EFFECT OF PARITY ON PELVIC MOTION AND TEMPOROSPATIAL CHARACTERISTICS DURING WALKING

Wendy Gilleard
Southern Cross University, Lismore Australia; email: wendy.gilleard@scu.edu.au

INTRODUCTION
Biomechanical effects of pregnancy may continue and then influence any subsequent pregnancies. Adaptations may also vary with parity [1]. The aim of the study was to investigate the effect of a first and then later pregnancy on pelvic segment range of motion (ROM) around the vertical, anterio-posterior and medio-lateral axes, velocity, step width and stride length during walking at a self selected self determined natural speed.

METHODS
One nulliparous subject was initially tested twice. For two subsequent pregnancies, test sessions were conducted at 18 weeks or less, 24 weeks, 32 weeks and 38 weeks gestation and at 8 weeks post-birth (Maternal Sessions 1 to 5). For comparative purposes, 8 nulliparous and 12 control subjects were included. Control group was tested initially then re-tested 16 weeks and 32 weeks later. An 8 camera motion analysis system was used to record 3D data of the pelvic segment and force plate data under the right foot. Markers were placed on both posterior superior iliac spines, and the S4 spinous process and both lateral ankle malleoli. The first test session was considered to be a familiarization session. For group data, as pregnancy is characterized by continuous changes over time, a repeated measures polynomial planned contrast was used to investigate the existence of linear trends from 24 to 38 weeks gestation. Differences between 38 weeks gestation and post-birth were examined using simple planned contrasts.

For Nulliparous, Pregnancy 1 and 2, data for each variable were graphed. For maternal group the mean ± twice the Standard Error (2SE) was calculated for each test session. For the control group the mean ± 2SE over the test sessions was calculated. Results for the effect of parity were based on graphical visual interpretation.

RESULTS AND DISCUSSION
There was no consistent pattern of change for Pelvis ROM about the medio-lateral axis for Nulliparous, and Pregnancy 1 and 2 (Figure 1). Post birth, in contrast to the Maternal group ROM increased for Pregnancy 1 and 2 (Figure 1, Table 1).

There was no consistent pattern of change for Pelvis ROM about the anterio-posterior axis for Nulliparous, and Pregnancy 1 and 2 (Figure 2). Pregnancy 2 showed a constant decreasing ROM as pregnancy progressed and no reversal Post birth similar to the Maternal group (Figure 2, Table 1). In contrast Pregnancy 2 showed a reversal Post birth.

Nulliparous Pelvis ROM about the vertical axis was similar to the Control Group (Figure 3). Pregnancy 1 and 2 showed a similar pattern to the Maternal group with a decrease in ROM over pregnancy (Figure 3, Table 1). Decreased ROM around vertical may have been a strategy to control increased angular momentum resulting from increased in lower trunk moment of inertia [3] as pregnancy progresses. For Pregnancy 1 and Maternal (Figure 3, Table 1) this continued post birth in contrast to Pregnancy 2.
Nulliparous Velocity was greater than the Control group (Figure 4). During Pregnancy 1 and 2 the pattern of change was similar to the Maternal group (Figure 4) which showed no significant trend for decrease over pregnancy (Table 1).

**Figure 4:** Velocity (ms⁻¹).

The Step Width for Nulliparous was similar to the control group (Figure 5). Throughout Pregnancy 1 and 2 there was a increase in Step Width with a reversal post birth similar to the Maternal group (Figure 5, Table 1). A consequence of increased step width is that the foot is more lateral with each step. The increased hip abduction moment and power in stance at late pregnancy [2] may reflect increased muscle activity to required move the larger trunk mass over the more lateral supporting leg. A secondary consequence of this may also be the reduced pelvic segment coronal plane motion seen in the present study as the higher abduction muscle activity may reduce the pelvic drop on the non supported side.

Nulliparous Stride Length was greater than the Control group (Figure 6). In Pregnancy 1 (in contrast to Pregnancy 2) the pattern was similar to the Maternal group in that there was a significant trend for decrease over the pregnancy which was resolved post birth (Figure 6, Table 1). The decrease in stride length as pregnancy progressed may have been related to the reduced pelvic rotation about the vertical axis.

**Figure 5:** Step width (cm).

**Figure 6:** Stride length (cm)

**CONCLUSIONS**

In general there was an individual response to each pregnancy indicating a potential effect of parity. However the results also indicated that each women’s mechanical response to pregnancy and resolution post birth differs. The carry over effect from previous pregnancy may be less important than the differences in adaptations by an individual.

**REFERENCES**


<table>
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<tr>
<th>Variable</th>
<th>Over Pregnancy</th>
<th>38 wks vs post</th>
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<tr>
<td></td>
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<tr>
<td><strong>Pevic Segment ROM (°)</strong></td>
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<td>Medio-lateral axis</td>
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<td>Velocity (ms⁻¹)</td>
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<td>Step width (cm)</td>
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<td>Stride length (cm)</td>
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</table>

* significant linear trend at p ≤ 0.05
* significant difference between 38 weeks and Post-Birth at p ≤ 0.05

Table 1: Repeated measure ANOVA F values for linear trends over pregnancy and F values for differences between 38 weeks gestation and post-birth.