From Pre-pregnancy to Postpartum: Spatiotemporal Gait Changes during Infant Carrying

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Summary

Motherhood introduces new and significant physical demands, including frequent infant carrying. Previous research has shown spatiotemporal gait differences between separate groups of mothers and nulliparous women. However, this is the first study directly comparing two women longitudinally from pre-pregnancy to postpartum during infant carrying.

Participants completed 3 gait conditions while carrying an infant mannequin (pre-pregnancy) or their own infant (postpartum): walking unloaded, carrying in arms, and using a baby carrier. Compared to pre-pregnancy, double limb support and stride width increased, speed decreased, and stride length shortened during postpartum carrying, suggesting shifts toward strategies to promote stability. Uniform patterns across tasks may indicate fundamental effects of pregnancy rather than responses to carrying their infant.

Introduction

Motherhood is a time of tremendous change in a person's life, introducing novel daily tasks and physical demands to care for their new and helpless infant. Research has identified gait pattern differences between nulliparous women carrying infant mannequins and mothers carrying their infants [1,2]. Specifically, mothers exhibit shorter step times and longer double limb support than nulliparous women [1]. However, previous studies compared distinct groups of individuals, limiting insight into individual adaptations. This study examines gait changes over time in two postpartum women, using their pre-pregnancy data as a control.

Methods

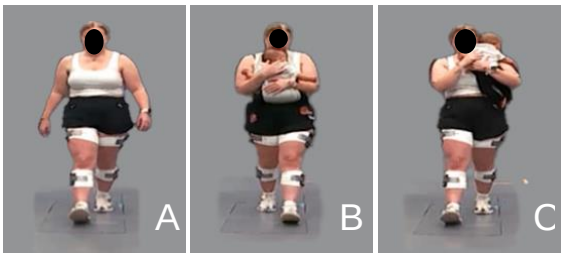

Figure 1: Gait conditions: Mother walking while unloaded (A), carrying her infant in a baby carrier (B), and carrying in arms (C).

Two healthy women participated in two data collections: pre-pregnancy (32 yrs, 1.7 ± 0.018 m, 89 ± 9.3 kg), and 3-4 months postpartum (33 yrs, 1.7 m, 92 ± 9.7 kg).

Participants performed 3 trials of overground walking at a self-selected speed for each of the 3 conditions: 1) unloaded (Figure 1A), 2) using a soft-structured baby carrier (Figure 1B), and 3) holding in arms (Figure 1C). In pre-pregnancy trials, participants held an infant mannequin (6.7 kg). Postpartum, participants held their infants (7.1 ± 1.1 kg, 18 wk).

Reflective markers tracked 3D motion (150 Hz) and were filtered using a low-pass Butterworth filter. Spatiotemporal gait variables were calculated and expressed as percentage change from pre-pregnancy to postpartum.

Results and Discussion

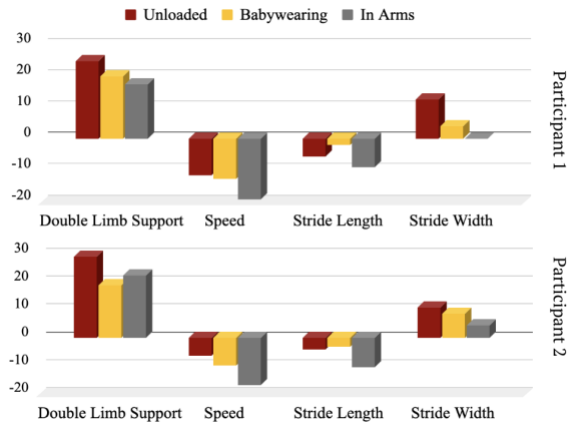

Figure 2: Percent change in spatiotemporal gait variables from pre-pregnancy to postpartum.

Consistent with previous findings [1], double limb support time increased postpartum across all conditions. Interestingly, both participants exhibited the largest increases in the unloaded condition. Walking speed consistently decreased [2] with concomitant changes in stride length. Carrying in arms resulted in the largest changes in these variables. Stride width also increased, particularly in unloaded conditions. Generally, a more cautious, controlled gait pattern that favors stability was observed postpartum. Some gait adaptations may be fundamental effects of pregnancy rather than distinct responses to carrying a load. Interestingly, carrying an infant - whether in arms or a carrier - appeared to have either mitigating or enhancing effects on these adaptations that require further investigation.

Conclusions

By focusing on intra-individual comparisons, we identified gait changes from pre-pregnancy to postpartum, offering new insight into biomechanical adaptations during infant carrying.

References

[1] Havens et al. (2024) *J Appl Biomech* **40**(2) 105-111.
[2] Juanquiera et al. (2015) *Gait Posture* **41**(3) 841-6.