Current Guidelines for Developing a Safe and Effective Prenatal Fitness Program

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Who Can Benefit From Maternal Fitness Guidelines Training?

- Physical and Occupational Therapists
- Exercise physiologists
- Nurses
- Personal trainers
- Birthing instructors
- Athletic trainers
Factors Influencing Increased Interest in Maternal Fitness

- Increased evidence supporting benefits of maternal exercise.
- Growth in number of women who exercise prior to pregnancy.
- Healthcare and fitness providers seeking current guidelines and research on maternal fitness.

Benefits of Prenatal Exercise

- Reduced maternal fat deposition and retention.
- Shorter and less complicated labor and delivery.
- Increased ability to tolerate the biomechanical and physiological stresses of pregnancy.
- Some evidence of enhanced maternal psychological health.

Postpartum Benefits of Exercise

- Decreased postpartum recovery period.
- Reduced fat retention.
- Faster return to pre-pregnancy fitness level.
- Reduced incidence of physical conditions.
- Improved mood state.
MATERNAL PHYSIOLOGICAL CHANGES DURING PREGNANCY

- Metabolic
- Cardiovascular
- Respiratory/Ventilatory
- Musculoskeletal

Metabolic Changes

- Metabolic rate can increase by 15-20%.
- Hormonal shifts cause changes in how maternal metabolism is regulated.

Maternal Physiological Mechanisms for Increasing Metabolic Function

- Hormones slow gastrointestinal tract transit time allowing greater absorption of nutrients.
- Increased fat storage during first two trimesters increased insulin production and sensitivity and maternal carbohydrate utilization.
- Greater rate of maternal carbohydrate utilization.
Effect of Exercise on Maternal Thermal Adaptations

- Regular exercise improves a woman’s ability to reduce her core temperature via:
  - Increased blood volume and decreased core temperature threshold for vasodilation of skin blood vessels.
  - Lowered sweat point.
  - Combined effect is greatly enhanced evaporative and radiant heat loss.

Heat Stress and Fetal Development

- Increased risk of neural tube defects when fetus is exposed to the intense heat stress of hot tub and saunas. Maternal thermal mechanisms are unable to dissipate heat sufficient to avoid dangerous fetal temperature increase when using hot tubs/saunas.
- Pregnant women should avoid hot tubs, saunas or high heat exercise environments throughout pregnancy.
Signs of Heat Exhaustion

- Increased, profuse sweating
- Skin redness
- Dizziness
- Nausea
- Fatigue

Exercise outdoors in a high heat and/or humidity situation may create dangerous maternal core temperatures.

Hydration and ability to use evaporative heat loss allow pregnant exercising women to maintain safe core temperatures.

Tips For Reducing Overheating

- Increase intake of cool fluids (avoid high sugar drinks which can slow absorption).
- Stop activity and go to cool environment.
- Lay down with upper body elevated.
- Take a cool water bath.
- If symptoms do not resolve within 30 minutes of rest and hydration seek medical attention.
Maternal Weight Gain

- Normal level of pregnancy weight gain is 25-35 pounds.
- Overweight or underweight women may need to modify that range.
- Pregnancy requires only 300 extra calories per day.
- Women who exercise throughout their pregnancy gain on average 8 pounds less than sedentary pregnant women.

Maternal Fat Gain

![Figure 6.2](image1.png)  
Figure 6.2 Regular exercise reduces fat deposition during pregnancy.

Maternal Weight Gain

![Figure 6.1](image2.png)  
Figure 6.1 Regular exercise reduces pregnancy weight gain.
Cardiovascular and Circulatory Changes

- Pregnancy hormones initiate blood vessel relaxation and reduced responsiveness resulting in vascular "underfilling."
- Response to vascular underfilling: hormones are released causing retention of salt and water increasing plasma volume.
- Cardiac output and blood volume increase by 40%.

Mechanisms Causing Cardiovascular System Changes

- Changes begin within the first weeks of pregnancy. Once egg implantation occurs it begins to send hormonal signals that initiate relaxation and reduced responsiveness in the arterial blood vessels.
- Lightheadedness, faintness, nausea, fatigue, rapid heart rate and increased sweating and urination may occur.

Cardiovascular Changes of Pregnancy

- Vascular underfilling stimulates the kidneys to retain more fluid to increase plasma volume. Results in increased blood volume and venous return to heart.
- Heart chamber volume increases 15-20% and stroke volume increases up to 40% by end of pregnancy.
Effect of Maternal Exercise on Cardiovascular Adaptations

- Regular, moderate level exercise during pregnancy has been shown to enhance the cardiovascular changes of pregnancy.

- One study showed that plasma volumes, red cell volumes and total blood volumes of regularly exercising pregnant women were up to 15% higher than non-exercising pregnant women.

Cardiovascular Changes/Prenatal Exercise

- Increases of 30-50% in cardiac output was observed in one study that compared fit, exercising pregnant women versus controls.

- The added reserves that fit pregnant women have may be beneficial for maintaining adequate blood flow to fetus when under stress.

Respiratory Changes

- Increased levels of progesterone initiate "overbreathing" improving efficiency of oxygen uptake and carbon dioxide elimination.

- Elevation and widening of rib cage improves breathing capacity during pregnancy.

- These changes can cause women to feel short of breath, but lung function remains at pre-conception levels.
Respiratory Adaptations

Adaptations of the respiratory system increase oxygen uptake and carbon dioxide removal to and from maternal and fetal tissues:

- Rising progesterone levels cause more frequent and deep breathing, and increased carbon dioxide sensitivity.
- Resting maternal oxygen consumption increases approximately 10-30% during pregnancy—greater demands from fetus, myocardium, respiratory muscles and kidneys.

Effect of Exercise on Maternal Respiratory Adaptations

Exercise training further enhances the respiratory changes of pregnancy:

- Increased levels of fitness correspond with greater oxygen uptake.
- Exercise trainings improves efficiency of oxygen transport and utilization by increasing alveolar ventilation and gas transfer at tissue level, and helps to maintain peak ventilation and maximal aerobic capacity.

Musculoskeletal Changes

COG moves "up and out"—lumbar, thoracic and cervical curves are exaggerated. Relaxin hormone increases laxity in joints, allowing anterior pelvic joint to widen up to an inch.
Effect of Prenatal Exercise on Labor/Delivery

- Dr. Clapp’s research:
- 35% decrease in need for pain relief.
- 75% decrease in the need for operative intervention (c-section, forceps).
- 55% decrease in need for episiotomy.
- 50% decrease in need to induce or stimulate labor with pitocin.
- 50% decrease in need to intervene because of abnormal HR.

Postpartum Changes

- Cardiovascular, circulatory, respiratory and metabolic responses of pregnancy slowly dissipate.
- Ligaments remain affected by relaxin hormone up to 6 or more weeks post delivery.
- COG returns to pre-pregnancy position.

Effect of Exercise on Fetus

- Current research shows that maternal exercise may result in fetal benefit.
- To date there are no short or long term fetal problems associated with women who continued to exercise during a non-complicated pregnancy.
Effect of Maternal Exercise On Placenta

- Research using ultrasound technique observed placental growth between the 16th and 24th week of pregnancy.
- Comparison between exercising pregnant women and non-exercising controls showed greater placental growth in exercising group during observed period.

Placental Growth with Exercise During Pregnancy
At term exercising group had 15% more surface area and vessels than control.

Fetal Response to Maternal Exercise
- An increased FHR is a normal response to sustained exercise.
- Intermittent stress and stimuli beneficial.
- Evidence of babies of exercising moms tolerated the stresses of contractions better than controls.
Babies of exercising moms were leaner at birth. Not underweight.

Longitudinal studies show at 1 year these babies did significantly better than controls on studies of mental/physical performance.

5 year study shows leaner children compared to controls: long term benefits?


ACOG GUIDELINES

- Moderate exercise, 3 times a week.
- No supine exercise post first trimester.
- Listen to your body, modify exercise.
- Be aware that body changes can affect balance and coordination.
- Choose activities that limit risk of abdominal trauma.
- Maintain adequate diet.
- Avoid hot and humid exercise environments and hydrate well.
- It takes 4-6 week to recover from pregnancy and birth, gradually resume exercise.

ACOG CONTRAINDICATIONS TO EXERCISE

- Pregnancy-induced hypertension
- Preterm rupture of membranes
- Preterm labor during the prior or current pregnancy or both
- Incompetent cervix/cerclage
- Persistent second- or third-trimester bleeding
- Intrauterine growth retardation
ACOG WARNING SIGNS AND SYMPTOMS

PRENATAL:
- Absent fetal movement
- Fetus growth is measured below gestational age
- Difficulty walking, extreme fatigue
- Dizziness, faintness or extreme shortness of breath
- Tachycardia
- Pubic pain or severe pain of any origin
- Uterine contractions
- Vaginal bleeding or fluid loss

PRENATAL EXERCISE PRESCRIPTION

- Intensity
- Duration
- Type
- Frequency

EXERCISE INTENSITY

The intensity of exercise should be at a level that feels "moderate to somewhat hard" (12-14 on 6-20 RPE scale or 4-5 on the 1-10 scale).

Educate pregnant client on how to use the "talk test" to gauge exercise intensity.

Intensity will need to be modified throughout pregnancy to enable women to maintain exercise session.
Exercise Intensity

- The use of training HR to measure intensity is poor indicator of maternal exercise exertion level.
- Cardiovascular and hormonal changes of pregnancy alter heart rate response.
- Total body monitoring is important in assessment.
- RPE allows for more whole body assessment.
- The goal is for the client to be able to carry on a conversation without feeling out of breath.

RATING OF PERCEIVED EXERTION (RPE) SCALE

- No exertion at all 6 (sitting)
- Extremely light 7
- Very light 8 (walking slowly)
- Light 9
- Somewhat hard 10
- Hard 11 (target zone)
- Very hard 12
- Extremely hard 13
- Maximal exertion 14

EXERCISE DURATION

- 20-45 minutes of aerobic exercise each session is ideal.
- Duration and intensity may need to be modified as pregnancy progresses.
- Decrease intensity before duration if RPE is over limit.
- Intermittent versus continued duration bouts of exercise may be better tolerated in late pregnancy.
EXERCISE TYPE

Women should choose activities that they enjoy and those that pose little risk to themselves or their fetus such as:

- Walking
- Swimming
- Cycling
- Low impact stationary exercise equipment and classes

CONTRAINDICATED EXERCISE ACTIVITIES

- Scuba diving (absolute)
- Water-skiing (absolute)
- Downhill skiing or high altitude sports
- Cross-country skiing
- Ice skating
- Gymnastics
- Horseback riding
- Avoid saunas and hot tubs

Exercise Type

- What activities does the client enjoy or is skilled at doing?
- What types of exercise are available to her?
- Does the activity pose any risk to her or her fetus?
- Can the activity be easily modified as her pregnancy progresses?
- Assess risk/benefit ratio to activity.
EXERCISE FREQUENCY

• In order to derive optimal benefit from aerobic exercise, the frequency should be 3-5 days a week.
• It's preferable to modify duration and intensity in order to maintain frequency.
• Reduce frequency, intensity and duration if weight gain and fetal growth are slowing.

Exercise Frequency

Depends upon:
- Her current level of fitness.
- How her pregnancy is progressing.
- The type of activity and intensity.
- There should be at least one day of active rest.
- Some women are able to comfortable sustain six days a week of exercise with modifications as pregnancy progresses.

WARM-UP / COOL-DOWN

- Slow walking or slow increase of other cardio activity for 5 minutes will help prepare the body for exercise.
- Each session should end with a slow reduction in exercise intensity to level 8-10 on the RPE scale.
STRENGTH TRAINING
- Avoid supine position.
- Warm up before strength training.
- Use a slow progression.
- Target major muscle groups.
- Use proper form

Maternal Strength Training Guidelines
- A gradual reduction in weight loads may be needed as pregnancy progresses.
- Avoid having client lift a weight or resistance that causes her to bear down or strain.
- One set of 10-12 repetitions is sufficient for strength gains.
- Focus on upper body to help prepare client for increased lifting with baby care.
- Remind client to use proper form and breathing with lifts.

Strength Training Guidelines
- Increased repetitions at lower weight loads may be needed as pregnancy progresses.
- Monitor exercise technique carefully by mirror observation or supervision to help correct progressive postural changes that may occur with advancing pregnancy.
- Avoid maximal static lifts.
Options for Strength Training

- Hand weights
- Resistance bands
- Machines
- Body weight

Abdominal Exercises During Pregnancy

Diastasis Recti

A thinning and widening of the linea Alba that occurs during pregnancy to allow room for fetal growth.
Sahrmann Abdominal Exercises

- Developed by Shirley Sahrmann, a PT who specializes in abdominal rehabilitation.
- Focus on transverse muscles.
- Supine position can be modified for second and third trimester.

Videos

- Diastasis recti
- Sahrmann
- Modified Sahrmann

FLEXIBILITY TRAINING

- Avoid ballistic movements
- Hold 10-15 seconds
- Avoid supine position after first trimester
Flexibility Exercises

- Changes in pregnant body COG can cause increased muscle soreness and discomfort.

- Posture shift (center of gravity moves up and out) can cause increased muscle fatigue and need for frequent stretching to alleviate muscle tension.

- The literature has not shown a correlation between decreased joint stability and production of relaxin hormone, but you should avoid hyperextension or flexion when performing exercises.

Flexibility Exercises

- Use slow gentle movements.
- Use breathing to enhance stretch.
- Avoid pointing toes with any movements because of increased risk of muscles cramping.
- Modify stretches if they become difficult as pregnancy progresses.
- Discontinue any stretch that causes pain or discomfort.

Videos

- Kneeling ball stretch
- Chair stretch forward
- Chair side stretch
- Ball pelvic clock
- Wall stretch
- Forward back stretch
- Plie
Pelvic Floor

Pelvic Floor Exercises

- If client has poor pelvic floor tone start with shorter contractions and higher repetitions.
- Find duration and repetition amount that client is able to sustain without PF fatigue.
- Slowly increase over time duration of contraction hold.
- Encourage client to form habit of doing PF exercises several times a day during activities such as brushing teeth or other daily tasks.

Pelvic Floor Exercises

- Graduated contraction and hold.
- Peak contraction and longer duration hold.
- Focus on relaxation phase as it is as important in total pelvic floor strength training.
- Remind client that determining what it feels like when she totally relaxes pelvic floor will be useful during pushing phase of delivery.
- Combine with other exercises such as four point stabilization.
Guidelines for Exercise Monitoring

• The most accurate method for determining whether a prenatal exercise program is appropriate is a client’s feedback.

• Ask frequently questions to assess how she is feeling during and after exercise.

• Inquire each exercise session about whether there have been any changes in her physical status, or concerns she may have regarding her pregnancy.

Exercise Monitoring Questions

1. Are you gaining weight within your healthcare providers recommendations?

2. Is your healthcare provider concerned about your level of weight gain?

3. Are you able to comfortable follow your exercise program without discomfort or extreme exhaustion?

4. Is your energy level normal?
Exercise Monitoring Questions

5. Is the fetus growing within normal limits at each clinic visit check?

6. Does your physician have any concerns about the progress of your pregnancy?

7. Has there been any change in the pattern or amount of fetal movement?

8. How do you feel?

Signs of Overtraining

- Elevated resting heart rate
- Frequent illness
- Lack of normal weight gain
- Chronic exhaustion
- Depressed mood state

Client Self Monitoring

- Instruct client to pay close attention to their physical well-being and report any changes in status prior to exercise.
- Client should avoid exercise when ill or if they feel extreme exhaustion.
- Instruct client on warning signs and symptoms of overtraining.
Supine Exercise Modification

- It is advised that pregnant women avoid doing any exercises while in supine position after the first trimester.
- The weight of the growing fetus can compress the vena cava, diminishing maternal venous return and fetal blood flow.

Avoid Supine Position After First Trimester

Raise upper body to 45 degrees or more

- Use modified supine position for exercises normally done on back. You can use pillows, an exercise ball or wedge to lift upper body up to 45 degrees from hip.
- If you become lightheaded and dizzy when doing exercises modified supine position at any point in pregnancy, roll over onto left side and rest.
Exercise Modification

- Each week of pregnancy presents with new physical challenges.
- View exercise prescription as a basic template that will be modified throughout pregnancy.
- Attempt modifying an exercise before eliminating.
- The most important factor to remember is that each pregnant woman will present with her own unique needs and challenges.

Belly Support Band

Use if round ligament pain is causing discomfort with weight bearing exercise.

Daily Resting Pulse

Teach clients how to monitor resting pulse each morning (helpful for determining whether body has recovered from exertion or is overstressed).
Modification Points To Consider

Try modifying current exercise routine by:

1. Reducing intensity by cutting pace, incline, or resistance until you reach a level that is well tolerated by participant.

2. Breaking up exercise bouts—two 20 minute cardio bouts may be better tolerated than one 40 minute.

3. Identifying causes for discomfort (ie: bike seat tilted too far forward, incorrect lifting techniques, need for belly support belt) and be creative in order to find options to correct discomfort.

Modification Tips

As pregnancy progresses, advise client that it is normal to feel more exertion with exercise.

Pregnancy is like wearing a backpack that is filled with more weight each week. If you are carrying increasing weight every day, all day your body is going to be more fatigued at baseline.

Exercise intensity and duration levels need to be modified as pregnancy progresses to correct for the additional load.

Modification Tips

Avoid applying the same exercise template for each pregnant client.

Be creative with exercises and practice finding ways to modify each exercise.

View it as an interesting challenge to modify exercise to fit your client's needs and limitations.

Determine appropriate modifications by working with your client and using her feedback to work as a team.
Proper Lifting Techniques

- Never bend forward from your waist to lift and object.
- Proper technique: squat or kneel in front of object, bring object to body and raise up using legs.
- It is helpful to inhale before lift, and then tighten tummy and hold as you lift and exhale.

Ergonomics In The Home

Pregnant women and new mothers should look for ways to fit their home work stations to their body by:

- Adjusting baby changing table to a height that allows user to comfortable use (usually waist height works best).
- Setting up a supportive, comfortable chair for baby feedings (use pillows to support back, step stool for feet and pillows or nursing ring to support baby).
- Practice baby lifting techniques from crib, carrier and floor (always bring baby to body before lifting, and use knees not back to raise up or down).

Prenatal Class Program Development
Maternal Class Instructor Qualifications

<table>
<thead>
<tr>
<th>Fitness or health related degree with fitness trainer certification.</th>
<th>Establish professional scope by reminding client that each woman and each pregnancy is unique, and your education and experience enable you to create a safe and effective prenatal fitness program.</th>
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<tbody>
<tr>
<td>Experience and training in prenatal fitness. Continuing education courses in maternal exercise training.</td>
<td>Instructor's personal experience with pregnancy should not be used as a reference point for clients. Use evidence based information and guidelines when developing exercise programs for clients.</td>
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Instructor Guidelines for Prenatal Class

- Each participant must provide a signed release to exercise from her obstetrician or midwife.
- It is helpful to have each participant fill out a health history prior to starting class.
- Signed consent/waiver from participant.
- Develop policies and procedures for management of emergencies.

Consent to Exercise

- Prior to working with any pregnant client require that she provides a signed consent that she’s cleared for exercise by her healthcare provider.
- Take a health history prior to starting exercise to gain information on her health status and exercise history.
- Note any physical limitations that may require modified exercise techniques.
Policies and Procedures

Have a plan of action in case of an emergency:

- Have client's healthcare and family contact number.
- If client presents with a physical problem, discontinue exercise and contact her healthcare provider.
- Do not allow client to drive self. Call ambulance, or if less serious, have family member come to pick her up.
- Follow up with client and determine whether it is safe for her to continue exercise by asking for clearance from healthcare provider.

Facility Requirements

- Onsite childcare if possible.
- A pool is a valuable exercise option for later pregnancy.
- Outdoor stroller exercise classes are a good option in fair weather environments.

Facility Requirements

- Temperature controlled.
- Clean, well ventilated.
- Restrooms easily accessible.
- Water fountain or drinking water source available.
- Mats, balls, and other fitness equipment and storage.
Class Outline

<table>
<thead>
<tr>
<th>Class duration</th>
<th>Class Frequency</th>
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<tr>
<td>1-1.5 hour is ideal. (Class time needed for blood pressure measurement, warm up, at least 30 minutes of cardio and strength and stretching portion).</td>
<td>3-4 days a week. May have to modify to fit facility limitations.</td>
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Cardio activities
(Are cardio machines such as treadmills, stationary bikes, rowing machines, elliptical machines or pool available, or is aerobic dance or walking an option).

Determine strength training methods and flexibility aids (balls, resistance bands, wedges, mats, weights).

Program Development

Pregnant women who were sedentary prior to exercise:

- Work with client on aiding her in understanding RPE scale, and help reassure her that it is safe for her to exercise.
- Ask her for frequent feedback and assist her in learning how to self modify exercise.
- You may increase her exercise load with gentle progression and as tolerated.

Exercise Program Development

Pregnant women who were exercising prior to pregnancy:

- May continue with her current exercise routine as long as she feels comfortable.
- There are no set weight lifting limits for pregnancy - use client feedback to determine when modifications may be needed.
- There is no medical reason to limit exercise in a fit pregnant woman if she is tolerating level well and her RPE is within guidelines.
- Advise athletes of the importance of staying within RPE limits and remind them that pregnancy is not a time for intense training.
Class Monitoring

At each class, monitor participant exercise response and record.

Pay close attention to any changes in participant response to exercise and encourage feedback.

Operate within your scope of practice.

Encourage proper referral and aid participant in follow through if needed.

Record Keeping

Maternal Fitness Class Record

Name______________________________

Date_____ Week Gestation_____ Blood Pressure_____/_____ RHR_____ Type exercise RPE Duration Workload

_____________                      _____              _____

_____________                      _____              _____

Comments____________________________________________________________

Date_____ Week Gestation_____ Blood Pressure_____/_____ RHR_____ Type exercise RPE Duration Workload

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Comments____________________________________________________________

Date_____ Week Gestation_____ Blood Pressure_____/_____ RHR_____ Type exercise RPE Duration Workload

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Comments____________________________________________________________
Cardiovascular Portion

- Prior to starting cardio have participant do 5 minutes of warm up (can be slow walking, or slow low increase of intensity on any machine).
- 30-40 minutes of cardiovascular exercise.
- Can be broken up into two sections with strength training between.
- Have participant record RPE for each exercise bout.
- Monitor participants using “talk test” and modify routines as needed when RPE is too high or low.

Case Study

A pregnant woman in her 24th week of pregnancy has started to feel discomfort with her running routine. She notices a tugging sensation on one side after 15 minutes of running.

She would like to continue running for as long as she can, and would like to know what types of modifications she could try to enable her to continue running.

Options include:

- Belly support band
- Shortened runs
- Breaks prior to start of discomfort
- Change in terrain
- Slowed pace
Case Study

A pregnant woman in her first trimester would like to start an exercise program but is unsure of what type of exercise to do. She is somewhat overweight and is concerned about overstressing her knee joints.

She would like to know what exercise type would allow her to improve her aerobic fitness and keep her weight gain within healthy limits, yet not stress her joints.

Options include:

Non-weight bearing exercise, such as swimming, exercise bike or rowing machine.

Start with low intensity, short duration exercise, 4-6 days a week. Build intensity and duration slowly as her body adjusts to exercise.

Exercise Class Goals

- Provide a well-rounded fitness program in a safe environment.
- Aid participant in setting realistic fitness goals.
- Teach participant how to self-monitor exercise intensity and modifications techniques.
- Establish and environment that fosters support, motivation and positive social interaction between class participants.
Conclusion
Prenatal fitness is safe and beneficial for pregnant women who have a non-complicated pregnancy.

Pregnant women should be encouraged to continue or even start a fitness program, and be provided exercise.

Provide modification techniques that allow her to continue exercising to the end of her pregnancy.

TRIP Database
- The TRIP Database is a clinical search tool designed to allow health professionals to rapidly identify the highest quality clinical evidence for clinical practice.

Questions?
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