THE IMPACT OF ANTHROPOMETRIC CHANGES AND PHYSICAL ACTIVITY ON DYNAMIC BALANCE DURING PREGNANCY

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INTRODUCTION

Anthropometric changes and physical activity (PA) are potentially two aspects that influence balance changes during pregnancy [1, 2]. Understanding balance changes is important, as falls are one of the leading mechanisms of accidental injury throughout pregnancy [2]. Currently few studies that have examined how anthropometric changes impact balance so we have a limited understanding of what mechanisms contribute to increased fall risk. Most studies up to this point have focused on correlating fall risk to gestational age (GA) without examining the underlying factors that contribute to dynamic balance. Therefore, the purpose of this study was to compare GA, anthropometric changes, and PA as potential correlates to balance changes in pregnancy.

METHODS

We have currently completed monthly testing (from second trimester of pregnancy through birth) and data analysis for 6 participants (average age of 27.75). Participants walked at a self-selected pace on a level treadmill for 60 seconds with 48 retroreflective markers taped to bony landmarks and segments [3]. A 10-camera motion capture system (Motionanalysis Corp., Santa Rosa, CA) captured marker movement at 100 Hz and low-pass filtered at 6 Hz. The 60-second capture was split into individual gait cycles and body center of mass (COM) was calculated using a 13-segment anthropometric model. Measures of COM motion with respect to the base of support (BOS) were used as dependent measures of balance. Anthropometric data were collected at each testing session [4] and used as independent variables along with GA. Waist circumference (WC) and body mass were used to find the change in weight distribution. To represent PA, a pedometer (Omron HJ-720itc) was worn for 4 days after testing and averaged into steps/minute.

Each independent variable was statistically analyzed using a stepwise multiple regression analysis in SPSS v23 so the correlation of independent variables could be compared.

RESULTS AND DISCUSSION

WC and body mass index (BMI) appear to have the greatest correlation to most accepted dynamic balance factors (Table 1). The following balance measures have positive correlations with WC and BMI: center of mass (COM) medial-lateral (ML) excursion, maximum COM ML velocity, and step width. These indicate that balance diminishes as WC and BMI go up. The positive correlation to minimum COG to rear foot border indicates that balance in the posterior direction is not necessarily a concern.

PA had little to no correlation to balance and other independent variables. This may alternatively suggest that our measure of PA may not have been accurately capturing physical abilities and/or exercise involvement. Additionally, GA alone had less of a correlation to balance than the correlation of WC and BMI. While the direct correlation does not indicate a strong relationship in the case of either GA, WC, or BMI and dynamic balance, a combination of anthropometric factors correlate well with balance during pregnancy.

CONCLUSIONS

Our results combine to show that certain anthropometric changes may be a better, or different, indicator than GA for balance changes. Physical activity may still correlate with dynamic balance, but our findings do not indicate this. Future investigations into this relationship will likely require more comprehensive methods of PA assessment in addition to examining other potential correlates to balance changes.

REFERENCES


ACKNOWLEDGMENTS

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Table 1. Stepwise multiple regression. Subscripts indicate alphabetical order of stepwise regression for each dependent variable.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Pearson Correlation Coefficient</th>
<th>Stepwise Multiple Regression</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Days to Birth</td>
<td>Waist circumference</td>
</tr>
<tr>
<td>COM ML excursion (mm)</td>
<td>-0.277 *</td>
<td>0.312 d</td>
</tr>
<tr>
<td>Max COM ML Velocity (mm/s)</td>
<td>-0.260 *</td>
<td>0.338</td>
</tr>
<tr>
<td>Min COG to R rear foot border (mm)</td>
<td>-0.430 d</td>
<td>0.496</td>
</tr>
<tr>
<td>Min COG to R fore foot border (mm)</td>
<td>0.229 *</td>
<td>-0.207 d</td>
</tr>
<tr>
<td>Step width (mm)</td>
<td>-0.246 *</td>
<td>0.342</td>
</tr>
</tbody>
</table>

R-value | P-value |
---      | ---     |
0.371   | < 0.001 |
0.483   | < 0.001 |
0.682   | < 0.001 |
0.434   | < 0.001 |
0.538   | < 0.001 |