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**Review article**

## PHYSICAL ACTIVITY DURING PREGNANCY AND AFTER DELIVERY

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**Abstract.** *It is well known that physical activity and proper diet can have beneficial effects on health improvement, as a prevention and as a therapy for chronic non-communicable diseases. Pregnancy is a special period in the life of every woman. Therefore, you often ask yourself whether it is advisable to exercise during pregnancy, when and how much? This review article, by analyzing the available literature data, has tried to explain what form of physical activity is recommended during pregnancy, depending on the period of pregnancy, under what conditions pregnant women should exercise, what forms of physical activity they should avoid and when they should not to practice it. In addition, we analyzed the role of physical activity in the prevention of gestational diabetes, the most common metabolic disorder that occurs during pregnancy. Following the recommendations of the FITT principle outlined in this paper, controlled exercise conditions with a specialized trainer and nutritionist, regular moderate physical activity adapted to different periods of pregnancy, undoubtedly contribute to the maintenance and improvement of the musculoskeletal and cardiovascular system of the pregnant woman, better control of her body weight and improvement of her psychological state.*

**Key Words:** *Pregnancy, Physical Activity, Gestational Diabetes, Lactation*

### INTRODUCTION

Physical inactivity is one of the growing health problems. Back in classical times, Aristotle advised pregnant women to eat well and take plenty of exercise. Spartan pregnant women were also active through their pregnancies, and their babies were stronger and leaner (Blundell, 1995). There are usually many questions that pregnant

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women think about while planning to start exercising during pregnancy. One of the first recommendations for exercising during pregnancy was published by the American College of Obstetricians and Gynecologists (ACOG), back in 1985. These recommendations were conservative, based on very limited records at the time. Following these recommendations, researchers focused on safety and health-related benefits of physical activity before conception. Today's research and recommendations related to physical activity during pregnancy refer to all women who have a normal pregnancy. In such pregnancies, physical activity bears a minimal risk while the benefits for the health of the mother and fetus are numerous (American College of Obstetricians and Gynecologists, 2015). It can reduce the risk of gestational diabetes (Wiebe, Boulé, Chari, & Davenport, 2015), preeclampsia (Aune, Saugstad, Henriksen, & Tonstad, 2014; Babbar & Shyken, 2016), hemorrhoids, leg cramps, improve physical fitness, help achieving recommended body weight, prevent constipation, back pain, sleep disorder, boost the mood, energy levels and mental well-being of a pregnant woman (Mayo Clinic Staff, 2016a; Mottola & McLaughlin, 2011).

Through physical activity, every pregnant woman will improve the performances of her cardiovascular system (Perales et al., 2016), and therefore have better endurance. Strong muscles will allow her to perform daily tasks effortlessly, which will leave more energy for the rest of the day.

But, it should be noted that physical activity has to be modified due to anatomical and physiological changes in pregnancy, depending on its stages.

In any case, despite all the recommendations, most women reduce their physical activity during pregnancy and many of them do not achieve the recommended level of physical activity, especially during the third trimester.

The American College of Sports Medicine (ACSM) and ACOG have similar guidelines when it comes to physical activity during pregnancy. First of all, it is necessary for a pregnant woman to do a medical examination and consultation with her gynecologist and see if it is safe for herself and the baby to start with some physical activity program (Price, Amini, & Kappeler, 2012). After that she needs to consult specialists in pregnancy exercising programs as well as a nutritionist (ACOG, 2015; ACSM, 2014; Mottola, 2016). All medical and obstetric conditions in which physical activity is not recommended should be excluded immediately (Artal, 2016) and the physical activity program should be individually designed.

Goals during pregnancy should be to keep and improve physical fitness and to avoid any effort that could have a bad effect on the mother and baby (Mottola & McLaughlin, 2011). When we talk about exercise intensity, it should be individually designed to be safe and acceptable for each pregnant woman, because it varies from person to person and changes during pregnancy. The three main areas of each program should be stretching, aerobic activities and weight training.

## THEORETICAL CONSIDERATIONS OF THE PROBLEM

### **Physiology of pregnancy**

Significant metabolic, endocrine, and physiological adaptations are inherent in pregnancy in order to ensure a sustained supply of nutrients and oxygen to the fetus (Mottola & Artal, 2016).

Pregnancy consists of three trimesters. During the first trimester, the body is exposed to numerous changes, as hormonal changes affect almost all organ systems.

These changes can cause symptoms such as extreme fatigue, swollen breasts, morning sickness, constipation, frequent urination, headache, heartburn and loss or gain in body weight, as early as the first weeks of pregnancy

This is a period in which the heart activity of the fetus begins and at the end of first trimester the baby is fully formed. In the second trimester, symptoms such as fatigue and nausea usually disappear. But the abdomen expands as the baby continues to grow. Therefore, a pregnant woman can feel a pain in her back and abdomen, swelling of the ankles, fingers, and face and other changes that are synchronize with growth and movement of the baby. In this trimester it is very important to monitor blood pressure since the first signs of hypertension and potentially eclampsia, leading to premature birth can develop. Some of the same discomforts from the second trimester will continue during the last trimester, plus, many expectant mother experience difficulty breathing and a more frequent need for the bathroom. In addition, new symptoms like shortness of breath, heartburn, trouble sleeping can appear as the baby continues to grow. During this time, the baby will start to see, hear and react to different stimuli. Therefore, physical activity has to be adjusted to specific changes in pregnancy (Sawin & Morgan, 1996).

As it can be concluded from the previous explanation, pregnancy is a dynamic anabolic condition and it affects all systems in the body (Sanghavi & Rutherford, 2014) and is characterized by specific physiological changes. The major changes affect the cardio-respiratory system. Cardiac output will increase by 30-40% (the max is achieved around the 24<sup>th</sup> week) as well as the heart rate by 10-15 bpm (reaching a maximal value by week 28 to 32). Together with this finding, the blood volume and number of red blood cells increase too. In late gestation, the heart rate reserve is reduced because the resting heart rate increases during pregnancy, minute ventilation increases at term around 50%, oxygen consumption and carbon dioxide production increase around 60%, and the  $\text{VO}_2$  max is preserved resulting in reduced anaerobic capacity (Sanghavi & Rutherford, 2014). As expected, at the same time blood pressure decreases (Soultanakis, 2016).

### **Aerobic exercise programs as a model of physical activity in pregnancy**

Aerobic exercise programs, in the moderate intensity zone, can affect body composition, and cardiorespiratory fitness. These programs affect the changes in body composition, with a significant increase in lean body mass, and can lead to a decrease of the systolic, and diastolic blood pressure, heart rate under strain, resting heart rate, and increase in  $\text{VO}_2$ max (Kostrzewa-Nowak et al., 2015). A study by Kostić & Zagorc (2005) has shown that programmed aerobic exercise is an effective tool in improving the level of the cardiorespiratory fitness in women. Furthermore, there are physical health benefits associated with physical activity and differences in body composition with age (Čokorilo, Mikalački, Korovljević, Cvetković, & Škrkar, 2012).

The recommendations of the ACOG are that pregnant women with normal, healthy pregnancies should be active for at least 30 minutes a day several times during the week. In its safety guide for safe exercise during pregnancy, the ACSM suggests that the intensity of exercise for most women should be moderate. For obese pregnant women, as well as for those not fit enough, exercise intensity should be light and has to be changed

over time (ACSM, 2014). Women who were sedentary before pregnancy should start gradually and reach a level of at least 30 minutes, three times a week (Mottola, 2016).

For pregnant women to assess the right intensity of their exercise, or if their intensity is too high, the ACSM recommends a “talk test” (women should be able to speak without difficulty while exercising), and can also use subjective assessment as an exercise indicator at the recommended level (ACSM, 2014; Mayo Clinic Staff, 2016b).

A certain number of pregnant women can exercise more intensively, provided that they were active and exercised before pregnancy at high intensity levels.

Hours of exercising on weekly levels depend on intensity. For women with good medical status, exercise should last 150 minutes weekly (Pescatello, Arena, Riebe, & Thompson, 2014). That means exercising for at least 30 minutes a day, or more (ACSM, 2014).

When it comes to adequate types of activities, it is recommended to choose a physical activity that engages large muscle groups, with rhythmic and dynamic movements, such as walking and swimming. In addition, bicycle riding is also recommended (Mayo Clinic Staff, 2016a). The best thing about riding a bicycle is the support that bikes give to pregnant women’s weight, and the fact that it reduces stress on the body. A fixed bike is an excellent exercise because of low injury risks. Aerobics and dancing are also recommended, but with caution, because maintaining balance can be problematic, as can rotations and jumping, so the recommendation is that if pregnant women want to do aerobics and dancing, they have to look for specially designed programs for pregnant women (e.g., aerobics in water).

### **Resistance training as a model of physical activity in pregnancy**

In combination with aerobic exercises, adequately dosed resistance training can be practiced (Petrov Fieril, Glantz, & Fagevik Olsen, 2015). The ACSM also recommends weight training, but the application of this activity depends on the previous level of training. Such strength training should include: 5-10 minutes of warm-up, 20-45 minutes of resistance training, and 5-10 minutes of cooling down (ACSM, 2014; Mottola & McLaughlin, 2011).

Resistance training should be focused on multiple and large muscle groups, 1-3 series with 12-15 reps, light intensity and less weight should be involved in the activity, moderate to light fatigue (Mottola, 2016). Breaks longer than usual should be made between the series. With untrained women it is necessary to provide machines for exercise in order to be able to control the amplitude of the movement, because of the increased secretion of the hormones relaxin and estrogen, all the ligaments are relaxed and poorly controlled during pregnancy, which can easily lead to injuries (Dehghan et al., 2014). Also, abdominal exercises should be done, but it is necessary to take safe positions or angles (per example: in the first trimester while you lie down on your back, before practicing ab exercise, it is important to keep your back as flat as possible on the floor).

The supine position after the first trimester is to be avoided, as well as the isometric contractions of the muscles and the Valsalva maneuver (Pescatello et al., 2014). During the second and third trimesters, exercises that involve lying on the back flat should be avoided as they reduce blood flow to the uterus. Relaxation and stretching exercises should be included before and after exercise.

Then, yoga can be taken up, because it reduces stress and pressure on the body and provides a sense of calm (Babbar & Shyken, 2016). Extended periods of time lying on the

back, excessive twisting, excessive stretching and severe contractions of the abdominal muscles in the second and last trimesters should be avoided.

Combination of cardiovascular and resistance training is recommended to achieve greater benefits.

### **The FITT principle**

In order to provide safe exercise guidelines, women with a low risk pregnancy should be utilizing prescribed exercises in accordance with the FITT principle, characterized by the frequency, intensity, time and the type of the activity i.e., modality of exercise (Mottola & Artal, 2016).

The suggested FITT guidelines by the ACSM (2018), Mottola (2016) and Pescatello et al. (2014) are:

#### **Frequency:**

- *Aerobic*: At least 3-5 days a week, and preferably all days in the week.
- *Resistance*: 2-3 days per week (non-consecutive).
- *Flexibility*: At least 2-3 days of daily stretching per week.

#### **Intensity:**

- *Aerobic*:
  - a) Moderate intensity (40-60% VO<sub>2</sub> reserve or 60-80% VO<sub>2</sub> max). The first way is to exercise within target heart rate zones, dependent on the age and fitness level of the pregnant woman. The second check is the rating of RPE (12-14 on a scale of 6-20), and the third check is the “talk test” to monitor exercise intensity. Heart rate ranges that correspond to moderate intensity exercise are: age <20 the range is 140-155, age 20-29 the range is 135-150, age 30-39 the range is 130-145 and over 40 the range is 125-140 beats per minute.
  - b) Moderate intensity (3-5.9 METs, RPE of 12-13 on a scale of 6-20).
  - c) Vigorous intensity for women that before pregnancy were engaged in strenuous activities, and for those that aim to reach a higher fitness level during pregnancy (6 METs, RPE 14-17 on a scale of 6-20).
- *Resistance*: Exerted until occurrence of moderate fatigue with multiple submaximal repetitions (i.e. 8-10, or 12-15).
- *Flexibility*: Stretch to the point of slight discomfort.

#### **Time:**

- *Aerobic*:
  - a) At least 15 minutes a day and gradually increasing to at least 30 minutes a day. This progression would result in total of 150 minutes per week of accumulated physical activity.
  - b) Vigorous intensity 75 minutes per week.
- *Resistance*: 1-3 sets depending on level of experience (major muscle groups).
- *Flexibility*: 10-30 seconds (static).

**Type:**

- *Aerobic:*
    - a) Physical activity that use the large muscle groups, with dynamic and rhythmic movement (per example walking, stationary cycling, swimming, group exercise).
    - b) A variety of weight-bearing and non-weight-bearing activities, well tolerated.
  - *Resistance:* A variety of free weight, machine, and body weight exercises, well tolerated.
  - *Flexibility:* Active, passive, and dynamic stretch exercises that target each muscle-tendon unit.
- \*METs – metabolic equivalents; RPE – rating of perceived exertion

**Physical activity in the prevention of gestational diabetes mellitus, preeclampsia, and excessive gestational weight gain**

The most frequent metabolic disorder diagnosed during pregnancy is gestation diabetes mellitus - GDM (Motola & Artal, 2016) that like other types of diabetes has an effect on how the cells utilize glucose (Goulopoulou et al., 2010). Hence, high blood sugar caused by GDM can compromise a pregnancy and baby's health, as well. It is one of the rising problems in pregnancy since it develops due to unhealthy lifestyle behaviors as well as inadequate exercise habits (Wang et al., 2017).

As their standard for GDM diagnosis, the World Health Organization (WHO) adopted the IADPSG evidence-based criteria in 2013 (World Health Organization, 2013). According to Sacks et al. (2012) several indices among the mentioned criteria are characterized by lower thresholds than previously accepted (i.e., a fasting glucose  $\geq 5.1$  mmol/l, or a one-hour result  $\geq 10.0$  mmol/l, or a two-hour result  $\geq 8.5$  mmol/l, using a 75 g oral glucose tolerance test), consequently yielding higher incidence of GDM.

GDM could be modified by an adequate lifestyle, i.e., exercise and diet control (Clapp, 2006).

Maintaining blood glucose concentrations within the normal range, avoiding ketosis and ensuring normal fetal growth are the main aims of the GDM treatment. The guidelines for a diet and exercise program directed toward reduction of body weight and increase in physical activity likely have positive effects on tissue insulin sensitivity in the prevention and treatment of type 2 diabetes (van Poppel, Ruchat, & Mottola, 2014). Cordero, Mottola, Vargas, Blanco, & Barakat Carballo, 2015) concluded that excessive gain in weight during pregnancy and a sedentary lifestyle increase the risk for developing GDM in normal weight pregnant women, and that exercise intervention has resulted in significantly reduced occurrence of GDM. At the same time, glucose tolerance is preserved and gain in weight is prevented. Furthermore, an improvement in the glycemic control and/or limiting insulin use is demonstrated due to the large success (71%) of the exercise interventions (Ruchat & Mottola, 2013).

There are many papers that have already proved the beneficial effect of aerobic exercise in the prevention or/and treatment of gestational diabetes mellitus (Ming et al., 2018; Al Hashmi, Nandy, & Seshan, 2019; Mishra & Kishore, 2018). In addition, the beneficial effect of physical activity was also proven using different in vivo animal models. So far, it was demonstrated that aerobic exercise decreased the production of reactive oxygen species (ROS) and oxidative stress in the fetal heart and minimized the risk of congenital heart defects via modulation of specific gene expression, in pre-

gestational diabetes (Saiyin et al., 2019). Also, it is well known that physical activity leads to a decrease in glycemia, decreasing body weight and visceral adipose tissue and, at the same time, increasing insulin sensitivity. In addition, both, aerobic and anaerobic exercise increase GLUT4 expression via insulin independent pathways through changes in intracellular level of calcium ions, AMP-dependent protein kinase (AMPK) activity and nitrogen oxide (NO) production which increase glucose uptake into the muscles and adipose tissue (Isaković, Janković, Mazić, Stanojević, & Nešić, 2018).

Beside gestational diabetes, physical activity also exhibits beneficial effects on preeclampsia and excessive gestational weight gain, as interconnected pathological conditions. Preeclampsia in a pregnancy has a prevalence of around 2 to 8% of all pregnancies. There are many risk factors for preeclampsia indicating heterogeneity of this disease with obesity being one of them (Jeyabalan, 2013). In respect to other risk factors like pregnancy specific issues (previous number of pregnancies, number of fetuses, specific genetic disorders), maternal pre-existing conditions (age, race, BMI, pregestational diabetes, hypertension, renal disease, antiphospholipid syndrome, some autoimmune diseases) family history of preeclampsia and smoking, obesity is modifiable and the only risk factor that can be positively affected by physical activity (Sui, Moran, & Dodd, 2013). As expected, together with obesity, excessive gestational weight gain results from decreased physical activity during pregnancy which additionally highlights the importance of adapted and controlled physical activity during pregnancy.

### **Sport activities as a risk factor during pregnancy**

Those activities that call for extra caution because of a pregnant woman's safety are ball sports, gymnastics, horse riding, skiing, martial arts and all other sports where, due to the nature of sport, there may be contacts and injuries, while some other activities (Artal, 2016; Mayo Clinic Staff, 2016a) call for modifications (e.g. riding a stationary bike instead of riding a bike on the road). Aerobic activities that are commonly used are walking, riding a bicycle and swimming, weak impact exercises. On the other hand, high impact exercises (e.g. aerobics, jogging, and running), are secure for healthy, well-trained women during pregnancy. By all means, pregnant women can perform different types of physical activities.

During exercise, there is a redistribution of blood from the internal organs into the muscles, lungs and heart so that an adequate amount of oxygen would be provided. Therefore, in the case of high intensity exercise, there may be a weaker oxygen supply to the uterus (De Oliveira Melo et al., 2012). It is necessary for pregnant women to exercise in the recommended heart rate zone, to make sure that sufficient oxygen supply will reach the fetus (Mottola, 2016). It is important that the breathing technique is correct during exercise. Also, as pregnancy progresses from the first, second to the third trimester, the modification of exercises is required, reducing or raising resistance, repetition, etc. Therefore, it is recommended for pregnant women to work directly with specialized trainers.

What should be emphasized is that warning signs if they occur during exercise (e.g. vaginal bleeding, muscle weakness, swelling of the amniotic fluid, contractions, headache, dizziness, fetal movement, etc.) should not be ignored during pregnancy (Mottola, 2016). If any of these symptoms occur, they should cease their physical activity and consult their gynecologist (Mayo Clinic Staff, 2016b).

### **Physical activity after delivery**

After giving birth, when a woman feels ready (about 1-6 weeks after delivery) and if there are no symptoms (e.g., pain or increased vaginal secretion), she can gradually return to her exercise routine without harmful effects (Mayo Clinic Staff, 2016b). In addition, the American College of Pediatrics recommends that all women breastfeed their babies during the first year of their life (Lovelady, 2016).

After delivery, healthy women should single out at least 20-30 minutes on the daily basis on most or all days of the week for exercising, and that would result in a total of at least 150 minutes per week of accumulated physical activity, moderate to vigorous intensity aerobic activity (Ferrari & Graf, 2017; ACOG, 2019).

One of the major concerns after delivery is the abdomen. The return of abdominal strength is an important factor for maintaining proper body posture, as well as pelvic control. Most healthy women should start with simpler exercises of lower intensity, such as walking, Kegel exercises and pelvic tilt exercise (Mayo Clinic Staff, 2016a; Mottola, & McLaughlin, 2011). Pelvic tilt exercises, plank and various yoga movements are a great way to re-engage the core muscles without too much strain (Babbar & Shyken, 2016). After the abdomen, the focus is on the muscles of the upper part of the body. Carrying a baby causes stress on the back and shoulders so stretching and strengthening these parts is helpful to alleviate the problems. Mothers will have some benefits even if they exercise for 10 minutes (ACOG, 2019).

Physical activity after delivery has a positive effect on body weight loss, improves the cardiovascular system, strengthens the abdominal musculature, raises the level of energy, leads to better sleep patterns, reduces stress and the manifestation of postpartum depression (Mayo Clinic Staff, 2016b). In addition, by introducing exercises into their daily routine, mothers set a positive example for their children. If the mother was very active during pregnancy, in most cases she would be able to continue exercising at the same level after delivery, without having to take a break.

If they do not have enough time to exercise, mothers can include babies into their exercise routine. For example, mothers can take daily walks with a baby in a stroller or a carrier, they can put the baby next to themselves on the floor while stretching or they can involve babies in strength exercises by raising the baby above their head while lying on their back. Mothers should try to find company, because exercising with other people raises the level of motivation.

Exercising during the period of lactation does not have a negative effect on milk volume and composition, nor does it negatively affect the baby's growth (Mayo Clinic Staff, 2016b). Physical activity does not affect the change of milk in terms of volume, proteins, lactose, energy, immunological components, and lipid composition when we compare women who exercise and those who are sedentary types, if the calorie intake is adequate. Also, the amount of lactic acid in the milk does not increase during physical activity, unless the physical activity is at maximum intensity. What is very important during the period of lactation is that 200 mg of calcium is transferred into milk every day. This results in 3-9% loss of bone density, and weight exercise has a positive effect on bone density in women during lactation (Lovelady, 2016). In the period of lactation, it is also recommended to have moderate physical activity.

Breastfeeding can help body weight loss, as mothers use stored fat cells in their body during pregnancy, along with calories from food, to allow milk production and to feed their babies. Through nutrition and exercise, a body weight loss of 0.5 kg per week is



reasonable (Lovelady, 2016). It may take 6 months or longer to return to the body weight that a woman had before pregnancy. Even then, weight can be arranged differently from that before pregnancy.

It is recommended for mothers to wear clothing that will keep their bodies cool, wear a bra that will protect their breasts, and stay hydrated.

### **Exercise environment and equipment**

During exercise in pregnancy and after delivery, exercise should not be conducted in conditions of high temperature and humidity (Pescatello et al., 2014). In order to avoid injuries during exercise, it is important to wear adequate equipment. Equipment should not limit the movements and should support the abdomen (in pregnancy) and breasts (in pregnancy and after delivery). Overheating during exercise should be avoided because high temperature causes our body to send more blood to our skin to help cool it. In this case less blood is left for the fetus (Mayo Clinic Staff, 2016a). Pregnant women and nursing women should always exercise in a comfortable environment (Mottola, 2016), should be well hydrated and take care of proper nutrition and adequate daily calorie intake (Ibidem).

### **Diet recommendations in respect to pregnancy and delivery**

Before, during and after exercise, women should be well hydrated (Mayo Clinic Staff, 2016a). Adequate fluid intake during training is particularly important. Also, it is necessary to take care of regular, healthy eating and daily energy intake, not eating for two, but eat twice as healthy (Mottola, 2016). The way the body works has changed, and the nutritional requirements have increased. Digestion is slow so that the body could absorb more nutrients from the food. It is necessary to eat smaller portions, not to skip meals and not to limit the amount of fruits and vegetables. Avoid temptations and get healthy food on time. Daily energy demands increase by approximately 300 kCal, for women who had normal body weight before pregnancy (first trimester minimal weight gain, second about 340 kCal, third about 450 kCal). Women who were overweight or obese need fewer extra calories (ACOG, 2016). Anyway, it is necessary to discuss individual energy needs with a nutrition specialist. Avoid caffeine, tobacco, alcohol and drugs. A smart choice of food after delivery can affect healthy body weight loss. Never resort to "magical" supplements and diets, because there is no magic formula for body weight loss. The recommendation is to consult a nutritionist.

## **CONCLUSION**

Many pregnant women are not getting enough physical activity. Sedentary behavior affects obesity, excessive gestational weight gain, and risk of developing chronic disease in both the mother and the baby. In order to have an effect on bad habits and sedentary behavior, the best way is to start with low-intensity physical activity. Medically screened women can begin or continue a moderate aerobic program. It is important to utilize the FITT principle (frequency at least 3 days a week, and preferably all days a week, starting at 15 minutes and gradually increase to 30 minutes at an appropriate intensity, using large muscle groups, with dynamic and rhythmic movement). Women who exercised before

conception can continue safely during pregnancy to exercise for 30 minutes or more every day until they have any symptoms. A combination of cardiovascular and resistance training is recommended to achieve greater benefits. Resistance training is safe and should be focused on multiple and large muscle groups with several precautions, such as holding one's breath and using light weights with higher repetitions (12-15 reps) performed to moderate or light fatigue.

After giving birth (about 1-6 weeks after delivery), if there are no symptoms, women can gradually return to her exercise routine without harmful effects. An important factor is the return of abdominal strength and maintaining proper body posture, as well as pelvic control. Most healthy women should start with simpler exercises of lower intensity, beginning with walking, Kegel exercises and pelvic tilt exercise, and after they have to pay attention to the muscles of the upper part of the body. Exercising in the period of lactation does not have a negative effect on milk volume and composition, nor does it negatively affect the baby's growth.

In addition, they have to take care of the equipment they wear, to provide support for their anatomical changes during pregnancy and after delivery. Always avoid movements in which there are jerks, large rotations and lying on the back for long intervals.

High levels of physical fitness in pregnant women result in shorter delivery and less maternal exhaustion during delivery.

Before starting the exercise program, each pregnant woman should consult her gynecologist, then specialized trainer and nutritionist.

It is worth highlighting the benefits of specially made pregnancy programs by specialized trainers:

- ensuring proper position during exercise;
- ensuring the use of stabilizer muscles in order to establish an adequate balance;
- avoiding injuries and inadequate muscular strain;
- proper dosing (intensity and volume);
- creating routine in exercise;
- exercise should be fun and interesting;
- providing support and motivation to achieve goals;
- the presence of the coach at each training session is necessary.

Taking all this into account, we should not forget that a healthy lifestyle is vital for all pregnant patients and that it includes controlled, individual and dosed physical activity.

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## FIZIČKA AKTIVNOST TOKOM TRUDNOĆE I NAKON POROĐAJA

*Poznato je da fizička aktivnost i pravilna ishrana utiču na unapređenje zdravlja, kao prevencija i kao terapija hroničnih nezaraznih bolesti. Trudnoća je posebno razdoblje u životu svake žene. Samim tim, često se postavlja pitanje da li je preporučljivo primenjavati fizičku aktivnost tokom trudnoće, kada i koliko? Ovaj pregledni rad je upravo, analizom dostupnih podataka iz literature, pokušao da objasni koji oblik fizičke aktivnosti se preporučuje tokom trudnoće, zavisno od stadijuma trudnoće, u kojim uslovima trudnice treba da upražnjavaju fizičku aktivnost, koje oblike fizičke aktivnosti treba da izbegavaju i kada ne treba da je upražnjavaju. Takođe, analiziran je i značaj primene fizičke aktivnosti u prevenciji gestacijskog dijabetesa, kao najčešćeg metaboličkog poremećaja koji nastaje u trudnoći. Uz primenu preporuka FITT principa navedenog u ovom radu, kontrolisanih uslova vežbanja uz specijalizovanog trenera i nutricionistu, redovna umerena fizička aktivnost prilagođena različitim stadijumima trudnoće, nesporno doprinosi održanju i unapređenju koštano-mišićnog i kardiovaskularnog sistema trudnice, boljoj control itelesne mase kao i unapređenju njenog psihološkog stanja.*

**Ključne reči:** *trudnoća, fizička aktivnost, gestacioni dijabetes, laktacija*