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Erasmus+ Programme
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Weekly fitness program for children and young adults with type 1 diabetes - EUT

1. INTRODUCTION

Albania is a small country situated in south-eastern of Europe.
The population is estimated to be at 2,845,955 inhabitants.
Being the last country in region that interrupted the connection with communism, Albania is facing many challenges in the field of offering good services to the community in general and specially to people with disabilities.
Albania is undergoing deep reforms since the collapse of communism.
Besides the reorganization of state structures the country is experiencing deep transformations in terms of lifestyle and other population characteristics, which implicates the emerging and potentiation of risk factors for diabetes.
The 2011 Albanian Census provided that 137,435 people of the age 15 years old and over, of which 75,239 women, live with disabilities (TELESEICT, 2016).
Parts of this group are also the persons who are treated with diabetes mellitus. Divided in three categories: people treated with type 2 diabetes (T2D) 90%; treated with type 1 (T1D) 5-9%; and less than 1% people treated with gestational diabetes (GDM).
Based at Bregu et. al survey, the overall prevalence of diabetes in Albania was 11.5% approximately 328 thousand people.
Diabetes prevalence was significantly higher among older subjects (18.6%) compared to younger ones (2.3%).
The aim of this paper is related to the second group, people treated with T1D, especially children and young adults, because a large percentage of them are not physically active due to the lack of scientific advices about exercising.
In the last decades, changes in people's lifestyle have impacted on the youth population . Currently, an estimated 80% of teenagers do not achieve public health guidelines for recommended levels of physical activity (i.e. 60 min per day or more of moderate to vigorous physical activity) , and more than half of boys and girls worldwide spend two hours or more per day watching television .
Despite the substantial evidence supporting the beneficial effect of physical activity, adolescents with T1D often do not achieve the recommended physical activity level and are sometimes less active than their healthy peers.
The general objective of this program is the improvement of the quality of life and the perception of health in youth with T1D through the creation of a weekly fitness workout program.

Similarly, the specific objectives are:

- To make known through evidence that exercise is beneficial for health in general and for the situation in particular;
- To sensitize the rest of the population about the advantages of physical exercise as a treatment for diabetes mellitus;
- To create an aerobic and strength activity program for T1D youth people.

After the first discussion with the "Albanian association of children and young people with diabetes", the comments were very welcoming from the future users of this activity program.

Because the gyms in Albania have limited programs dedicated to T1D people, they were very happy to hear that this project was coming to life.

Regular training increases muscle capillary density, oxidative capacity, lipid metabolism and insulin signaling proteins, which are all reversible with detraining .

This paper is going to explain step by step every dimension of a safety training process for them.

2. NEEDS

Diabetes is a chronic disease that occurs when the **pancreas** is no longer able to make **insulin**, or when the body cannot make good use of the insulin it produces.

Insulin is a hormone made by the pancreas, which acts like a key to let glucose from the food we eat pass from the blood stream into the cells in the body to produce energy. All carbohydrate foods are broken down into glucose in the blood. Insulin helps glucose get into the cells. Not being able to produce insulin or use it effectively leads to raised glucose levels in the blood (known as **hyperglycemia**). Over the long-term high glucose levels are associated with damage to the body and failure of various organs and tissues.

There are three main types of diabetes – **type 1, type 2 and gestational**.

- **Type 1 diabetes** can develop at any age, but occurs most frequently in children and adolescents. When you have type 1 diabetes, your body produces very little or no insulin, which means that you need daily insulin injections to maintain blood glucose levels under control.
- **Type 2 diabetes** is more common in adults and accounts for around 90% of all diabetes cases. When you have type 2 diabetes, your body does not make good use of the insulin that it produces. The cornerstone of type 2 diabetes treatment is healthy lifestyle, including increased physical activity and healthy diet.

However, over time most people with type 2 diabetes will require oral drugs and/or insulin to keep their blood glucose levels under control.

Gestational diabetes (GDM) is a type of diabetes that consists of high blood glucose during pregnancy and is associated with complications to both mother and child. GDM usually disappears after pregnancy but women affected and their children are at increased risk of developing type 2 diabetes later in life.

According to World Health Organization (WHO) the number of people with diabetes rose from 108 million in 1980 to 422 million in 2014.

Prevalence has been rising more rapidly in low- and middle-income countries (e.g. Albania) than in high-income countries.

Diabetes is a major cause of blindness, kidney failure, heart attacks, stroke and lower limb amputation.

Between 2000 and 2016, there was a 5% increase in premature mortality from diabetes.

In 2019, an estimated 1.5 million deaths were directly caused by diabetes. Another 2.2 million deaths were attributable to high blood glucose in 2012.
In Albania, about 78 thousand diabetics are diagnosed, while every year approximately 4 thousand new cases of diabetes are diagnosed. A large percentage of diabetics is unknown due to the lack of a database.

Type 1 diabetes is a challenging condition to manage for various physiological and behavioural reasons.

Regular exercise is important, but management of different forms of physical activity is particularly difficult for both the individual with type 1 diabetes and the health-care provider.

People with type 1 diabetes tend to be at least as inactive as the general population, with a large percentage of individuals not maintaining a healthy body mass nor achieving the minimum amount of moderate to vigorous aerobic activity per week.

Regular exercise can improve health and wellbeing, and can help individuals to achieve their target lipid profile, body composition, and fitness and glycaemic goals. However, several additional barriers to exercise can exist for a person with diabetes, including fear of hypoglycaemia, loss of glycaemic control and inadequate knowledge around exercise management.

This project provides an up-to-date consensus on exercise management for individuals with type 1 diabetes who want to exercise regularly, including glucose targets for safe and effective exercise and nutritional adjustments to protect against exercise-related glucose excursions.

The International Society for Pediatric and Adolescent Diabetes (ISPAD) advocates the importance of encouraging children and adolescents to be physically active and less sedentary to help control their body weight and mitigate increased cardiovascular risk.

Therefore, physical activity is one of the pillars in the treatment of diabetes and in the maintenance of a healthy lifestyle .

3. EXPLANATION OF THE ACTIVITY

Regular physical activity is essential to help keep blood glucose levels under control. It is most effective when it includes a combination of both **aerobic exercise** (e.g. jogging, swimming, cycling …) and **resistance training**, as well as reducing the amount of time spent being inactive.

There are established international pediatric exercise guidelines for the pediatric population and a comprehensive pediatric-specific review of exercise in both T1D and Type 2 Diabetes by Pivovarov et al. provides current perspectives and a decision tree-based approach for blood glucose management in children with T1D .

If you are treated with T1D, staying active can help lower your chances of developing other complications. These can include high blood pressure, heart disease, nerve damage, and vision loss.

Regular exercise may also help improve your overall quality of life.

Strenuous activity can cause blood sugar to drop. This can lead to low blood sugar, which is called **hypoglycemia**. Intense bouts of exercise can also cause blood sugar to rise. If it rises above normal levels, it's known as **hyperglycemia**.

Take a moment to learn how you can exercise with type 1 diabetes while keeping blood sugar in a safe range.

Aerobic exercise involves repeated and continuous movement of large muscle groups . Activities such as walking, cycling, jogging, and swimming rely primarily on aerobic energy-producing systems (day 3 and 4 of the fitness program).

Resistance (strength) training includes exercises with free weights, weight machines, body weight, or elastic resistance bands (day 1 and 2).

Flexibility exercises improve range of motion around joints . Balance activities like tai chi and yoga combine flexibility, balance, and resistance activities (day 6).

Mixed activities, such as interval training or team/individual field sports, are associated with better glucose stability than those that are predominantly aerobic , although variable results have been reported for intermittent, high-intensity exercise (day 5).

In our seven day fitness program for T1D young people we have combined all the types of activities described above to take benefit from their impact on different body systems.

In type 1 diabetes, aerobic training increases cardio respiratory fitness, decreases insulin resistance, and improves lipid levels and endothelial function.

The effect of resistance exercise on glycemic control in type 1 diabetes is unclear. However, resistance exercise can assist in minimizing risk of exercise-induced hypoglycemia in type 1 diabetes.

Stretching increases range of motion around joints and flexibility but does not affect glycemic control.

Additional carbohydrate intake and/or insulin reductions are typically required to maintain glycemic balance during and after physical activity.

Frequent blood glucose checks are required to implement carbohydrate intake and insulin dose adjustment strategies.

Insulin users can exercise using either basal-bolus injection regimens or insulin pumps, but there are advantages and disadvantages to both insulin delivery methods.

Continuous glucose monitoring during physical activity can be used to detect hypoglycemia when used as an adjunct rather than in place of capillary glucose tests.

The target range for blood glucose prior to exercise should ideally be between 90 and 250 mg/dL (5.0 and 13.9 mmol/L).
Carbohydrate intake required will vary with insulin regimens, timing of exercise, type of activity, and more, but it will also depend on starting blood glucose levels.

Very intense exercise such as sprinting, brief but intense aerobic exercise , and heavy power lifting may promote hyperglycemia, especially if starting blood glucose levels are elevated.

Similarly, combining resistance training (done first) with aerobic training (second) optimizes glucose stability in type 1 diabetes.

Individuals with type 1 diabetes should test for blood ketones if they have unexplained hyperglycemia (250 mg/dL).

Exercise should be postponed or suspended if blood ketone levels are elevated (1.5 mmol/L), as blood glucose levels and ketones may rise further with even mild activity.

Regular stretching and appropriate progression of activities should be done to manage joint changes and diabetes-related orthopedic limitations.

Exercise management for young people with T1D is complex and one approach does not fit all.

Many factors influence an individual's glycemic response to exercise including the type, intensity and duration of the activity, the amount of insulin on board and the person's stress/anxiety levels.

To further complicate management, even when all these factors are kept constant, an individual's response to exercise may or may not be predictable on repeated exercise occasions.
Diabetes should not prevent individuals from achieving their exercise goals whether these are occasional fun activities or at a more high-performance level. Indeed, many individuals with T1D have gone on to accomplish extraordinary sporting achievements.

PHYSICAL ACTIVITY PROGRAM

Based on the selected literature, a possible exercise program for people with T1D has been developed.

The project takes place 3 to 6 times/ week, preferably in the morning.

The total time of the program is 12 weeks, and can be carried out by both individuals who have or not have access in sport centres.

The program is designed to fit the possibilities of different target groups about the need of equipments.

The exercise routine should be supervised by professionals.

DAY 1 – HIIT (HIGH INTENSITY INTERVAL TRAINING)

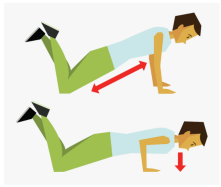
WARM UP: 10-15 MINUTES

9 EXERCISES
30-45 SECOND WARM UP PER EXERCISE

HIIT 15 MINUTES/15 EXERCISES
40 SECOND WORK/ 20 SECONDS BREAK
PUT THE HIIT MUSIC TIMER 40/20 FOR AN EASY ORIENTATION
DO AS MANY REPS AS POSSIBLE FOR EACH EXERCISE

****FOR THE RIGHT TECHNIQUE OF EVERY EXERCISE PLEASE CONSULT YOUR PERSONAL TRAINER OR ASK FOR PROFESSIONAL ADVICE.***

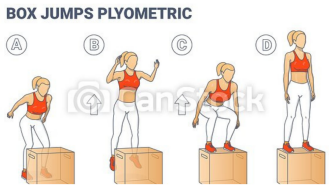
1.Lunges



2.Push Up

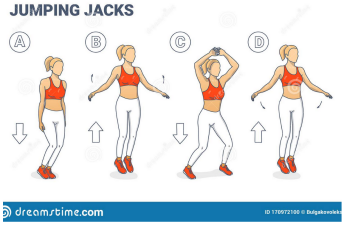
3.Sumo Squat

4.Plank to Push Up



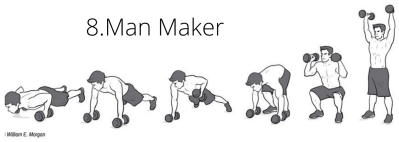
5.Box Jump

6.Burpee

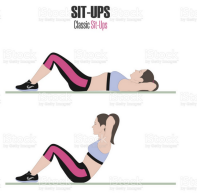


7.Jumping Jacks

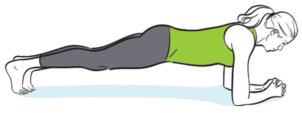
8.Man Maker



9.Jump Squats



10.Sit Ups



11.Plank

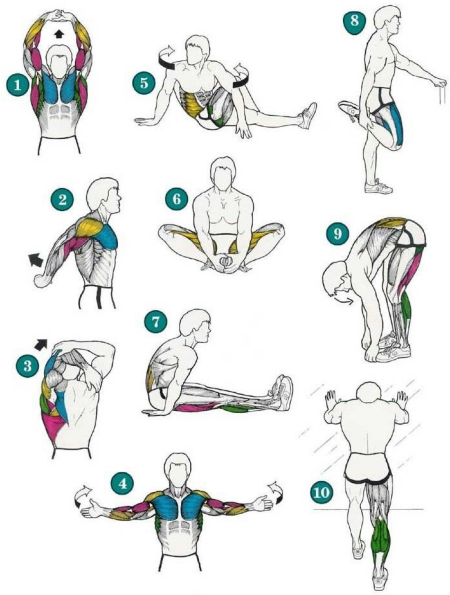
12.Wall Sit

13.Thruster

14.Devil Press

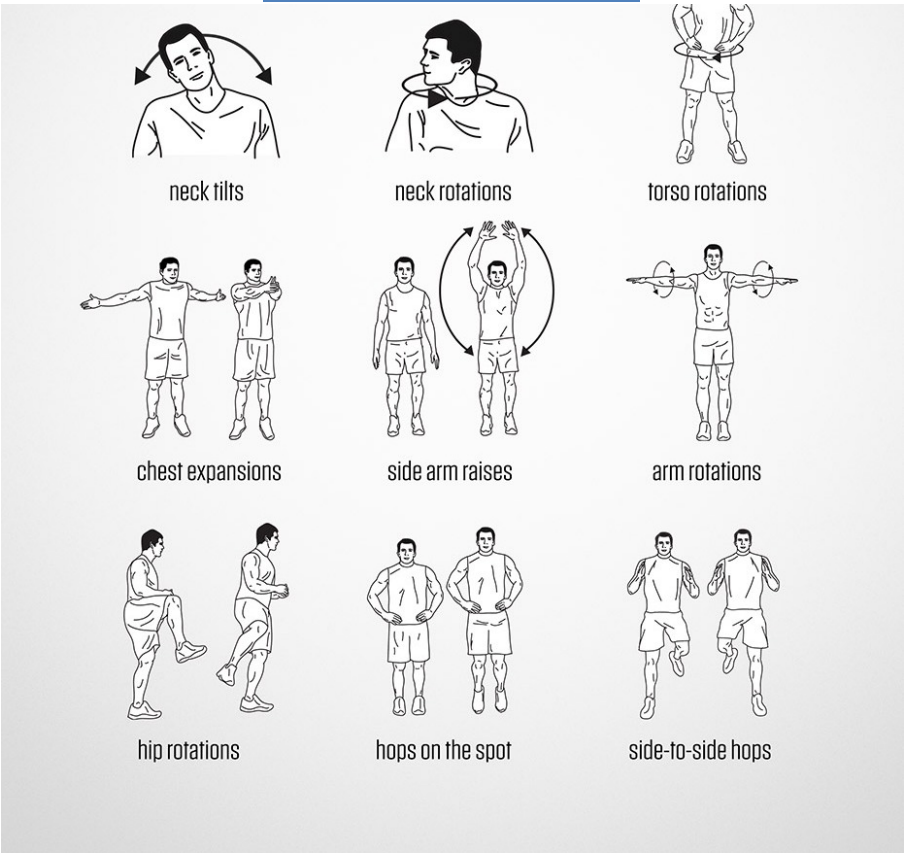
15.Hollow Rock

STATIC STRETCHING: 10 MINUTES
15 SECONDS HOLD ON



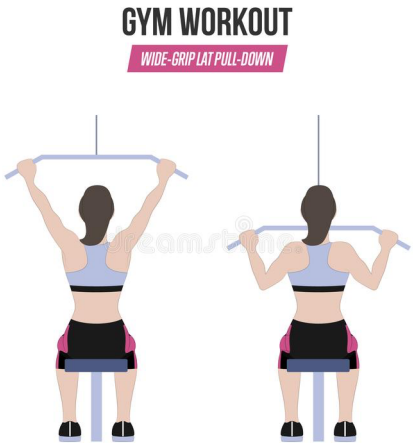
DAY 2 – RESISTANCE TRAINING

WARM UP: 10-15 MINUTES
10 REPETITIONS PER SIDE



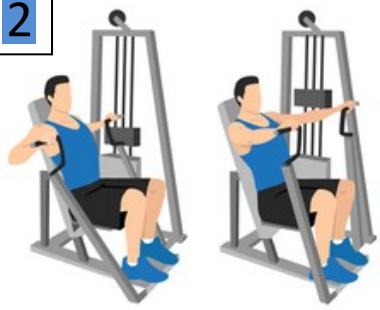
FULL BODY WORKOUT
8 EXERCISES
30-45 SECONDS REST BETWEEN SETS
45-90 SECONDS REST BETWEEN EXERCISES

1



LATERAL PULL-DOWN
3 SETS WITH 10 REPS
50-60 % OF 1RM (ONE MAXIMAL REPETITION)

2



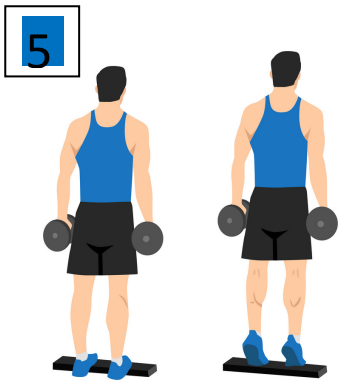
CHEST SEATED MACHINE PRESS
4 SETS WITH 8 REPS
50-60% OF 1 RM

3 **GYM WORKOUT**
Leg Press

LEG PRESS
3 SETS WITH 12 REPS
60% OF 1 RM

4

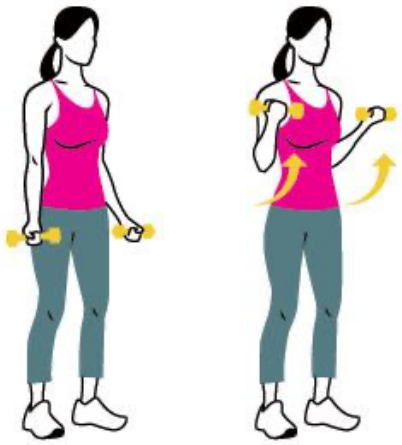
SHOULDER PRESS
3 SETS WITH 8 REPS
50% OF 1 RM



DUMBBELL CALF RAISES
4 SETS WITH 15 REPS
60-70% OF 1 RM

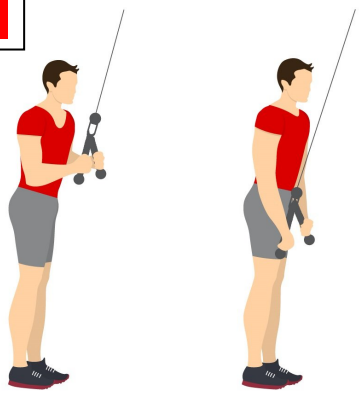
BENCH PRESS
3 SETS WITH 8 REPS
50-60% OF 1 RM

7



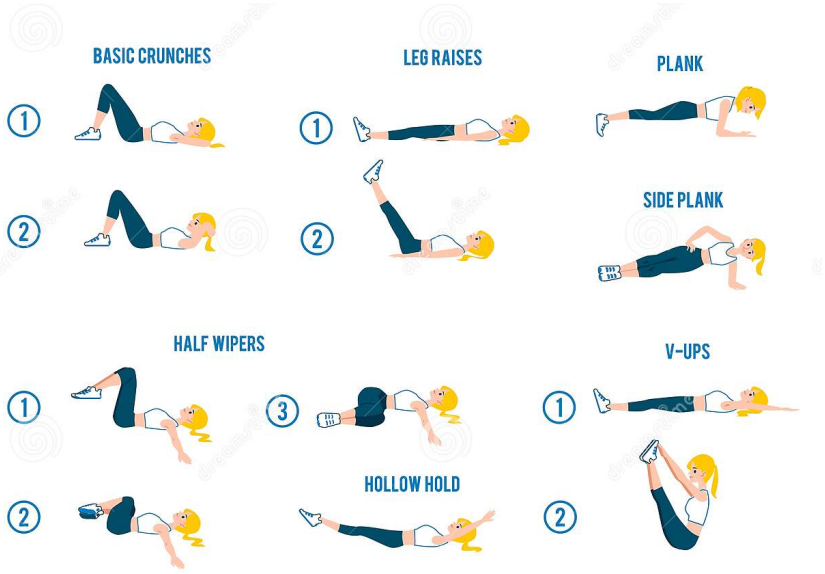
DUMBBELL BICEPS CURL
3 SETS WITH 8 REPS/SIDE
60% OF 1RM

8



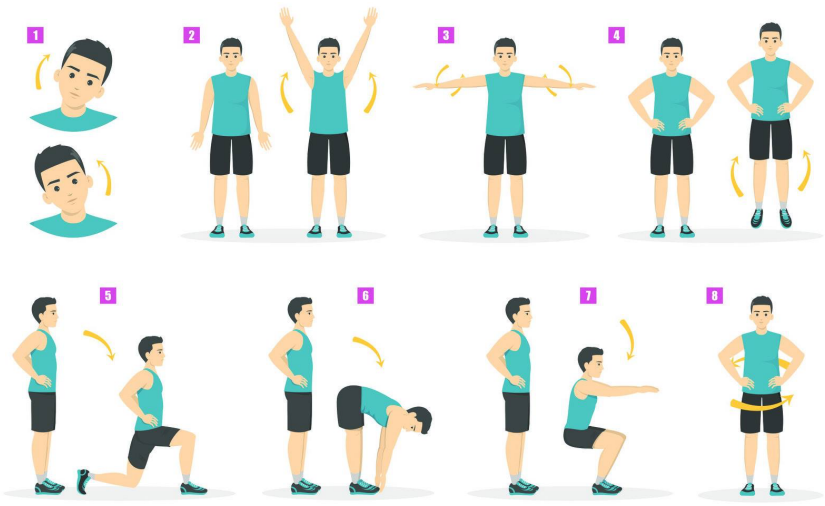
TRICEPS PULL DOWN
3 SETS WITH 8 REPS
60% OF 1RM

ABS WORKOUT 15 MINUTE
3 ROUNDS / EACH ECERCISE
10 REPS
30 SECONDS BREAK BETWEEN SETS AND EXERCISES



DAY 3 – CARDIO

WARM UP: 10-15 MINUTES
8 EXERCISES
30-45 SECONDS WARM UP PER EXERCISE



CARDIO
5 EXERCISES
90 SECONDS REST BETWEEN SETS
120 SECONDS REST BETWEEN EXERCISES
****SECOND ROUND STARTS WHEN YOU FINISH THE FIRST ROUND WITH THE 5 EXERCISES***

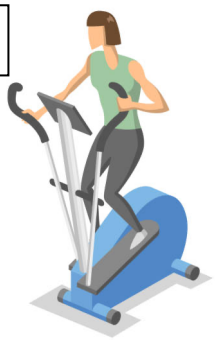
1

STATIONARY BIKE
2.5 KM FIRST ROUND AND 2 KM SECOND ONE

2

JUMP ROPE
300 JUMPS FIRST ROUND
200 JUMPS SECOND ONE

3



ELLIPTICAL ORBIT MACHINE
500 METERS FIRST ROUND/ 400 METERS SECOND ONE

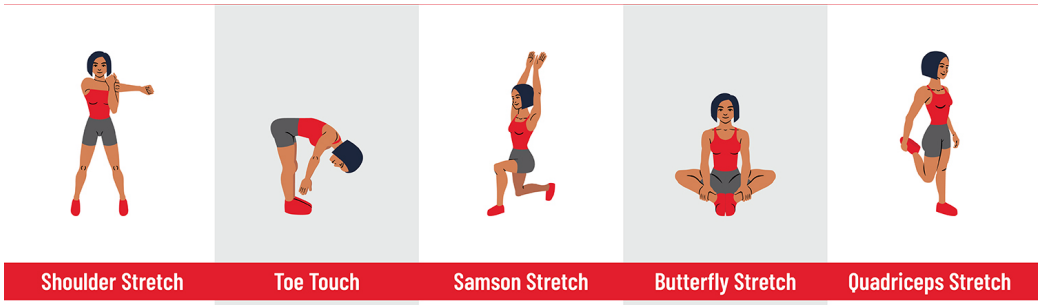
4

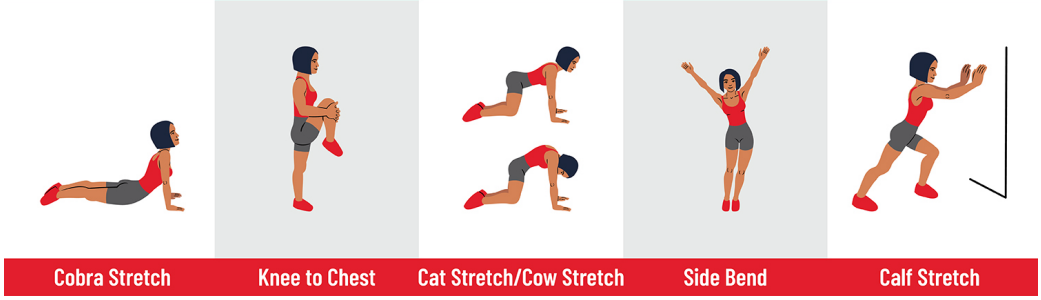
TREADMILL RUN
1.2 KM FIRST ROUND/ 1 KM SECOND ONE

5

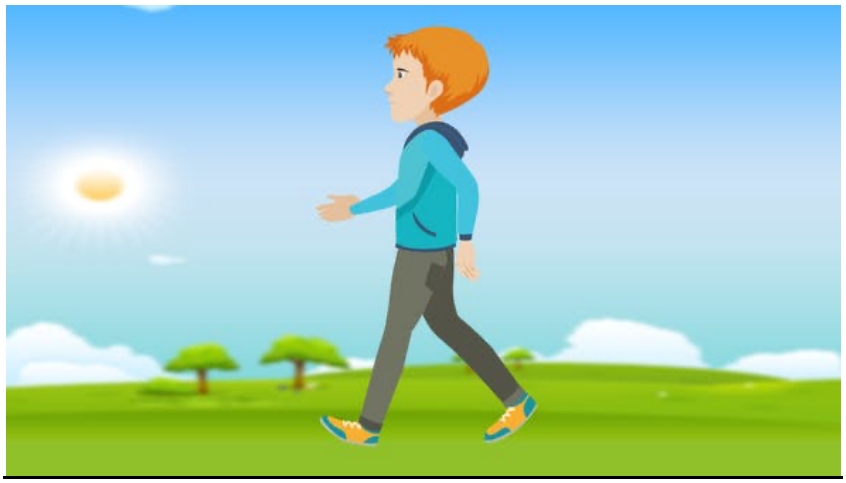
STAIR CLIMBER MACHINE
25 CALORIES FIRST ROUND
20 CALORIES SECOND ONE

LOWER BODY STATIC STRETCH: 10 MINUTES
15 SECONDS HOLD ON FOR EACH PART



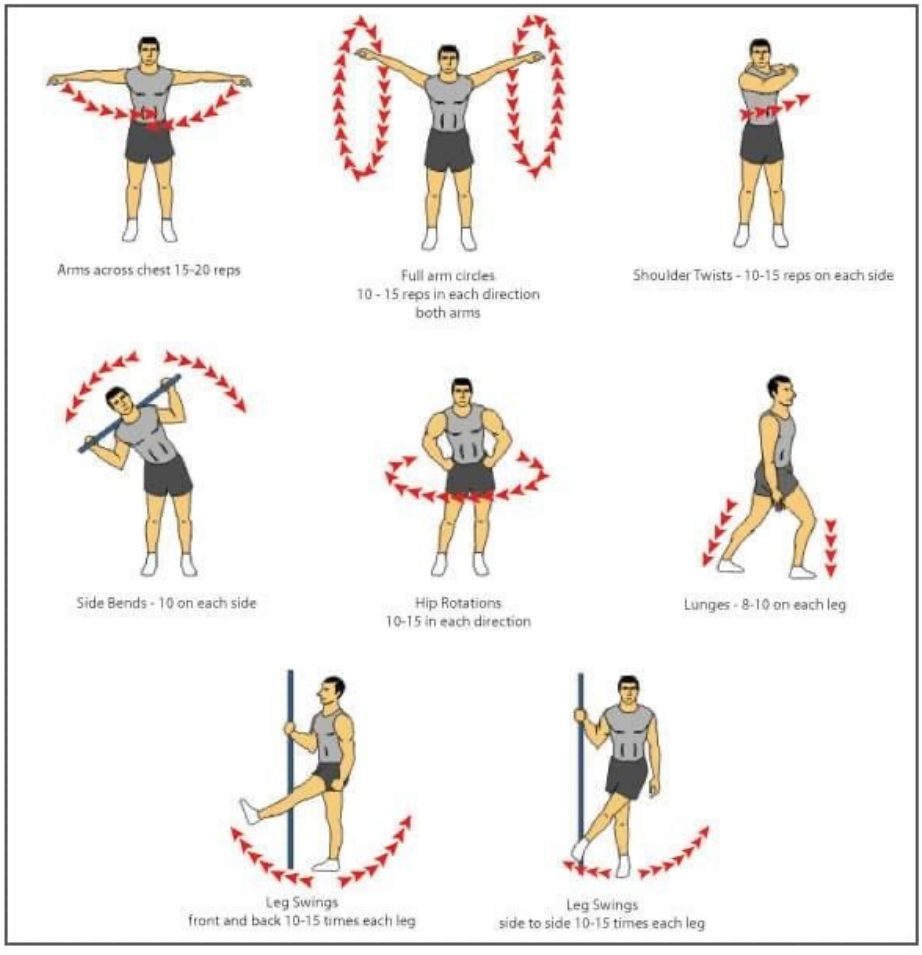


DAY 4 – DAY OFF : A WALK TO RELAX AND REGENERATE



DAY 5: SPORTS

WARM UP: 10-15 MINUTES



SPORTS
EACH WEEK CHOOSE A SPORT TO PLAY
NO MATTER IF YOU PLAY IN A TEAM OR YOU DO SOME DRILLS OF THAT SPORT BY YOURSELF
30-45 MINUTES OF SPORT ACTIVITY/WEEK

****IMPORTANT IS THE FACT THAT THE INTENSITY MUST BE LOW TO MODERATE AND EVERY TEAM MEMBER MUST KNOW YOUR HEALTH CONDITION***
TAKE WITH YOU SOME CANDIES AND A FIRST AID KIT FOR ANY INCONVENCIENCE

FOOTBALL

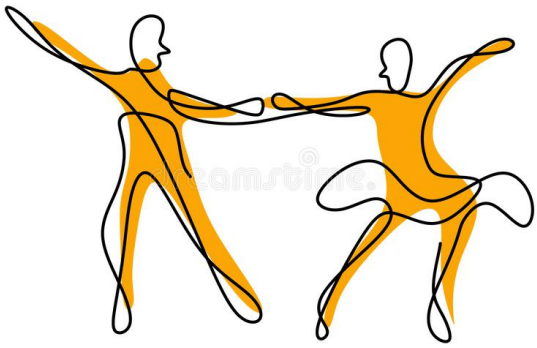
BASKETBALL

VOLLEYBALL

FULL BODY STRETCHING: 10 MINUTES
15 SECONDS HOLD ON FOR EACH PART WITH THE HELP OF A FRIEND

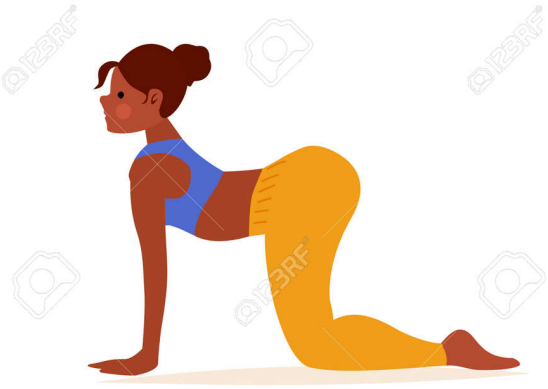
DAY 6: FLEXIBILITY

WARM UP: 10-15 MINUTES
THIS TIME WARM UP YOURSELF BY DANCING THE SONGS YOU LIKE THE MOST



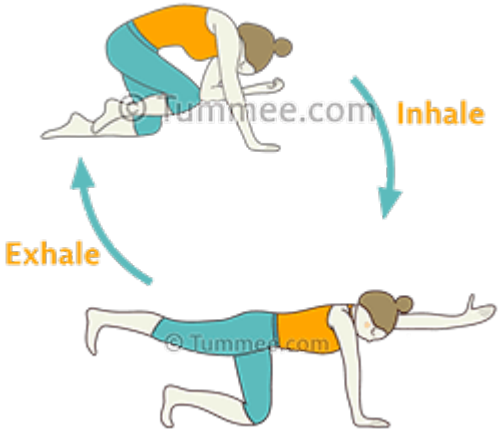
YOGA FLEXIBILITY
30-45 SECONDS FOR EACH POSITION

ABDOMINAL STRETCH



BACK RELEASE

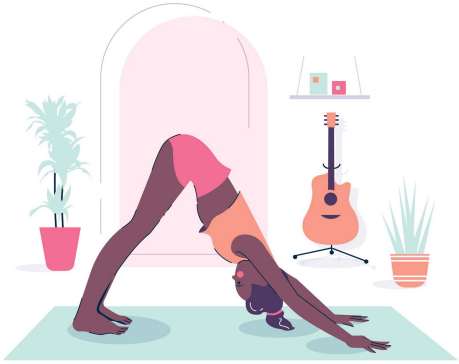
YOGA POSE



CORRECT BREATHING PROCESS

ADVANCED YOGA POSE

BALANCE



BRIDGE

INHALE-EXHALE

DAY 7: REST DAY

ONE DAY PER WEEK MUST BE TOTALLY OFF SO YOUR CELLS ARE REGENERATED

****IT IS NOT SAID THAT DAY 1 IS MONDAY AND DAY 7 IS SUNDAY. YOU CAN MIX THE DAYS ACCORDING TO YOUR PLANS.***
****TRAIN FOR A MINIMUM OF 3 DAYS PER WEEK TO A MAXIMUM OF 6 DAYS PER WEEK, FOR 60 MINUTES UNDER THE SUPERVISION OF A FITNESS TRAINER.***
****BY CREATING YOUR TRAINING ROUTINE YOU WILL BE ABLE TO UNDERSTAND BETTER YOUR BODY REACTIONS.***

4. ADDITIONAL MATERIALS USED

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