INTRODUCTION

Pregnant women have been found to have lower upper extremity strength than non-pregnant women (Masten and Smith, 1988). Similarly, decreases in strength have been demonstrated in women after compared to before pregnancy (Treuth et al., 2005). These findings have important implications for the safety of pregnant women as well as for job assignment. The objective of this study was to compare strength in handgrip, back extension and quadriceps muscles in pregnant women and paired controls.

METHODS AND PROCEDURES

Twenty women were recruited and tested at the beginning of the second trimester of pregnancy, at 14.8(1.7) weeks. They were paired with 20 non-pregnant women of childbearing age according to height and weight (Table 1).

All measurements were performed using the same equipment and protocol as in Wang et al. (2005). Maximal power grip was determined with a hand held dynamometer (Preston). For back strength, the participants sat in the Isometric Trunk Ergonomic Chair in a semi-kneeling posture and pulled back against two load cells connected to two straps attached to a harness (Figure 1). The straps were attached at the level of T9. For quadriceps strength, the participant sat on a plinth with both knees bent to 90° and with a 1338N load cell connected above the ankle of the dominant leg. The participant was asked to contract her quadriceps muscles gradually and maximally in an attempt to extend her lower leg and pull against the load cell.

For all strength measurements, the participants performed three trials after some practice, and the highest value among the three trials was recorded. Correlations and Student t-tests were calculated for each variable of interest to compare the two groups.

Figure 1: The Isometric Trunk Ergonomic Chair Used for Testing Back Extensor Strength.

RESULTS

The groups were almost perfectly matched for height and mass ($r>0.98$, $p<0.005$), Table 1. The pregnant group was slightly older than
the non-pregnant group, but the difference did not reach significance.

Strength was lower for the pregnant group on all measures (Table 1). The difference between the two groups reached significance for the two measures of back strength (over 30%) and for quadriceps strength (over 24%), but not for handgrip (~10%), Table 1.

DISCUSSION

The results of this study are consistent with previous data from the literature (Treuth et al. 2005) showing a decrease of strength associated with pregnancy, except for handgrip where no significant difference between the groups was found in this study contrary to Masten and Smith (1988). Small changes in grip strength were also mentioned by Morrissey (1998). This could be caused by a lack of statistical power due to a smaller sample for this parameter (14 subjects instead of 20), or reflect a true lack of difference.

SUMMARY

In this study, 20 women in the early second trimester of pregnancy were paired with 20 non-pregnant women by height and weight. Grip strength, back extensor strength (sitting) and quadriceps strength were measured for the two groups. Strength was significantly lower for the pregnant group for back strength (by over 30%) and quadriceps strength (~25%).

REFERENCES


ACKNOWLEDGEMENTS

This study was funded by a grant from Canada NSERC-CHRP 238002-2000.

<table>
<thead>
<tr>
<th></th>
<th>Pregnant N = 20</th>
<th>Non-pregnant, N = 20</th>
<th>Correlation R (p)</th>
<th>p for t-test difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>28.6 (4.56)</td>
<td>26.1 (4.67)</td>
<td>-.08(.74)</td>
<td>.12</td>
</tr>
<tr>
<td>Height (m)</td>
<td>1.65 (.06)</td>
<td>1.65 (.06)</td>
<td>.99(.00)</td>
<td>.74</td>
</tr>
<tr>
<td>Mass (kg)*</td>
<td>61.57 (6.64)</td>
<td>61.38 (6.48)</td>
<td>.98(.00)</td>
<td>.53</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>22.78 (2.72)</td>
<td>22.72 (2.66)</td>
<td>.98(.00)</td>
<td>.63</td>
</tr>
<tr>
<td>Grip strength (N)</td>
<td>246.65 (47.26)</td>
<td>273.49 (72.91)</td>
<td>.54(.04)</td>
<td>.13</td>
</tr>
<tr>
<td>Max Back Moment (Nm)</td>
<td>98.41 (33.51)</td>
<td>141 (24.08)</td>
<td>.11(.64)</td>
<td>.00</td>
</tr>
<tr>
<td>Back strength (N)</td>
<td>477.02 (132.94)</td>
<td>716.82 (106.18)</td>
<td>.28(.22)</td>
<td>.00</td>
</tr>
<tr>
<td>Quadriceps strength(N)</td>
<td>404.26 (118.19)</td>
<td>534.19 (138.11)</td>
<td>.41(.07)</td>
<td>.00</td>
</tr>
</tbody>
</table>

*For pregnant women, this is the pre-pregnancy mass,
**N = 14 for grip strength due to missing data for the pregnant group.

Table 1. Demographic and strength data for the two groups. Means (SD) in the first two columns.