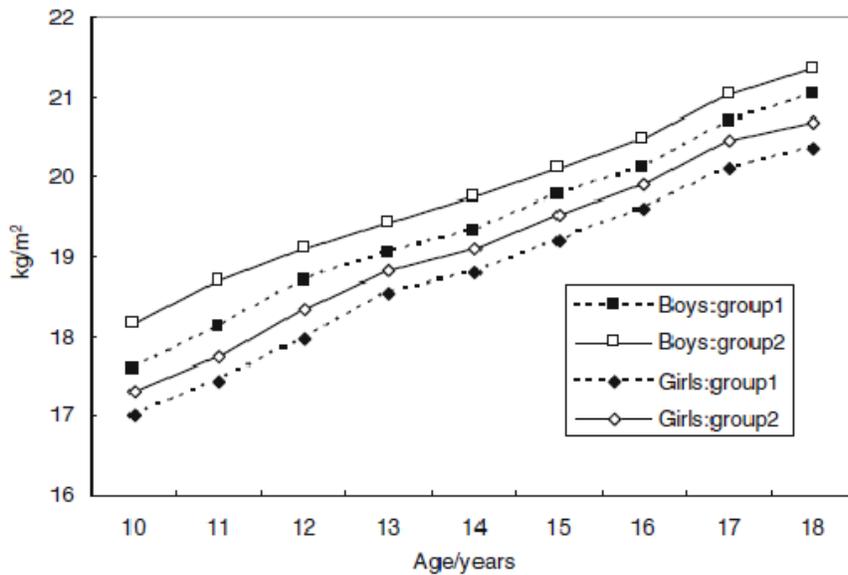
	Boys		Girls	
	Number	More than 1 h of PA per day (%)	Number	More than 1 h of PA per day (%)
Primary school students	4,794	1,981 (41.32)	4,713	1,753 (37.19*)
Junior high students	4,928	1,674 (33.97)	4,972	1,497 (30.11*)
Senior high students	4,856	1,344 (27.68)	4,767	1,107 (23.22*)
Total	14,578	4,999 (34.29)	14,452	4,357 (30.15*)

*Significant difference between boys and girls, $P < 0.01$

For more detailed information into the percentages by age we have this table, where it show the percentage of subjects in each range of 1 year(Zhang Ying-Xiu et al. 2013).

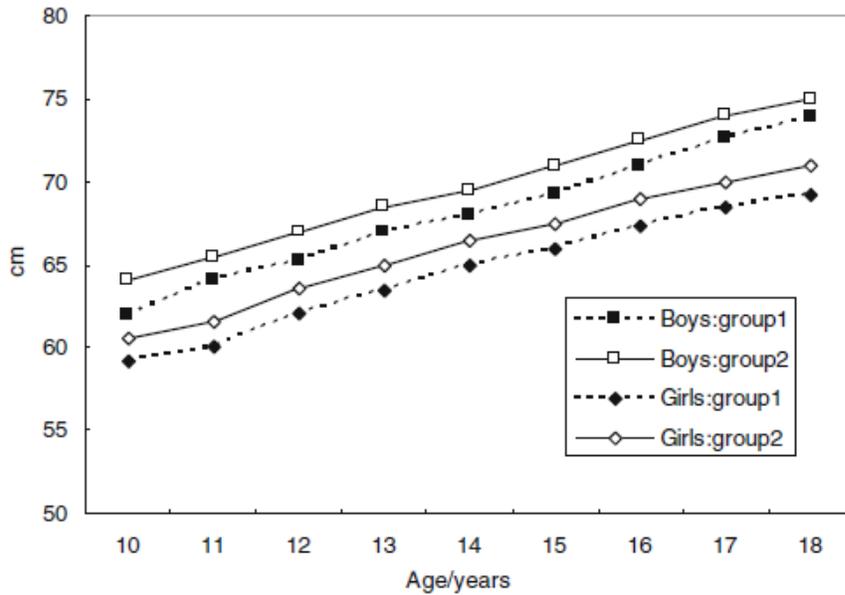


After the measurements we obtained this table, showing the median values of BMI in different groups, where group 1 is the group who practices 1h of PA each day and group 2 is the one who doesn't. (Zhang Ying-Xiu et al. 2013).

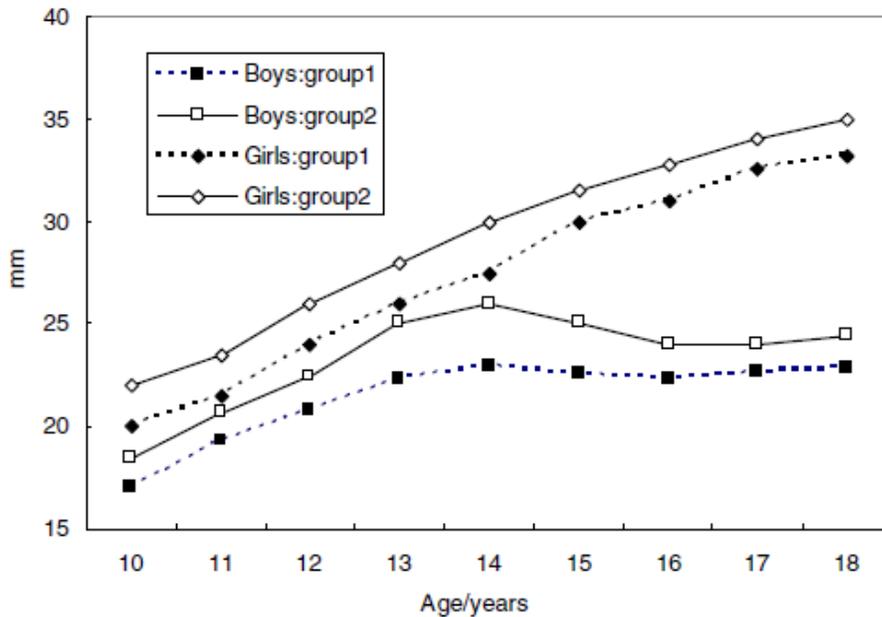


This show that the group who practices physical activity has a lower grade of BMI, which is better to prevent obesity in older age(Zhang Ying-Xiu et al. 2013).

In this next one we have the Waist circumference of both groups

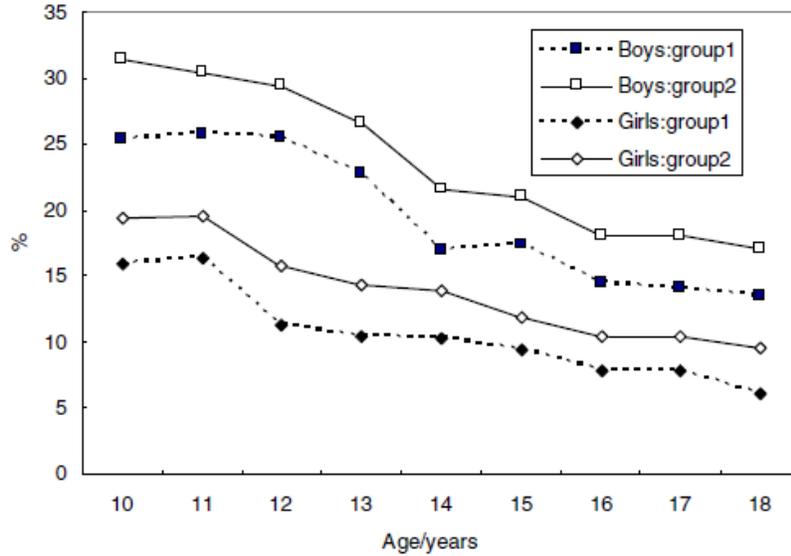


Here we can observe the Skinfold thickness (SFT) for boys and girls, we have to take into consideration that because of the puberty the boys start to gain more muscles than girls, and that's why we experiment that jump in the SFT(Zhang Ying-Xiu et al. 2013).



As can be seen in the fig. students who practices physical activity for at least 1h per day have less fat accumulated on the body. (Zhang Ying-Xiu et al. 2013).

Lastly according to the last fig. we can observe the combined prevalence of obesity and overweight on subjects from group 2 (Zhang Ying-Xiu et al. 2013).



According to the info obtained in the different tables we can conclude that PA plays an important role in the prevention of overweight and obese in adolescence and reduce health risks, the growing worldwide increase in obesity provide a strong evidence on this aspect, and its needed to encourage the children to practice PA, and to don't follow a sedentary life, that is the main problem in this Era. (Zhang Ying-Xiu et al. 2013).

Table 2 Prevalence of overweight and obesity in boys and girls with different PA time

Sex	Age(years)	Group 1			Group 2		
		Number	Overweight(%)	Obesity(%)	Number	Overweight(%)	Obesity(%)
Boys	10 – 12	1,981	18.78	6.71	2,813	21.61*	8.67*
	13 – 15	1,674	13.98	5.08	3,254	16.29*	6.64*
	16 – 18	1,344	10.79	3.20	3,512	13.15*	4.58*
	Total	4,999	15.02	5.22	9,579	16.70**	6.48**
Girls	10 – 12	1,753	12.44	2.34	2,960	14.76*	3.45*
	13 – 15	1,497	8.68	1.40	3,475	10.71*	2.50*
	16 – 18	1,107	6.23	0.99	3,660	8.03*	2.08*
	Total	4,357	9.57	1.68	10,095	10.93*	2.63**

* $P < 0.05$

** $P < 0.01$

As we can observe in this Table, there is a prevalence in both overweight and obesity in children who doesn't practice physical, concluding that the practice of PA is one of the best factor to treat obesity and overweight problems. (Zhang Ying-Xiu et al. 2013).

5.1 SYSTEMS TO TREAT OBESITY

5.1.1 DIETARY TREATMENT

We need to shift the energy balance to reduce the stored energy, and for this we can diminish the energy intake or increase the energy expenditure, or in the last case by altering the overall settings of energy homeostasis by modulating metabolic signals. The main used method for obesity treatment has been the limitation of energy intake, using hypocaloric diets, but their effectiveness is limited and fades rapidly with time (X. Remesar et al. 2000).

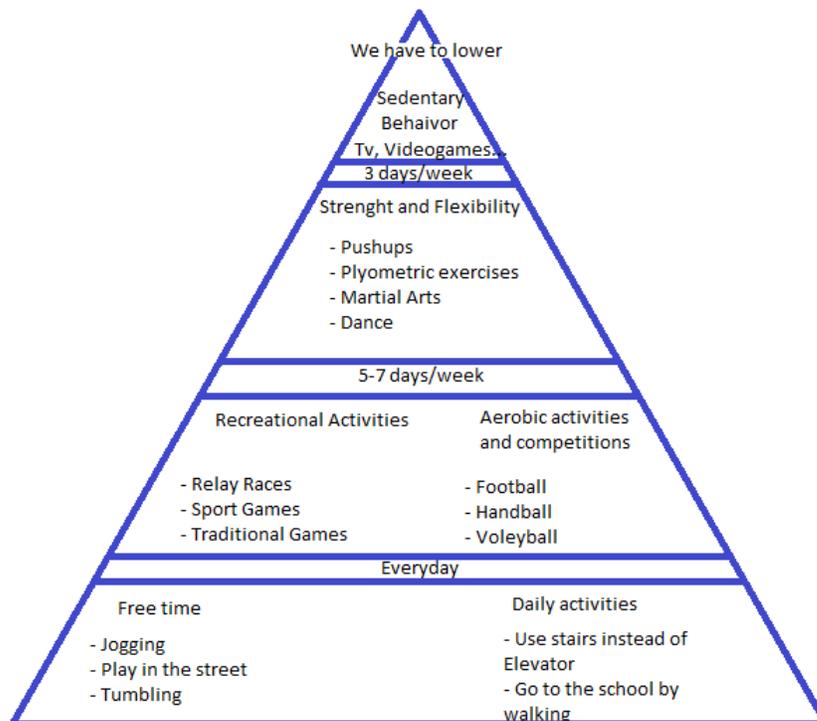
Table 1. Systems for the treatment of obesity

diminishing energy intake	decreasing energy intake	restrictive hypocaloric diets	
		low calorie or acaloric foods	
		mechanical barriers to intake	jaw wiring
			gastric balloon
	gastroplastia		
	decreasing nutrient availability	decreasing food absorption	surgical bypasses
			drugs decreasing nutrient availability
		dietary manipulation	dissociated and ketogenic diets
			hyperproteic diets
	decreasing appetite	psychological methods	conductist conditioning
suggestion, autocontrol and magic			
anorectic drugs			
increasing energy expenditure	exercise		
	increasing thermogenesis	exposure to cold	
		thermogenic drugs	
modulating energy homeostasis	diminishing adipose tissue mass	inhibition of adipocyte differentiation	
		surgical removal	lipectomy
			liposuction
		localized adipose tissue lysis	
	immunological targeting of adipose tissue		
	hormones / drugs modulating energy homeostasis		

5.1.2 OBESITY PREVENTION FROM PHYSICAL ACTIVITY

The progression of obesity is thanks to the macro as well as the micro ambient, on the macroambient the globalization seems to be the most important cause, in the other hand, according to the microambient, alimentary models, physical activity done by the parents and the relations with the friends from childhood, and every publicitaty aspect. It's really important to say that the income of the family is really important also, as well as, families with more economic resourses have access to better aliments and to more time to do extra activities, all in that, in Europe there has been created the “*EU Platform for Action on Diet, Physical Activity and Health*” and between the field this platform include we can find the physical activity promotion, that is the one where we will focus in this point. (L.A Moreno et al, 2012)

We usually use pyramids to represent what we should consume or what not, so for children and adolescent it seems good to represent also what they should do in their growing up age to prevent obesity (Fig 1.)



In the lower level we have the exercises that they have to do with their parents, that's because the good influence that this could inculcate to them, it would be good to show them that it's better to use the stairs instead of the elevator even if the other way is easier (Thanks to that we improve the moderate aerobic activity in children.

In the second level we will introduce recreative activities like different kind of sport games, introducing also some kind of competition as well as aerobic activity, we hereby recommend at least 1 hour of duration in the total time of the session.

In the third level we have to start with activities that improves the muscles of the subject, martial arts are a really good one as they also improve their coordination and flexibility, but other kind of exercises like dance or plyometric exercises can be used. At least we need a minimum of 3 days per week in this aspect

Last in the top level of the pyramid we can observe the kind of activities that the children should avoid like watching TV for long time, playing videogames, etc. because this will induce in a sedentary behavior, and even if it's not that noticeable when they are still kids the body get used to that and when the growing age end it will be a real problem. (L.A Moreno et al, 2012)

Those programs have been tested in 4 investigations in Europe for a short time, and even with the short time of the investigation they proved that there were a important improvement in the diet and in the physical activity habits, plus if you combine diet and physical activity there was some effect on the IMC, but not that big to be significant. (Waters E et al, 2005).

5.2 CONSIDERATIONS FOR PATIENTS WITH DISEASES

It's really important for patients affected by DM II to pass a rigorous medical exam before start to practicing sports because the increased risk they have towards coronary artery disease and silent cardiac ischemia, even though is the patients have a good glycemic control and no chronic complication it shouldn't be a problem but before any kind of training program it has to be checked according to the age of the patient

In the following table we can appreciate the recommendations according to the glucose levels, it's really important to follow them, because otherwise patients can have strong complications

Blood glucose levels (mg/dl)	Recommendations
>300	Do not exercise on that day
250-299	Exercise must be done with caution; if blood glucose rises after 10 min of exercise, exercise must be stopped.
150-249	Safe levels for exercise
100-149	Be alert for signs and symptoms of hypoglycemia.
<100	No exercise

5.2.1 EXERCISE PROGRAMS FOR DIABETIC PATIENTS

Exercise programs should have mostly aerobic endurance exercises, that improves fitness, muscular strength, and endurance, helping to the modification of the body composition, and as we are talking about patients with type II DM they have to be combined with resistance training, but we have to avoid high intensity exercise when the patient is associated with DM (C. Nakhanakhup et al, 2006)

In the following table we can appreciate the different kind of aerobic exercises that we can use with the patient and the different intensity at what the exercise has to be done, there is also the time needed and the frequency of the activities (C. Nakhanakhup et al, 2006)

Type	Duration	Frequency	Intensity
Aerobic exercise such as walking, running, bicycling, swimming	At least 30 min/session or 150 min/week 90 min/week	3–5 days a week	40–60% VO ₂ max or RPE 10–16 or 50–70% of maximum heart rate >60% VO ₂ max or >70% of maximum heart rate
Resistance	10–15 repetitions	2 days a week	40–50% of 1 RM
Warm up/cool down	5–10 min	Before and after exercise	Low intensity

Depending on what we want to improve we should apply one kind of exercise or another as well as the sessions and the time, so for cardiovascular performance the best is something between three or five sessions each week as well as introduce some physical activity in the daily routine helping the fat consumption involving a loss of weight, but as we stated before some patients are not able to perform those kind of exercises like with blood glucose higher than 300mg/dl, congestive heart failure, uncontrolled arrhythmias, severe valvular malfunction, or an aerobic capacity lower than 5 METs, and it's totally forbidden for them to do those activities.

(C. Nakhanakhup et al, 2006)

When we want to focus on resistance training it's well known that between ten or fifteen repetitions for each group of muscles and with a ratio in endurance/resistance of 3:1, and taking into consideration that the intensity has to be around 50% of 1 RM. (C. Nakhanakhup et al, 2006)

If we speak about patients with severe complications in type II DM we have to restrict a lot of kind of exercises but still we can do some for them from the point of physical activity, this table will show what kind of exercises they will be able to perform. (C. Nakhanakhup et al, 2006)

	Clinical manifestations	Exercise recommendation
Peripheral neuropathy	Numbness, tingling, coldness, burning pain, hypersensitivity to touch	Non-weight-bearing exercise such as swimming, bicycling
Autonomic neuropathy	Incomplete bladder emptying, stomach and bowel problems, orthostatic hypotension, sweating	Exercise stress test is necessary before starting an exercise program.
Diabetic retinopathy	Scar tissue in the retina	Contraindication in vigorous aerobic and resistance exercise
Cardiovascular disease	Occurrence of chest pain	Exercise stress test
Hypertension	Blood pressure higher than 140/90 mmHg	Breathing technique during resistance exercise should be trained
Dyslipidemia	Increased plasma levels of VLDL and TG, decreased plasma level of HDL	Low intensity and prolonged exercise

Both Aerobic and resistance exercise when applied to diabetic patients has to be adjusted individually, that's it, every patient will have different clinical status and that's why we have to check every aspect of that before applying a different method of training to them, thanks to the regular physical exercise we hereby encourage the positive adaptation of the organism to the control of blood glucose concentration, insulin action, muscular strength and exercise tolerance, to produce beneficial effects the physical activity or exercise has to be performed inside steps of 40%-60% of intensity and a global duration of 150 mins per week, it's important to pay attention on the level of glucose on blood before the exercise and after it as we have to prevent hypoglycemia, more important is the re-hydration of the body, before, during and after the physical activity, as well as pass a medical study where we can identify any complication related to cardiovascular functions which may be risky if a not taking into consideration before setting the exercise program, also we need to include diet control, and lifestyle to make it better. (C. Nakhanakhup et al, 2006)

6. CONCLUSION

It's showed in the work that one of the most dangerous diseases in the world is the Obesity because it not only affect to the shape of our body, but to the health, and its present in an innumerable kind of diseases as Diabetes or Heart Diseases as well as it can directly affect patients with cancer or help to the development of it, and along with genetic or biologic factors the biggest cause of obesity is the sedentary life and the bad nutrition because of the rhythm of life, that has become fast and easy in this society we live now, that's why it's really important to

educate the children in the art of doing physical exercise because as we can see it help to prevent obesity in older ages as well as maintain a good health condition in them, with this we also can conclude that thanks to the physical exercise, not only we will be able to get rid of the obesity but also we can fight the different diseases without the needing of using any kind of medicament or drugs because just by doing physical exercise our capacity of life and our immunological system get improved in high ranges, gaining great benefits for health even if we don't have a disease, and reducing the risk of futures health problems in our organism, even so we need to take into consideration different medical status of the people we want to apply the physical training to avoid risks, and to see what kind of exercise we can use with them in all the cases even if it's a small improvement, there has been an improvement in their condition, in their health and in their life in general.

6. KOKKUVÕTE

Rasvumine on üks ohtlikumaid haigusi maailmas, kahjustades mitte ainult välimust, vaid ka üldist tervislikku seisundit. Rasvumise suurim riskifaktor on istuv eluviis ja vale toitumine, mille põhjuseks on sageli tänapäevane elurütm. Rasvumise ennetamiseks on oluline õpetada lapsi tegelema spordiga ja püüda säilitada liikumisharjumus kogu eluks. Liikumine aitab ennetada mitmesuguseid haigusi, mõjudes soodsalt immuunsüsteemile ja tõsta elukvaliteeti ning vähendada vajadust ravimite järele. Krooniliste haiguste all kannatavatele inimestele treeninguid korraldades tuleb silmas pidada nende seisundit, et tervis ei halveneks ja ka väikesed edusammud on nende elukvaliteedi ja toimetuleku seisukohalt olulised.

7. REFERENCES

- [1] Corey Rynders, Arthur Weltman, Charles DelGiorno, Prabhakaran Balagopal, Ligeia Damaso, Kelleigh Killen, and Nelly Mauras. "*Lifestyle Intervention Improves Fitness Independent of Metformin in Obese Adolescents*" - *Medicine & Science in Sport & Exercise*. 23 sept 2011
- [2] Cuadra-Martínez, D., Georgudis-Mendoza, C. N. & Alfaro-Rivera, R. A. (2012). Representación social de deporte y educación física en estudiantes con obesidad. *Revista Latinoamericana de Ciencias Sociales, Niñez y Juventud*, 10 (2), pp. 983-1001.
- [3] Moreno, L.A.; Gracia-Marco, L. ; *Prevención de la obesidad desde la actividad física: del discurso teórico a la práctic*. *An Pediatr (Barc)*. 2012;77:136.e1-e6. - vol.77 núm 02
- [4] X. Remesar, J.A. Fernández-López, M. Foz and M. Alemany; *Methods in the treatment of obesity* CONTRIBUTIONS to SCIENCE, 1 (4): 463-478 (2000)
- [5] Jessica L. Fraser-Thomas*, Jean Côté & Janice Deakin *Youth sport programs: an avenue to foster positive youth development*. *Physical Education and Sport Pedagogy* Volume 10, Issue 1, 2005
- [6] Trevor Archer, Anders Fredriksson, Erica Schütz, Richard M. Kostrzewa. *Influence of Physical Exercise on Neuroimmunological Functioning and Health: Aging and Stress*. *Neurotox Res* (2011) 20:69-83, DOI 10.1007/s12640-010-9224-9
- [7] Zhang Ying-Xiu, Zhou Jing-Yang, Zhao Jin-Shan, Chu Zun-Hua. *The role of 1-h physical activity every day in preventing obesity in adolescents in Shandong, China*. *Eur J Pediatric* (2013) 172:325-330, DOI 10.1007/s00431-012-1882-6
- [8] Mitch J Duncan, Corneel Vandelanotte, Cristina Caperchione, Christine Hanley, W Kerry Mummery. *Temporal trends in and relationships between screen time, physical activity, 'overweight and obesity*. *BMC Public Health* (2012) 12:1060, <http://www.biomedicalcentral.com/1471-2458/12/1060>.

- [9] Bruno Linetzky, Fernando De Maio, Daniel Ferrante, Jonatan Konfino, Carlos Boissonnet, *Sex-stratified socio-economic gradients in physical inactivity, obesity, and diabetes: evidence of short-term changes in Argentina*, Int J Public Health (2013) 58:277-284, DOI 10.1007/s00038-012-0371-z.
- [10] Andrea Kriska, Linda Delahanty, Sharon Edelstein, Nancy Amodei, Jennifer Chadwick, Kenneth Copeland, Bryan Galvin, Laure El ghormli, Morey Haymond, Megan Kelsey, Chad Lassiter, Elizabeth Mayer-Davis, Kerry Milaszewski, Amy Syme. *Sedentary Behavior and Physical Activity in Youth With Recent Onset of Type 2 Diabetes*. Pediatrics 2013;131:e850
- [11] C. Nakhanakhup & P. Moungrmee & H.J. Appell & J.A. Duarte, *Regular physical exercise in patients with type II diabetes mellitus*, Eur Rev Aging Phys Act (2006) 3:10-19, DOI 10.1007/s11556-006-0002-x
- [12] Barbara Strasser, *Physical activity in obesity and metabolic syndrome*, Ann. N.Y. Acad. Sci. 1281 (2013) 141-159.
- [13] Wild S, Sicree R, Roglic G, King H, Green A. *Global prevalence of diabetes; estimates for the years 2000 and projections for 2030*. Diabetes Care 27:1047-1053 (2004)
- [14] Cuadra-Martinez, D., Georgudis-Mendoza, C.N. & Alfaro-Rivera, R.A. (2012), *Representacion social de deporte y educación física en estudiantes con obesidad*, Revista Latinoamericana de Ciencias Sociales, Niñez y Juventud, 10 (2), pp. 983-1001
- [15] Elizabeth R. Pulgaron, PhD *Childhood Obesity: A Review of Increased Risk for Physical and Psychological Comorbidities*. Clinical Therapeutics/Volume 35, Number 1, 2013
- [16] Yuzo Sato, Masaru Nagasaki, Masakazu Kubota, Tomoko Uno, Naoya Nakai. *Clinical aspects of physical exercise for diabetes/metabolic syndrome*. Diabetes Research and Clinical Practice 77S (2007) S87-S91
- [17] Christina Voulgari, Stamatina Pagoni, Aaron Vinik, Paul Poirier. *Exercise improves cardiac autonomic function in obesity and diabetes*. <http://dx.doi.org/10.1016/j.metabol.2012.09.005>
- [18] Trevor Archer, Anders Fredriksson, Erica Schlotz, Richard M. Kostrzewa, *Influence of Physical Exercise on Neuroimmunological Functioning and Health: Aging and Stress*. Neurotox Res (2011)20:69-83, DOI 10.1007/s12640-010-9224-9
- [19] Corey Ryndeers, Arthur Weltman, Charles Delgirno, Prabhakaran Balagopal, Ligeia Damaso, Kelleigh Killen, and Nelly Mauras. *Lifestyle Intervention Improves Fitness Independent*

- of Metformin in Obese Adolescent*. American College of Sport and Medicine 2011, DOI: 10.1249/MSS.0b013e31823cef5e.
- [20] C. Fagour, C. Gonzalez, S. Pezzino, S. Florenty, M. Rosette-Narece, H. Gin, V. Rigalleau. *Low physical activity in patients with type 2 diabetes: The role of obesity*. Diabetes and Metabolism 39 (2013) 85-87
- [21] Agus Kartono, *Modified minimal model for effect of physical exercise on insulin sensitivity and glucose effectiveness in type 2 diabetes and healthy human*. Theory Biosci (2013), DOI 10.1007/s12064-013-0181-8
- [22] Bjame K. Jacobsen, Synnove F. Knutsen, Keiji Oda, Gary E. Fraser. *Obesity at age 20 and the risk of miscarriages, irregular periods and reported problems of becoming pregnant: the Adventist Health Study-2*. Eur J Epidemiol (2012) 27:923-931, DOI 10.1007/s10654-12-9749-8
- [23] J. Hwang & Y. H. Kim, *Physical Activity and its Related Motivational Attributes in Adolescents with Different BMI*. Int J. Behav. Med. (2013) 20:106-113, DOI 10.1007/s12529-011-9196-z
- [24] Paul D. Loprinzi, Gina Pariser. *Physical activity intensity and biological markers among adults with diabetes: considerations by age and gender*. Journal of Diabetes and its Complications 27 (2013) 134-140.
- [25] Yuval Heled, Yair Shapiro, Yoay Shani, Daniel S. Moran, Lea Langzam, Varda Barash, Sanford R. Sampson, Joseph Meyerovitch. *Physical Exercise Enhances Hepatic Insulin Signaling and Inhibits Phosphoenolpyruvate Carboxykinase Activity in Diabetes-Prone*. Metabolism, Vol 53, No7 (July), 2004: pp 836-841.
- [26] Y. Heled, Y. Dror, D.S. Moran, T. Rosenzweig, S.R. Sampson, Y. Epstein, J. Meyerovitch, *Physical exercise increases the expression of TNF α and GLUT1 in muscle tissue of diabetes prone Psammomys obesus*. Life Sciences 77 (2005) 2977-2985
- [27] Nedim Soydan, Reinhard G. Bretzel, Britta Fischer, Florian Wagenlehner, Adrian Pilarz, Thomas Linn. *Reduced capacity of heart rate regulation in response to mild hypoglycemia induced by glibenclamide and physical exercise in type 2 diabetes*. <http://dx.doi.org/10.1016/j.metabol.2012.12.003>
- [28] Edite Teixeira de Lemos, Jorge Oliveira, Joao Pascoa Pinheiro, Flavio Reis. *Regular Physical Exercise as a Strategy to Improve Antioxidant and Anti-Inflammatory Status: Benefits in Type 2 Diabetes Mellitus*. Hindawi Publishing Corporation, Oxidative Medicine and Cellular Longevity, Volume 2012, ArticleID 741545, 15 pages. DOI: 10.1155/2012/741545.
- [29] Marmar Vaseghi, Michael J. Ackerman, Ravi Mandapati. *Restricting Sports for Athletes With Heart Disease: Are We Saving Lives, Avoiding Lawsuits, or Just Promoting Obesity and Sedentary Living?* Pediatr Cardiol (2012) 33:407-416, DOI 10.1007/s00246-012-0170-6