Push Lever Propulsion Wheelchair

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**Needs**
- 3.3 million wheelchair users in US
- Subacromial Impingement Syndrome (SAIS) – leading cause of shoulder pain due to glenohumeral joint inflammation
- Aging population – demand increase

**Benefits**
- Reduces pain- and fatigue-induced SAIS caused by compressive forces of current models
- Increase ease of use and quality of life
- Cost effective ($800)
  - NuDrive (competitor) - $2000

**Market**
- Pushrim Propulsion
  - Mechanically inefficient
  - High risk of upper-extremity injuries
- Push Lever Propulsion
  - Additional weight of 14kg
  - Requires whole wheelchair purchase

**Current State**
- Cheaper, lighter, better alternative to current options
- Simple design
- Can be attached to existing manual wheelchairs
- A rowing motion in the sagittal plane will reduce the moment on the glenohumeral joint the most

**Constraints**
- Weight < 6.8 kg
- Minimum door width – 36”
- Compatibility with K3 wheelchair – market as a wheelchair attachment
- RESNA: WC-1 Wheelchairs - Volume 1

**Value**
- Improves efficiency and ease of use
- Reduces productivity loss (wages)
- Reduce costs of:
  - Presurgery Costs (Physical therapy, Pain Medications, Braces)
  - Shoulder arthroscopy - $8000 with 3 month recovery
  - Open surgery - $18,000 with 6 month recovery
  - Arthroplasty - $21,000 with 9 month recovery

### Technique vs. Work Done by Shoulder

<table>
<thead>
<tr>
<th>Technique</th>
<th>Work Done by Shoulder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pushrim</td>
<td>0%</td>
</tr>
<tr>
<td>Push Lever</td>
<td>25.5%</td>
</tr>
<tr>
<td>Rowing (Transverse)</td>
<td>-59.0%</td>
</tr>
<tr>
<td>Rowing (Sagittal)</td>
<td>-61.7%</td>
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</tbody>
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