FREEZING OF GAIT OR AXIAL RIGIDITY?
UNDERSTANDING THE COORDINATIVE NATURE OF EN-BLOC TURNING IN PARKINSON’S DISEASE

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PURPOSE
To investigate axial coordination in PD patients with FOG and those with severe axial rigidity while turning

HYPOTHESIS
PD patients with FOG and those with severe axial rigidity will present similar en-bloc axial coordination while turning

KEY FINDINGS
PD patients with FOG and those with severe axial rigidity presented similar en-bloc axial coordination while turning

Background
- En-bloc coordination is characterized by reduced spatial and temporal separation between axial segments (head, shoulders, pelvis) during body rotations
- Individuals with Parkinson’s disease (PD) present preplanned and reactive changes in axial body segment coordination during preplanned and reactive changes in axial body segment coordination during preplanned and reactive changes in axial body segment coordination during preplanned and reactive changes in axial body segment coordination during preplanned and reactive changes in axial body segment coordination during
- Groups: PD-FOG (n=13), PD-FOG and neck rigidity (n=11), PD-control (n=11)
- PD-FOG had the lowest magnitude of spatial axial separation, both compared to PD-control. PD-FOG and PD-rigid did not differ in these variables.
- Results suggested that, FOG influenced the coordination between axial segments, probably because of impaired sensorimotor feedback; whereas rigidity may influence the amplitude of axial movements probably because of reduced range of motion of axial joints.
- Given that postural robustness, as shown by reduced variability of continuous relative phase, is linked to limited use of proprioceptive feedback [3-4], FOG episodes and loss of balance may be caused by poorer perception of body displacement during turns.
- In conclusion, en-bloc movements in PD may be associated with both sensorimotor deficits and muscle hypertonicity.

Methods
- Five Optotrak® cameras tracking rigid bodies used to create two digitized markers in each segment
- Turning onset of each segment was defined using a method described by Hollands et al.[5]
- Groups: PD-FOG (FOG and neck rigidity ≤ 2), PD-rigid (no FOG and neck rigidity score ≥ 3), PD-control (neck rigidity score ≤ 2 and no FOG) (see Table 1)
- Ten 180° turning trials (5 left and 5 right sides)
- Axial coordination between segments: Head-Shoulders; Shoulders-Pelvis; Head-Pelvis
- Dependent variables:
  Spatial: Maximum separation between segments (°)
  Spatiotemporal: continuous relative phase (°) [6], continuous relative phase variability (°) and turning speed (°/second).

Results
Table 1- Participants’ demographics

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>AGE (years)</th>
<th>UPDRS-III</th>
<th>Neck rigidity (0-3)</th>
<th>3MS (0-100)</th>
<th>FOG Influence</th>
</tr>
</thead>
<tbody>
<tr>
<td>PD-FOG</td>
<td>73.0 ± 9.4</td>
<td>55.2 ± 15.8</td>
<td>≤ 1.5</td>
<td>90.3 ± 0.5</td>
<td>0</td>
</tr>
<tr>
<td>PD-rigid</td>
<td>72.1 ± 11.5</td>
<td>63.5 ± 16.6</td>
<td>≤ 1.5</td>
<td>90.0 ± 0.5</td>
<td>0</td>
</tr>
<tr>
<td>PD-control</td>
<td>27.7 ± 15.5</td>
<td>67.2 ± 16.5</td>
<td>≤ 0.8</td>
<td>91.4 ± 0.8</td>
<td>0</td>
</tr>
</tbody>
</table>

Key References