Exercise and pregnancy: focus on the competitive and elite athlete

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Why are we talking about this?
Because it’s...BOULDER!
Where have we been...

• several guidelines regarding physical activity and exercise during pregnancy and postpartum period (American College of Obstetrician and Gynecologists, Canadian Society of Exercise Physiologists and Society of Obstetricians and Gynecologist of Canada, American College of Sports Medicine, The Royal College of Obstetricians and Gynecologists)

• But...until the IOC consensus meeting in September 2015, there was not any consensus statement on “Exercise in Pregnancy and the Post-partum Period in elite sports particularly for High-level Athletes”
Exercise and pregnancy in recreational and elite athletes: 2016 evidence summary from the IOC expert group meeting, Lausanne

- Published in British Journal Sports Medicine 2016
- IOC (International Olympic Committee) assembled an international expert committee to review the literature on physical activity and exercise (1) during pregnancy and (2) after child-birth, using rigorous systematic review and search criteria
- September 2015 IOC meeting of 16 experts in Lausanne
- IOC consensus meeting had two aims:
  - (1) to comprehensively review risk factors related to different physical and physiological states of a pregnant athlete and
  - (2) to provide recommendations for training and competing during pregnancy and postpartum period for high levels athletes.
- IOC/ National Sports Federations encourages all women to exercise throughout their entire life as well as encouraging high level performance
  - “Pregnancy is recognized as a unique time for behavior modification and is no longer considered a condition for confinement.”
- More elite athletes are pursuing high levels of sports into their 30s
  - May want to RETURN to their sport, train while pregnant
  - Where is the research and what do we do with these patients?
3 Goals of the Consensus Statement

• (1) Summarize common conditions, illnesses and complaints which may interfere with strenuous exercise and competition, during pregnancy and after childbirth;

• (2) Provide recommendations for exercise training during pregnancy and after childbirth, for high-level regular exercisers and elite athletes

• (3) Identify major gaps in the literature that limit the confidence with which recommendations can be made
What are the athletes thinking and hearing?

• “Advanced Maternal Age” “AMA”
• “The older I get the less likely I will get pregnant.”
• “The older I get the risker my pregnancy is.”
• Depending on the sport this time in the upper twenties and thirties may be exactly at the time they are achieving peak performance
  • *What do they do? What should they do?*
  • *How can we serve them better?*
  • *How do we translate medicine to the athlete?*
It’s our job to:

• Remember many of these women may be struggling with issues related to RED-S (relative energy deficiency in sport) which CAN impair their fertility

• Athlete specific concerns for health care providers to ask:
  • What are the reproductive health recommendations to athletes
  • How do things like Female Athlete Triad/RED-S contribute/not contribute
    • long-term reproductive repercussions of RED-S for women are unknown
    • further research is required
    • negative impact on fertility: disordered eating and the associated hormonal imbalance

• These women may have previous histories of disordered eating but DON’T assume they all do; don’t assume they don’t, just ask about it

• Not scare them but relate to them
Eating disorders

• Eating disorders, pregnancy and athletes can be a challenging situation
  • No data on PREVALENCE of eating disorders in pregnant athletes

• Complications associated with eating disorders and pregnancy
  • hyperemesis gravidarum, anemia, spontaneous abortion, preterm birth (PTB), caesarean section, and postpartum depression
  • Low birth weight for neonate, developmental disorders in childhood, anxiety, depression, substance abuse

• Management and treatment
  • Consider them high risk, involve MFM, watch for HTN, premature delivery, difficult labor, IUGR (intrauterine growth restriction)
  • Emphasis on thorough team approach
IOC on exercise and pregnancy in recreational and elite athletes

• **Part 1** focused on the *effects of training* during pregnancy and on the management of common *pregnancy-related complaints* experienced by athletes

• **Part 2** addressed maternal and fetal perinatal *outcomes*

• **Part 3** reviewed the implications of pregnancy and childbirth on *return to exercise* and on common illnesses and complaints in the *postpartum period*

• **Part 4** recommendations for *future research*
Thermoregulatory adaptations to pregnancy

- Raising core temperature above 103 degrees (39 degrees Celsius) can increase risk of fetal neural tube defects/abnormalities
  - fetal neural tube formed 35–42 days from the last menstrual period
- At 60–70% of VO$_{2\text{max}}$ in a controlled environment exercise for up to 60 min does not raise core temperature above 100.4 F/38°C
- Where could we see higher body core temperature with strenuous exercise?
  - Marathons, exercising outdoors in hot and humid weather
- This has not been evaluated in elite pregnancy athletes
Energy expenditure

• Energy expenditure will stay high among pregnant elite athletes who continue to train during pregnancy

• Total energy intake required will depend on: exercise type, frequency, intensity and duration of the activities performed

• Emphasis placed on helping an exercising woman to monitor whether appropriate energy intake is occurring by comparing her weight gain and body mass index (BMI) with the Institute of Medicine (IOM) recommendations
Endurance

• In recreational athletes, *no differences* in aerobic fitness (measured by VO$_{2\text{max}}$) tested *during the last 2 months* of a singleton pregnancy vs *6–8 weeks postpartum*

• In highly conditioned athletes, a moderate-to-high level of exercise during and after pregnancy may lead to:
  • An *increase* of VO$_{2\text{max}}$ ~ 5–10% after pregnancy
  • *Improved anaerobic* working capacity

• From these studies, indications are a woman's aerobic fitness will stay the same or improve slightly during pregnancy if she continues to exercise as her maternal symptoms permit
VO2max testing

• Three standard tests of near maximum exercise capacity:
  • (1) peak VO₂ test
  • (2) true VO₂max test
  • (3) tests ending at volitional fatigue
    • No harmful events reported for either mother nor fetus after these tests
    • Not ethical to test pregnant women to ‘failure’
    • Studies show transient fetal bradycardia when the pregnant elite athlete exercises at above 90% of maximal maternal HR
    • Uncertain whether these transient fetal HR changes influence neonatal outcomes

• *To be appropriately cautious, maximal VO2 testing above 90% of VO2max is not recommended, except in highly supervised research settings*
Exercise at altitude during pregnancy

• Elite endurance athletes train at altitude
• Uncertain if a pregnant athlete will (1) benefit from this and (2) not compromise her health or that of the fetus
  • No study has explored the limits of combined exercise and altitude exposure in pregnancy
• To test the effect of exercise in pregnant athletes at altitude, symptom-limited VO_{2\text{max}} exercise tests conducted in seven healthy pregnant women at:
  • 33–34 weeks gestation at sea level within a week, also at an altitude of 6000 feet, after rapid ascent
  • no ominous fetal responses
• no studies on pregnant endurance elite athletes exercising at high altitudes
  • cross-country skiers & runners
• theoretical concern about training at altitude while pregnant is hypoxia and exercise both decrease blood flow to the uterus → contribute to a decrease in fetal arterial oxygen saturation
• With the lack of data, it seems “advisable to refrain from high-intensity training regimes at altitudes greater than 1500–2000 m (0.9 mile to 1.2 mile)
Strength training

• Light-to-moderate weight training with free weights or weight machines generally with no adverse health effects during pregnancy
  • Large strength gains reported in apparently healthy pregnant women who adopted strength training twice per week for 12 weeks during pregnancy
    • 36% for leg press
    • 39% for leg curl
    • 39% for lat pull down
    • 41% for lumbar extension
    • 56% for leg extension
  • Training was associated with a 14% increase in lumbar endurance
Elite athletes and strength training

• For elite athletes it is unknown the effect of strenuous strength training on both mom and baby

• Evidence to consider for elite athletes include the effects of heavier weight lifting include with the Valsalva maneuver seen during weight training:
  • a rapid increase in blood pressure and intra-abdominal pressure = temporary decrease blood flow to the fetus
    • Unknown what these repercussions are to the fetus with these temporary changes
  • Large increases in intra-abdominal pressure = pelvic floor harm
    • May give increase the risk of urinary (UI) or anal incontinence (AI) or pelvic organ prolapse (POP) during or after pregnancy
Clinical issues in pregnancy: common complaints & diagnoses/prevention & treatment options

- highlight the major symptoms of pregnancy and explore medical issues, with a special focus on high-level regular exercisers and elite athletes
Clinical issues in pregnancy: common complaints & diagnoses/prevention & treatment options

• Nausea/vomiting
  • Quality rating: high in the general pregnant population, no studies on elite athletes
    • Be mindful of issues which are unique to this pt population which would further exacerbate this issue

• Fatigue
  • No studies were found to evaluate the rate of fatigue in elite athletes
    • Neither in the general pregnant population nor in elite athletes were clinical trials found on the effect of exercise to reduce fatigue!

• Mental health and well being
  • Assumption: elite athletes suffer depression less frequently
    • Fact: prevalence in elite athletes suggests no difference in rates of depression from the general population
    • Similar general population, female athletes struggle with depression more than male athletes
    • Athlete-specific triggers for depression: injury, failure in sport performance, and involuntary termination of the athletic career
    • Among athletes, sports governing bodies and officials, tendency to downplay or ignore psychiatric problems
    • athletes under-report depressive symptoms and rarely seek help
    • Uncertain if these tendencies persist in pregnancy
    • No data on the prevalence of depression among pregnant athletes
Clinical issues in pregnancy: common complaints & diagnoses/prevention & treatment options

- **Pre-eclampsia**
  - **Mechanisms through which exercise might reduce the risk of pre-eclampsia**
    - Weissgerber *et al* proposed four mechanisms by which exercise might reduce the rate of pre-eclampsia:
      - enhanced placental growth and vascularity
      - prevention and/or reduction of oxidative stress
      - reduction of inflammation
      - correction of endothelial dysfunction
    - Each of these factors promotes endothelial dysfunction → leads to late stage symptoms of pre-eclampsia
  - maximum effect on these mechanisms, exercise should be started in the *first trimester*

- **Gestational hypertension**
  - No studies in elite athletes
  - **The role of exercise in the prevention of gestational hypertension**
    - Two epidemiological studies have evaluated the impact of exercise exposure before and during pregnancy on the rate of gestational hypertension:
      - One reported a 70% reduction in gestational hypertension among Hispanic women who exercised before pregnancy; The other found no effect of exercise before or during pregnancy on the rate of gestational hypertension
      - recent large RCT showed women who initiate structured exercise early in pregnancy are:
        - 3X more likely to PREVENT gestational hypertension
        - 1.5X more likely to prevent excessive GWG
        - 2.5 times more likely to prevent macrosomic or large babies
  - Quality rating for prevention: moderate, no studies in elite athletes.
Clinical issues in pregnancy: common complaints & diagnoses/prevention & treatment options

- Gestational Diabetes

- No prevalence studies of GDM among elite athletes
- Women who are most active before, and during pregnancy are at lower risk of developing GDM
- “Given the risk factors, high-level exercisers and elite athletes would be expected to have reduced risk for developing GDM.”
Careful with DRUGS: WADA

- ALWAYS CHECK MEDS FOR ELITE ATHLETES!
- https://www.globaldro.com/Home
## Outcomes: Exercise Level of Evidence

<table>
<thead>
<tr>
<th>Activity and Effect</th>
<th>Level of Evidence</th>
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<tbody>
<tr>
<td><strong>Strenuous activity and miscarriage</strong></td>
<td>LOW to MODERATE evidence for a negative effect of strenuous exercise on miscarriage</td>
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<tr>
<td><strong>Lifting and miscarriage</strong></td>
<td>LOW to MODERATE evidence for a negative effect of lifting on miscarriage</td>
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<tr>
<td>Exercise during pregnancy reduces excessive birth weight</td>
<td>HIGH level of evidence; lack studies in elites</td>
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<tr>
<td>Effects of exercise on preterm birth rate in the general population</td>
<td>MODERATE quality evidence (RCTs &amp; observational studies); lack studies in elites</td>
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<tr>
<td>No effect of exercise on Apgar score in the general population</td>
<td>MODERATE evidence; no studies on elites</td>
</tr>
<tr>
<td>Induction, episiotomy and epidural anesthesia and exercise</td>
<td>MODERATE evidence exercise does not increase rates of induction, episiotomy or epidural in general population; no studies in elites</td>
</tr>
<tr>
<td>Prolonged labor and exercise</td>
<td>No studies identified which specifically address duration of labor in elite athletes</td>
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### Outcomes: Exercise Level of Evidence

| Relationship between physical activity and the duration of labor | MODERATE evidence physical activity does not increase 1\(^{\text{st}}\) or 2\(^{\text{nd}}\) stage of labor; suggestion of physical activity during pregnancy either decreases or has no effect on the total duration of labor; no data in elites on prolonged labor |
| Acute and elective caesarean delivery | Inconsistent evidence on the effect of exercise during pregnancy on C/S; Overall women in exercise groups had LOWER risk of C/S; Low to moderate levels of physical activity during pregnancy among healthy pregnant women modestly increase chance of NSVD; No studies on elite athletes |
Postpartum Periods: defined three

- Hospital-based
  - during hospital stay
- Immediate postpartum
  - hospital discharge to 6 weeks postpartum
  - This is what the literature defines it to be
  - In general women have been told NOT to exercise
  - They are doing Pelvic floor muscle exercise
  - NOT TRUE in the elites as they are starting earlier
- Later postpartum
  - 6 weeks to 1 year, corresponding sometimes to cessation of breast feeding
Factors effecting return to exercise after childbirth in elites

• Pelvic floor injury
  • **Scant data** on whether or not future pelvic floor health impacted by resuming strenuous activity in early postpartum period as the tissue recovers from the delivery
    • *Early return to heavy physical work after childbirth INCREASES risk of urinary incontinence and pelvic organ prolapse*
    • *No studies on how timing of return to strenuous exercise or competitive sport postpartum effects pelvic floor function in elites*
    • If athlete has an increased risk factor with a levator ani injury they may want to minimize activities which create large increase in intra-abdominal pressure and/or repetitive high impact for SEVERAL MONTHS postpartum
      • No evidence to support this recommendation
      • **URGENT need for more research in recovery after childbirth**

• Exercise after C/S
  • Dependent on issues such as BP, anemia, fatigue, pain management, wound healing
    • *Elites need to talk to their obstetric care provider to ensure they are medically fit for exercise*
    • Once cleared they can do both aerobic and strength training, increasing time, frequency and intensity
    • **REMEMBER 15-30 day “detraining period” can lead to significant muscle atrophy**
Exercise and breast feeding

• WHO advises women to breast feed for at least 6 months
• One study reviewed the increased caloric expenditure associated with breast feeding impacts an athlete’s postpartum weight loss and return to competition
  • the concern of intense exercise impairing milk production in quantity and nutritional qualities has NOT been confirmed
  • INSTEAD....high-volume aerobic exercise during breast feeding resulted in slightly greater quality and quantity of milk
  • Moderate weight reduction while nursing is safe and does not compromise neonatal weight gain

• In a study of long distance runners, many modified their running behavior during breast feeding, but of those who ran competitively prior to pregnancy and breast fed, 84.1% reported running during breast feeding.
  • Most felt running had no effect on their ability to breast feed
Exercise and breast feeding

• Athletes may benefit from wearing a personally fitted sports bra that offers support rather than compression
  • this provides significantly increased breast and bra comfort compared with a standard encapsulation sport bra during exercise
  • Using a breast pump before exercise may allow the postpartum athlete greater flexibility in the workout and feeding schedule and should result in a more comfortable exercise experience if the breasts are not full
Return to competitive sport

- scant knowledge on athletes returning to exercise and competition after childbirth
- retrospective study of 40 Norwegian elite athletes, **77% continued to compete at the same level after childbirth**
  - Within the first 6 weeks postpartum, 12 (38%) of the elite athletes started jogging compared with 2 (4.3%) in non-athletes
- case study of a marathon runner, Potteiger et al found while the individual did not qualify for the Olympic marathon, she was able to **resume an intense training regimen within 4 weeks after delivery with no apparent medical complications**
- in another study, female Olympic and masters athletes reported feeling more physically fit and having improved technical skill after childbirth and often improved the records they achieved before pregnancy
Common postpartum complaints/diseases

- Postnatal depression
- Postpartum weight loss in athletes
- Low back and pelvic girdle pain
- Pelvic floor disorders
- MSK issues
Return to sport: Elite athlete return to exercise: what have we learned?

• Limited number of studies on factors relating to return to exercise following pregnancy and childbirth in the general exercising population

• Very few in elite athletes studies on factors relating to return of exercise

• Little information or evidence on which to base advice for athletes on issues relating to common complaints in the postpartum period

• Three distinct elements:
  • (1) return to participation
  • (2) return to sport
  • (3) return to performance

• Within each element, the athlete, physician, physiotherapist and coach should carefully consider the unique elements of the athlete’s personal performance, childbirth experience, lactation and sport demands to provide a flexible and individualized program for return to sport
Questions moving forward

• Fertility
• Medical conditions
• Physiological and anatomical changes
• Exercise testing
• Athlete training/Return to Sport
• Exercise intervention studies
• Research questions related to labor and birth
• Exercise in the postpartum period
• Breastfeeding
Conclusion

• very few studies on recreational and elite athletes in any of the topics listed above

• impact of strenuous physical activity, exercise and high-intensity strength training has been little studied during pregnancy and in the postpartum period

• Where evidence exists, it relates to light and moderate exercise

• Randomized controlled trials are not feasible for most of the questions listed, many recommendations will rely on data from cohort studies

• “We call for international collaboration to advance research in this area so that athletes can be given advice based on evidence, rather than anecdote.”
Thank you! Let’s make some more research!
What do we know? What don’t we know?

• We know exercise is good for mom and baby
  • Both in pregnancy and after

• Excellent time for change

• Currently NO exercise guidelines for elite athletes and women who exercise at an intense level
  • They are going to do it with or without us so we better catch up!