Exercise in pregnancy

Guidelines of the American College of Obstetricians and Gynecologists for exercise during pregnancy and the postpartum period

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New guidelines for exercise in pregnancy and postpartum have been published by the American College of Obstetricians and Gynecologists

In January 2002 the American College of Obstetricians and Gynecologists (ACOG) published new recommendations and guidelines for exercise during pregnancy and the postpartum period. Regular exercise is promoted for its overall health benefits. Pregnancy is recognised as a unique time for behaviour modification and is no longer considered a condition for confinement. It is currently recognised that habits adopted during pregnancy could affect a woman’s health for the rest of her life. For the first time the recommendation suggests a possible role for exercise in the prevention and management of gestational diabetes.

The recommendations also promote exercise for sedentary women and those with medical or obstetric complications, but only after medical evaluation and clearance. Box 1 lists the absolute contraindications to aerobic exercise during pregnancy, and box 2 the relative contraindications. As with any form of exercise prescription, these recommendations also include the warning signs to terminate exercise while pregnant (box 3). The recommendations also offer guidelines for sports and recreational activities. It cautions against participation in contact sports and recommends avoidance of scuba diving.

As for postpartum resumption of activities, the recommendations note that rapid resumption has no adverse effects, but gradual return to former activities is advised. This review includes background and comments to the above recommendations.

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The health benefits of physical activity are well recognised, and conversely sedentary habits and low levels of cardiorespiratory fitness are leading risk factors for subsequent development of cardiovascular disease.

The Centers for Disease Control and Prevention and the American College of Sports Medicine (CDC-ACSM) have recommended the accumulation of 30 minutes or more of moderate intensity physical activity on most, and preferably all, days of the week. Moderate intensity physical activity is defined as activity with an energy requirement of 3–5 metabolic equivalents (METS). For most healthy adults, this is equivalent to brisk walking at 3–4 mph. The CDC-ACSM statement also recognises that more intense exercise performed in 20–60 minute sessions on three to five days a week will result in higher levels of physical fitness.

Despite the fact that pregnancy is associated with profound anatomical and physiological changes, there are few instances that should preclude otherwise healthy, pregnant women from following the same recommendations.

MUSCULOSKELETAL ADAPTATIONS

Anatomical and physiological changes during pregnancy have the potential to affect the musculoskeletal system at rest and during exercise. The most obvious of these is weight gain. The increased weight in pregnancy may significantly increase the forces across joints such as the hips and knees by as much as 100% during weight bearing exercise such as running. Such large forces may cause discomfort to normal joints and increase damage to arthritic or previously unstable joints.

“Despite a lack of clear evidence that musculoskeletal injuries are increased during pregnancy, these possibilities should nevertheless be considered when prescribing exercise in pregnancy.”

Data on the effects of increased weight of pregnancy on joint injury and pathology are lacking. Because of anatomical changes, pregnant women typically develop lumbar lordosis, which contributes to the very high prevalence (50%) of low back pain in pregnant women. Balance may be affected by changes in posture, predisposing pregnant women to loss of balance and increased risk of falling. However, increased incidence of falling during pregnancy has not been reported. Another musculoskeletal change during pregnancy is increased ligamentous laxity thought to be secondary to the influence of the increased levels of oestrogen and relaxin. Theoretically, this would predispose pregnant women to increased incidence of strains and sprains. This hypothesis has been substantiated by objective data on the metacarpophalangeal joints. Despite a lack of clear evidence that musculoskeletal injuries are increased during pregnancy, these possibilities should nevertheless be considered when prescribing exercise in pregnancy.

Box 1 Absolute contraindications to aerobic exercise during pregnancy (with permission from ACOG)

- Haemodynamically significant heart disease
- Restrictive lung disease
- Incompetent cervix/cerclage
- Multiple gestation at risk for premature labour
- Persistent second or third trimester bleeding
- Placenta praevia after 26 weeks gestation
- Premature labour during the current pregnancy
- Ruptured membranes
- Pregnancy induced hypertension

Box 2 Relative contraindications to aerobic exercise during pregnancy (with permission from ACOG)

- Severe anaemia
- Unevaluated maternal cardiac arrhythmia
- Chronic bronchitis
- Poorly controlled type I diabetes
- Extreme morbid obesity
- Extreme underweight (body mass index <12)
- History of extremely sedentary lifestyle
- Intrauterine growth restriction in current pregnancy
- Poorly controlled hypertension/pre-eclampsia
- Orthopaedic limitations
- Poorly controlled seizure disorder
- Poorly controlled thyroid disease
- Heavy smoker

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Uterine activity has been measured in exercising pregnant women,7–12 and minimal or no changes were reported during the last eight weeks of pregnancy. In some reports, physical activity has been associated with an increase in uterine contractions.7 The magnitude of uterine contractions reported is usually low. There are only anecdotal reports that strenuous training may cause preterm labour. Nonetheless, until there is unequivocal evidence that strenuous exercise has no impact, a physically active woman with a history of, or who is at risk of, preterm labour should be advised to reduce her activity in the second and third trimesters.13

NU TrITIONAL REQUIREMENTS

After the 13th week of pregnancy, about 1.2 extra MJ (300 kcal) per day are required to meet the metabolic needs of pregnancy.11–13 This energy requirement is increased further when daily energy expenditure is increased through exercise. In weight bearing exercise, such as walking, the energy requirement progressively increases with the increase in weight during the course of the pregnancy. A related consideration to nutrition and exercise during pregnancy is adequate carbohydrate intake. Pregnant women use carbohydrates at a greater rate both at rest and during exercise than do non-pregnant women.11–14 It also appears that, during non-weight bearing exercise in pregnancy, there is preferential use of carbohydrates, possibly the result of the anaerobic component of this type of activity.17

CARDIOVASCULAR ADAPTATIONS

Pregnancy induces profound alterations in maternal haemodynamics. Such changes include an increase in blood volume, heart rate, and stroke volume as well as cardiac output, and a decrease in systemic vascular resistance.15–18 By midpregnancy, cardiac outputs are 30–50% greater than before pregnancy.19 Most studies show that maternal stroke volume increases by 10% by the end of the first trimester and is followed by a 20% increase in heart rate during the second and third trimesters.20–22 Mean arterial pressure decreases 5–10 mm Hg by the middle of the second trimester and then gradually increases back to prepregnancy levels. The decreased mean arterial pressure is the result of increased uterine vasculature, uteroplacental circulation, and the decrease in vascular resistance of predominantly the skin and kidney.23 These haemodynamic changes appear to establish a circulatory reserve necessary to provide nutrients and oxygen to both mother and fetus at rest and during moderate but not strenuous physical activity.

The cardiovascular changes associated with body posture is an important consideration for pregnant women both at rest and during exercise. After the first trimester, the supine position results in relative obstruction of venous return and therefore decreased cardiac output. For this reason, supine positions should be avoided as much as possible during rest and exercise. In addition, motionless standing is associated with a significant decrease in cardiac output, thus this position should be avoided.24 Conflict evidence exists on maternal heart rate response to steady state submaximal exercise during pregnancy.25–27 Both blunted and normal responses to weight bearing and non-weight bearing exercise have been reported,24–29 making use of heart rate monitoring to guide exercise intensity during pregnancy difficult.

RESPIRATORY ADAPTATIONS

Pregnancy is associated with profound respiratory changes: minute ventilation increases by almost 50%, largely as a result of increased tidal volume.28–30 This results in an increase in arterial oxygen tension to 106–108 mm Hg in the first trimester, decreasing to a mean of 101–106 mm Hg by the third trimester.31 There is an associated increase in oxygen uptake, and a 10–20% increase in baseline oxygen consumption. Physiological dead space increases during pregnancy but the pregnancy remains unchanged.29–31 During treadmill exercise in pregnancy, arteriovenous oxygen difference is decreased.24 Because of the increased resting oxygen requirements and the increased work of breathing caused by pressure of the enlarged uterus on the diaphragm, there is decreased oxygen availability for the performance of aerobic exercise during pregnancy. Thus both subjective workload and maximum exercise performance are decreased.25–31 However, in some fit women, there appear to be no associated changes in maximum aerobic power or acid-base balance during exercise in pregnancy compared with non-pregnant controls.25–31

THERMOREGULATORY CONTROL

The cardiovascular system is affected most by the increased metabolic demands of exercise, and therefore a major factor is the dissipation of the excess heat generated by exercise. During pregnancy, basal metabolic rate, and therefore heat production, is increased above non-pregnant levels. The increase in body temperature during exercise is directly related to the intensity of the exercise. During moderate intensity, aerobic exercise in thermoneutral conditions, the core temperature of non-pregnant women rises an average of 1.5°C during the first 30 minutes of exercise and then reaches a plateau if exercise is continued for an additional 30 minutes.24 A steady state of heat production versus heat dissipation is accomplished by increased conductance of heat from the core to the periphery through the cardiovascular system as well as through evaporative cooling through sweat. If heat production exceeds heat dissipation capacity, for example during exercise in hot, humid conditions or during very high intensity exercise, the core temperature will continue to rise. During prolonged exercise, loss of fluid as sweat may compromise heat dissipation. Maintenance of euvolaemia, and therefore blood volume, is critical to heat balance.

Data on the effects of exercise on core temperature during pregnancy are limited.12,13 In fetal body core temperatures are about 1°C higher than maternal temperatures. In animal studies, an increase in maternal core temperature of more than 1.5°C during embryogenesis has been observed to cause major congenital malformations.32–34 These data coupled with the results of human studies suggest that hyperthermia in excess of 39°C during the first 45–60 days of gestation may also be teratogenic in humans.35 However, there have been no reports that hyperthermia associated with exercise is teratogenic in humans.

FETAL RESPONSES TO MATER NAL EXERCISE

In the past, the main concerns of exercise in pregnancy were focused on the fetus, and any potential maternal benefit was thought to be offset by potential risks to the fetus. In the uncomplicated pregnancy, fetal injuries are highly unlikely. Most of the potential fetal risks are hypothetical.

The principal question that remains to be answered is does the selective redistribution of blood flow during regular or prolonged exercise in pregnancy interfere with the transplacental transport of oxygen, carbon dioxide, and nutrients?
and, if it does, what are the lasting effects, if any? The indirect evidence is that there are no lasting effects. Given this concern, water exercise may be an excellent choice of exercise during pregnancy because, during immersion, a centripetal shift in blood volume occurs. It is well recognised that, during obstetric events, transient hypoxia could result initially in fetal tachycardia and an increase in fetal blood pressure. These fetal responses are protective mechanisms allowing the fetus to facilitate transfer of oxygen and decrease the carbon dioxide tension across the placenta. Any acute alterations could result in fetal heart rate changes, whereas chronic effects may result in intrauterine growth restriction. There are no reports to link such adverse events with maternal exercise.

Responses of fetal heart rate to maternal exercise have been the focus of numerous studies. Most of the studies show a minimum or moderate increase in fetal heart rate by 10–30 beats/min over baseline during or after maternal exercise. Fetal heart rate decelerations and bradycardia have been reported to occur with a frequency of 8.9%. The mechanism leading to fetal bradycardia during maternal exercise can only be speculated on: probably a vagal reflex, cord compression, or fetal head malposition. No associated lasting effects of the fetus have been reported. Several studies have attempted to assess umbilical blood flow during maternal exercise with Doppler velocimetry. These studies are technically difficult to conduct during exercise, so most measurements are taken before and after exercise, by which time any changes could have returned to normal.

Epidemiological studies have suggested for a long time that a link exists between strenuous physical activity, deficient diet, and the development of intrauterine growth restriction. This association appears to be particularly true for mothers engaged in physical work. It has also been reported that mothers whose occupation requires standing or repetitive, strenuous, physical work such as lifting have a tendency to deliver earlier and have small for gestational age infants. However, other reports have failed to confirm these associations, suggesting that other factors or conditions, such as insufficient nutrition, have to be present for strenuous activities to affect fetal growth.

“It appears that birth weight is not affected by exercise in women who have adequate energy intake.”

In another study it was concluded that mean birth weight is substantially lower when women exercised at or above 50% of preconception levels compared with non-exercisers. Another study found no difference between birth weight of offspring of vigorous exercisers and those of sedentary women, whereas others even found an increase in birth weight. It appears, however, that birth weight is not affected by exercise in women who have adequate energy intake. Reports on continuous physical training during pregnancy in athletes indicate that such activities carry very little risk.

Although the reported birth weights are lower than expected by an average of 500 g, these facts may be a partial explanation of some anecdotal reports of shorter duration of labour in some of these subjects.

The information available in the literature is too limited to allow risk assignment for either premature labour or fetal growth restriction in recreational or professional athlete exercising mothers, and the link to deficient diets has not been sufficiently addressed. Clinical observations indicate that patients at risk of premature labour may have labour triggered by exercise. Women who are diet conscious often do not receive the minimum required nutrients. The combined energy requirements of pregnancy and exercise coupled with poor weight gain may lead to fetal growth restriction.

**CLINICAL EVALUATION**

Exercise prescription requires knowledge of the potential risks and assessment of the physical ability to engage in various activities. Given the potential risks, albeit rare, thorough clinical evaluation of each pregnant woman should be conducted before an exercise programme is recommended. Routine prenatal care, as advocated in ACOG publications, is sufficient for monitoring the exercise programme.

**MEDICAL SCREENING BEFORE EXERCISE**

The overall health, obstetric, and medical risks should be reviewed before a pregnant woman is prescribed an exercise programme. In the absence of contraindications, a pregnant woman should be encouraged to engage in regular, moderate intensity physical activity to continue to derive the same associated health benefits during pregnancy as before pregnancy. However, there are contraindications to exercise because of pre-existing or developing medical conditions, and pregnancy is not different. In addition, certain obstetric complications may develop in pregnant women regardless of the previous level of fitness, which would preclude them from continuing to exercise safely during pregnancy. The contraindications to exercise listed are suggested only as guides to determining the appropriateness of exercise during pregnancy for individual women. Box 3 highlights the warning signs of complications.

**EXERCISE PRESCRIPTION**

The elements of exercise prescription should be considered in every physical activity framework regardless of its purpose—that is, basic health, recreational pursuits, or competitive activities. Consideration should be given to the type and intensity of exercise as well as to the duration and frequency of exercise sessions to carefully balance between potential benefits and potential harmful effects. Additional attention should be given to progression in intensity over time.

**Basic exercise prescription for overall health and wellbeing**

**Type of exercise**

Exercise prescription for the development and maintenance of fitness in non-pregnant women consists of activities to improve cardiorespiratory (aerobic exercise) and musculoskeletal (resistive exercise) status. Exercise prescription in pregnancy should include the same elements. Aerobic exercise can consist of any activities that use large muscle groups in a continuous rhythmic manner—for example, activities such as walking, hiking, jogging/running, aerobic dance, swimming, cycling, rowing, cross country skiing, skating, dancing, and rope skipping. Because control of exercise intensity (see below) within rather precise limits is often desirable at the beginning of an exercise programme, the exercise prescription includes activities that are particularly useful. There are no data to support the restriction of pregnant women from participating in these activities, although some activities carry more risk than others. There are several activities that pose increased risks in pregnancy such as scuba diving and exercise in the supine position. Swimming, however, has not been associated with adverse effects and has the advantage of creating a buoyant condition that is well tolerated. Activities that increase the risk of falls, such as skiing, or those that may result in excessive joint stress, such as jogging and tennis, should include cautionary advice for most pregnant women, but evaluated on an individual basis with consideration for individual abilities. Certainly, the risk of related injuries is difficult to predict.

In addition to aerobic activities, activities that promote musculoskeletal fitness are part of an overall exercise prescription. Typically, these include both resistance training (weightlifting) and flexibility exercises. Limited information
exists on strength training during pregnancy. In one study, 3 individually prescribed strength training (one set of up to 12 repetitions) of multiple muscle groups was used as part of an overall conditioning programme for pregnant women. Fetal heart rates were monitored during training at 28 and 38 weeks gestation, and they remained unchanged. It was concluded that relatively low weights with multiple repetitions lifted through a dynamic range of motion appear to be a safe and effective type of exercise during pregnancy. Although supporting data are lacking, it would be prudent to limit repetitive isometric or heavy resistance weightlifting and any exercises that result in a large pressor effect during pregnancy. Because of the increased relaxation of ligaments during pregnancy, flexibility exercise should be individualised for the same reason. Maintenance of normal joint range of motion, however, should not interfere with a moderate exercise routine in pregnant women.

Intensity of exercise
Intensity is the most difficult component of an exercise regimen to prescribe for pregnant women. To derive health benefits, non-pregnant women are advised to participate in at least moderate intensity exercise. In the combined CDC-ACSM recommendations for physical activity and health, moderate exercise is defined as exercise of 3–4 METS or any activity that is equivalent in difficulty to brisk walking. There is no reason to alter this recommendation for pregnant women with no medical or obstetric complications. The recommended intensity of physical activity for developing and maintaining physical fitness is somewhat higher. The ACSM recommends that intensity should be 60–90% of maximal heart rate or 50–85% of either maximal oxygen uptake or heart rate reserve. The lower end of these ranges (60–70% of maximal heart rate or 50–60% of maximal oxygen uptake) appears to be appropriate for most pregnant women who did not engage in regular exercise before pregnancy, and the upper part of these ranges should be considered only for those who wish to continue to maintain fitness during pregnancy. In a meta-analysis study of exercise and pregnancy, it was reported that, with exercise intensities of 81% of heart rate maximum, no significant adverse effects were found.

Given the variability in maternal heart rate responses to exercise, target heart rates cannot be used to monitor exercise intensity in pregnancy.

Ratings of perceived exertion have been found to be useful during pregnancy as an alternative to heart rate monitoring of exercise intensity. For moderate exercise, ratings of perceived exertion should be 12–14 (somewhat hard) on the 6–20 scale. Evidence of the efficacy of this approach is that, when exercise is self paced, most pregnant women will voluntarily reduce their exercise intensity as pregnancy progresses. Although an upper level of safe exercise intensity has not been established, women who were regular exercisers before pregnancy and who have uncomplicated, healthy pregnancies should be able to engage in high-intensity exercise programmes, such as jogging and aerobics, with no adverse effects. The nutritional, cardiovascular, and musculoskeletal condition of the subject as well as fetal wellbeing should be periodically assessed during the prenatal office visits in pregnant women undertaking high-intensity exercise programmes. Additional testing should be considered as clinically indicated—for example, non-stress fetal heart testing and ultrasound to assess fetal growth. Dietary modifications and changes in exercise routines should also be considered if clinically indicated.

Duration of exercise
Two concerns should be addressed before prescribing prolonged exercise (in excess of 45 minutes of continuous exercise) regimens for pregnant women. The first is thermoregulation. Exercise preferably should be performed in a thermoneutral environment or in controlled environmental conditions (air conditioning). Attention to proper hydration and subjective feelings of heat stress are essential. The second concern is energy balance. Energy costs of fitness exercise should be estimated and balanced by appropriate energy intakes. Setting of limits to exercise durations is not possible because of the reciprocal relation between exercise intensity and duration. It should be noted that, in studies in which exercise was self paced, in a controlled environment, core temperatures rose less than 1°C over 30 minutes and stayed within safe limits. Accumulating the activity in shorter exercise periods, such as 15 minute periods, may obviate concerns related to thermoregulation and energy balance during exercise sessions. ACSM recommends that non-pregnant women exercising to increase or maintain fitness may exercise for up to 60 minutes per exercise session.

Frequency of exercise
In the current CDC-ACSM recommendations for exercise aimed at health and wellbeing, the recommendation for non-pregnant women is that an accumulation of 30 minutes a day of exercise occur on most if not all days of the week. In the absence of either medical or obstetric complications, pregnant women could adopt the same recommendation.

Progression
Pregnant women who have been sedentary before pregnancy should follow a gradual progression of up to 30 minutes a day. This recommendation is not different from that for non-pregnant sedentary women who begin an exercise programme. Pregnancy is not a time for greatly improving physical fitness. Therefore, women who have attained a high level of fitness through regular exercise before pregnancy should exercise caution in engaging in higher levels of fitness activities during pregnancy. Further, they should expect overall activity and fitness levels to decline somewhat as pregnancy progresses.

Recreational activities
Most reports of participation in active recreational activities during pregnancy are anecdotal in nature. In general, participation in a wide range of recreational activities appears to be safe. The safety of each sport is largely determined by the specific movements required by that sport. Activities with a high risk of falling or those with a high risk of abdominal trauma should be considered undesirable. Participation in recreational sports with a high potential for contact, such as ice hockey, soccer, and basketball, could result in serious trauma to both mother and fetus. Similarly, recreational activities with increased risk of falling, such as gymnastics, horseback riding, downhill skiing, and vigorous racquet sports, have inherent high risk of trauma in pregnant and non-pregnant women. Scuba diving should be avoided throughout pregnancy because the fetus is at increased risk of decompression sickness secondary to the inability of the fetal pulmonary circulation to filter bubble formation. As for exertion at altitude, reports are available for activities at less than 2500 m (6000 feet). In one study conducted at 2500 m, it was concluded that pregnant women may engage in periods of exercise and/or moderate physical tasks, but are limited in performing high-intensity physical activities. No adverse fetal responses were recorded during this study.

Other studies confirm the lack of adverse effects on the fetus at altitudes typically used for mountain sports such as hiking or skiing (less than 2500 m). All women who are recreationally active should be aware of signs of altitude sickness for which they should stop exercise, descend from altitude, and seek medical attention (box 3).

Water exercise
The major effect of immersion is a redistribution of extravascular fluid into vascular space, resulting in an increase in blood volume. This effect occurs very rapidly and is proportional to the depth of immersion, leading to a decrease in
systemic blood pressure (both systolic and diastolic). These changes are accom-
pounded by a decrease in antidiuretic hor-
more, aldosterone, and plasma renin activity while the atrial natriuretic factor
decreases.

The shift in blood volume leads to
ventilatory changes with a decline in
vital capacity, ventilation capacity, and
expiratory reserve volume. Immersion
is ideal for dissipating exercise induced
increased temperature during exercise in
pregnancy.

“No adverse effects on the fetus have
been reported to occur
during water exercise in
pregnancy.”

In longitudinal studies of immersion
exercise in pregnancy at 60% maximal
oxygen consumption, it was found to be
a safe activity, with advantageous effects
on oedema, thermal regulation, and
buoyancy, thus minimising the risk of
joint injuries. Furthermore, no adverse
effects on the fetus have been reported
to occur during water exercise in
pregnancy.

COMPETITIVE ATHLETICS

Competitive athletes are likely to en-
counter the same limitations as faced by
recreational athletes during pregnancy.
The competitors tend to maintain a more
strenuous training schedule throughout
pregnancy and to resume high intensity
postpartum training sooner. The
concerns of the pregnant, competitive ath-
lete fall into two general categories: (a)
the effects of pregnancy on competitive
ability; (b) the effects of strenuous train-
ing and competition on pregnancy, par-
ticularly the fetus. Such athletes would
certainly require closer obstetric supervi-
sion than the routine prenatal care.
Additional testing and intervention
should occur as clinically indicated.

As pregnancy progresses, several
changes occur that will prevent the ath-
lete from attaining the same perform-
ance levels as before pregnancy. Weight
gain, by itself and in the presence of lax-
ity of joints and ligaments and change in
the centre of gravity, will cause unavail-
able limitations in most sporting activi-
ties. The ability to stop and start or to
change direction will progressively
decrease. Any attempts to substitute comp-
ensatory movements for finely tuned
skill movements result in inefficient
movement, decrease in competitive abil-
ity, and increase in the risk of injury. Per-
formance in sports in which endurance is
important may be adversely affected
by the physiological anaemia commonly
associated with the increased blood
volume of pregnancy.

Despite the fact that pregnancy ad-
versely affects performance in the com-
petitive athlete, most elite athletes prefer
to continue to train during pregnancy.
The relatively high intensity, long dura-
tion, and frequent workout schedules of
most competitive athletes may place
them at greater risk of thermoregulatory
complications during pregnancy. Partic-
ular attention should be paid to main-
taining proper hydration during and
between these exercise sessions. Fluid
balance during an exercise session can
be monitored by weighing before and
after the session. Any loss of weight is
fluid loss that should be made up before
the next exercise session (1 lb weight
loss = 1 pint of fluid).

Because of the type (high intensity,
prolonged, and frequent) of training
done by elite athletes, it is likely that
weight gain will be less for both mother
and fetus than for sedentary women.
This lower birth weight has been attrib-
uted to decreased neonatal fat mass.

SPECIAL POPULATIONS

Pregnant women with diabetes, morbid
obesity, or chronic hypertension should
have individualised exercise prescrip-
tion. The information available in the lit-
erature is limited with regard to the role
of physical activity for these women. Two
randomised trials of exercise training in
women with gestational diabetes have
been published. In one study, arm
ergonomy exercise three times a week
for about 20 minutes a session at 50% maximal
oxygen consumption resulted in
normalisation of glycaemic control
after four weeks in contrast with diet
alone. A second study included 41
women at 28–33 weeks gestation who,
despite dietary treatment, had persistent
fasting hyperglycaemia of 105–140 mg/
dl. Study control subjects were treated
with insulin. The exercise patients per-
formed moderate cycle exercise three
times a week and maintained an active
lifestyle for the duration of pregnancy.
Through this regimen, the exercising
patients maintained euglycaemia and
did not require insulin. In a study of
women with type 1 diabetes mellitus, a
postprandial walking programme did not
achieve the desirable glycaemic control.
Epidemiological data suggest that
exercise may even be beneficial in
the primary prevention of gestational
diabetes particularly in morbidly obese
women (body mass index > 33), but not
in women of normal weight. The
American Diabetes Association has en-
dorsed exercise as “a helpful adjunctive
therapy” for gestational diabetes when
euglycaemia is not achieved by diet
alone. There is currently no infor-
mation available on the effect of exercise
on women with chronic hypertension.
The standard of care for women with
pregnancy induced hypertension is to
limit physical activity.

EXERCISE IN THE POSTPARTUM
PERIOD

Many of the physiological and morpho-
logical changes of pregnancy persist for
to six weeks post partum. Thus, exer-
cise routines may be resumed only
gradually after pregnancy and should be
individualised. Physical activity can thus
be resumed as soon as physically and
medically safe. This will certainly vary
from one woman to another, with some
being capable of engaging in an exercise
routine within days of delivery. There are
no published studies to indicate that, in
the absence of medical complications,
rapid resumption of activities will result
in adverse effects. Undoubtedly, having
undergone detraining, resumption of
activities should be gradual. No known
maternal complications are associated
with resumption of training. Moderate
weight reduction while nursing is safe
and does not compromise neonatal
weight gain. Failure to gain weight is
associated with decreased milk produc-
tion, which may be secondary to inad-
quate fluid or nutritional intake to bal-
ance training induced outputs. Nursing
women should consider feeding their
infants before exercising in order to
avoid the discomfort of engorged
breasts. In addition, nursing before
exercise avoids the potential problems
associated with increased acidity of milk
secondary to any build up of lactic acid.
Finally, a return to the restrictive
limits of exercise after pregnancy has
been associated with decreased postpartum
depression, but only if the exercise is stress relieving and
not stress provoking.

SUMMARY

Pregnancy should not be a state of
confinement, and pregnant women with
uncomplicated pregnancies should be
encouraged to continue and engage in
physical activities. Recreational and
competitive athletes with uncomplicated
pregnancies may remain active during
pregnancy, and modify their usual exer-
cise routines as indicated in this review.
All active pregnant women should be
examined periodically to assess the
effects of their exercise programmes on
the developing fetus, so that adjustments
can be made if necessary. Women with
medical or obstetric complications
should be carefully evaluated before rec-
ommendations on physical activity par-
ticipation during pregnancy are made.
Despite the fact that pregnancy is associ-
ated with profound anatomical and
physiological changes, exercise has mini-
mal risks and confirmed benefits for
most women.


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In March 2002, Sports Medicine Australia (SMA) also released a consensus statement on exercise in pregnancy, independently of the American College of Obstetricians and Gynecologists (ACOG). Not surprisingly most of the recommendations are similar, with an emphasis on encouraging activity during pregnancy because of its short and long term benefits. The latest guidelines also acknowledge that an exercise programme can be started or increased in a normal, healthy pregnancy.

After extensive review of the literature, both guidelines concede that there are no reported adverse pregnancy outcomes related to exercise during pregnancy and most of the potential risks such as reduced transplacental oxygen and nutrients, and hypothermia related teratogenesis are hypothetical. The ACOG (and SMA) no longer recommend heart rate targets to assess intensity of exercise but prefer self regulation and scales of perceived exertion. The ACOG guidelines only briefly comment on contact sports, advising that there may be a risk of trauma and therefore they should be avoided.

SMA’s statement was initiated after a ban was placed on pregnant women participating in the moderate contact sport of netball. These guidelines therefore describe in more detail related research into abdominal trauma and sports injuries. This discussion suggests that many contact sports may in fact pose no serious risk to the mother or fetus.

The ACOG’s guidelines for the first time provide helpful comment on competitive athletes and special groups (diabetic, obese, and hypertensive) of pregnant women. Overall, the latest ACOG guidelines are more comprehensive and generous in their advice to pregnant women. Like SMA, they encourage women to exercise before, during, and after pregnancy after appropriate medical assessment and advice.

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