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Exercise in Pregnancy: Guidelines

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Abstract: In recent years it has been recognized that in all phases of life, including pregnancy, physical activity promotes health benefits and precludes comorbidities, the scientific evidence is indisputable. Several organizations around the world have updated in recent years the guidelines and recommendations for exercise in pregnancy. The December 2015, updated guidelines of the American College of Obstetricians and Gynecologists emphasize that physical activity in pregnancy has minimal risk. Although recommending exercise in pregnancy, the anatomic/physiological changes, absolute and relative contraindications should be considered. Women who exercised regularly before pregnancy, in the absence of contraindications, can continue and engage in moderate to strenuous activities, although information on strenuous activities in pregnancy is still limited. This review summarizes the most recent published and recommended guidelines.
Key words: exercise, pregnancy, guidelines

In 2008, the US Department of Health and Human Services issued physical activity guidelines for Americans, including pregnant women. Several professional organizations followed suit.[1] In December 2015, the American College of Obstetricians and Gynecologists (ACOG) released new recommendations for exercise in pregnancy, encouraging all women with uncomplicated pregnancies to engage in aerobic and strength conditioning exercises through pregnancy.[2] A comparison of guidelines from 9 countries around the world reveal many similarities and in the absence of contraindications support prescribing moderate-intensity physical activity to all pregnant women.[3]

The 2015 ACOG guidelines emphasize that even if not previously active, pregnancy is an ideal time to adopt lifestyle modification, because more than other time in her life, pregnant women have the most available access to medical supervision and care.

The ACOG committee opinion summary and recommendations are listed below:

(1) Physical activity during pregnancy is associated with minimal risks and benefits.
(2) In view of normal anatomic, physiological changes, and fetal requirements, women may need to modify exercise routines.
(3) Before recommending an exercise program, a thorough clinical evaluation should be conducted to ensure that there are no contraindications.
(4) Women with uncomplicated pregnancies should be encouraged to participate in aerobic and strength conditioning

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exercises before, during, and after pregnancy.
(5) Regular physical activity promotes and maintains physical fitness, prevents comorbidities, manages weight, and improves psychological well-being.

The global obesity epidemic and physical inactivity has resulted in multiple comorbidities in pregnancy, most frequently gestational diabetes (GDM) and preeclampsia. Exercise has been demonstrated to reduce both the risk of GDM[4] and preeclampsia[5] in these women.

Elite athletes may encounter the same limitations as recreational athletes during pregnancy; however, they do have additional concerns. The additional concerns are: (a) the effects of pregnancy on competitive ability and (b) the effects of strenuous exercise/training on pregnancy and fetus. Elite athletes may require closer supervision for their prenatal care. Additional testing and intervention should occur as clinically indicated.

At a September 2015 International Olympic Committee meeting, 16 experts reviewed the information available with regard to strenuous and competitive activities, guidelines for female athletes engaging in strenuous physical activities, and how to manage conditions that may interfere.[6]

Exercise Prescription in Pregnancy

Physical fitness is an integral part of well-being; it should be equally prescribed to pregnant and nonpregnant women.

Most professional organizations agree that women who exercised regularly before pregnancy, in the absence of complications/contraindications may engage in moderate to high-intensity exercise in pregnancy.

Furthermore, for the first time the ACOG guidelines state that bed rest is rarely indicated in pregnancy and encourages ambulation.[1]

For previously sedentary individuals, contrary to previous recommendations, pregnancy is considered now an ideal time for behavioral modification. In the absence of obstetric or medical contraindications, exercise and an active lifestyle is safe and beneficial in pregnancy.

ACOG and other professional organizations have identified conditions that are considered absolute contraindications (Table 1) and relative contraindications (Table 2) to exercise in pregnancy.[1]

In the absence of any of the above contraindications, exercise in pregnancy is safe and desirable, and pregnant women should be encouraged to continue or to initiate such activities that are currently recognized as safe in pregnancy.

For prescribing exercise in pregnancy the same principles are followed as those recommended for the general population.[7] All pregnant women should have detailed clinical evaluations at their first office visit at which time motivational counseling tools such as Five A's (ask, advise, assess, assist, and arrange) can be used to reinforce or introduce healthy lifestyle routines.[8] Because of the normal anatomic and physiological changes, pregnant women may experience symptoms (Table 3), which could interfere with their exercise routines.[9]

Some of these symptoms are transient, and most of them can be managed symp-

TABLE 1. Absolute Contraindications to Aerobic Exercise During Pregnancy

Hemodynamically significant heart disease
Restrictive lung disease
Incompetent cervix or cerclage
Multiple gestation at risk of premature labor
Persistent second-trimester or third-trimester bleeding
Placenta previa after 26 weeks of gestation
Premature labor during current pregnancy
Ruptured chorioamniotic membranes
Preeclampsia or pregnancy-induced hypertension
Severe anemia

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TABLE 2. Relative Contraindications to Aerobic Exercise During Pregnancy

Anemia
Unevaluated maternal cardiac arrhythmia
Chronic bronchitis
Poorly controlled type 1 diabetes
Extreme morbid obesity
Extreme underweight (body mass index < 12)
History of extremely sedentary lifestyle
Intrauterine growth restriction in current pregnancy
Poorly controlled hypertension
Orthopedic limitations
Poorly controlled seizure disorder
Poorly controlled hyperthyroidism
Heavy smoker

tomatically.[6,9] However, if symptoms persist additional interventions may be necessary and in some cases suspend temporarily the exercise routines.

Through pregnancy women should be informed of potential increased risk for injuries, albeit rare.

Depending on the gestational age the following conditions could potentially result in either maternal or fetal injuries during first, second, and third trimester (Table 4).

The goal should be to maintain physical fitness and derive health benefits within the physiological limits of pregnancy while maintaining maternal and fetal well-being.

Physical fitness benefits are well recognized, and include:

(1) Health-related benefits: cardiorespiratory endurance, body composition, muscular strength endurance, and flexibility and
(2) Skill-related benefits: agility, coordination, balance, power, reaction time, and speed.

TABLE 3. Common Symptoms in Pregnancy, %

Fatigue	> 90
Diastasis recti abdominis	27-100
Nausea, vomiting	80-85
Varicose veins	73
Urinary incontinence	43
Low-back pain	35-61
Carpal tunnel syndrome	21-62
Supine hypotension	20
Symphysis pubis dysfunction	3

TABLE 4. Potential Mechanisms Leading to Injuries or Interfering With Exercise in Pregnancy[10]

Maternal
Laxity of joints and ligaments may predispose musculoskeletal injuries, pelvic girdle pain caused by hormonal actions, relaxin, and other) and lordosis/low background pain (due in part to the increase in hormonal actions and anatomic changes)[11,12]
Edema could cause nerve compression syndrome
Cardiovascular events: supine hypotension, arrhythmia, and aortocaval syndrome
Dehydration, heat stress, and increased catecholamines could be the cause for first-trimester miscarriage[13] and premature labor in the third trimester
Fetal
Heat stress could cause congenital malformations[14]
Impaired uterine and umbilical blood flow could cause: fetal hypoxia, fetal distress, and reduced birthweights[15]
Fetal heart rates increase 10-30 bpm, reflecting normal responses.[16,17] Rare occurrences of fetal bradycardia were documented[18]
Prematurity

Most of these benefits, if not all, can be maintained in pregnancy; however, due to normal anatomic and physiological changes and adaptations in pregnancy some limitations may occur.

These limitations may be more relevant for elite athletes while engaging in strenuous competitive activities during pregnancy.

The impediments to strenuous exercise in pregnancy include the following:

(a) Lower oxygen reserves secondary to the reduced lungs functional residual capacity and the increase in the oxygen consumption.
(b) The primary respiratory alkalosis of pregnancy may not be sufficient

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to compensate for the developing metabolic acidosis during strenuous and prolonged exercise.[19]

(c) Testing lowlander pregnant women, after rapid ascend to 6000 feet altitude (reduced oxygen environment) revealed some limitations to maximal aerobic exercise capacity; however, no ominous fetal responses were observed.[20,21]

Some concerns have been raised in the past about elite athletes engaging in prolonged and strenuous exercise, specifically could body core temperature reach teratogenic levels and is glucose homeostasis altered. In response to a 60 minutes treadmill exercise (at normal room temperature of 21°C) at 55% of VO_2 max, rectal (body core) temperature rose only by 0.6°C and remained within safe limits.[22] However, in the same study it was determined that during prolonged exercise at about 55% of maximal oxygen consumption, a continuous decrease of glucose levels approaching hypoglycemic levels occur after 45 minutes. Thus, strenuous and prolonged exercise in excess of 45 minutes can result in hypoglycemia. This information is helpful in guiding recreational and elite athletes on how to judiciously manage prolonged exercise in pregnancy and ascertain adequate caloric intake before exercise.[22]

Another issue for pregnant elite athletes to consider is that the resting heart rate is elevated in pregnancy, which results in a decreased functional heart rate.[23] Furthermore, as maternal heart rate increases at a slower rate in response to progressive exercise intensity, pregnant training target heart rates will differ from nonpregnant subjects; both blunted and nonblunted heart responses to exercise in pregnancy have been observed.[22]

For the recreational athlete, the use of ratings of perceived exertion may be a more effective means to monitor exercise intensity[24] and certainly most practical for most recreational athletes is the "talk test," as long as a woman can normally carry a conversation she is likely not overexerting herself.[25]

TABLE 5. Warning Signs to Discontinue Exercise in Pregnancy[2]

Vaginal bleeding
Regular and painful uterine contractions
Amniotic fluid leakage
Dyspnea before exercise
Dizziness
Headache
Chest pain
Muscle weakness affecting balance
Calf pain or swelling

Both recreational and elite athletes should be cognizant of when to discontinue an exercise session and seek medical attention as listed in Table 5.

Many physical and sports activities are safe; however, given specific maternal or fetal risks in pregnancy, certain activities such as those at risk for abdominal trauma should be avoided (Table 6). Because of the fetal inability to decompress during scuba diving, scuba diving is contraindicated in pregnancy. The fetal pulmonary circulation is affected by bubble formation, which could lead to fetal demise.

For lowlander, rapid ascent and exertion up to 6000 feet is safe in pregnancy,[21]

TABLE 6. Safe Physical Activities in Pregnancy

Walking
Swimming
Stationary cycling
Low-impact aerobics
Certain types of yoga and modified pilates (hot yoga and hot pilates should be avoided)
For previously active women (in consultation with health care providers):
Running or jogging
Racquet sports
Strength training
Unsafe physical activities in pregnancy[2]
Contact sports: boxing, ice hockey, soccer, basketball
Activities at high risk for falling: downhill snow skiing, water skiing, off-road cycling, gymnastics, horseback riding, and other
Scuba diving
Sky diving

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same information applies to air travel and airplane cabin pressure.

At women's prenatal visits, health care providers should inquire about lifestyle, physical activities, diet, and advise women on safe and unsafe activities.

Special Populations

EXERCISE PRESCRIPTION FOR OBESE PREGNANT WOMEN AT RISK FOR GDM, PREECLAMPSIA, AND FETAL MACROSOMIA

Obese pregnant women and their offspring are at risk for multiple comorbidities, among them GDM, preeclampsia, operative deliveries, macrosomia, epigenetic modifications, and other. It is becoming increasingly evident that lifestyle modification that includes physical activity and a judicious diet can prevent many of these complications. A sedentary lifestyle and additional weight gain have been recognized as independent risk factors for maternal and fetal complications. In view of the obesity epidemic and its consequences, the 2009 IOM gestational weight gain recommendations for obese pregnant women have been called into question.[26] Guidelines for lifestyle modification in pregnancy for obese women cannot be limited to physical activity alone, interventions should include both exercise and judicious diet.

One program for obese GDM women achieved normoglycemia and significantly reduced macrosomia and neonatal morbidity with judicious diet and an exercise program detailed below.[4,27,28]

Exercise prescription for obese pregnant women (modified from Artal et al[28])

Objective	Caloric expenditure > 28 metabolic equivalents (MET)-h/wk Metabolic equivalent of 30-minute brisk walk: 4-6 METs 5 (METS) × 3.5 × 100 kg/ 200(constant) = 9-10 Kcal/min 10 × 30 minutes = 300 kcal/d
Frequency	Daily
Intensity	Moderate, such as brisk walk
Time	At least 30 minutes daily
Type	Large muscle groups

Postpartum

In the absence of complications and depending on mode of delivery physical activities/exercise can be resumed as soon as medically safe. Rapid resumption of exercise routines has not been found to result in adverse effects. By and large, timing of return to exercise routines is gradual and variable. Pelvic floor exercises could be initiated in the immediate postpartum period. Elite athletes are particularly concerned about detraining and eager to return immediately to their training routine as endurance performance is decreased by 4% to 25% during periods of training cessation lasting 3 to 4 weeks. Breastfeeding could be initiated immediately postpartum. It is recommended to breastfeed before each exercise session.

Summary

In summary, the vast majority of pregnant women are sedentary; only 16% of all pregnant women follow ACOG guidelines. Contrary to past believes, pregnancy is an ideal time for lifestyle modification. Pregnant women are more prone to comply; they have access to medical care and are under close medical supervision.

A healthy lifestyle has short, long-term, and beyond benefits for mother and offspring.

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