



Sport Wheelchair Installation Workshop

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Push Optimization Study 2015-2016



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What We Knew...



- Changes in chair installation have...
 - **Some effect on pushing performance**
 - Some effect on shooting performance
 - Some effect on turning performance
 - Some effect on health



Research Project...



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- Determine the effect of changing your chair setup on performance and health factors

Orientation Week

1. Measure current setup
2. 5-5-30 Push test



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BASELINE

Chair Measurement Checklist

Athlete Name:

Metric	Value	Notes
Chair Name		
Wheel Size (")		
Axle Camber (o)		
Seat Width (")		
Wheel-Wheel Distance (")		
Wheel Base (")		
Seat Depth (")		
Centre of Gravity (")		
Rear Seat Height (")		
Front Seat Height (")		
Seat Angle (o)		
Back Rest Height (")		
Back Rest Angle (o)		
Foot Rest Length (")		
Foot Rest Vertical Position Front (")		
Foot Rest Vertical Position Back (")		
Foot Rest Horizontal Position (")		
Foot Rest Angle (o)		
Chair Mass (kg)		
Wide Axle?	Y/N	
General Comments:		



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Project...

Research Week:

1. Set up Adjustable Chair
2. 50% Max Speed
3. 80% Max Speed
4. 5push
5. 5push
6. 30push



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Configurations 2015-2016:



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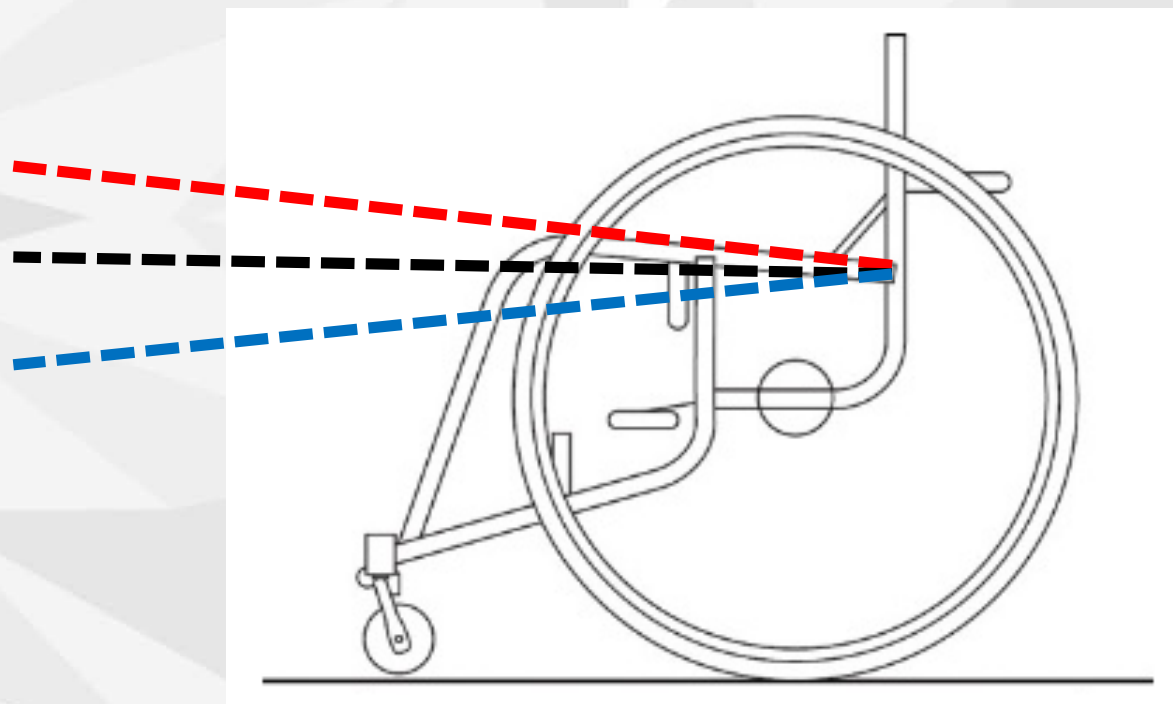
- **Seat Dump Angle**
- CoG
- Wheel Width

Project...

Configurations:



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$\pm 5^\circ$

Configurations 2015-2016:



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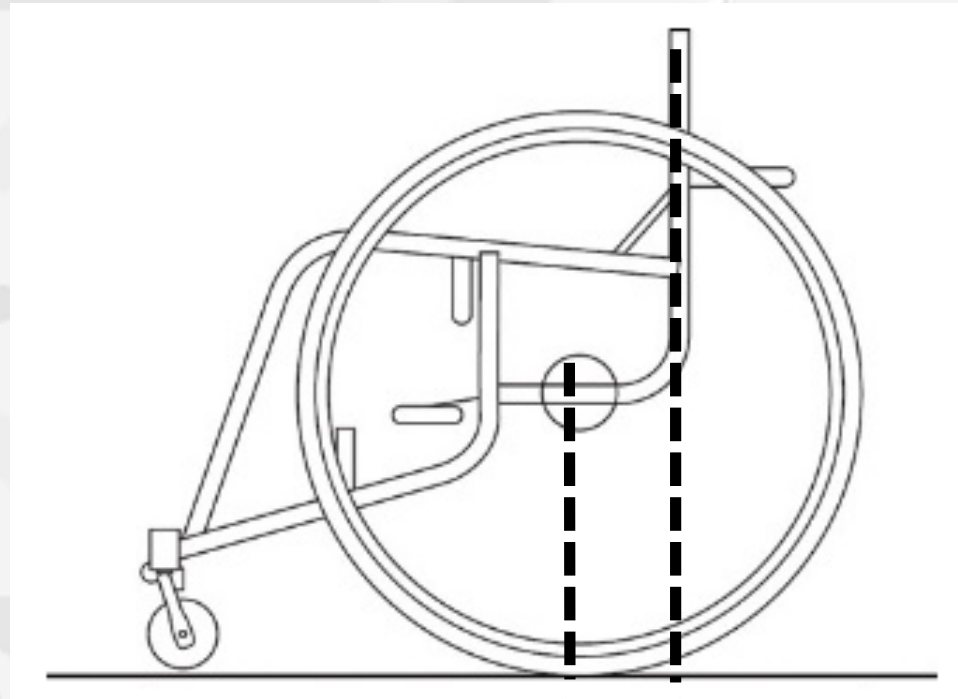
- Seat Dump Angle
- CoG
- Wheel Width

Project...

Configurations:



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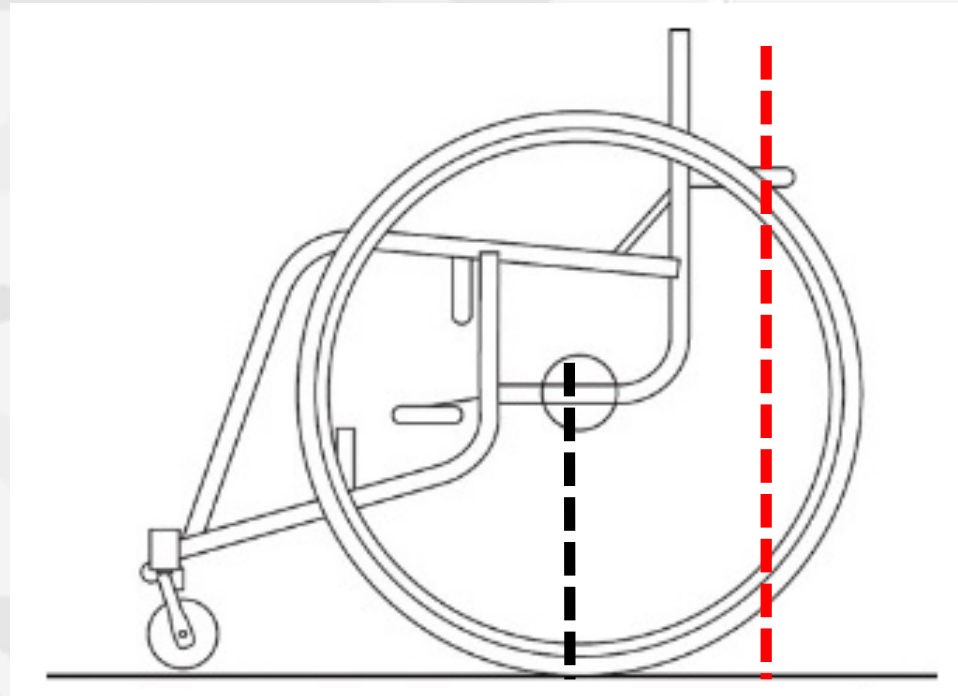


Project...

Configurations:



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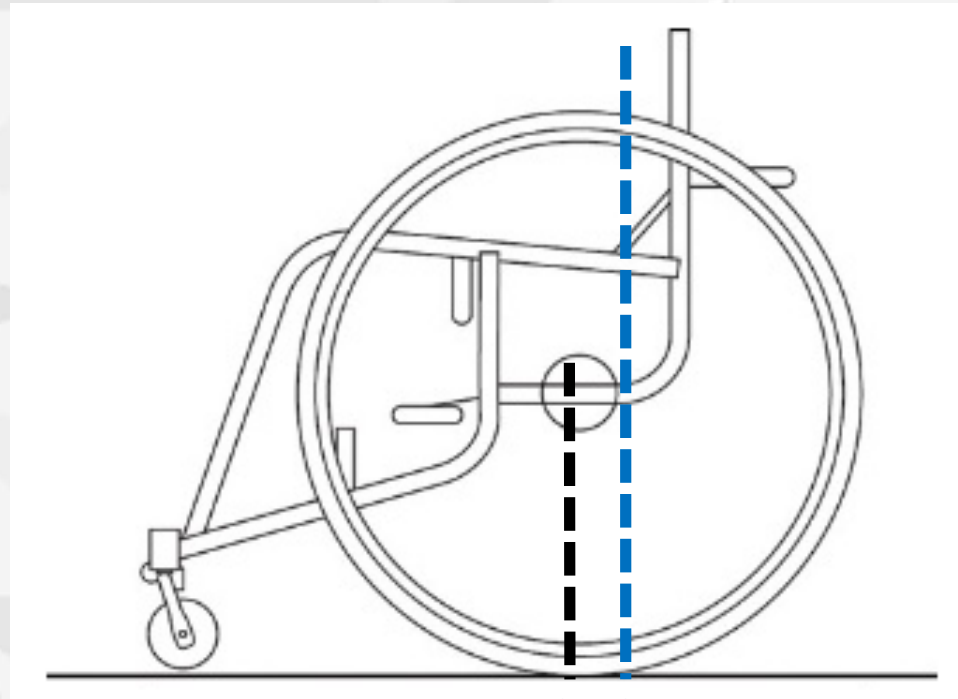
+4"

Project...

Configurations:



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-4"

Configurations 2015-2016:



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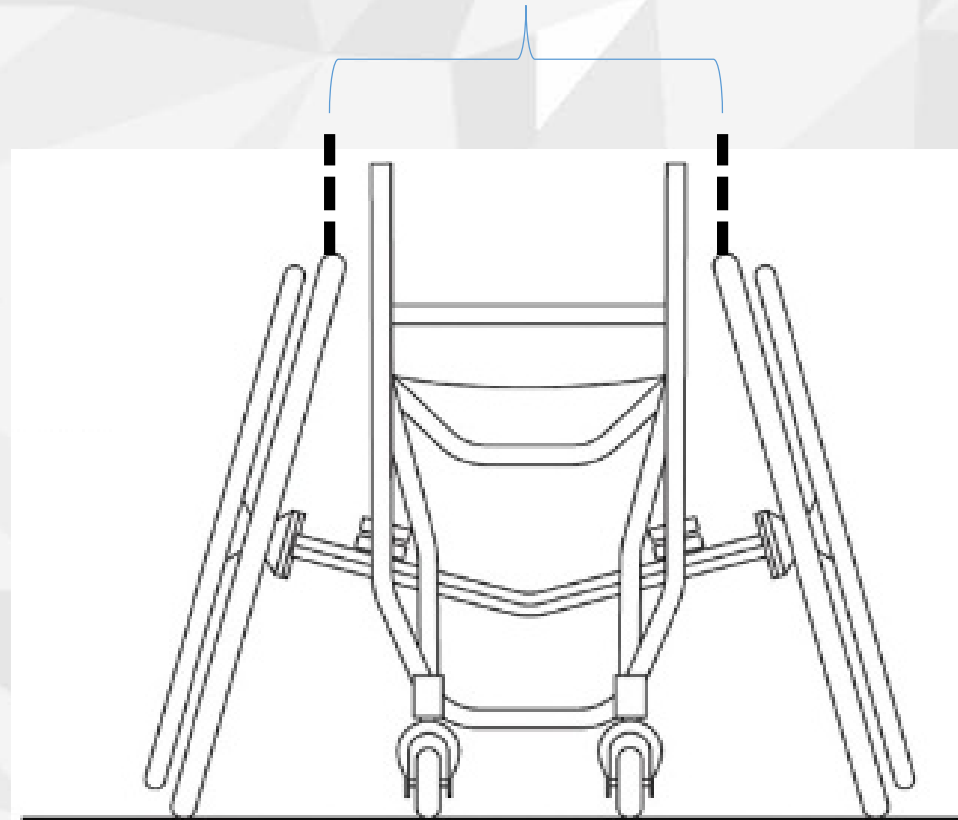
- Seat Dump Angle
- CoG
- Wheel Width

Project...

Configurations:



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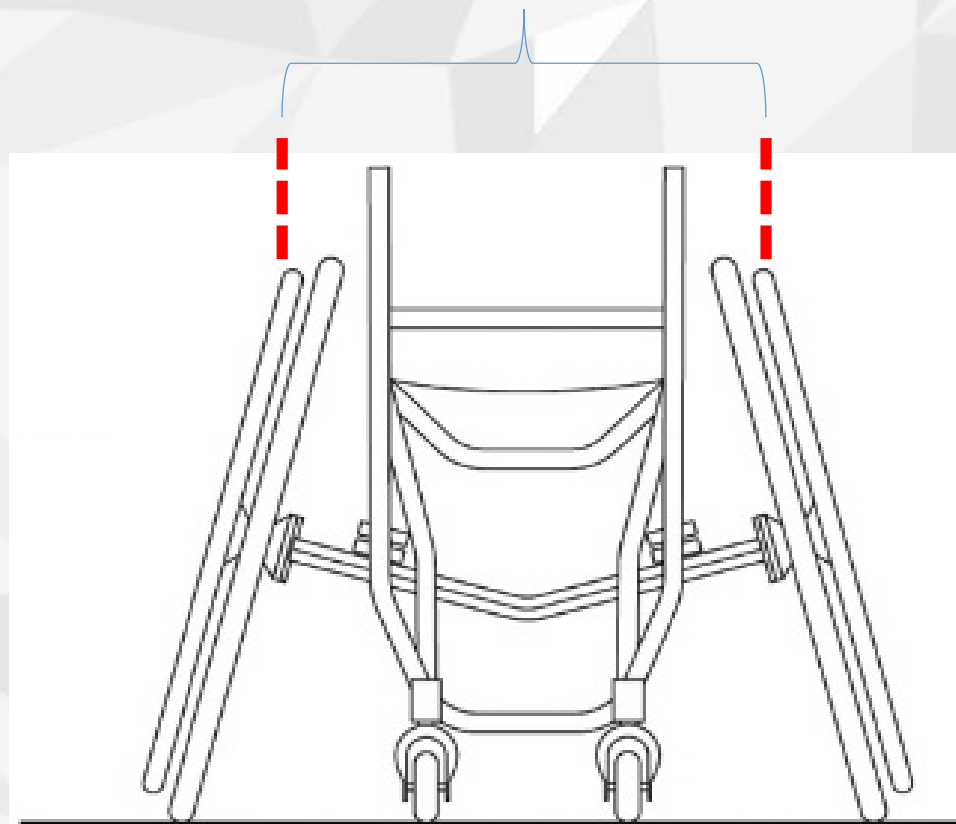


Project...

Configurations:



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+10%

Configurations 2016-2017:



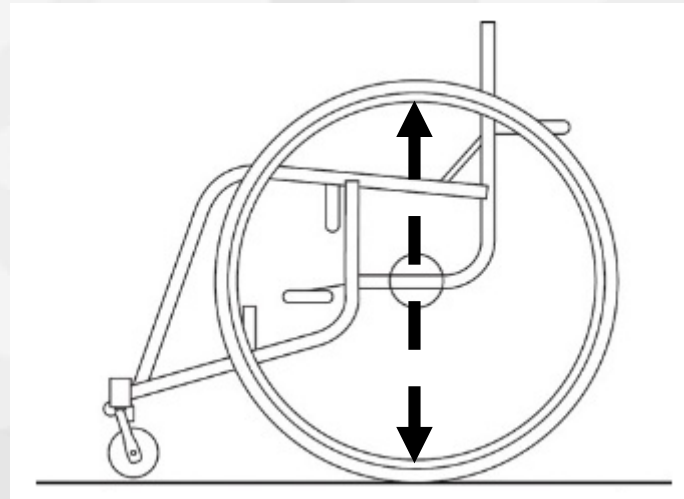
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- Rim Size
- Seat Height

Configurations:



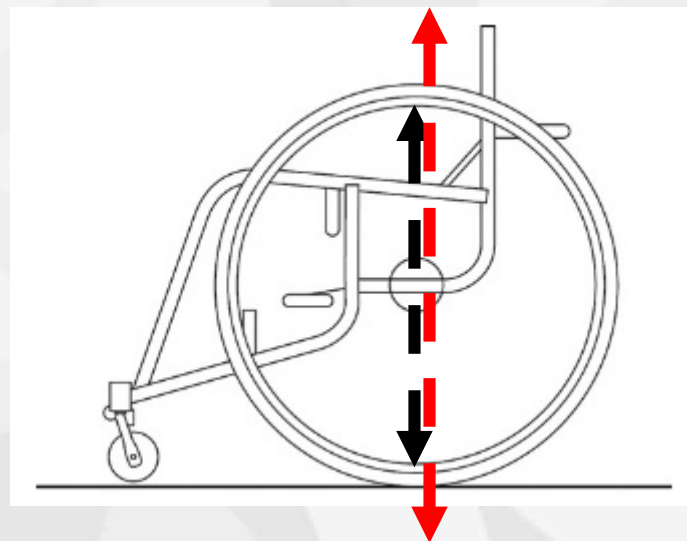
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Configurations:



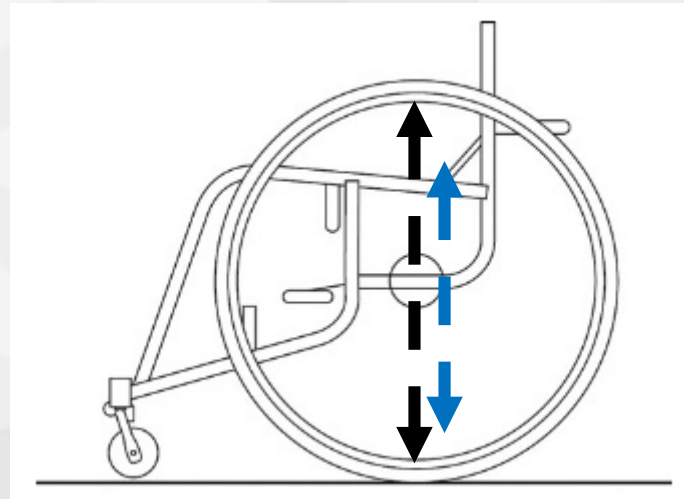
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Configurations:



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Configurations:

- Rim Size
- **Seat Height**

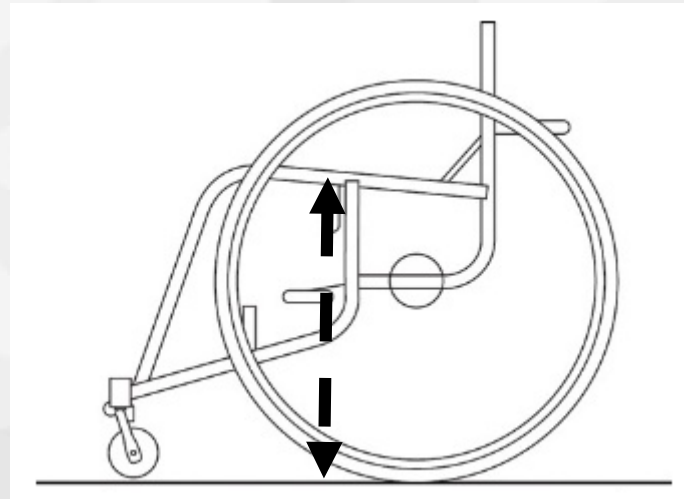


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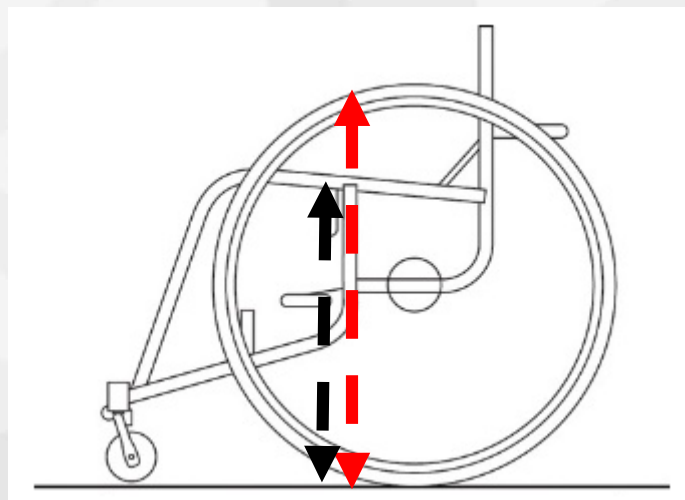
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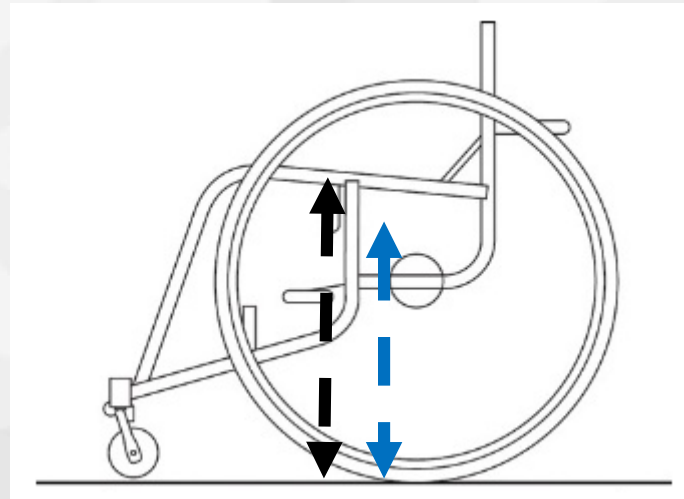
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Configurations:



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Case Study



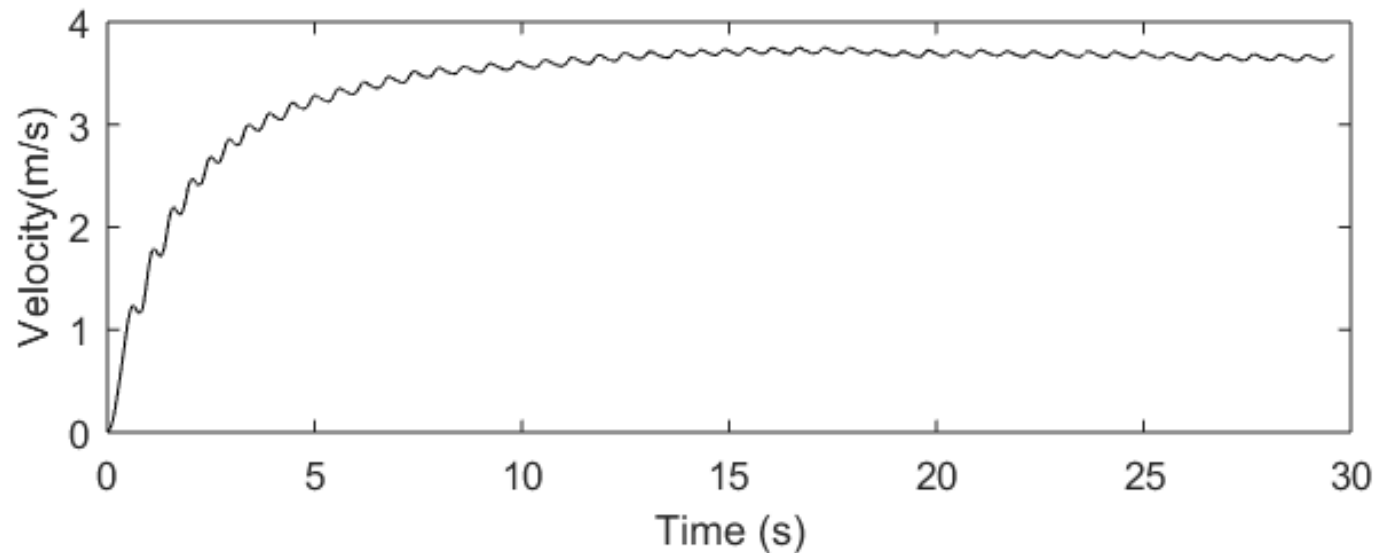
- Athlete X feels more stable/comfortable in ball chair with more Dump
 - How do they perform?
 - How have their joint loads changed?

Research Project...



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- Determine the effect of changing your chair setup on performance and health factors
 - Speed and Distance Covered
 - Joint Loading and Forces

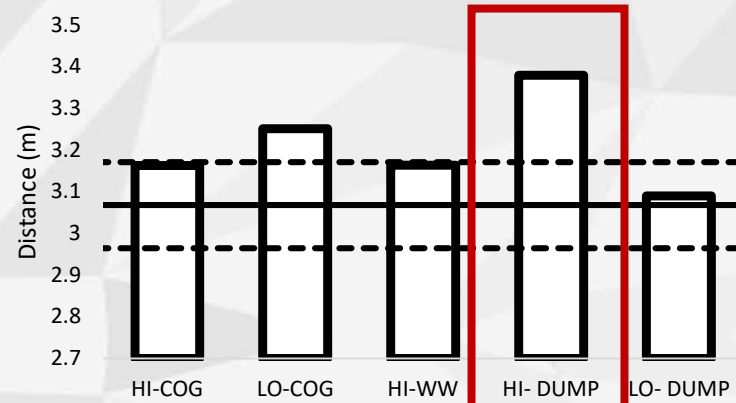


Case Study

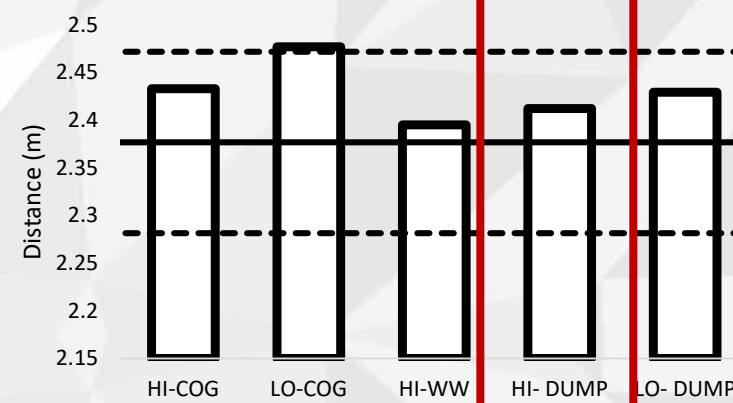


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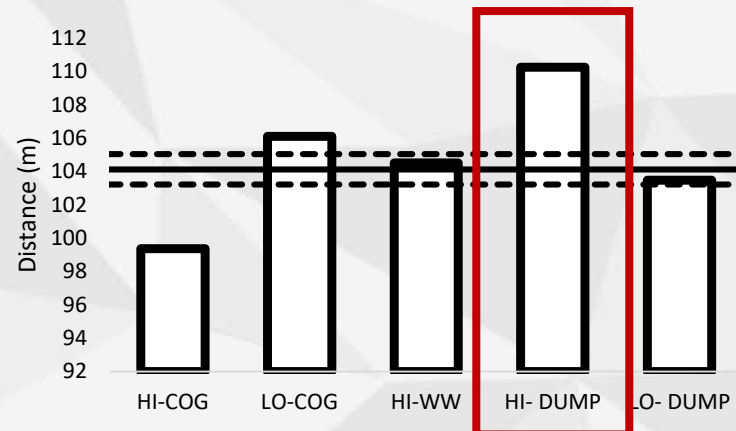
Distance Covered After 3 Pushes



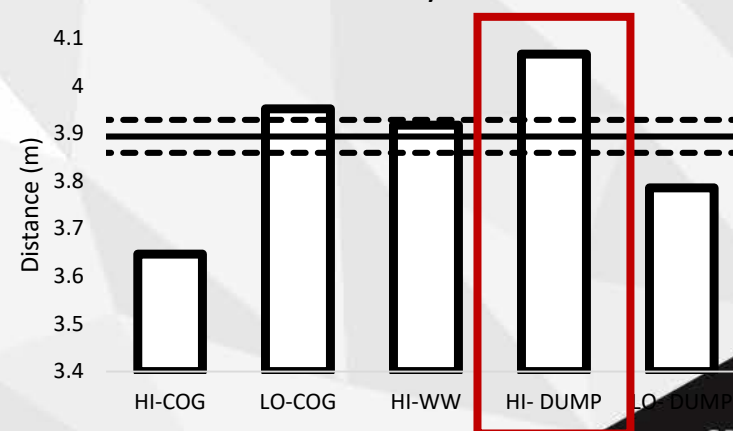
Velocity After 3 Pushes



Distance Covered- 30s



Peak Velocity- 30s



Case Study



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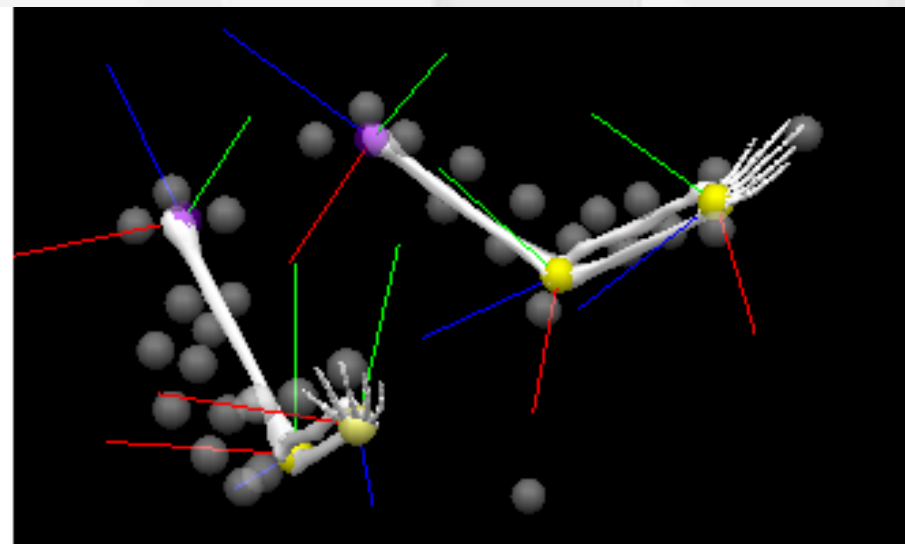
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Research Project...



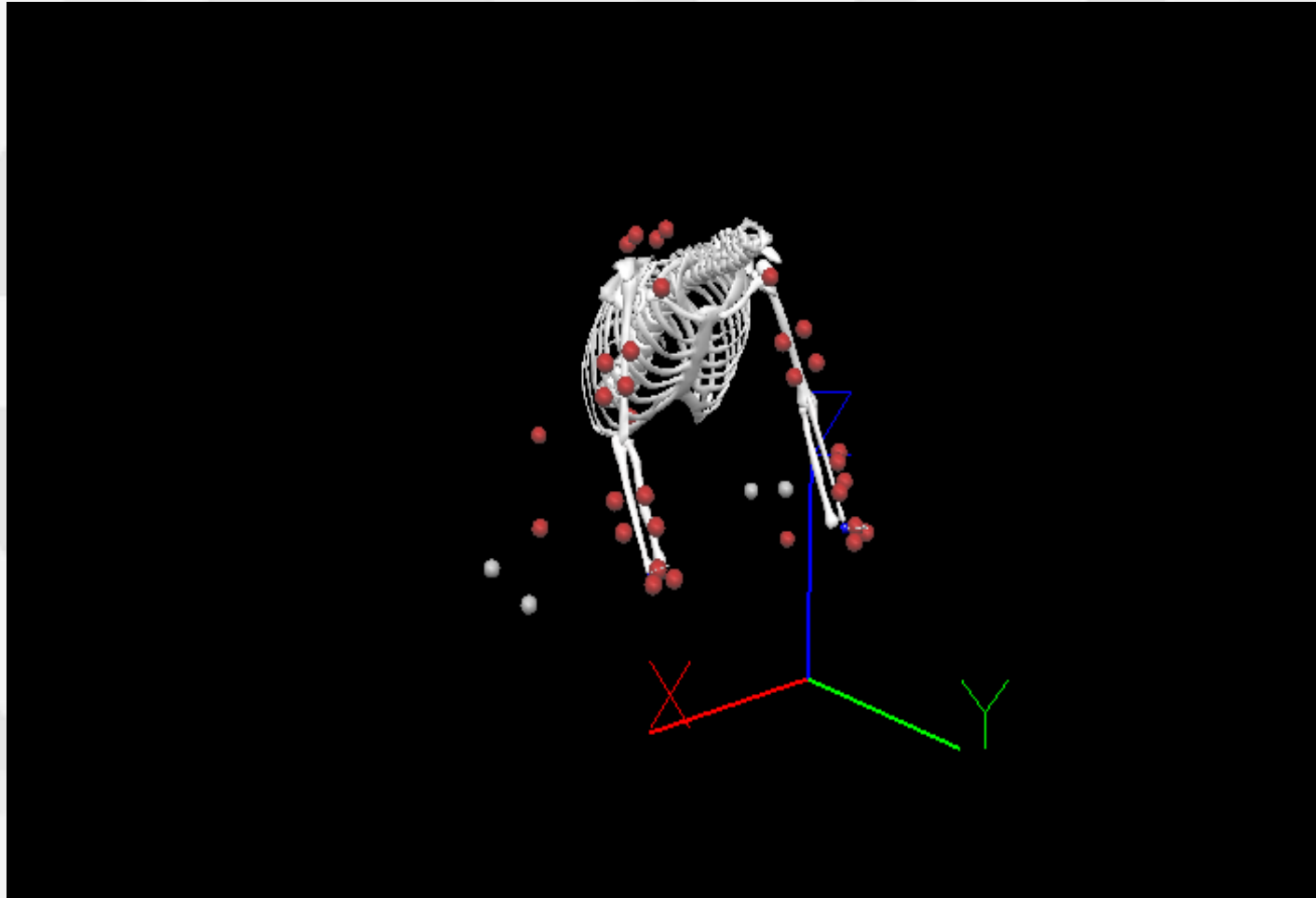
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- Determine the effect of changing your chair setup on performance and health factors
 - Speed and Distance Covered
 - **Joint Loading and Forces**





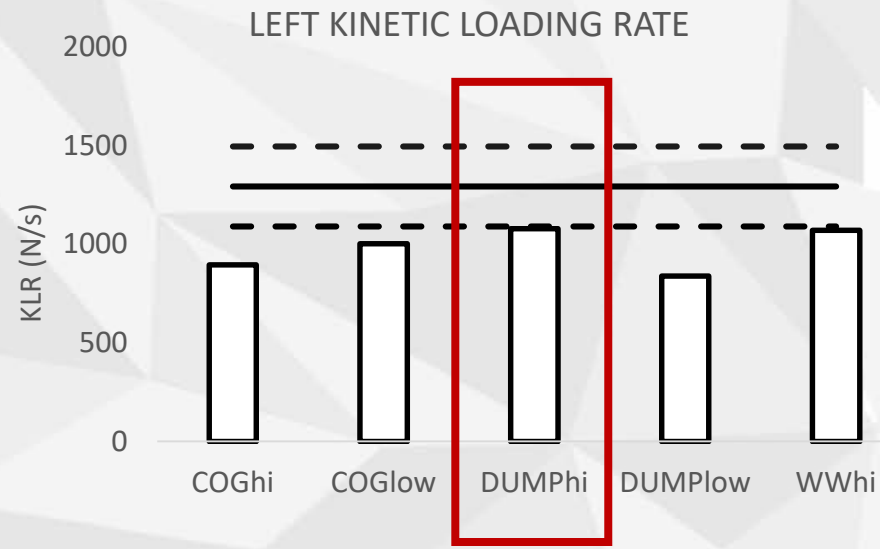
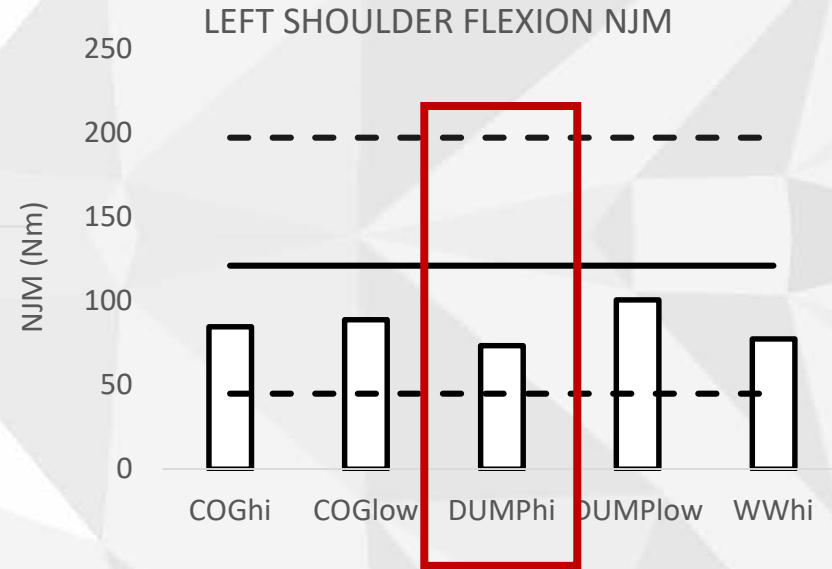
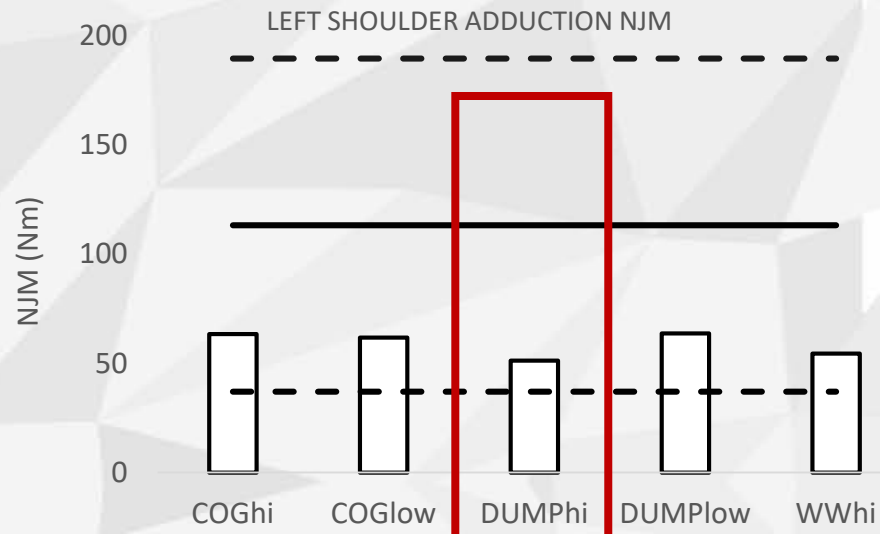
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Data...



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Data...

- Athlete comfort
- Better Performance
- Less Loading
- Other consideration
 - Shooting/Rebounding
 - Pivoting
 - Turning
 - Etc.



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Make the Change!

Conclusions...



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- For the Group
 - Mostly performed just as well in current setup as with changes
 - Small trends for:
 - Higher COG covering less distance in 3 pushes
 - Low COG covering more distance in 30s
 - Low COG faster peak velocity
 - Higher DUMP less shoulder loading

Highly Individual

... informs chair design for new athletes



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Study Limitations

- Athlete Load
- Relative to existing chair installation
- Other sport demands
- Independent chair parameters



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Future Directions

- Modeling & simulating chair installation
- Ongoing validation of model



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QUESTIONS

- Thank you



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