Pelvic Physical Therapy Distance Journal Club
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Biomechanical and musculoskeletal differences between postpartum runners and nulliparous controls. Christopher SM, Bauer L, Maylone R et al. JWHPT 2022;46(1):11-17.
Doi:10.1097/jwh0000000000000226.

Introduction:

- 47% of female runners are of childbearing age
    - 38% of pregnant runners continue running during third trimester
    - About 50% returned to running 6 weeks postpartum
    - 35% who return to running report musculoskeletal pain
- We know that there exist changes in posture, gait, exercise tolerance, and laxity during pregnancy and the postpartum phase
    - Increased lumbar lordosis
    - Anterior pelvic tilt
    - Diastasis Rectus Abdominis
    - Weakened pelvic floor
    - Wider step width
    - Decreased single-leg support time
    - Increased cardiac response to exercise
    - Decreased VO_2 max
- There is little research about running biomechanics in the postpartum runner.

Aim/Primary Aim: To investigate differences in overground running kinetics, strength, and flexibility in healthy postpartum runners and age-matched nulliparous controls.

- Hypothesis: Postpartum runners will have altered kinetics, strength, and flexibility compared to their controls

Study Design/Study Format: Case-control study design

Methods:

- Participants were recruited through flyers and online running groups
    - 9 postpartum and 9 controls
- “Postpartum runner”: Give birth in past 2 years, 18-41 years, premenopausal, run without pain at least once a week
- Control Group: Age matched within 2 years, nulliparous, premenopausal, run without pain at least once a week

<u>Kinetics</u>

- 5 minute self-paced warmup on treadmill
- Participants then ran on a 23 m pathway with 2 force plates in self-selected running shoes. They were given 3-5 practice trials then the examiners collected data
    - Force plates on the pathway measured ground reaction force (GRF)with participants running at 3.61-3.99 m/s (7:25-6:45 minute mile)
- Three trials for each leg were collected and the average was taken
    - As no side-to-side differences were found, the two limbs were then averaged together for each participant

- Collected varying kinetic data, the only significant difference between groups being instantaneous braking load rate
    - The authors did not define how this was calculated, but suggest it is the speed that anteroposterior force is dissipated
    - This term is not used in other running studies, suggesting that it is not a standard measurement and therefore lacks clinical relevance

Flexibility

- Hamstring Flexibility: Hip active knee extension test using digital inclinometer

Strength

Measured using handheld dynamometer:

- Sidelying hip abduction and adduction
- Prone hip external rotation and internal rotation with knee flexed to 90 degrees
- Prone knee flexion at 45 degrees
- Seated knee extension with knee at 30 degrees flexion

Results:

- Postpartum runners ran 2.83 days/wk vs 4.11 in control group ($p=0.027$)
- Instantaneous braking loading rate in postpartum runners was 24.3% greater than controls ($p=0.046$).
    - Dissipated the braking force quicker
- No other significant difference in kinetic data
- Postpartum runners demonstrated 14% less hamstring flexibility ($p=0.034$)
- Postpartum runners demonstrated 25.9% less hip abduction strength, and 51.6% less hip adduction strength than control group ($p<0.05$)

Discussion:

- This study demonstrates some biomechanical, flexibility, and strength differences between postpartum runners vs. age-matched nulliparous runners.
- The study does not define how instantaneous braking load rate is calculated and therefore this difference between groups cannot be applied clinically.
- Research demonstrates that female runners with greater peak braking force hold higher risk of running-related injury (Napier)
    - More research is needed to indicate how or if we need to address this, especially in the postpartum population
- A weakness of this study is the authors did not look at muscle strength commonly associated with braking force (tibialis anterior, gastrocnemius, soleus) to suggest the cause of this between-group difference
- Unsure about the relationship between hip strength and injury risk in runners
    - However, a meta analysis found hip abductor weakness may be associated with ITB syndrome in distance runners (Mucha)
- Decreased hamstring flexibility is a risk factor for running-related injury
- Postpartum runners have decreased sagittal hip motion vs their pre-pregnancy gait
    - Authors and Provenzano hypothesize that increased levels of relaxin hormone contribute to increased mobility in lumbopelvic complex, and the hamstring compensates by becoming tighter
- As pelvic PTs, we know how to assess posture, abdominal function, lumbopelvic stability, and pelvic floor function, all of which are impacted during pregnancy

    - Emerging research may clarify the effect of these factors on running performance and injury risk
- Strengths: age matched controls, self-selected shoes and running speed replicate real environment
- Weaknesses: very small study with limited power, controls didn't match n days training or mileage, didn't define terms/calculations, lack of comprehensive strength and flexibility testing

Conclusion/Summary: Preliminary research suggests that postpartum runners have some biomechanical, strength, and flexibility differences. However, we cannot assume these findings have an effect on running performance or injury risk. At this time, we cannot say that all runners should be screened for these factors before returning to or beginning to run postpartum.

Clinical Application: We cannot yet determine if screening all runners for hip strength, gait mechanics, and LE flexibility and addressing these impairments is indicated.

Discussion questions:

- I found it interesting that this study found no side-to-side difference between legs. How many of your runners have the same weakness or ROM deficits side-to-side?
- Have you noticed clinically or in the literature a relationship between hamstring flexibility and increased lumbopelvic instability?
- How do you think impaired lumbopelvic stability affects running performance?

Other References:

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