Wheelchair seating principles used to optimise driver performance in SCI.

Action Research demonstrated through Case Studies.

By Caroline Rule  (BSc Occ Ther)
Rolling Rehab
May 2018
WFOT Congress
New drivers

- Lose balance on right turns
- Unable to transfer strength to steering wheel ↓ trunk stability

Experienced drivers

- Develop compensation techniques
- Are these adequate in emergency situations?

Seating principles → Impact → Convince
Goals and principles of wheelchair seating
- similar to seating goals for driving

1. **Stabilise Pelvis**
   - Stop sideways movement
   - Prevent sliding forwards

2. **Stabilise spine**
   - Stop sideways collapse
   - Stop slumping

3. **Tilt in space**
   - Improve stability
   - Counteract gravity
   - Align head in space

4. **Steering wheel**
   - Transfer of strength
   - Improved balance

---

Stabilising Interventions used in vehicle

**Stabilise pelvis**
- CG Lock,
- Wedge cushion

**Stabilise spine**
- Bodypoint Chest strap

**Tilt in Space**
- Wedge cushion
- Reclined backrest

Signed Consent obtained for use of photos and videos from all participants
Testing Procedure

Round 1
Own set up

Round 2
CG  Wedge  Strap  Recline  All 4

Round 3
Own choice

Follow up
2 months

4 experienced drivers
Different levels SCI
Driving school vehicle
Tested on skid pan
Balance Test Designs

- Left & Right turns
- Braking
  - S Bends
  - Figure 8
  - Roundabout
  - Mini Circle
T12 Paraplegic – with stable trunk
Mr B C5/6 Quadriplegic

**Compensation techniques:** sits with left hip higher than right to prevent falling to left

- Using compensation techniques
- Stabilised
### Mr B Results

<table>
<thead>
<tr>
<th>Choice of interventions:</th>
<th>Comments and Observations:</th>
<th>Carry over into own car:</th>
<th>2 month follow up:</th>
</tr>
</thead>
<tbody>
<tr>
<td>All 4</td>
<td>Chest Strap biggest impact on performance: “I’d get speeding fines all day”</td>
<td>Uses wedge and recline in own car seat</td>
<td>No changes to position.</td>
</tr>
<tr>
<td></td>
<td>Significant improvement in performance when stable.</td>
<td>Strap only for racing.</td>
<td>Realised the importance of positioning for new drivers.</td>
</tr>
</tbody>
</table>
Mr V C6/7 Quadriplegic

**Compensation techniques:** Wedged position, backrest reclined, pushes head against headrest to stabilise self on corners.

**Using compensation techniques**  
**Stabilised**
<table>
<thead>
<tr>
<th>Choice of interventions:</th>
<th>Comments and Observations:</th>
<th>Carry over into own car:</th>
<th>2 month follow up:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strap Wedge Recline</td>
<td>Very competitive</td>
<td>Wedge and recline</td>
<td>Recognised benefit of using a quad spinner, recommended it to others.</td>
</tr>
<tr>
<td></td>
<td>Asked to try with quad spinner</td>
<td>(already uses it, has bucket seat )</td>
<td>Sits higher than before, less tension in shoulders</td>
</tr>
<tr>
<td></td>
<td>Strap “makes him want to race”</td>
<td>Strap “if it was easier to use.”</td>
<td>Increased wedge in seating position.</td>
</tr>
<tr>
<td></td>
<td>Significant time improvement</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Mr M – T2 Paraplegic

**Driving Position:** Far from steering wheel, backrest reclined, seat higher

**Difficulties:** Loses balance on right turns
Lacks strength when turning steering wheel at high speeds.

---

**Minimal compensation techniques**

---

**Stabilised**
<table>
<thead>
<tr>
<th>Choice of interventions:</th>
<th>Comments and Observations:</th>
<th>Carry over into own car:</th>
<th>2 month follow up:</th>
</tr>
</thead>
<tbody>
<tr>
<td>All 4</td>
<td>Very surprised and pleased with improvement in performance due to stabilising.</td>
<td>Uses tilt in car seat with reclined backrest. Strap – good for performance but not worth the effort CG lock – maybe!</td>
<td>Changed driving position. Sits closer to steering with increased recline and wedge. Has helped a lot with reducing loss of balance in car.</td>
</tr>
</tbody>
</table>
Conclusion

- Experience limitations
- Collaborate to find solutions
- Bucket seats
- Sponge wedge cushion
- Must be quick and easy to use
- Combination of positioning & stabilising
- Educate drivers with SCI
- Optimise performance
- Significant impact
Thank you

Zwartkops Raceway
Driving Ambitions
QuadPara Association
Rolling Rehab
Eugene Searle - Photographer