

AMERICAN CHIROPRACTIC BOARD OF SPORTS PHYSICIANS™ POSITION STATEMENT ON

EXERCISE AND ATHLETIC PARTICIPATION DURING PREGNANCY

Introduction

It is impossible to provide a set of definitive recommendations that apply to the safe participation of all pregnant females in any type of exercise or sporting event. There is simply too much variability with respect to individual fitness levels, intensity and nature of the exercise and specifics of each individual pregnancy. Consequently, the intention of this position statement is to outline policy and recommendations which are currently available through the American College of Obstetrics and Gynecology (ACOG), American College of Sports Medicine (ACSM) and the Society of Obstetrics and Gynaecology of Canada (SOGC). These recommendations and considerations should provide the sports practitioner with a better understanding of the demands of pregnancy and how these patients may more safely continue to participate in exercise and sport while minimizing the potential risk to the unborn child.

There is currently disagreement among national organizations concerning several aspects of exercise and a pregnant female. Due to ethical concerns of controlled randomized studies, recommendations are primarily extrapolations of experimental findings of non-human subjects. The ACOG, ACSM and SOGC differ on the optimal interpretation of these findings to ensure the safety of both the mother and unborn child. Furthermore, these recommendations must be conservative enough to apply to all pregnant females from the recreational fitness buff to the elite competitive athlete. Each individual must be assessed to establish personal fitness level, demands of the physical activity, and medical considerations including obstetrical history in order to tailor exercise and athletic recommendations appropriate for that patient.

Methods and Materials

Publications received from the ACOG included the following: ACOG Technical Bulletin Number 189 (Feb. 1994): An Educational Aid to Obstetrician-Gynecologists entitled "Exercise During Pregnancy & The Post-Partum Period", ACOG Technical Bulletin Number 173 (Oct. 1992) "Women and Exercise" and the ACOG Patient Education pamphlet entitled "Exercise & Fitness: A Guide for Women" (APO45). The Society of Obstetricians and Gynecologists of Canada forwarded a copy of the SOGC Clinical Practice Guidelines for Obstetrics entitled "Healthy Beginnings: Guidelines For Care During Pregnancy and Childbirth" which was approved by the SOGC Council as a policy statement in November 1995 and revised in 1998. Finally, the guidelines and recommendations for pregnant athletes from the American College of Sports Medicine were obtained from a chapter on special populations in the publication entitled *Guidelines for Exercise Testing & Prescription, 6th Ed.* These national guidelines were reviewed to determine specific recommendations as well as to identify discrepancies and incongruent information regarding exercise and athletic participation during pregnancy.

There are several aspects of physical activity and pregnancy that are of concern when considering guidelines for an exercising female. The ACOG, ACSM and SOGC have established guidelines and recommendations that cover many similar issues. In particular, recommendations are available concerning exercise intensity, contraindications, appropriate physical activities and general exercise concerns. Unfortunately, there is both agreement and discrepancy found when information provided by these three organizations are compared. As such, some of these recommendations will be included so that the differences can be identified and the reader can formulate his or her own conclusion regarding these issues and relevant patients.

Exercise Intensity

A primary concern with vigorous exercise is the potential for exercise induced hyperthermia. There is an increase in basal metabolic rate and heat production during pregnancy while fetal temperatures average 1 degree C above maternal readings. (2) Furthermore, a maternal temperature of 39.2 degrees C or 102.6 degrees F has been identified as a possible threshold for teratogenic and neural tube defects within the first trimester of pregnancy. (2,3,5) The level of intensity at which a pregnant woman may safely exercise should be carefully considered by the healthcare provider.

The SOGC clinical practice guidelines suggests that pulse heart rate, rating of perceived exertion (Borg scale of RPE) and the ability to talk during physical activity ("talk test") be monitored during exercise. (3) The SOGC states that the ACOG's recommendation of 140 beats per minute is "too low for many women" and suggests target heart rate zones which reflect maternal age, physical fitness, stage of pregnancy and other individual factors. These zones reportedly apply to all apparently healthy pregnant women and are reprinted in **Table 1**. In addition to heart rate, the pregnant female was advised to monitor the intensity of her exercise by determining a rating of perceived exertion according to the Borg 15 Point Scale. A range of 12 to 14 was recommended using that particular RPE scale. The final method to monitor exercise intensity was the "talk test". That test was simply the ability of an individual to carry on a conversation during exercise. An inability to talk indicated that the exercise had become anaerobic and therefore excessively intense for a pregnant individual. A final recommendation on that subject advised against an increase in either intensity or duration of habitual physical activity prior to the 15th week or after the 28th week of gestation. The risk of such increases was early teratogenic effects during neural tube closure and increased fetal demands for oxygen and fuel in later weeks. (3)

Maternal Age (Years)	Heart Rate Target Zone (Beats/Min)
Less than 20	140-155
20 to 29	135-150
30 to 39	130-145
Greater than 40	125-140

Similar to SOGC guidelines, the ACSM recommends that exercise intensity during pregnancy is best monitored by means of pulse heart rate, rating of perceived exertion (Borg scale of RPE) and the "talk test". However, the ACSM considers conventional heart rate target zones as a less reliable means of monitoring intensity during pregnancy since the resting heart rate was increased

throughout pregnancy and maximal heart rate may be reduced in later gestation. Alternatively, the ACSM suggested rating of perceived exertion (RPE) as a more stable method regardless of pregnancy status. According to the 6 to 20 point Borg Scale, a target intensity of 12 to 14 is appropriate for pregnant women. Lastly, overexertion was to be avoided by employing the "talk test" as previously described. (5)

There was some discrepancy with regard to the ACOG's recommendations concerning exercise intensity during pregnancy. The ACOG Patient Education handout entitled "Exercise and Fitness" advises pregnant women against exercising at an intensity that exceeds a maximum heart rate of 140 beats per minute. Furthermore, several physiological studies were outlined in the ACOG Technical Bulletin Number 189 which concluded that vigorous maternal exercise caused 300 to 350 gram reductions in birth weight, significant increases in maternal core temperature and 5 to 15 beats per minute increases in fetal heart rates. A discussion of thermoregulatory concerns was also presented and concluded that the incidence of birth defects was not increased in women who continued to exercise during early pregnancy. Furthermore it states, in the beginning of the "Recommendations for Exercise in Pregnancy and Postpartum" section, that "there are no data in humans to indicate that pregnant women should limit exercise intensity and lower heart rates because of potential adverse effects". (2)

Contraindications to Exercise During Pregnancy

The ACOG, ACSM and SOGC have all established their own sets of absolute and relative contraindications to exercise during pregnancy. **Table 2** summarizes some of these medical conditions and concerns that preclude these women from physical activity. (2,3,5)

Table 2. Contraindications to Exercise During Pregnancy

ACOG Contraindications	SOGC Contraindications	ACSM Absolute	ACSM Relative	SOGC Withdrawal	ACSM Discontinue
Pregnancy-induced hypertension	Previous obstetrical problems such as an incompetent cervix or a significant history of preterm labor	Heart disease	High blood pressure	Cardiac or pulmonary problems and anemia	Pain or bleeding
Preterm rupture of membranes	Medications that may alter maternal metabolic and cardiopulmonary capacities	Ruptured membranes	Anemia or other blood disorders	Vaginal bleeding during pregnancy	Dizziness or faintness
Preterm labor during the prior or current pregnancy or both.	Serious uncontrolled metabolic disorder (e.g., Type 1 diabetes mellitus or thyroid disease)	Preterm labor	History of intrauterine growth retardation	Pre-eclampsia/ eclampsia	Pubic pain
Incompetent cervix/ cerclage.	Infectious diseases (e.g., mononucleosis or hepatitis)	Multiple gestation	History of precipitous labor	Preterm. labor	Palpitations
Persistent second- or third-trimester bleeding.	Multiple gestation	Bleeding	Palpitations or Irregular heart rhythms	Intrauterine growth retardation	Back pain
Intrauterine growth retardation	Eating disorders, poor nutrition, or very low maternal adiposity	Placenta previa	Breech presentations in the last trimester	Abnormal glucose intolerance	Rapid heart rates
Women with a history of other medical or obstetrical conditions must be carefully evaluated before exercise is permitted. Such conditions include chronic hypertension and active thyroid, cardiac, vascular, or pulmonary disease.	Clinically significant cardiopulmonary disorders (e.g., ischemic or valvular heart disease, uncontrolled hypertension, peripheral vascular disease, chronic obstructive pulmonary disease) which may compromise maternal cardiac output, uterine blood flow, or arterial oxygen saturation	History of 3 or more spontaneous abortions or miscarriages	History of bleeding during pregnancy	Clinically significant pubic or lower back pain	Shortness of breath

Incompetent cervix
 Extremely sedentary lifestyle
 Diabetes
 Thyroid disease
 Excessive obesity
 Extreme underweight
 Multiple gestation
 Difficulty in walking

Activities Acceptable During Pregnancy

General exercise recommendations concerning activities considered safe and those to be avoided during pregnancy have been made by the ACOG, ACSM, and SOGC. These activities and exercises are outlined in **Table 3 and 4.** (2,3,5). Unfortunately, there are few references made concerning the safe participation in most sports. Sports to be avoided included those with the risk of abdominal trauma or those in which a loss of balance or coordination could result in personal injury for the pregnant female and unborn child. (2,3,5)

Table 3. Recommended Activities Acceptable During Pregnancy

ACOG Handout	ACOG Tech Bulletin #189	SOGC	ACSM
<ul style="list-style-type: none"> Walking Jogging Swimming Tennis Golf Bowling Alpine skiing on "safe slopes" 	<ul style="list-style-type: none"> Continuation of regular, mild-to-moderate exercise routines three or more times per week is preferred to intermittent activity Exercise until fatigue but not exhaustion Monitor maternal symptoms to guide any modifications in exercise intensity Non-weight bearing exercises are preferred to minimize risk of injury Ensure proper heat dissipation, especially in the first trimester, through adequate fluid replacement and appropriate clothing and environmental conditions Pregnant women must ensure adequate diet to satisfy the increase in caloric needs of exercise as well as the 300 kcal/day associated with pregnancy Pre-pregnancy exercise routines should be resumed gradually after delivery as physiologic and morphological changes persist 4-6 weeks postpartum. 	<ul style="list-style-type: none"> Rhythmical exercises which use large muscle groups Walking Swimming Stationary cycling Low impact aerobics Modified abdominal exercises which use side lying or standing positions Kegel exercises to strengthen the pelvic floor muscles 	<ul style="list-style-type: none"> Non-weight bearing activities such as stationary cycling or exercise in water Walking Transition from weight bearing to non-weight bearing activity as body weight increases Exercises can be resumed 8 weeks postpartum or as advised by the obstetrician Guidelines for mode, frequency and duration of exercise for the general, non-pregnant population (as outlined in chapter 5 of the guidelines for exercise testing and prescription, 4th edition) are reportedly appropriate for pregnant women

There is little information available concerning the safe participation in Olympic sporting events. Most National Governing Bodies for winter and summer Olympic sports do not have any formal policy or recommendations concerning pregnant athletes with the noted exception of boxing. (10) It is the formal policy of the United States Amateur Boxing Association is that women may not participate in amateur competitive boxing while pregnant. However, individual State Athletic Commissions should be investigated as the existence of policy by such an agency may supersede that of the National Governing Body for that particular sport. (10)

Table 4. Recommended Activities To Be Avoided During Pregnancy

ACOG	ACOG	SOGC	ACSM
<ul style="list-style-type: none"> Prolonged strenuous exercise should probably be avoided, particularly in hot weather water skiing at any time overheating during any exercise (rectal or subaxillary temperature not to exceed 101 degrees F following a routine exercise program) diving during latter portions of pregnancy dehydration during any exercise surfing at any time scuba diving at any time 	<ul style="list-style-type: none"> Avoid supine positions after the first trimester. Avoid prolonged positions of motionless standing. Morphological changes in pregnancy should serve as a relative contraindication especially during the third trimester. Avoid exercise with the potential for even mild abdominal trauma or activities in which a loss of balance would be detrimental to either the mother or fetus. 	<ul style="list-style-type: none"> exercising in warm and/or humid environments (limit hot tubs, saunas and steam which could lead to adverse fetal outcome) anaerobic exercise or exercising to maximum heart rate sports which require increased balance coordination or the potential for injury, falls and blows downhill skiing (modify or avoid) mountain climbing (modify or avoid) water skiing 	<ul style="list-style-type: none"> for already exercising women, athletic training for competition should be discontinued weight training for muscular conditioning is controversial flexibility exercises are to be avoided due to "looseness of joints" (however, "stretching to relieve muscle soreness for postural imbalance may be beneficial") supine positions during later gestation (after fourth month) high ambient

Table 4. Recommended Activities To Be Avoided During Pregnancy

ACOG	ACOG	SOGC	ACSM
<ul style="list-style-type: none">exercising at an intensity that causes maximum heart rate to exceed 140 beats per minute		<ul style="list-style-type: none">supine positionsoverstretching ligaments and tendons that may have increased laxity caused by gestational hormonesscuba diving	temperatures and humidity during exercise

Additional Considerations for Exercise During Pregnancy

It is important for the healthcare provider to establish the prepregnancy level of physical fitness and exercise at the initial prenatal visit. At that time, the patient should be questioned about daily routines including work and recreational physical activities as well as planned changes during the pregnancy. Information should be gathered concerning medical and obstetrical history that might restrict or prohibit exercise participation. These details provide a pre-pregnancy reference point from which an exercise program may be started or continued during the course of the pregnancy. Follow up questions concerning level of physical activity and any changes in medical history should be part of subsequent visits. (3)

The prenatal visit also provides the healthcare provider with an opportunity to educate the pregnant female on some of the risks, benefits and concerns of exercise. Pregnant women should be warned against dehydration, hyperthermia and exercising to lose weight. According to Canada's Food Guide, pregnant women require 2200 to 2400 kcal/day with an additional 100 kcal/day during the first trimester and 300 kcal/day in the second and third trimesters. (3) This amount does not consider the additional caloric expenditure of physical activity and should be adjusted accordingly to ensure the substrate fuel demands of both the mother and developing fetus. These extra calories are best found in foods high in complex carbohydrates such as rice, pasta and potatoes which should make up at least 30 to 40 percent of the total daily intake. (3)

According to the SOGC, exercise programs are to include 10 to 15 minute warm-ups and cool-downs in order to prevent injuries and adverse affect on fetal heart rate. Duration should be 15 to 30 minutes with rest and fluid breaks if necessary. Regular exercise done three times a week is preferred to intermittent exercise. Adequate fluid and breast support is advised and exercises involving rhythmical contraction of large muscle groups are preferred. (3) Discussion of appropriate and contraindicated exercises should be discussed as well as methods of monitoring exercise intensity.

The ACOG indicates that most of the guidelines concerning the design of an exercise program are the same for both pregnant and nonpregnant females. (1) However, the ACOG points out that these recommendations are "reasonable extrapolations" and not the product of prospective, randomized clinical trials. Modifications to these general guidelines should be considered and exercise prescription in pregnancy should always be individualized and include a health assessment. In its publication entitled "Exercise During Pregnancy and Postnatal Period Home Exercise Programs", the ACOG provides a list of signs and symptoms which require immediate cessation of exercise during pregnancy. (6) This referenced list is also found within ACSM's Guidelines for Exercise Testing and Prescription. (5) (Refer to **Tables 5 and 6**)

Table 5. Serious Obstetrical Symptoms/Problems Requiring Withdrawal of Med Clearance

SOGC	ACOG/ACSM
Cardiac or pulmonary problems and anemia	Pain or bleeding
Vaginal bleeding during pregnancy	Dizziness or faintness
Pre-eclampsia/eclampsia	Pubic pain
Pre-term labor	Palpitations
Multiple gestation	Back pain
Abnormal glucose intolerance	Rapid heart rate
Intrauterine growth restriction (IUGR)	Shortness of breath
Clinically significant pubic or lower back pain	Difficulty in walking

Table 6. Symptoms of Common Obstetric Problems Indicating OB Consult

Evidence of bleeding
Fluid discharge from the vagina suggesting premature rupture of membrane
Sudden swelling of the extremities
Unexplained abdominal pain
Absence or decrease in fetal movement
Persistent uterine contractions suggesting the onset of premature labor
Insufficient weight gain
Other symptoms including persistent headaches, visual disturbances, dizziness, or general fatigue

The ACSM lists a number of benefits that are the result of a well-designed prenatal exercise program. These include improved aerobic and muscular fitness, facilitation of and recovery from labor and enhanced maternal psychological well being. Citing the same concerns as the SOGC of neural tube defects and competition for substrates, the ACSM does not advise the start of a new strenuous exercise program during the first or third trimesters. (5) Alternatively, gradual increases are to be introduced during the second trimester when the risks of exercise are relatively low. Weight training for muscular conditioning is described as "controversial" but pregnant women are advised to stretch but avoid flexibility exercises due to joint laxity. The ACSM recommends that a properly designed prenatal exercise program lasting 15 to 30 minutes and with a frequency of three to five times a week is usually well tolerated notwithstanding any contraindications. Appropriate and contraindicated exercises are listed in **Table 2 and 3**, however, it should be noted that the ACSM recommends that a woman who is already exercising prior to pregnancy should discontinue athletic training for competition. (5) Following the delivery, the ACSM indicates that exercise following general, non-pregnant guidelines of mode, frequency and duration can be resumed eight weeks postpartum or as directed by the patient's obstetrician. According to the ACSM's Guidelines for the Team Physician, "women may resume a characteristic sports activity such as swimming or cycling within 2 weeks of uncomplicated postpartum recovery." Furthermore, ACOG were to be followed during training to establish conservative exercise targets in order to avoid injury or overuse injuries. (7)

Discussion

The guidelines and recommendations found within the ACOG, ACSM and SOGC provide direction for management of the pregnant patient. There was both agreement and discrepancy among the national organizations with regards to exercise intensity, contraindications and recommendations for suitable activities. These organizations were able to provide reasonable physiological support behind their recommendations however the lack of consensus provides ambiguity in the development of exercise prescriptions for a pregnant female.

The ACSM identifies improved aerobic and muscular fitness as well as facilitation of and recovery from labor as benefits derived from regular prenatal exercise. (5) However, the ACOG states that a "most women who perform regular weight-bearing exercise prior to pregnancy note a progressive decline in performance beginning in early pregnancy." (3)

VO₂ Max was also significantly lower in pregnant women because of the enlarging uterus limiting diaphragm expansion and increased fetal oxygen demand. (13) For that reason, carbohydrates are used preferentially which causes significantly reduced plasma glucose concentrations during strenuous exercise or prolonged workouts lasting more than 45 minutes. In order to reduce the risk of hypoglycemia, adequate calories and workout sessions lasting less than 45 minutes should be recommended. (13) Furthermore, the research is divided with regards to labor and delivery. (9,11,13,15) Some studies report quicker labor and delivery while others have failed to identify any improvement in either the duration or severity of labor and delivery following a regular prenatal exercise program. (11)

There is discrepancy with regards to the level of exercise intensity appropriate during exercise as well as the most effective way of monitoring this aspect of physical activity. The ACOG provides the recommendation in a patient education handout that a maximum heart rate of 140 beats per minute is considered a safe upper limit during pregnancy. However, ACOG Technical Bulletin 189 states "there are no data in humans to indicate that pregnant women should limit exercise intensity and lower heart rates because of potential adverse effects". The SOGC believes that 140 beats per minute is too conservative for many women and suggests their own target heart rate zones which consider several variables which should reportedly be factored into target heart rate determination. The recommended methods of monitoring heart rate were similar for the SOGC and ACSM however, unlike the SOGC, the ACSM did not believe that heart rate determination was as accurate a measure of exercise intensity as was the measure of perceived exertion found in Borg and other related scales.

Recommendations concerning participation in specific athletic and recreational activities were variable among the national organizations investigated. (2,3,4,5,6,7) There was consensus for general guidelines such as avoidance of sports which involved the potential for blunt abdominal trauma or risk of personal injury due to a loss of balance or coordination. However, there was little information concerning a female athlete who may compete in one of many athletic sports. Furthermore, the lack of formal policy and recommendation from National Governing Bodies for Olympic sports adds to the problem and creates the situation in which a lack of information may unnecessarily restrict or inappropriately permit athletic participation during pregnancy.

There was variety with regard to contraindications to exercise during pregnancy. (2,3,4,5,6,7) Multiple gestation, bleeding and some medical conditions were items in which the ACSM,

ACOG and SOGC did not agree upon with regards to the appropriateness of exercise during pregnancy.

Recent studies concerning pregnancy outcomes have produced findings that do not seem to support some of the national guidelines. Specifically, despite the concern that exercise induced hyperthermia may possibly cause teratogenic effects, studies have failed to identify an increase in neural tube or birth defects in women who exercise regularly. It has been suggested that the potential hyperthermia is offset by an adaptive response that includes increased minute ventilation and skin blood flow. However, pregnant women were still advised to ensure adequate hydration, proper clothing and avoidance exercise in hot, humid environments.

Studies concerning birthweights are inconsistent with results demonstrating decreased, increased and similar weights as those of nonexercising controls. One source suggests that birth weight is not affected in women who have a proper calorie intake. Vigorous exercise was also thought to create the risk of competition for oxygen and fuel substrates. However, investigations have failed to demonstrate a "fetal steal syndrome" in which oxygenated blood is shunted away from the placenta. (7) It appears that increased hematocrit and oxygen extraction to prevent impairment of fetal oxygenation are compensatory changes to exercise that occur during pregnancy. (5)

Increased risk of pre-term labor was another concern regarding regular participation in intense physical activity. At training intensities, there is a 40 to 50% reduction in splanchnic blood flow from resting levels. This reduction creates the potential for impaired oxygen and nutrient availability for the fetus as well as a fall in myometrial oxygen delivery that could stimulate uterine contractions and lead to pre-term labor. Again, study results do not support these concerns. One ongoing prospective study demonstrated that there was no difference in incidence of pre-term deliveries. That same study found, however, that women who exercised regularly delivered at term (>260 days) an average of 5 days earlier than control subjects. This effect was considered desirable by the women and their healthcare providers.

Pregnant women are advised to avoid flexibility exercises and certain activities as a result of increase joint mobility and ligament laxity. Several studies have failed to establish a higher rate of athletic injury in this special population and some have even found fewer injuries as a result of increased caution during pregnancy. (13) Furthermore, 45 minutes or more of physical activity per week corresponds to decreased incidence of lumbar pain in pregnancy. (15)

Recommendations concerning exercise at high elevations were not included in the national guideline material investigated. However, research has found that pregnant women should "avoid physical exertion at altitudes over 8250 feet at least until after 4 to 5 days of exposure". (14)

Despite the variability and discrepancy, it was consistently found that regular physical exercise enhanced the psychological sense of well being and self esteem for the mother. Further benefits identified in research studies include improvements in nausea, fatigue and back pain. (13)

Conclusion

The current recommendations concerning exercise during pregnancy are conservatively based on physiological concern for the health and safety of mother and unborn child. These recommendations focus on potential acute and chronic adverse effects that could result as part of a normal physiological response to sustained intense physical exercise.

While there exists variability amongst SOGC, ACOG and ACSM guidelines, they all address many of the same issues such as exercise intensity and duration, types of exercise and contraindications. Ethical considerations restrict the performance of prospective randomized control studies however current research is beginning to provide information which is inconsistent with these physiological concerns and recommendations. The healthcare provider is left with a variety of guidelines and recommendations to consider in the management of physical activity of a pregnant female. However, considering the potential for harm, care should be taken before these national guidelines are sidestepped in favor of recent research findings. Before these recommendations and guidelines are questioned, more research is required which addresses variables such as exercise intensity, pre-pregnancy physical fitness, age and obstetrical considerations. National guidelines must be conservative in order to apply to the majority of pregnant women in the most situations. It is impossible to create a set of guidelines that apply to all pregnant females in every situation. It is up to the healthcare provider to assess the specific needs of the patient and to establish an individualized recommendation based on the details of one pregnant individual at a time.

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