Aerobic Exercise During Pregnancy

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Abstract: **A critical review of the current literature on aerobic exercise during pregnancy shows a lack of conclusive evidence supporting either the safety or danger of exercise to the fetal-maternal unit. There is no clinically significant effect on fetal outcome. The recommendations of the American College of Obstetricians and Gynecologists are presented and reviewed, and implications for family practitioners are discussed. (J Am Bd Fam Pract 1990; 3:50-3.)**

Regular exercise has become a way of life for an increasing number of women in the reproductive age group. Investigators have reported that up to 67 percent of women exercise regularly, but reports vary widely.[1] Although there are numerous studies about the safety of exercise during pregnancy, the results are inconclusive.[2-9] Prescribing an exercise regimen during pregnancy has become difficult because of the lack of uniform data. Women often question the safety of exercise during pregnancy and would benefit from more definite guidance from their physicians.

Benefits and Risks of Aerobic Exercise

Benefits of aerobic exercise during pregnancy are largely hypothetical. There are reports that exercise might shorten labor or help women endure prolonged labors.[2-4,8,10,11] Aerobic exercise has been shown to ameliorate states of depression,[12,13] and pregnancy, particularly the postpartum period, is associated with depression in as many as 50 percent of women.[14,15] There are no studies on exercise and well-being during pregnancy. Aerobic exercise during pregnancy can result in improved physical fitness.[16,11] In fact, some athletes have performed better shortly after a pregnancy than ever before.[17] Additionally, exercise might reduce weight gain during pregnancy,[4] which could be beneficial to those who are predisposed to excessive weight gain and to gestational diabetes.[18] However, less weight gain might also predispose to impaired fetal growth.

The hypothetical risks of aerobic exercise during pregnancy include shunting of blood flow away from the fetus, leading to fetal hypoxia[19-22]; overheating of the fetus, again risking fetal hypoxia and teratogenesis[6]; and most importantly, increasing chances of poor pregnancy outcomes: miscarriage, premature rupture of membranes, placental abruption, premature labor, or a fetus suffering from long-term intermittent hypoxia (Table 1).

The evidence to support the benefits of exercise during pregnancy is scanty and inconsistent. Studies have been hampered by the subjective clinical nature of identifying labor endpoints, health-provider bias, and the problems inherent in small sample size, self selection of patients, and retrospective designs. Erkkola[11] and Wong[10] found length of labor to be shorter in trained gravidas, and other studies confirmed the same finding.[2-4,8] Most other benefits are conjectural and supported mainly by anecdotal reports. By extrapolation from studies of nonpregnant women, it seems reasonable that aerobic exercise and conditioning can improve the capacity to endure a prolonged labor and positively influence the sense of well-being during pregnancy.

However, there is also evidence supporting the potential risks of aerobic exercise during pregnancy.

Uterine Blood Flow

Uterine and placental blood flow during exercise has been measured primarily in animals via chronic catheterization of the uterine artery. During acute bouts of exercise, uterine blood flow decreased 0–32 percent, with lesser declines or redistribution of flow and no decline in placental blood flow,[19-22] thus sparing the fetal-placental unit. Hyperthermia, alkalosis, and catecholamine excess all have been postulated as mechanisms.[19,23,24] Differences in physiologic processes between quadrupeds and humans make application of these studies to humans speculative.

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Table 1. Potential Benefits and Risks of Aerobic Exercise.

Benefits	Risks
1. Improve sense of well-being	1. Prolonged intermittent fetal hypoxia
2. Maintain physical fitness	2. Fetal temperature elevation
3. Improve ability to endure labor	3. Premature labor
4. Limit excessive weight gain	4. Premature rupture of membranes
5. Improve glucose homeostasis	5. Placental abruption

Hyperthermia

It has been postulated that maternal temperature is the major determinant of fetal temperature. Elevations in maternal temperature above 39°C (102.2°F) have been associated with teratogenesis.[25] Maternal temperature rises during bouts of exercise exceeding 70 percent $\dot{V}O_2$ max (maximal aerobic capacity as measured by peak oxygen uptake),[26] but studies suggest that the elevation remains far below the danger level.[26-28] Animal studies also show relations between hyperthermia and decreased birth weight, decreased placental weight, teratogenesis, and increased rates of fetal demise, but the association has been limited to early pregnancy.[25,29]

Fetal Heart Rate

In the past, technical difficulties have made assessment of fetal heart rate during pregnancy inaccurate. Results using Doppler monitoring have shown an increase in heart rate after exercise,[19,20,24,27,28,30,31] bradycardia during exercise,[31,32] or no significant change.[33] Carpenter[34] recently recorded fetal heart rate using two-dimensional ultrasonography during submaximal and maximal exercise. Thirty-seven women, some normally active and others self-described as sedentary, completed 85 submaximal and 79 maximal exercise tests. In 18 of these tests, fetal bradycardia was noted. Fifteen of the positive tests occurred at maximal exertion, and all but one occurred after the conclusion of the test (exercise bout). Thirty minutes later, a nonstress test was performed, and all were reactive. Future perinatal problems or pregnancy outcome were not predicted by the positive test.

It is not clear whether the fetal bradycardia is reflective of hypoxia, is catecholamine mediated, or, if recurring and chronic, leads to potential compromise of the fetus. In this study, bradycardia was very uncommon in exercise of less than maximal effort.

Pregnancy Outcome

Does exercise during pregnancy affect fetal outcome? Birth weight, Apgar scores, complications, and fetal death rate have been studied in relation to aerobic exercise.

Rats, both exercise trained and untrained, had litters with decreased fetal birth weights, fetal reabsorbtions, and decreased placental weights when exercised through midgestation.[5]

Human studies have been mostly retrospective or small. They showed no significant relations between exercise and fetal growth, length of gestation, or fetal outcome.[2,3,8,9] Clapp and Dickstein studied 336 women prospectively.[4] They were grouped nonrandomly as inactive, exercising at or above a minimal conditioning level – but stopping before 28 weeks' gestation, and exercising through the late third trimester. Minimal conditioning level was defined as exercising at least one-half hour, 3 times per week to 50 percent of $\dot{V}O_2$ max. Women who continued to exercise through the late third trimester, even when matched for prepregnancy maternal weight, gained significantly less weight during pregnancy (12.2 kg versus 16 kg), averaged shorter pregnancies (273 versus 280 days), and delivered significantly smaller babies (3000 g versus 3630 g). A trend was noted associating exercise with increased rate of premature rupture of membranes and decreased numbers of prolonged labors and cephalopelvic disproportion.[4] Uterine activity during the third trimester has not been shown to increase with aerobic exercise performed to 70 percent $\dot{V}O_2$ max.[35]

Regular exercise during pregnancy has not been shown to have any clinically significant effect on pregnancy outcomes as described above. Clapp and Dickstein's study, suggesting an effect on birth weight, has not been confirmed in other research. Additionally, the variation in birth weights was appropriate for gestational age at both the upper and lower limits.

Guidelines for Exercise

In 1985, the American College of Obstetricians and Gynecologists (ACOG) developed guidelines for exercise during pregnancy based on a

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Table 2. American College of Obstetricians and Gynecologists Guidelines.*

1. Regular exercise (at least three times per week) is preferable to intermittent activity. Competitive activities should be discouraged.
2. Vigorous exercise should not be performed in hot, humid weather or during a period of febrile illness.
3. Ballistic movements (jerky, bouncy motions) should be avoided. Exercise should be done on a wooden floor or a tightly carpeted surface to reduce shock and provide a sure footing.
4. Deep flexion or extension of joints should be avoided because of connective tissue laxity. Activities that require jumping, jarring motions, or rapid changes in direction should be avoided because of joint instability.
5. Vigorous exercise should be preceded by a 5-minute period of muscle warm-up. This can be accomplished by slow walking or stationary cycling with low resistance.
6. Vigorous exercise should be followed by a period of gradually declining activity that includes gentle stationary stretching. Because connective tissue laxity increases the risk of joint injury, stretches should not be taken to the point of maximum resistance.
7. Heart rate should be measured at times of peak activity. Target heart rates and limits established in consultation with the physician should not be exceeded.
8. Care should be taken to rise gradually from the floor to avoid orthostatic hypotension. Some form of activity involving the legs should be continued for a brief period.
9. Liquids should be taken liberally before and after exercise to prevent dehydration. If necessary, activity should be interrupted to replenish fluids.
10. Women who have led sedentary lifestyles should begin with physical activity of very low intensity and advance activity levels very gradually.
11. Activity should be stopped and the physician consulted if any unusual symptoms appear.

Pregnancy only

1. Maternal heart rate should not exceed 140 beats per minute.
2. Strenuous activities should not exceed 15 minutes in duration.
3. No exercise should be performed in the supine position after the fourth month of gestation is completed.
4. Exercises that employ the Valsalva maneuver should be avoided.
5. Calorie intake should be adequate to meet not only the extra energy needs of pregnancy, but also of the exercise performed.
6. Maternal core temperature should not exceed 38°C (100.4°F)

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study performed by an 8-member panel headed by Artal (Table 2).[36] The guidelines recommend exercising for no longer than 15 minutes, at a heart rate not to exceed 140 beats per minute, to a core temperature not greater than 38°C (100.4°F). These guidelines were not taken directly from Artal's research[32,36-38] but were designed to be safe for 99.9 percent of the pregnant population.[1] Used as the standard of care, they may be too restrictive for the majority of trained exercisers, but prescriptions in excess of these recommendations may be questioned by the courts in the event of poor pregnancy outcomes.

Summary

There is a general lack of evidence to support or refute the safety of exercise during pregnancy. Animal studies may not have applicability to humans, and human studies have been of small groups and mostly of poor design. Randomization is nearly impossible in this type of research.

There is a suggestion of impairment of blood flow to the uterine compartment, although evidence supports redistribution of blood flow, sparing the placental unit during exhaustive exercises. There are associated fetal heart rate abnormalities with exhaustive aerobic exercise; however, there is no evidence that pregnancies are jeopardized as a result of these changes. Further studies by prospective design with large numbers of exercisers are needed.

It might be reasonable to provide the ACOG guidelines to low-risk patients, in addition to conveying the possible dangers of strenuous exercise in hot, humid conditions.[35] Exercise levels above those recommended in the guidelines should be discussed with pregnant women contemplating more strenuous training programs. Until there is further evidence to support the safety of aerobic exercise during pregnancy, the physician's most important function is to discuss current knowledge with patients and allow them to make their own decisions.

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